## Annex 2. Feasibility Study

**Programme title:** Ecosystem-based Adaptation in the Indian Ocean (‘the Programme´)

**Programme Duration:** 10 years

**Accredited Entity:** Agence Française de Développement (AFD)

**Executing Entity:** Critical Ecosystem Partnership Fund (CEPF)

**Countries:** Comoros, Madagascar, Mauritius, Seychelles

**Document Date:** 1 April 2020

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# 1. Introduction

Island developing states are extremely vulnerable to climate change. Ecosystem-based Adaptation (EbA) is highly relevant to island developing states due to their high reliance on ecosystem services. EbA encourages conservation, improved management and restoration of ecosystems to provide the essential services that people need to adapt to climate variability. The Critical Ecosystem Partnership Fund (CEPF)[1] supports Civil Society Organizations (CSOs) to conserve critical ecosystems in biodiversity hotspots. AFD, a donor to CEPF, proposes through the Programme to expand CEPF's current focus on biodiversity conservation to prioritize EbA outcomes in a pilot hotspot region: Madagascar and the Indian Ocean Islands. The Programme will work in four island nations where CEPF has existing CSO networks and current grant portfolios: Comoros, Madagascar, Mauritius and Seychelles.

A fundamental purpose of CEPF is to engage civil society, such as community and indigenous groups, nongovernmental organizations (NGOs), academic institutions and private enterprises, in ecosystem conservation in the hotspots. To guarantee their success, these efforts must complement existing strategies and programs of national governments and other conservation funders. To this end, CEPF promotes working alliances among diverse groups, combining unique capacities and reducing duplication of efforts for a comprehensive, coordinated approach to conservation. One way in which CEPF does this is through preparation of an Ecosystem Profile for each hotpot. The Ecosystem Profile articulates a shared strategy for action, developed in consultation with local stakeholders, that lays out a multi-year investment plan for CEPF, informed by a detailed situational analysis. Development of updated ecosystem profiles that identify the priorities for EbA is an essential part of Component 1 of the Programme. While the ecosystem profiling process will provide opportunity for more detailed engagement with the Programme stakeholders, a consultation process has already been undertaken to inform this feasibility study and the Programme design. National workshops were organized in each of the Programme countries as described in Annex. 7 (Stakeholder Consultation report) and more than 150 individual stakeholders from 87 organizations and institutions provided input and feedback on the proposed Programme.

This document provides background information critical for the design of the Programme that is described in the Funding Proposal. The Feasibility Study is organized into the following chapters:

Chapter 1. Introduction

Chapter 2. Profile of the Biodiversity Hotspot and Programme countries. This chapter provides a brief overview of the geography of the region and defines the countries included within the Programme, based on their inclusion in the biodiversity hotspot.

Chapter 3. Climate and climate change. This chapter describes for each Programme country the current climate, observed changes, climate projections and presents likely impacts as they are

[1] The Critical Ecosystem Partnership Fund (CEPF) was established in 2000 as a mechanism to enable Civil Society Organizations (CSOs) to support conservation of critical ecosystems within biodiversity hotspots. CEPF is a joint initiative of l'Agence Française de Développement (AFD), Conservation International (CI), the European Union, the Global Environment Facility (GEF), the Government of Japan and the World Bank.

described in national climate change documents of the Programme countries and other published research.

Chapter 4. Biological importance of the hotspot and countries. This chapter provides key information on the biomes, habitats and associated ecosystem services.

Chapter 5. Socio-economic profile of the Madagascar and the Indian Ocean islands Hotspot.

Chapter 6. Climate change policies and strategies. This chapter provides information on the institutional, legislative and policy/strategy framework for EbA work in each of the Programme countries. The Programme seeks to support the existing national policies and strategies.

Chapter 7. Programme description and implementation arrangements. This chapter provides the same information as in the Full Proposal but is included to allow this to be a stand-alone document. Additional information is provided on staffing at the CEPF secretariat in general and for this Programme in particular.

Chapter 8. Key Biodiversity Areas and Ecosystem Services (KBA+). This chapter describes the KBA+ methodology that has been piloted for Madagascar for the identification of natural ecosystems of critical importance for ecosystem services. This methodology will be used as part of the priority setting process in Component 1 of the Programme under which the priority areas for investment will be identified through a consultative process with stakeholders.

Chapter 9. Other Ecosystem based Adaptation projects. This chapter provides information on other existing, recent and planned EbA initiatives in the Programme countries, with which the Programme will need to ensure complementarity – through avoiding duplication and finding synergies.

Chapter 10. Civil Society in the biodiversity hotspot and Programme countries. CEPF will provide funding to CSOs for EbA actions. This chapter provides an overview of the existing landscape of civil society organizations in each country and their capacity.

Chapter 11. Conclusion

In addition to this document, another important document has been provided as annex 21. This is the CEPF Operational Manual that outlines all of CEPF's policies and operating procedures. The operations manual is based on the culmination of CEPF's 20 years of experience providing grants to CSOs. The operations manual and CEPF's impact to date in the field of biodiversity conservation demonstrate CEPF's high capacity to execute the proposed Programme.

# 2. Profile of the Biodiversity Hotspot and Programme Countries

### *Madagascar and the Indian Ocean Islands Hotspot*

The island countries included within the Programme are within a recognized biodiversity hotspot – a region of very high biodiversity importance but which is extremely threatened. While the different islands of the hotspot share specific biogeographical features, they form a single unit characterized by a wide disparity in scale in terms of both land mass and human population. Madagascar, an island-continent, makes up about 95 percent of the hotspot's land area and is home to about 92 percent of the population, much larger than the three island groups of Comoros, Seychelles, the Mascarene Islands (comprising La Réunion, Mauritius and Rodrigues) and other scattered islands in the Western Indian Ocean.

The hotspot has often been considered a priority among hotspots, because of its extremely important species diversity—with about 15,000 plant species, of which more than 12,000 are endemic—and because of the high-level taxonomic endemism (i.e. endemic genera and families), which demonstrates distinct evolutionary mechanisms related to the isolation of the hotspot. The area also qualifies as a hotspot due to a very high level of degraded natural ecosystems, illustrated by the massive deforestation of Mauritius and Madagascar, and the disappearance of many higher vertebrates, like the dodo, which has become a global symbol of species extinction. In the preparation of the last CEPF Ecosystem Profile for the hotspot (CEPF, 2014), distribution data for 1,655 globally threatened species and 379 other patrimonial species (site endemics or species not yet assessed but considered endangered by experts) were used to identify 369 Key Biodiversity Areas. In addition, 13 conservation corridors were identified on mainland Madagascar, containing clusters of KBAs with biophysical homogeneity that have served to provide a geographical focus for investment during CEPF's current phase of funding 2015-2020.

While human well-being and economic development rely heavily on ecosystems, the environment of the hotspot is under immense threat. Humans have deeply disturbed ecosystems and biodiversity across the hotspot for centuries, but today enhanced anthropogenic pressures due to population growth and exacerbated by climate change seriously threaten the already degraded and often fragmented ecosystems. Deforestation and habitat loss continue at an alarming rate in Madagascar and the Comoros, mostly as a response to the need for farmland and energy for the growing local communities. Wild species are overexploited for local consumption or international markets—a situation that is especially a concern in regard to coastal resources, which provide a majority of the protein for the hotspot's people. Across the hotspot ecosystems are being degraded, impacting on the quantity and quality of the ecosystem services they are able to provide to the people that depend on them.

Civil society is already heavily engaged in the preservation of the environment in the four Programme countries, and has gained a lot of experience in developing new models for a better integration of the conservation and development challenges. Yet, the civil society landscape is still dominated by a small group of international organizations. Local and national organizations face difficulties in accessing funding and lack some capacities needed to sustain their activities. At the local scale, community engagement has proven an effective way to improve the management of natural resources and the

protection of ecosystems and biodiversity, but it is still hampered by the lack of organizational skills and continuous support that would allow success to be sustained. The Ecosystem Profile (CEPF, 2014) also highlighted the great potential for enhanced regional cooperation on conservation issues, as the civil societies of the different islands have developed complementary skills and areas of expertise that have not yet been capitalized on across the hotspot.

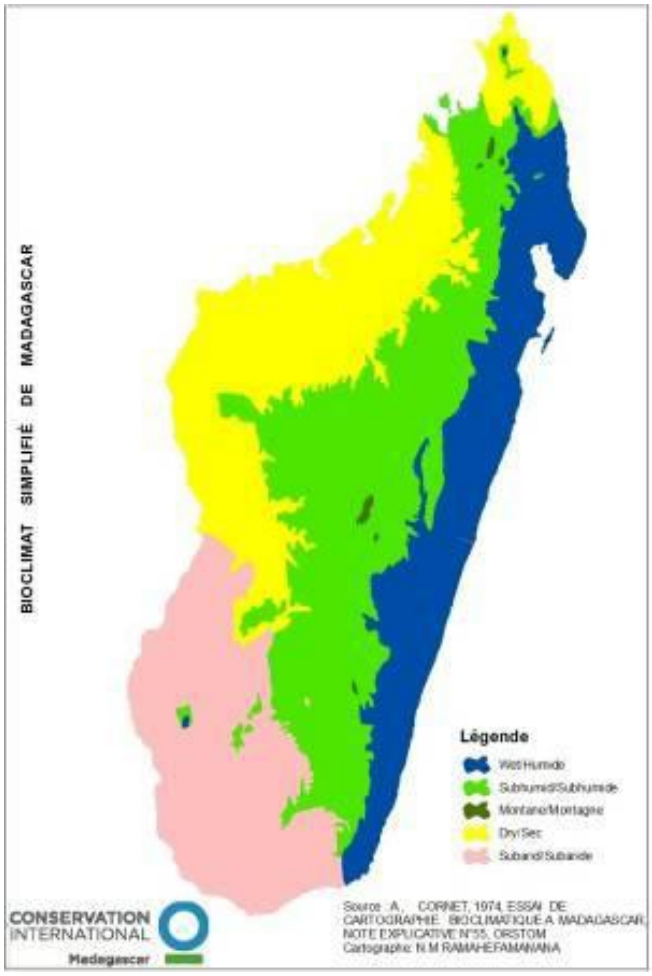
### *Geography and Geology*

The hotspot includes a large group of islands in the southwest Indian Ocean, included within a quadrangle of about 1,700 km on each side whose peaks would be located in the northern coral islands of Denis and Bird in the Republic of Seychelles, in the west for the Comoros, in the east for Rodrigues in Mauritius, and in the south, the tip of Madagascar (Figure 1). The Comoros Islands form the part of the hotspot that is the nearest to the African continent. Located off the coast of Africa by less than 300 km, Madagascar lies off the African continent at a distance of about 400 km at its narrowest point. The distance from the other land masses is even larger on the other side of the hotspot: the Seychelles are located at about 2,000 km from the Maldives and at nearly 1,700 km from the Chagos Archipelago.

*Figure 1. Map of the Madagascar and Indian Ocean Islands Hotspot*

The island of **Madagascar** covers an area of 587,041 km$^2$, extending over 1,500 km from north to south and 500 km from east to west at its widest point. The coastline stretches over nearly 5,000 km. The basal bedrock of the island is formed of a Precambrian crystalline formation which constitutes the backbone of the central highlands covering two-thirds of the territory and peaking at 2,643 meters. This bedrock has a marked asymmetry between a steep cliff overlooking the narrow eastern coastal plain, while to the west, the altitude decreases fairly steadily as you go down to the sedimentary western and southern plains. The island is influenced by the monsoon and trade winds from the east, and the presence of the central ridge causes a precipitation differential between the wetter East and the drier West. These elements are reflected in a wide variety of bioclimates: tropical warm to temperate cool, from subequatorial to marked mountain climate, from the semi-desert South to the soggy wet northeast coast (SNGDB, 2002). Five main bioclimatic zones have been identified (Figure 2): wet, subhumid, mountain climate, dry and sub-arid bioclimates (Ramananjanahary *et al.*, 2010). Each of these bioclimates corresponds to a natural formation with a fauna and flora biodiversity specific to each (SNGDB, 2002).

*Figure 2. Simplified bioclimatic map of Madagascar*



Situated 700 km west of Madagascar, **Réunion** is a 70 km long volcanic island with a northwest-southeast direction. It covers an area of 2,504 km² with a maximum altitude of 3,069 meters at the Piton des Neiges, the highest peak in the Indian Ocean. The emergence of the volcano about three million years ago is the origin of the formation of the island. Although part of the hotspot biologically, **Réunion is not part of the Programme as it is an Overseas Department and Region of France.**

**Mauritius**, also in the Mascarene archipelago, is a volcanic island formed about 8 million years ago and covering an area of 2,040 km ². It is located about 170 km from La Réunion. Its relief is less rugged than its neighbor, and reaches 828 meters at Piton de la Petite Rivière Noire. The coastline stretches over 322 km and it is almost entirely surrounded by a fringing coral reef enclosing a lagoon. The climate is tropical to subtropical, with an average annual rainfall of 2,100 mm subject to strong variations (from 750 mm to 4,350 mm, Willaime 1984 and Padya 1989). The **Rodrigues Island** is the smallest island of the Mascarene archipelago with 109 km$^2$. Lying approximately 560 km east of Mauritius, Rodrigues determines the eastern boundary of the hotspot. The island is surrounded by coral reefs which form a lagoon about double its surface area (200 km ²) and comprises 18 islets. Rodrigues has the largest caves and limestone deposits of the Mascarene islands. It has a maritime tropical climate with an average annual rainfall of 1,120 mm and a temperature averaging around 26° C in summer and 22° C in winter.

The Republic of Mauritius also includes **Agalega** Atoll with an area of 21 km², located 1,000 km north of Mauritius, and **St. Brandon** Atoll whose lagoon is comparable to that of Rodrigues (190 km²), while the land surface covers only 3 km$^2$, distributed among 55 islands.

The **Seychelles Islands** are situated to the northwest of Madagascar. The land surface covers only 455 km$^2$ but the islands are scattered over a sea area of over one million km$^2$ (the Exclusive Economic Zone covers 1.4 million km$^2$). The central archipelago (about 244 km²) is located on the "Mahe Plateau", a mainly underwater microcontinent that used to be connected to the Indian sub-continent and Madagascar before they drifted apart, about 60-65 million years ago. On this plateau are the main 42 granitic islands including Mahe (152.5 km²), Praslin (27.6 km²) and La Digue (10.1 km²), as well as Silhouette (20 km$^2$) and its satellite, North Island, formed during a more recent volcanic period (60 million years). As for the Seychelles external coral islands, they are atolls or sandbanks, largely derived from volcanic episodes; after their active phase, volcanoes slowly sink whereas corals rise up to the surface at a pace of about 1 mm per year, resulting in a ring-shaped formation, typical of coral atolls. Three groups of islands can be identified: Amirantes (29 islands), the Farquhar group (13 islands) and the Aldabra group (67 islands). Seychelles have a tropical climate with an average annual rainfall ranging from 1000 mm in Aldabra to over 2400 mm in Mahe, and the temperature averages at 26 ° C. The Seychelles are rarely subject to cyclones directly although they are affected by the broader weather patterns caused by cyclones. They enjoy a hot and humid climate all year round with slight daily temperature variations.

The **Comoros** Islands resulted from volcanic hotspots subsequent to the separation of Malagasy and African plates (Nougier et al., 1976). Based on oceanic basaltic bedrock, they are in fact the tip of sunken volcanoes. The archipelago features four main islands. **Grande Comore** has no significant bays and the coast is hardly indented. It has two mountain ranges, the Karthala whose peak rises at 2,361 meters above sea level and La Grille, in the northern part of the island, whose peak reaches 1,087 meters. The volcanic soils there are extremely porous, water rapidly seeps into rocks and the island

has no rivers. **Anjouan** is a very mountainous island with steep slopes. Some rivers have carved into the sides of the mountain to create deep, narrow ravines and cirques into the steep walls separated by ridges. Two peaks can be found Ntrinji (1,595 meters) and Trindrini (1,474 meters). The coastal area has only a few small plains. **Moheli Island** rises to 790 meters above sea level. Its terrain is rugged, with deeply steep-sized valleys, carved out by many small rivers. It is lined with a 10 to 60 meters deep coralline plateau and is accompanied south by eight small mountainous islands. The island of **Mayotte** is the oldest island of the archipelago (about 8 million years old), and also the lowest: its summit peaks at 660 meters. The old volcanism has left a crater occupied by the lake Dziani Petite-Terre. The highly indented coasts present deep bays, rocky headlands, peninsulas, and one of the 10 lagoons with a coral double barrier in the world, after which Mayotte is called the Lagoon Island. **Mayotte is administered as an overseas Department and Region of France and is not therefore included in the Programme.**

# 3. Climate and climate change in the Hotspots and Programme Countries

## 3.1. Current Climate in the Madagascar and the Indian Ocean Islands Hotspot

### *Comoros*[2]

Comoros has a humid tropical climate under oceanic influence characterized by two major seasons: a hot and humid season (austral summer) called "Kashkazi" and a dry and cool season (austral winter) called "Kuzi" characterized by regular trade wind gusts. During the warm season, or rainy season, (November to April), the average air temperature is 27°C, with highs between 31 and 35°C and lows around 23°C. The temperature during the colder season, from December to March averages 23 to 24°C. Highs are around 28°C and lows are 4 to 5°C lower than those of the warm season. Mean annual rainfall for the islands is 1000 mm. In Grande Comore it varies between 1398 mm and 5888 mm, in Anjouan between 1371 mm and 3000 mm, and in Moheli between 1187 mm and 3063 mm. Comoros is known for its many microclimates which are largely determined by exposure to prevailing winds, relief and altitude. Generally, the regions located at the west of the islands are the ones with highest rainfall.

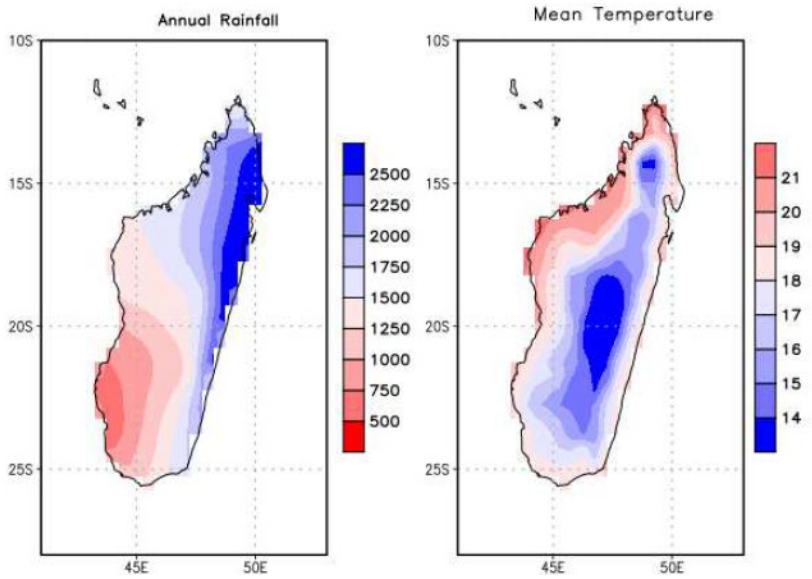
### *Madagascar*[3]

Madagascar's climate is highly varied, with the South West being semi-arid while the East coast is humid. There are two distinct seasons: a rainy season from November to April and a dry season from May to October. Regional and local climatic variations depend on relief, altitude, proximity to the Ocean and prevailing winds. Average temperature varies from 23-27°C on the coast and 16-19°C in the highlands (see Figure 3). The average annual precipitation varies from 1,000 to 1,500 mm. The heaviest rainfall occurs on the east coast between May and September with average annual precipitation varying from 2,030 mm to 3,250 mm.

[2] This section is summarised from the information provided in the country's National Adaptation Programme of Action (Govt. Comoros, 2006) unless indicated otherwise.

[3] This section is summarised from information provided in Madagascar's National Adaptation Plan (Govt. of Madagascar, 2019)

*Figure 3. Average annual rainfall and temperature in Madagascar from 1971-2000 showing the regional variation. Source: Climate Research Unit, as reported in MEDD (2019).*




### *Mauritius*

Like the other countries of the hotspot, Mauritius has two seasons: a hot and rainy summer from November to April (which reaches its peak from January to March), and a relatively cooler and less rainy winter from June to September. Mean summer temperature is 24.7°C and mean winter temperature is 20.4°C. Mean annual rainfall over the island is 2010mm. February and March are the wettest months; October is the driest.

The archipelago is located in the zone of the trade winds, constant winds which in this hemisphere blow from the south-east, especially in the cool season.

### *Seychelles*

Generally, the climate of the Seychelles archipelago is strongly influenced by the ocean, mainly through (i) monsoonal wind shifts; (ii) changes in the position and intensity of the South Indian Ocean tropical anticyclone; (iii) seasonal migrations and changes in intensity of the complex intertropical troughs, and; (iv) ocean currents and sea surface temperature patterns in the equatorial Indian Ocean. Studies have shown that there has been substantial climate variability over the past hundred years in the Seychelles (Govt. of Seychelles, 2009).

The Seychelles are located just south of the equator and have a tropical climate with all year-round high humidity levels and an average temperature between 24 and 30ºC. Temperatures on Mahé vary from 24 to 30°C, and rainfall ranges from 2,900 mm annually at Victoria to 3,600 mm on the mountain slopes. During the coolest months, July and August, the average low is about 24 °C. The southeast trade winds blow regularly from May to November. The hot months are from December to April, with higher humidity (80%). March and April are the hottest months, but the temperature seldom exceeds 31°C.

## 3.2 Changing Climate in the Madagascar and Indian Ocean Islands Hotspot

### *Changing climate in Comoros*

Long-term climate data for the Comoros is based on recording of weather at a single site and therefore doesn't capture the variation across the country (see figure 5 for example). Based on the available information, average annual temperature in the Comoros has increased by 0.9°C over the last century (Min Rural Development, Fisheries, Handicrafts and Environment, 2006). The most pronounced increase is during the rainy season months of March to May. The increasing trend officially reported by the Government of the Uniuon of the Comoros, is also observed in the Berkeley Earth dataset, which is based on the temperature records from 39,000 unique global meteorological stations. The Berkeley Earth method takes temperature observations from a large collection of weather monitoring stations and produces an estimate of the underlying global temperature field across all of the Earth's land areas. Once this temperature field has been generated, it is possible to estimate the temperature evolution of individual regions by interrogating the model for the region in question, as has been done for Comoros in the Figure below. See http://berkeleyearth.org/about-data-set/ for further details on the data set and methodology.

*Figure 4. Average annual temperatures in Comoros 1960-1989, in °C. Source: Min. Rural Development, Fisheries, Handicrafts and Environment (2006)*

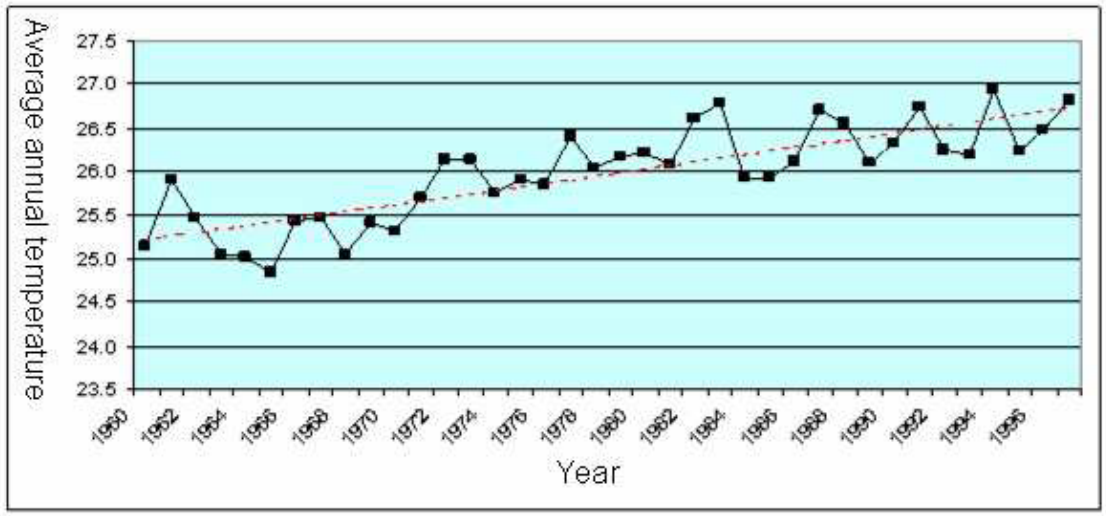
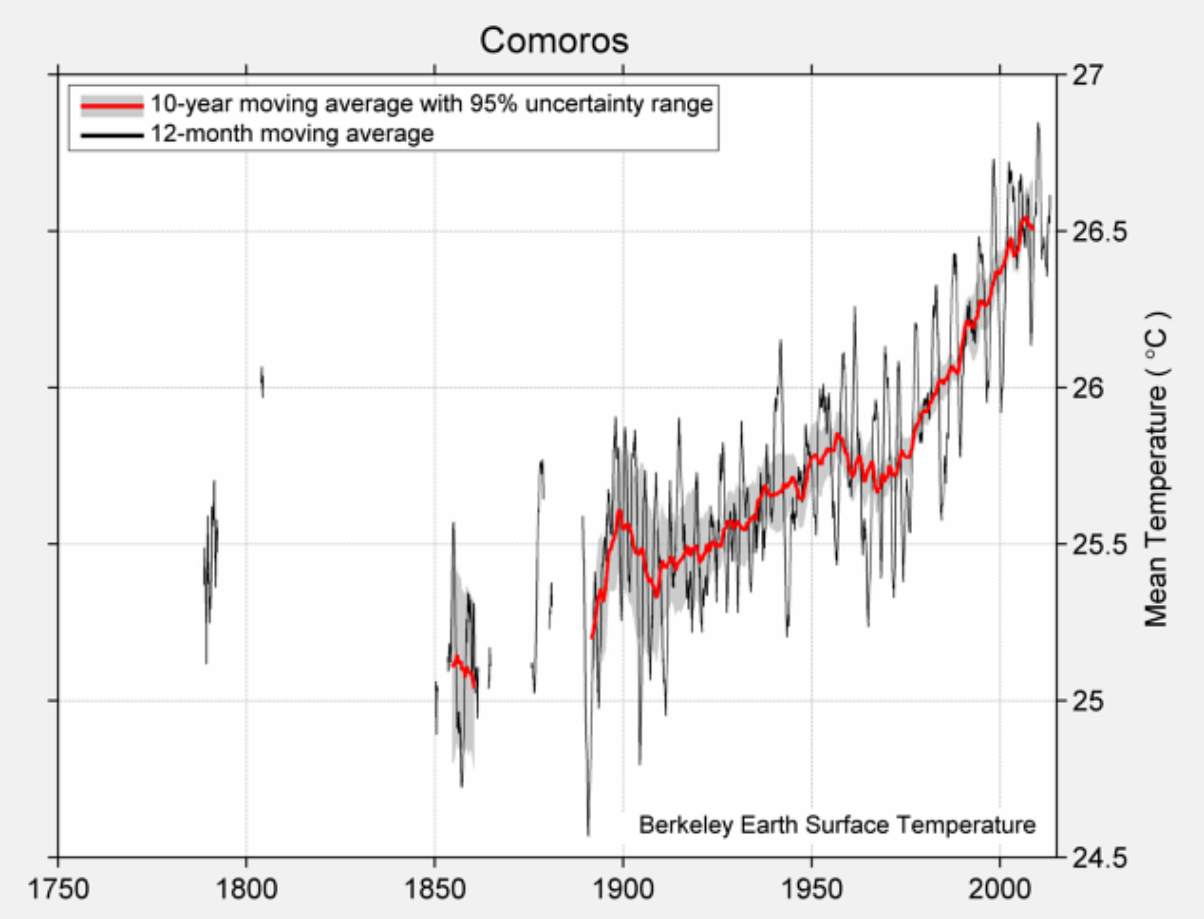


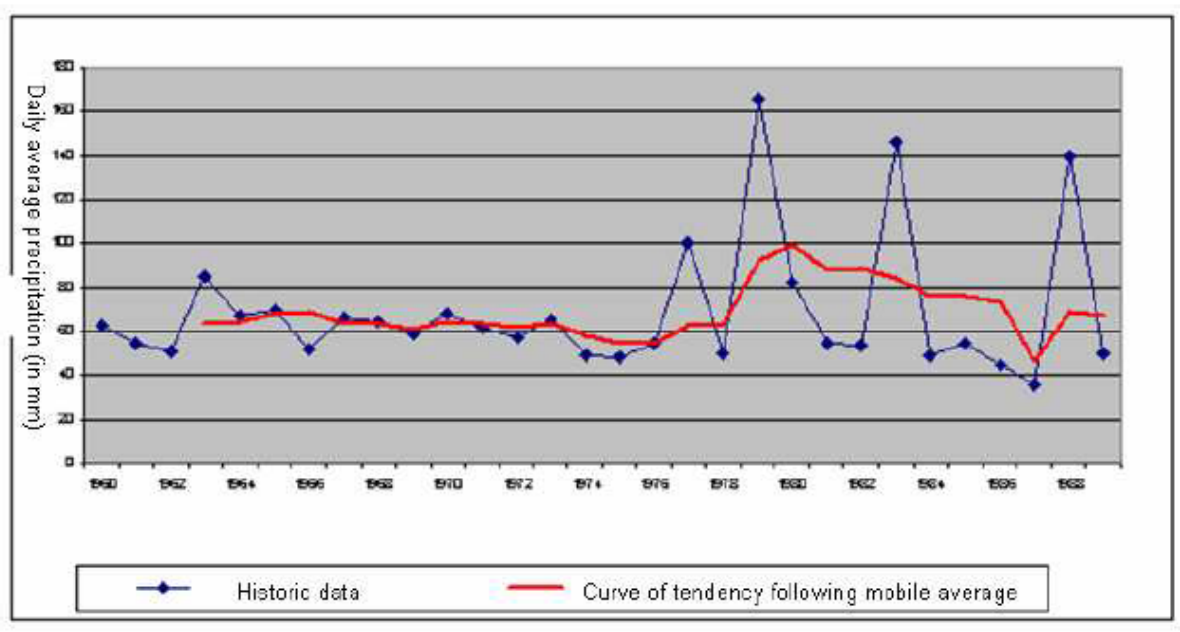
*Figure 5. Average monthly temperature for Comoros based on the Berkley Earth data set*




See http://berkeleyearth.org/about-data-set/ for further details on the data set.

Changes in rainfall patterns are less clear. The Comoros NAPA (Min Rural Development, Fisheries, Handicrafts and Environment, 2006) reports that the rainy season has become more irregular and has become shorter (from 6 months down to 3 months). From 1960-1975, Comoros experienced reduced precipitation, which then increased again in 1976 and then became highly variable from 1977-1989. The dry season has become longer, with a delay in the start of the rainy season. Prolonged periods of drought occurred in the late 1990s and early 2000s.

*Figure 6. Precipitation recorded from 1960 to 1989. Source: NAPA, based on national meteorological network data*




According to the country's NAPA, there is also some evidence that the frequency of cyclones and storms is tending to increase and their season has become more and more unpredictable. Between 1911 and 1961, 23 cyclonic events hit the country, an average of one cyclone every two years. Between 1967 and 1986, 13 cyclonic events hit the country, an average of one cyclone per year. The year 2004 was particularly marked by violent cyclones, that caused loss of life and significant damage to agriculture and infrastructure.

The climate change projections for Comoros presented here are based on the models used by the Coupled Model Inter-comparison Programme, Phase 5 (CMIP5) that are included in the IPCC's Fifth Assessment Report (AR5). The following projections are reported at the World Bank's Climate Change Knowledge Portal (CCKP)[4]:

- Temperatures are projected to increase by 0.8-2.1 °C by the 2060s and by 1.2-3.6 °C by the 2090s. The projections indicate that all seasons will experience similar rates of increase in temperature.
- Rainfall projections for annual precipitation are highly variable and inconclusive in the models. The projections for seasons suggest that rainfall will decrease during the dry season (June-November) and increase in the rainy season (December to February).

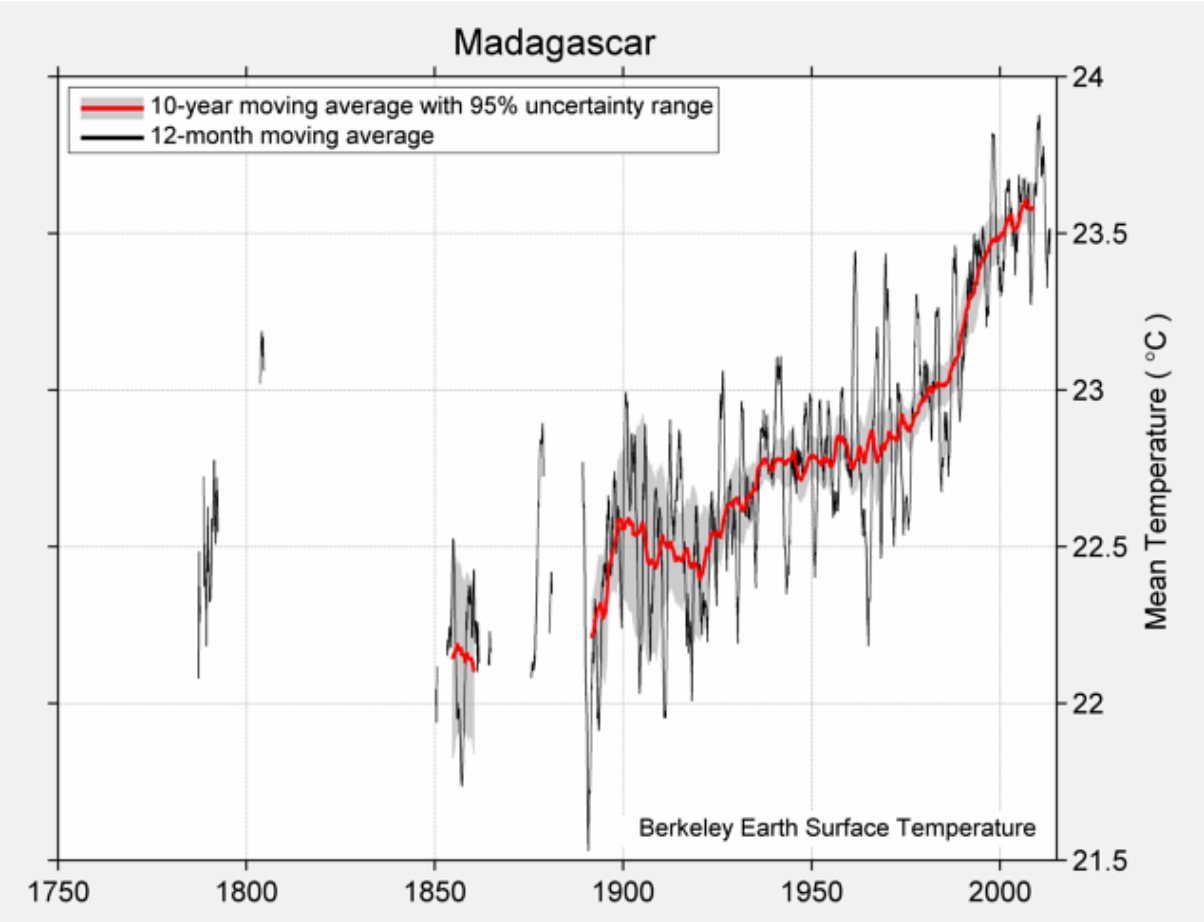
Comoros' NAPA notes that the impacts of climate change to the country will be both geophysical and socio-economic. The country is likely to be adversely affected by changes in rainfall levels and patterns, increased temperatures, sea level rise, ocean acidification and increased frequency of climatic hazards (such as tropical cyclones, droughts, episodes of heavy rainfall and flooding). Exacerbating these climate change impacts is the extreme poverty of the majority of the population and the precarious state of its natural resources and ecosystems on which much of the population depends directly.

[4] https://climateknowledgeportal.worldbank.org/country/comoros/climate-data-projections

### *Changing Climate and projections in Madagascar*

A detailed study by Tadross *et al.* (2008) summarized historical climate trends based on weather station data. Observational evidence shows that the minimum temperature in Madagascar has been consistently increasing over the last 65 years. In the South, temperatures have been steadily increasing since the 1950s (0.2°C warmer in 2000) and drought has become more frequent; in the North temperatures have also started rising but to a lesser extent. There has been a lower volume of rainfall nationally in more recent years. The observations on temperature are also borne out in the Berkeley Earth data set clipped for Madagascar (see Figure 7).

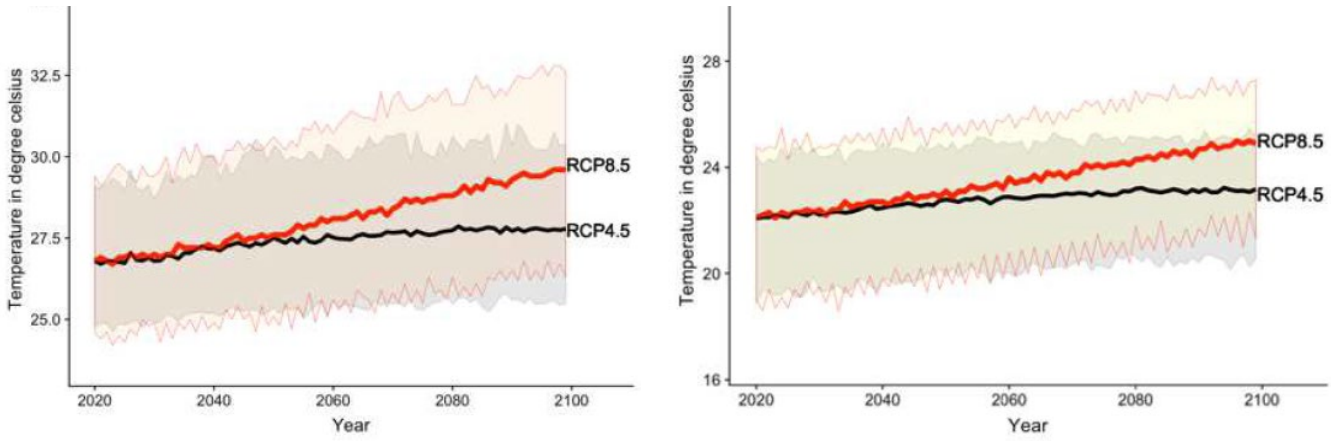
*Figure 7. Average monthly temperature for Madagascar based on the Berkeley Earth data set*




Tadross et al. (2008) also projected future temperature changes in Madagascar using a regional climate model based on 13 global climate models (GCM) up to the period 2046-2065. The model projected warming across the island (with regional differences) and areas of both increasing and decreasing precipitation. Southern Madagascar was projected to have the greatest warming (2.6°C by 2055), while less warming is predicted in the coastal areas and the North (1.1°C). These analyses have since been updated by the national meteorological service (Direction Générale de la Météorologie) and partners (MTTM/DGM et al., 2019), who came to similar conclusions. The more recent study was based on 18 GCMs from CMIP5 and projected future temperatures and precipitation using a moderate

future GHG emissions scenario (RCP 4.5) and a more elevated GHG emissions scenario (RCP 8.5). The models project increases of both minimal and maximal temperatures by 1.3 to 1.6°C by 2050 and 1.7 to 2.9°C by 2080 (MTTM/DGM et al. 2019) – see Figure 8.

*Figure 8. Projected average annual maximal (figure on left) and minimal (figure on right) temperatures projected for the period 2020 to 2100 using scenarios RCP 4.5 and RCP 8.5. Source: MTTM/DGM et al. (2019)*




Tadross et al. (2008) explored changes in precipitation using projections based on 6 downscaled GCMs, and found that median rainfall will increase throughout the summer months (November to April). During the winter (May – October) the tropical regions are projected to be wetter, and have more frequent storms, while the Southern half of the East coast is projected to be drier by 2050. Rainfall intensity is forecast to increase during the rainy season but decrease in the dry season. Models indicate that the likelihood of cyclones forming will decrease during the early part of the main cyclonic season, but that their intensity, associated winds and destructive power are suspected to increase. The more recent 2019 study (MTTM/DGM, 2019) notes that the modelling is less conclusive with some models projecting higher rainfall, and some lower. However, overall less rainfall is expected during the winter months (see Figure 9). The 2019 study also notes the regional variations expected across the country in both temperature and precipitation trends (see Figure 10).

*Figure 9. Projected average monthly rainfall for the periods 2030, 2050 and 2080 projected using scenarios RCP 4.5 and RCP 8.5 by comparison to a 1971 to 2000 reference period. Source: MTTM/DGM et al. (2019)*

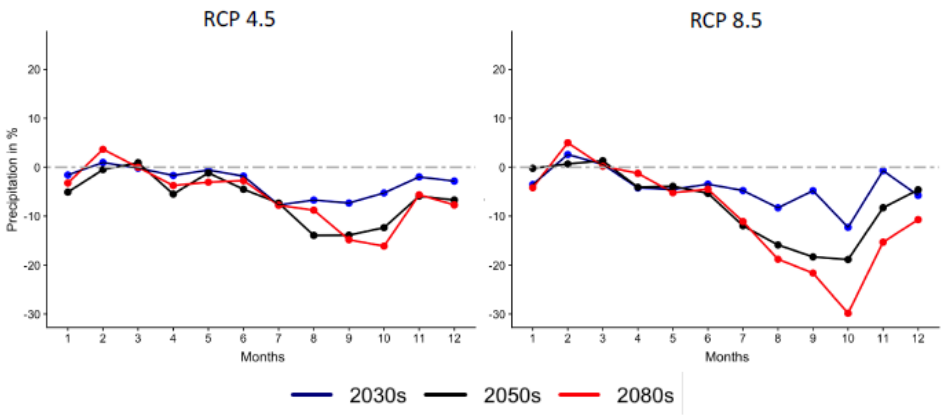
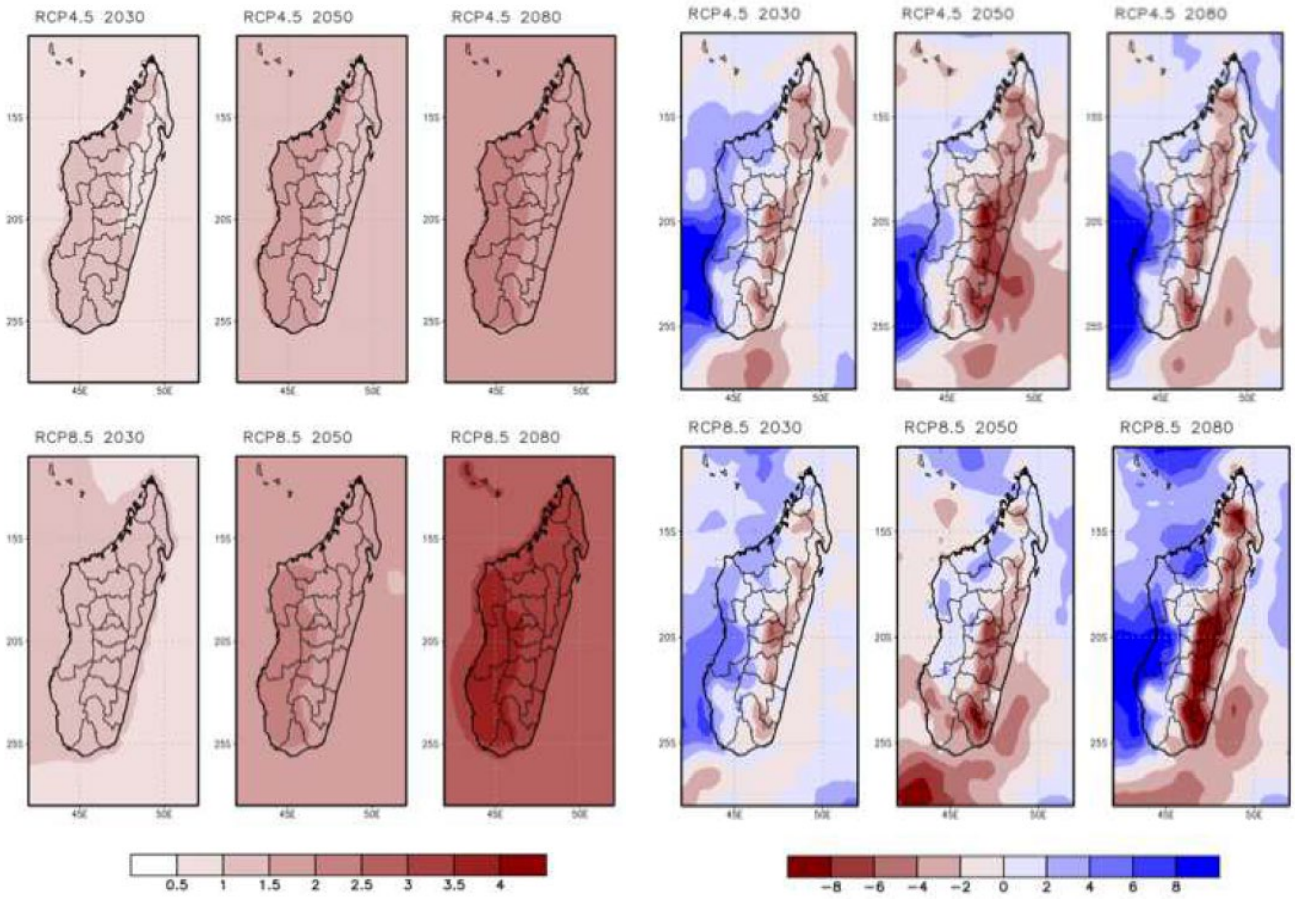


*Figure 10. Evolution of average annual minimal temperature anomalies (images on left) and average annual rainfall anomalies for 2030, 2050 and 2080 relative to the 1971-2000 period under both the RCP 4.5 and RCP 8.5 scenarios. Source: MTTM/DGM (2019)*




Sea-level rise for Madagascar's coastal regions is projected to be in the range of 34-48cm by the end of the 21st century (MTTM/DGM, 2019). However, there are regional variations expected and for example Morondava on the west coast is projected to see rises of approximately 7-8 mm per year and lose 5 to 6 cm of coastline per year, while Mahajanga in the North-west is expected to have less rapid rises of 3-4 mm per year (MEED, 2019).

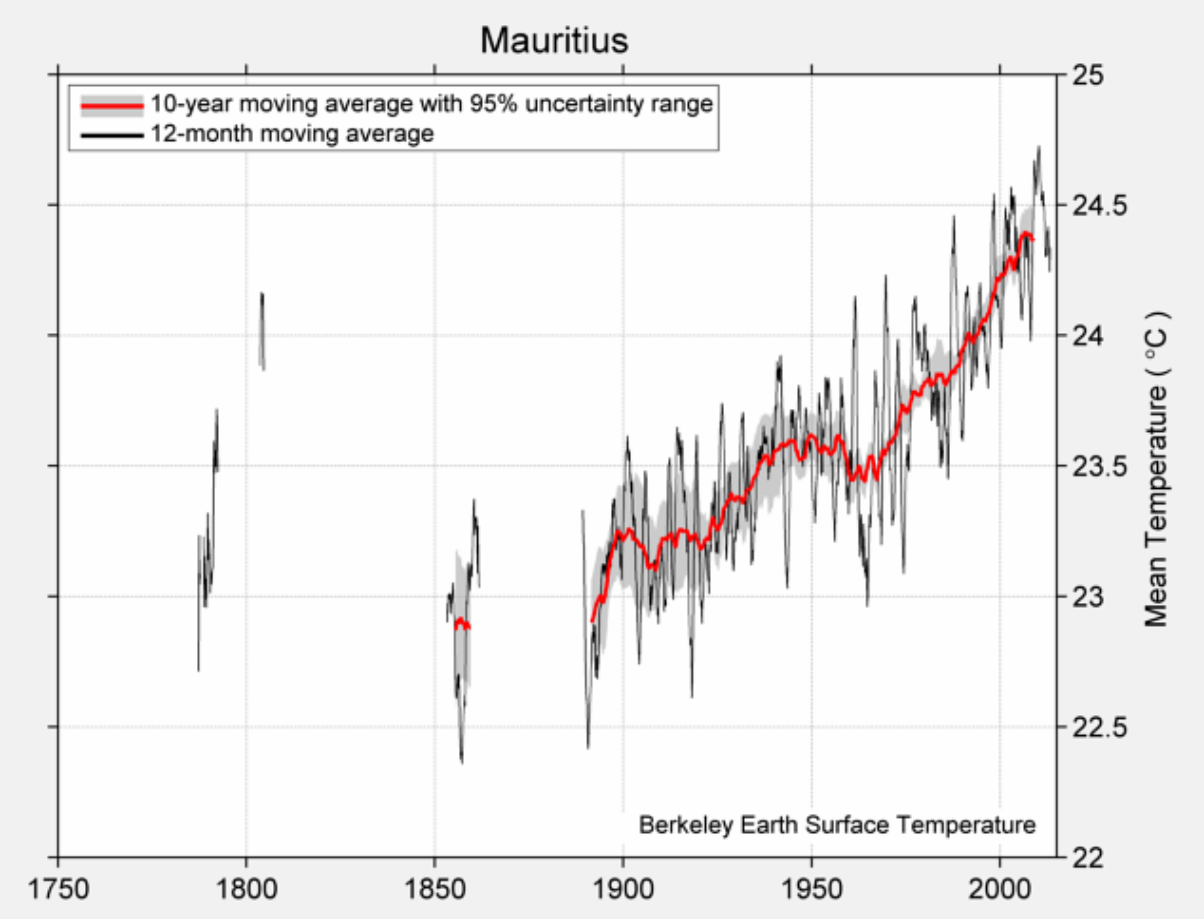
### *Changing Climate and projections in Mauritius*[5]

The impacts of climate variability and extreme weather events are becoming a concern to the Republic of Mauritius, including Rodrigues, St Brandon and Agalega. The climate of the South West Indian Ocean (SWIO) small island states is influenced by large ocean-atmosphere interactions such as trade winds. They are often affected by tropical cyclones and other extreme weather. Some of them like the Saint Brandon or the Cargados Carajos Shoals and Agalega Islands are threatened by sea-level rise as well.

[5] This section is adapted from the summary information provided about climate change on the website of the Mauritus Meteorological Services website. www. http://metservice.intnet.mu/climate-services/climate-change.php

According to the Mauritius Meteorological Service, analyses of temperature recorded at Mauritius and its outer islands show a warming trend[6]. Average temperature at all stations is rising at the rate of 0.15°C per decade and has risen by 0.74 – 1.2°C when compared to the 1961-90 long term mean. Similar warming trends have also been observed at the outer islands like Rodrigues, St Brandon and Agalega. The last two of these islands are 1.5 km$^2$ and 70 km$^2$ in area, at about 2 m above mean sea level at their highest point and a variable population of less than 100. The temperature at Agalega is rising at the rate 0.11°C per decade with an average rise of 0.62°C during the last ten years when compared with the 1961-90 mean. Temperature at St Brandon and Rodrigues has warmed up by 0.5 – 1.0°C. These trends are also borne out in the Berkeley Earth data set clipped for Mauritius (see Figure 11).

*Figure 11. Average monthly temperature for Mauritius based on the Berkeley Earth data set*




According to the Mauritius Meterological Service, sea levels in the southwest Indian Ocean based on reconstructed tide gauge data and Topex/Poseidon altimeter for the period 1950-2001 shows a rise

[6] http://metservice.intnet.mu/climate-services/climate-change.php

of around 1.5 mm/yr at Port Louis and 1.3 mm/yr at Rodrigues, (Church, *et al*., 2006). Analysis of Port Louis data for the period 1987-2007 gives a mean rise of 2.1 mm/yr[7].

Warming of the atmosphere has also impacted the hydrologic cycle over the southwest Indian Ocean. Long-term time series of rainfall amount over the past century (1905 to 2007) show a decreasing trend in annual rainfall over Mauritius. In fact, the average rate of decrease per decade is around 57 mm. The total decrease during the last ten years is about 8% when compared to the 1950s.

Annual rainfall over the outer islands indicate significant variation from year to year but long-term analysis do show decreasing rainfall trend, though lesser than the main island Mauritius.

Other observed impacts are:

- A lengthening of the intermediate dry season, the transition period between winter and summer, has been observed.
- There has been a shift in the start of the summer rains. This shift in the onset of the rains is highly significant as it translates into much pressure on the water sector to meet increasing demands of the agricultural, tourism, industrial and domestic sectors.
- The number of consecutive dry days is increasing while the number of rainy days is decreasing.
- Even though the number of rainy days is decreasing, heavy rainfall events leading to numerous flash floods and temporary interruption of certain socio-economic activities during the summer months of February and March has increased
- The frequency of extreme weather events, heavy rains and storms of tropical cyclone strength or higher, has increased significantly over the last two decades.

Analysis of data from Mauritius Meteorological Services does not show any increase in the number of storms in the SWIO tropical cyclone basin. However, a plot of the number of storm formations over the last 32 years (1975- 2008) clearly shows an increasing trend in the number of storms reaching tropical cyclone strength (winds above 165 km/hr). Furthermore, since the last decade observations indicate rapid or even explosive intensification of tropical storms.

The World Bank's Climate Change Knowledge Portal (CCKP)[8], using CMIP5 models, reports the following projections for Mauritius under a high emissions scenario (RCP 8.5):

- Mean annual temperature will rise by 1.3°C by 2050;
- Mean annual precipitation will fall by 52 mm by 2050.

### *Changing Climate and projections in Seychelles[9]*

Several analyses of surface air temperature records over the last 50 years have concluded that there has been a warming of the Seychelles region since at least the 1970s (Govt. of Seychelles, 2009). Both maximum and minimum average temperatures are increasing, with average warming trend of 0.33°C and 0.82°C respectively over the last 40 years (Bijoux, 2019). The Berkeley Earth data set examined

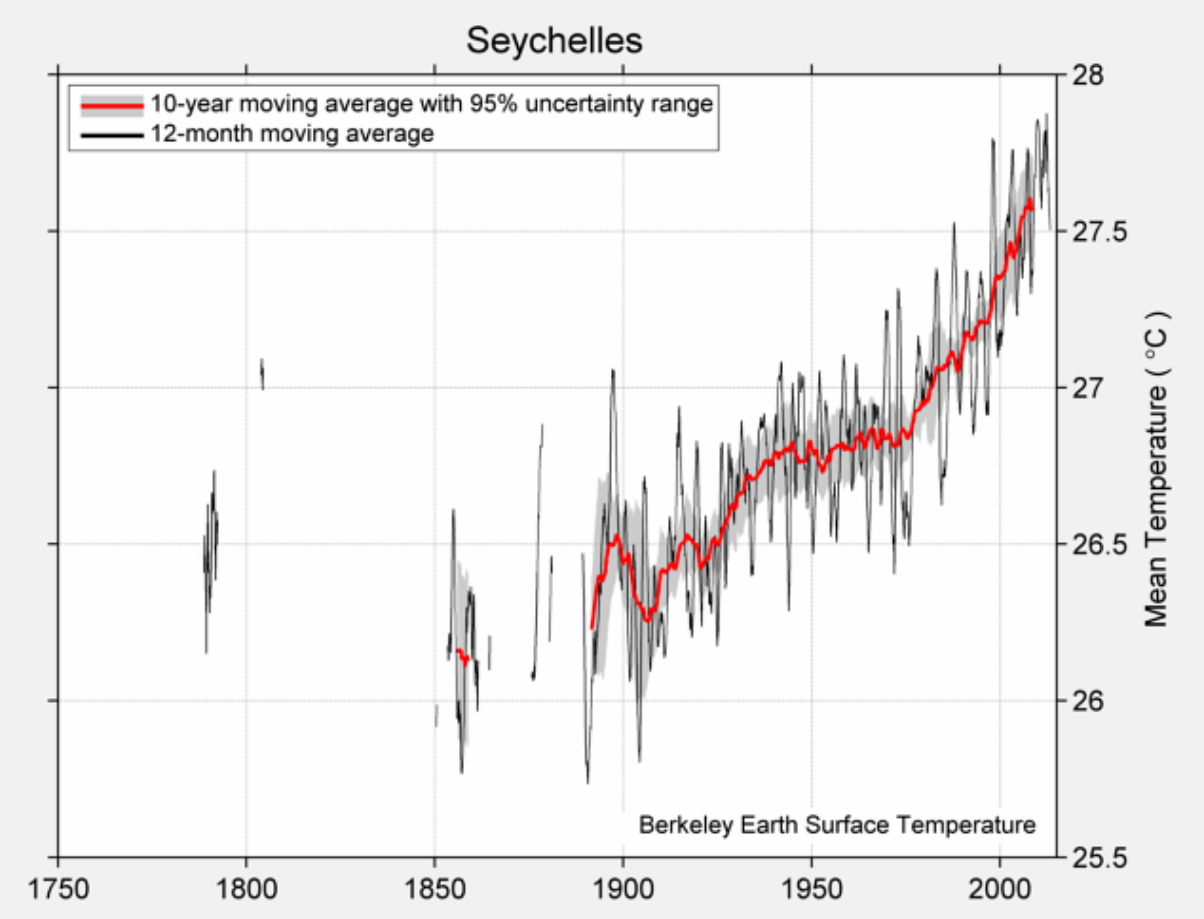
[7] http://metservice.intnet.mu/climate-services/climate-change.php

[8] https://climateknowledgeportal.worldbank.org/country/comoros/climate-data-projections

[9] This section is summarised mostly from the Seychelles National Climate Change Policy (2009), except where mentioned otherwise. The SNCC gives additional references not cited here for some of the information provided.

for Seychelles also corroborates these observations (see Figure 12) The number of cooler nights has also been decreasing (Govt. of Seychelles, 2009). An upward trend in sea surface temperature has been recorded although some regional studies have not corroborated, making more observations and analysis necessary to understand the situation (Govt. of Seychelles, 2009).

*Figure 12. Average monthly temperature for Seychelles based on the Berkeley Earth data set*




Annual rainfall trends on Mahé analyses from 1972 to 2006 show that the climate is getting wetter with an increase of approximately 13.7mm per year (Govt. of Seychelles, 2009). The long-range data suggests that there are also multi-year rainfall cycles in the Seychelles, linked to natural phenomena such as the El Nino Southern Oscillation, the Atlantic Multi-decadal Oscillation. In addition, there are regular heavy rainfall events that have caused flooding and significant damage to infrastructure.

Sea-level rise is a serious concern because the mean elevation of the coastal plateau of the granitic islands, where the majority of the population live, is 2-10 m, whereas the coral islands vary from 1.8 meters to 9 meters above sea level (Govt of Seychelles, 2009). The data available for measuring sea surface temperatures in the country and region is relatively short, dating from the 1980s, which makes conclusive assessment difficult. Nevertheless, several analyses suggest that there is a rise consistent with the global mean sea level rise (Govt of Seychelles, 2009), which is corroborate by satellite data for the more recent years.

The Seychelles lie outside of the trajectories of most cyclones, but the country is affected by the extreme rainfall and wave swells that accompany cyclones. Extreme storm events, some associated with cyclones, have caused significant damage in the country.

The effects of climate change in the Seychelles are expected to be mostly negative with projected increases in sea levels, storm and tidal surges, extreme sea surface temperatures, variability in rainfall patterns and coastal flooding, which will affect the way of life of all residents (Bijoux, 2019). Climate models for Seychelles, over the period 2010-2100, indicate that average annual rainfall will increase. The rainy season is 'more likely than not' to be wetter, while the dry season is 'more likely than not' to be dryer (Govt. of Seychelles, 2009). There are also geographical differences within the country. For example, in the Aldabra area rainfall is less likely to increase than in Mahé. However, it is important to note the limitations of current models for modelling future scenarios in the context of small islands.

Sea level rise is also projected to increase and ocean acidification is expected to have serious consequences for coral reefs, with knock-on effects for significant parts of the economy (see below). The frequency of extreme weather events such as heavy rainfall and storm surges is expected to increase and will affect mainly the coastal areas. The combined effects of sea level rise, coral bleaching/acidification and the increased incidence of storm surges leading to coastal erosion are expected to have considerable impacts on coastal areas.

According to Seychelles' Second National Communication, key future climate trends include:

- Air temperature for both Mahe and Aldabra area is more likely than not to warm by +3.0°C;
- The relative warming will occur mainly during the cooler southeast monsoon;
- The warming ranges are from +0.4°C to 0.7°C, 0.9°C to 1.4°C and 1.8°C to 2.9°C respectively for the years 2025, 2050 and 2100.
- Likely extremes of low rainfall in the dry season with a deficit of -12.7 % (-9.9 mm) in rainfall for the year 2025, and a decrease of -36.3 % (-31.1 mm) in the year 2100;
- In contrast, the likely extremes of wet conditions are likely to be characterized by an increase of +5.9 % (+19 mm) for the year 2025, +9.3 % (+25.4 mm) for the year 2050 and +12.4% (+38.6 mm) for the year 2100.

In conclusion, the Seychelles is economically and environmentally vulnerable to climate change and its associated extreme events. The concentration of development in narrow coastal zones, non-resilient populations and ecosystems make the Seychelles extremely sensitive to climate change impacts. The impact on coastal livelihoods as a result of sea level rise, storm and tidal surges, increased sea-surface temperatures, and coastal flooding will have serious consequences. The effects of climate change on tourism in small islands are expected to be largely negative. Furthermore, changes in long-term rainfall patterns and temperature changes will also have adverse consequences for water, food and health.

### *Summary of Climate Risks and Potential Impacts in the Programme countries*

In summary, all of the countries in the Programme are already observing the impacts of climate change. Even if historical local data are sparse, some trends are clear and consistent overall the region: there is an increasing temperature trend in all the countries, and sea level is rising. Rainfall data and storms are more difficult to characterize, but risks will get higher. This confirms IPCC results (see Wong

et al, 2014 for instance), as well as the most recent IPCC report (SROCC, 2019, see Magnan et al there in: talking about islands "Disproportionately higher risks are expected in the course of the 21st century"). The Five Reasons For Concern (RFCs) of the IPCC illustrate the impacts and risks of different levels of global warming for people, economies and ecosystems across sectors and regions. One would note that warm water corals for instance, which are central to the economies and ecosystems of the Region, are considered in the Special Report on 1.5 of the IPCC as the system which will be the most impacted and at risk under global warming.

Models, whatever the scenario (see for example RCP 4.5 and 8.5 above) show that the temperature and sea level trends will continue; rainfall patterns, and extreme events such as cyclones and winds and waves associated will continue to affect the region and cause damages to populations and ecosystems. If one look for instance to sea level rise, based on spatial trend patterns from January 1993 to May 2019, the Indian Ocean region and in particular East of Madagascar has the strongest regional trend of the World see figure 9 of the WMO Statement on the State of the Global Climate in 2019). The same is true for cyclone, even if predictions for strength and intensity are not uniform, and the most recent data are showing that the South Indian Ocean basin had an active season in 2019: there were 18 cyclones of which 13 reached hurricane intensity equalling the largest number on record (WMO, 2020).

The region has a high exposure to climate-related hazards including tropical cyclones, heavy rainfalls, storm surges and droughts. The SWIO-RAFI study (2017) indicated that over the last 50 years, Comoros, Madagascar, Mauritius and Seychelles have been affected by more than 100 natural disasters, 94 of them related to hydro-meteorological phenomena. The population affected by these hazards was estimated at 14.4 million people across the four counties, and the physical damage resulting from climate events was estimated at USD 13.1 billion. The affected population and physical damages resulting from climate-related hazards are likely to rise in the coming years, as both the frequency and the intensity of these hazards are expected to increase in the context of climate change.

As a consequence, the governments are concerned about how climate change will impact on the future course of their sustainable development. Despite all the differences between the Programme countries, it is striking how they all face similar climate risks that have similar potential impacts. Table 1 summarizes the main shared risks and how they will likely impact on key sectors of the economy of each country.

*Table 1. Summary of the main Climate risks facing the Programme countries and potential impacts*

| Climate Risk | Potential Impacts |
|---|---|
| *Water Resources* | |
| **Increased temperatures** | Reduction of key water points; draining of standing freshwater sources and watercourses during the dry season |
| **Reduced rainfall and increased drought conditions** | Reduced river flows, resulting in reduced access to water supplies for drinking, sanitation and energy generation, and reduced water quality |
| **Increased intensity of cyclones** | Cyclone-induced destruction of water infrastructure and flood-induced water quality reductions due to increased sedimentation |
| *Agricultural Production* | |
| **Increased temperatures** | Crop damage and reduced yields |

| | |
|---|---|
| **Increased precipitation during the rainy season** | Higher rates of evapotranspiration, reducing soil moisture and increasing soil degradation<br>Increased need for irrigation<br>Increased livestock mortality |
| **Reduced rainfall in the dry season and increased drought conditions** | Increase in pests and diseases<br>Increased sedimentation, soil erosion and siltation, compromising flat lowland areas |
| **Increased cyclone intensity** | Damage to crops, supply chains and infrastructure from cyclones |
| *Coastal Ecosystems* | |
| **Increased temperatures** | Increased sea surface temperatures and ocean acidification, impacting coral reefs and other coastal ecosystems |
| **Increased cyclone intensity** | Destruction of marine habitats and biodiversity loss |
| **Sea level rise** | Increased coastal erosion, inland soil erosion and saltwater intrusion<br>Reduced water quality and increased flooding in densely populated coastal urban areas |
| *Fisheries* | |
| **Sea level rise** | Reduced productivity due to increased sedimentation and runoff, and reduced water quality |
| **Rise in sea surface temperature** | Temperature-induced shifts in the ranges and populations of fish; changes in reproduction cycles |
| **Increased cyclone intensity** | Destruction of fish habitat and ecosystem (e.g., coral reefs and mangroves); migration of fish away from historical fishing areas |
| **Increased frequency of extreme events** | Increased production costs due to destruction of infrastructure and interruption of supply chains |
| *Human Health* | |
| **Increased temperatures** | Extended range of disease-carrying vectors (e.g., mosquitoes) to higher elevations |
| **Increased frequency of extreme events and flooding** | Increased risk of diarrheal and other waterborne diseases such as cholera<br>Increased risk of acute respiratory disease |

Adapted from USAID, 2016

# 4. Biological Importance of the Hotspots and Countries

This Chapter mostly consists of extracts from the Ecosystem Profiles produced by CEPF for the hotspots (CEPF 2014), with updated information where available and relevant to the GCF Programme. The Ecosystem Profile provides much more background information that has not been provided here, particularly with respect to biodiversity and conservation priorities. It is available from the CEPF website along with other information about CEPF's work in the hotspot at https://www.cepf.net/our-work/biodiversity-hotspots/madagascar-and-indian-ocean-islands .

The designation as "Hotspot" refers to a set of highly diverse habitats, resulting from climate variability related to latitude, altitude, the steep hills which, combined with the effects of foehn associated with trade winds, concentrate the rainfall on the eastern slopes of the mountains. Geological and soil differences (granitic basement, old or recent volcanism, and atolls, sandy formation, sedimentary formations) contribute to the diversification of habitats. Simply put, we can find on most islands a succession of habitats, with grasslands and deciduous lowland forests, deciduous and evergreen forests of medium altitude mountain forests, ericoid vegetation of high altitude on the highest points, beyond 1,800 meters above sea level at least (e.g. on La Réunion, Madagascar and Grande Comore).

In the **granitic or volcanic islands**, the relief has often isolated a number of natural areas in these ecosystems, creating conducive conditions for speciation and leading to the presence of species with very limited distribution and a highly localized endemism. This is the case in Madagascar (Raxworthy and Nussbaum, 1995, 1996, Raselimanana, 2000 Rabibisoa, 2008), but also in Seychelles inselbergs granitic islands, for instance (Stoddart, 1984).

The **reef islands of the hotspot**—the *Iles Eparses* and Seychelles "outer islands" in particular, with their low altitude and marine influences—mainly feature coastal vegetation (mangroves, halophytes herbaceous formations, brackish steppes, mediolittoral, herbaceous and shrub, herbaceous to shrub supralittoral formations). For the larger islands, these formations are found together with inland vegetation (adlittoral karst mangrove tree formations, adlittoral coconut tree formations in brackish, pond brackish herbaceous formations, CBNM, 2013). These islands are home to colonies of seabirds, and sometimes some spectacular species (such as the Aldabra tortoise) but generally speaking, the fauna is poorly diversified.

The **wetlands** (lakes, lagoons, marshes, mangroves, rivers and streams, bays, estuaries and deltas) are particularly important in terms of endemic biodiversity (fish, amphibians, waterfowl, shellfish, Odonata) and for the environmental services they provide. Malagasy wetlands occupy more than 3,000 km of rivers and streams, and about 2,000 $km^2$ of lakes are divided in 256 catchments. The surface area of lowland wetland of the Mascarene Islands has shrunk as a result of drainage and urbanization activities.

**Madagascar**, due to its size, features the greatest diversity of ecosystems. The island is divided into three major biomes with five types of terrestrial ecosystems (Moat and Smith, 2007, see Table 2). The **East Biome** includes the eastern region with a hot and humid climate; it is subject to the permanent effects of winds from the Indian Ocean (Ramananjanahary *et al.*, 2010) and the central region, located at a higher altitude, with a more or less cool climate, includes the highlands comprising Tsaratanana, Ankaratra, Andringitra the Sambirano and Amber Mountains). The **West Biome** covers the western

region with a dry tropical climate due to the effects of the monsoon with tropical distinct seasons, comprising the dry forests of the West and North. Finally, the **South biome** comprises the southern and south-western regions with arid or sub-arid climate, covered with thorny forests or xerophytic bush characterized by its *Euphorbia*.

*Table 2. Types and Surface Area of Ecosystems in Madagascar*

| Type of ecosystem | Overall area (km²) (2005) | Percent of land cover |
|---|---|---|
| 1-Mosaic of grass formation / plateau grass wooded formation | 246,687 | 41.67 |
| 2-Wooded grass formation /shrub formation | 135,739 | 22.93 |
| 3-Degraded Humid Forest | 58,058 | 9.81 |
| 4-Rain forest | 47,737 | 8.6 |
| 5-Dry forest of the West | 31,970 | 5.40 |
| 6-Farm crops | 23,522 | 3.97 |
| 7-Dry spiny forest in the Southwest | 18,355 | 3.10 |
| 8-Wetlands | 5,539 | 0.94 |
| 9-Degraded spiny forest of the Southwest | 5,427 | 0.92 |
| 10-Subhumid forest of the West | 4,010 | 0.68 |
| 11-Mangroves | 2,433 | 0.41 |
| 12-Coastal shrub formation of the Southwest | 1,761 | 0.30 |
| 13- Tapia forest | 1,319 | 0.22 |
| 14-Coastal forest | 274 | 0.05 |
| 15-Rainforest of the West | 72 | 0.01 |

Source: MBG, 2013

**The coastal habitats** include estuary and lagoon systems, mudflats, vegetation, pebble beaches, dunes, mangroves, etc. The sea levels are characterized by the importance of reef formations (about 3,450 km out of 5,600 km coast of Madagascar have reef formations, Cooke *et al*., 2012) and the presence of large seagrass beds. The representativity of these habitats varies with the topography and the system of marine and coastal currents, as evidenced by the comparison between Rodrigues and Mauritius.

*Table 3. Coastal and Marine Habitats: an estimate of the Surface Area (ha) for Mauritius and Rodrigues*

| Coastal and marine habitats | Mauritius | Rodrigues |
|---|---|---|
| Beaches and dunes | 2885 | 8 |
| Seagrass beds | 3279 | 17765 |
| Mudflats | 919 | 656 |
| Mangroves | 145 | 24* |
| Coral reefs | 6303 | 7005 |

*Source: NWFS & STEM 2008; table prepared for CEPF, 2014*

Three large **marine ecosystems** border the hotspot. The marine ecosystem of the Algulhas Current is characterized by warm waters (20-30 °C) and low primary productivity, except for a few higher productivity points associated with small areas of upwelling of water and ocean turbulence. This marine ecosystem is spectacular for its marine biodiversity as it contains the majority of coral reefs in the Western Indian Ocean. The Somali Current, a large marine ecosystem, is situated to the north and is dominated by an intense upwelling system and seasonal cold water along the Somali coast, pushed by the northeast monsoon. This system is extremely productive, though less rich in species. To the east of these two ecosystems is the Mascarene Plateau, a distinctive granite ridge of continental origin extending between latitudes 2°S and 22°S, with an average depth of only 100 meters. The Mascarene Plateau connects the Seychelles, Mauritius and Réunion Islands, and is considered to be a large marine ecosystem in itself. The Mascarene ecosystem is characterized by low productivity while its biodiversity is high.

### Species Diversity and endemism: Terrestrial biodiversity, including wetlands

One of the hotspot features is the extremely high floral and faunal endemism. The threshold of endemism for a region to qualify as a hotspot is 1,500 endemic plants; the Madagascar flora alone comprises about 10,000 endemic species. Endemism in the hotspot is marked not only at species level, but also at higher taxonomic levels: for instance, eight plant families, five bird families, and five primate families are represented nowhere else in the world. The global importance of the hotspot is particularly high for mammals (95 percent endemism), plants (around 90 percent endemism for Madagascar) and reptiles (96 percent endemism).

*Table 4. Number of Species native to the Hotspot for a selection of taxa*

| | Madagascar | Comoros | Mauritius & Rodrigues | Seychelles | Réunion | Total |
|---|---|---|---|---|---|---|
| **Terrestrial mammals** | 200 | 7 | 5 | 6 | 4 | **211** |
| **Birds** | 297 | 165 | 133 | 258 | 110 | **503** |
| **Reptiles** | 406 | 7 | 32 | 36 | 17 | **457** |
| **Amphibians** | 295 | | 2 | 12 | 2 | **309** |
| **Freshwater Fish** | 183 | 29 | 71 | 35 | 50 | **213** |
| **Plants (estimate)** | *11,200* | *2000* | *700* | *700* | 900 | **13,000 to 14,000** |

Source: Table prepared for CEPF, 2014. Source data: *Mammals: Wilson et al, 2005, IUCN, 2013; Birds: BirdLife, 2013; Reptiles, Uetz and Hosek (eds), 2013; fish: Froese & Pauly (eds), 2013; Amphibians: AmphibiaWeb, 2013; plants: various – see CEPF, 2014*

### Species Diversity and Endemism: Marine Biodiversity

Over 10,000 shallow water marine species are identified in the Western Indian Ocean, including more than 2,000 species of fish.

The Western Indian Ocean is home to 174 species of elasmobranchs including 108 species of sharks and 66 species of skates (Kiszka *et al.*, 2009b) or about 9 percent of species globally. Eleven shark species are endemic to the Western Indian Ocean (Kiszka *et al.*, 2009b).

The Indian Ocean is home to 2,086 species of coral reef fish (Allen, 2008). In the South West Indian Ocean, the number of species is between 600 and 800. One of the most remarkable and famous species of fish in the region is the coelacanth (*Latimeria chalumnae*) whose morphology has changed very little over the past 350 million years, earning him the nickname of living fossil by the general public. It is present in abyssal areas, particularly in the Comoros archipelago.

Southwestern Indian Ocean is home to five of the seven species of the world's marine turtles—green turtle (*Chelonia mydas*), the hawksbill (*Eretmochelys 30pprox.30e*), olive ridley *(Lepidochelys olivacea*), loggerhead (*Caretta caretta*) and the leatherback (*Dermochelys coriacea*)—and is a major region worldwide for the breeding and feeding of these five species (IFREMER, 2013). Particularly important nesting sites exist in the Comoros and the Seychelles and the Iles Eparses.

The western Indian Ocean is an important area for marine mammals. The Mozambique Channel, the Seychelles plateau, and to a lesser extent, the Mascarene Islands, were identified in a prospective survey in 2012 as major areas for *Pseudorca crassidens, Grampus griseus* and *Globicephala macrorhynchus* (Tetley, Kiszka and Hoyt, 2012). Large populations of cetaceans attract tourists to several coastal regions of the hotspot such as Mayotte, Antongil Bay and Île Sainte-Marie in Madagascar which are important areas for breeding humpback whales (*Megaptera novaeangliae*).

A recent assessment of the Western Indian Ocean indicates that the region is home to at least 8,627 species of shallow water invertebrate macrofauna (Cooke, 2012). As well as for terrestrial invertebrates, there remain data gaps, for the species described with respect to their distributions or the trends in the evolution of the populations. In the absence of available synthesis, the few data below are made by way of illustration.

Surveys by Richmond (2001) report 419 species of echinoderms in the Western Indian Ocean of which 373 are distributed around East Africa and Madagascar and 81 species are endemic to the region. For the marine areas around Madagascar alone, 1,400 species of marine gastropods, 306 species of sponges and 650 cnidarian species have been recorded (Vasseur, 1981). In the reefs of the Toliara region, 779 species of crustaceans were identified in 1978 (Thomassin, 1978). In Seychelles, it is estimated that there are 450 species of molluscs, 350 species of sponges, 155 echinoderms and 165 species of marine crustaceans (cited as John Nevill, pers. Com. By CEPF, 2014). Marine invertebrates represent an important economic resource (e.g. sea cucumbers, lobsters, crabs, octopus fishing activities).

### *Priority Areas for Biodiversity Conservation: Key Biodiversity Areas*

The teams in charge of the 2014 Ecosystem Profile identified 369 KBAs in the hotspot (CEPF, 2014), based on biodiversity importance. The work required the compilation of more than 5,500 data points on the presence of 1633 threatened (on the IUCN Red List) as well as information on additional 381

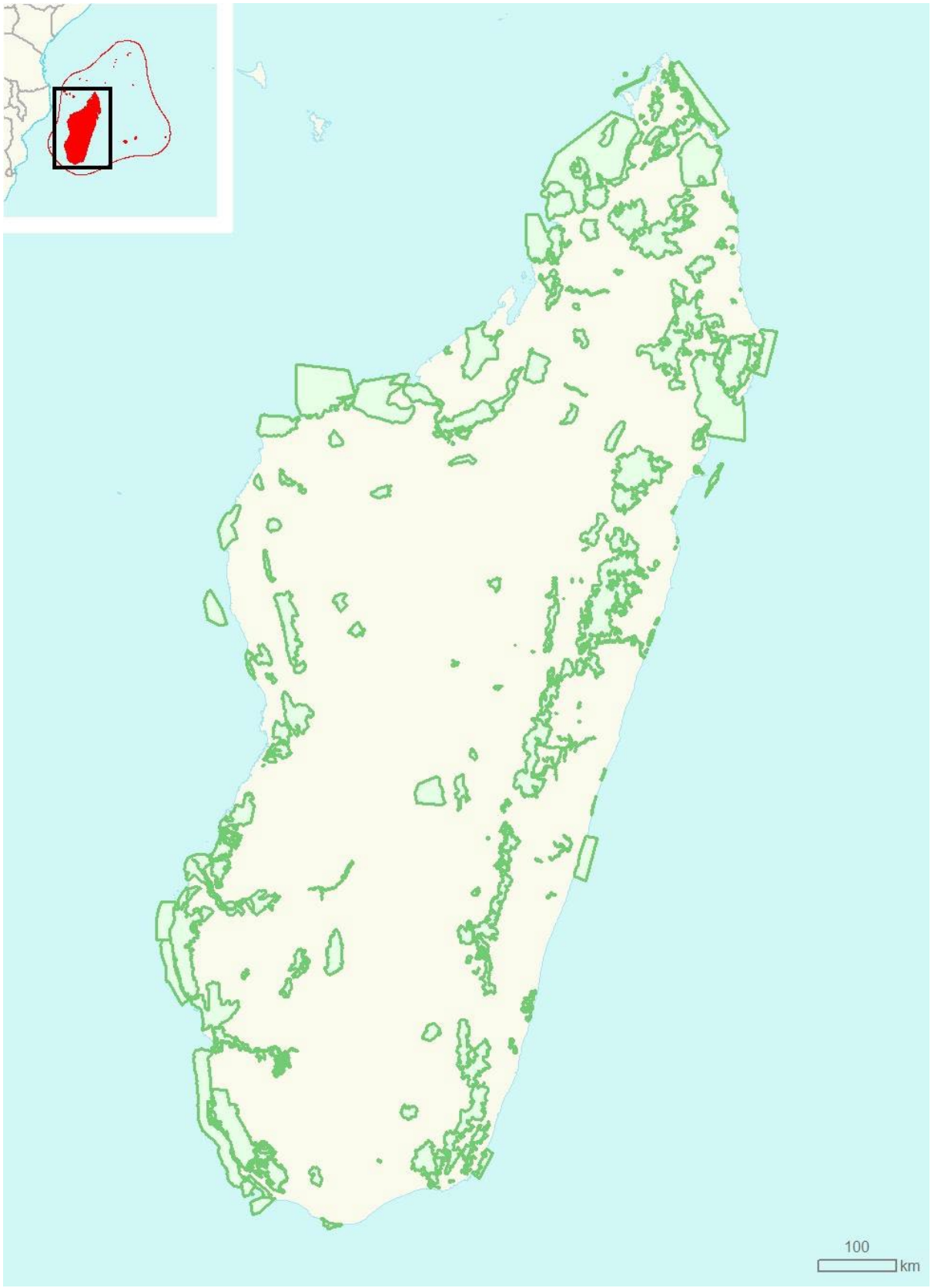
species (not yet assessed, locally important etc.), as shown in Table 5. Together, the 369 sites host 338 Critically Endangered species, 659 Endangered species and 667 Vulnerable species.

*Table 5. Distribution per Country/territory of the Hotspot Key Biodiversity Areas*

| **Number of KBAs** | |
|---|---|
| Comoros | 20 |
| Madagascar | 212 |
| Mauritius | 17 |
| Seychelles | 57 |
| France: | 63 |
| *La Réunion* | *38* |
| *Mayotte* | *19* |
| *Iles Eparses* | *6* |
| TOTAL | 369 |

In Madagascar, this work led to the identification of 212 KBAs – an increase of almost 30 percent from the 164 sites identified as KBAs during the previous assessment by CI in 2006. This increase mainly comes from new data on plants, from the identification of important marine and coastal areas, and from a greater attention to wetlands. The new dataset also takes into consideration recent extension or changes in protected areas boundaries. In several cases, former KBAs were merged to reflect the fact that they now represent single management units. Figure 13 presents the 212 KBAs identified for Madagascar. Detailed lists of all the KBAs are available in the Ecosystem Profile (CEPF, 2014).

*Figure 13. Key Biodiversity Areas in Madagascar*

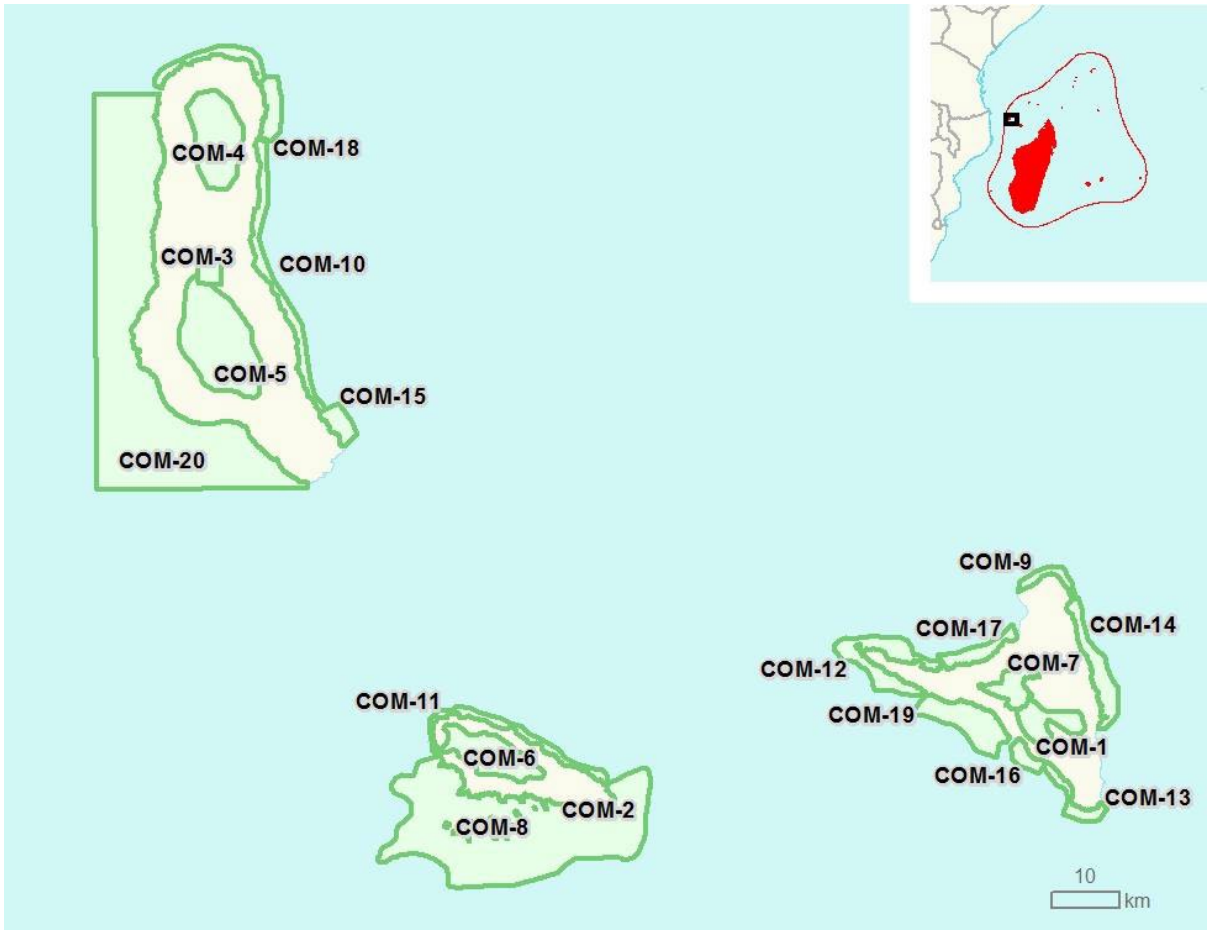


In Comoros, the inventories and the mapping of natural sites are extremely patchy, with many old data, often not geo-referenced (in most cases, species occurrences are at best defined at the island level, not at site level).

Six important sites, relatively well documented, were identified initially in the Ecosystem Profile as KBAs and easily fulfilled the methodological requirement to qualify as KBAs. In addition to these sites, important coastal and marine areas for each island were also identified, all of which include sea turtle nesting sites and extensive coral reefs that appeared important to local stakeholders during the consultations, even if they have not been inventoried yet.

With these limitations, 20 KBAs have been identified, with only six strictly terrestrial ones, and 14 for coastal and marine areas. However, the number of sites and their biogeographical distribution clearly indicates an incomplete identification, and some smaller, lesser-known sites of biological importance would certainly be identified as KBAs should more field research and inventories be done. Figure 14 presents the 20 KBAs identified for the Comoros and a full list of KBAs is provided in the Ecosystem Profile (CEPF, 2014).

*Figure 14. Key Biodiversity Areas in the Comoros*



For the Ecosystem Profile, a new total of 57 KBAs were identified in the Seychelles (CEPF, 2014). For most marine sites, comprehensive inventories of threatened species have not yet been compiled. The terrestrial KBA sites of high biodiversity value cover 27,093.5 ha, which represents 59.5 percent of the total land area of Seychelles. This total is lower than the one given in the KBA inventory of Senterre *et al.* (2013), as some areas have been left out from the CEPF selection or merged into larger sites as explained in the Ecosystem Profile. The marine sites cover more than 124,000 ha. The maps below present the 57 KBAs identified for the Seychelles, and a full list of KBAs is provided in the Ecosystem Profile.

*Figure 15. Key Biodiversity Areas in the Seychelles*

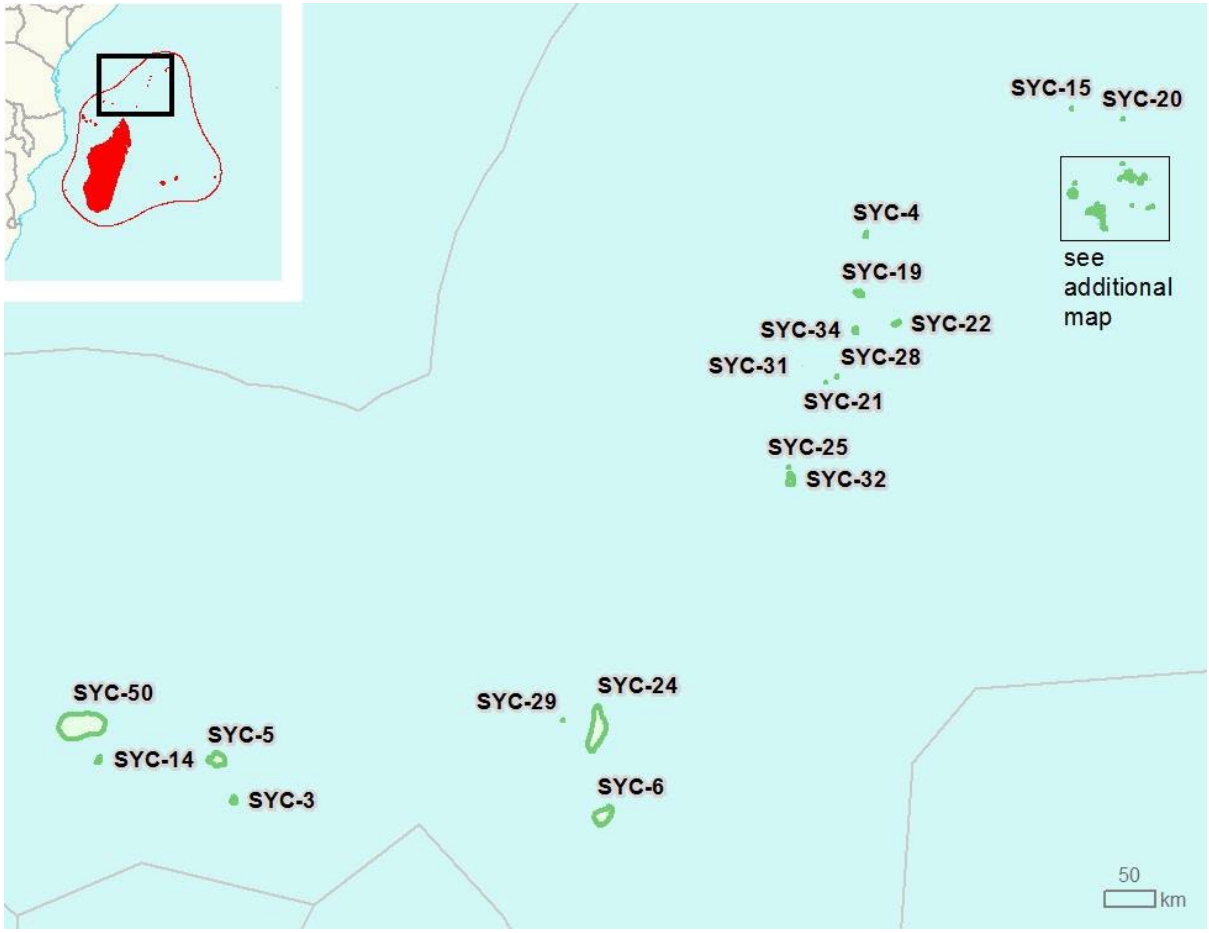
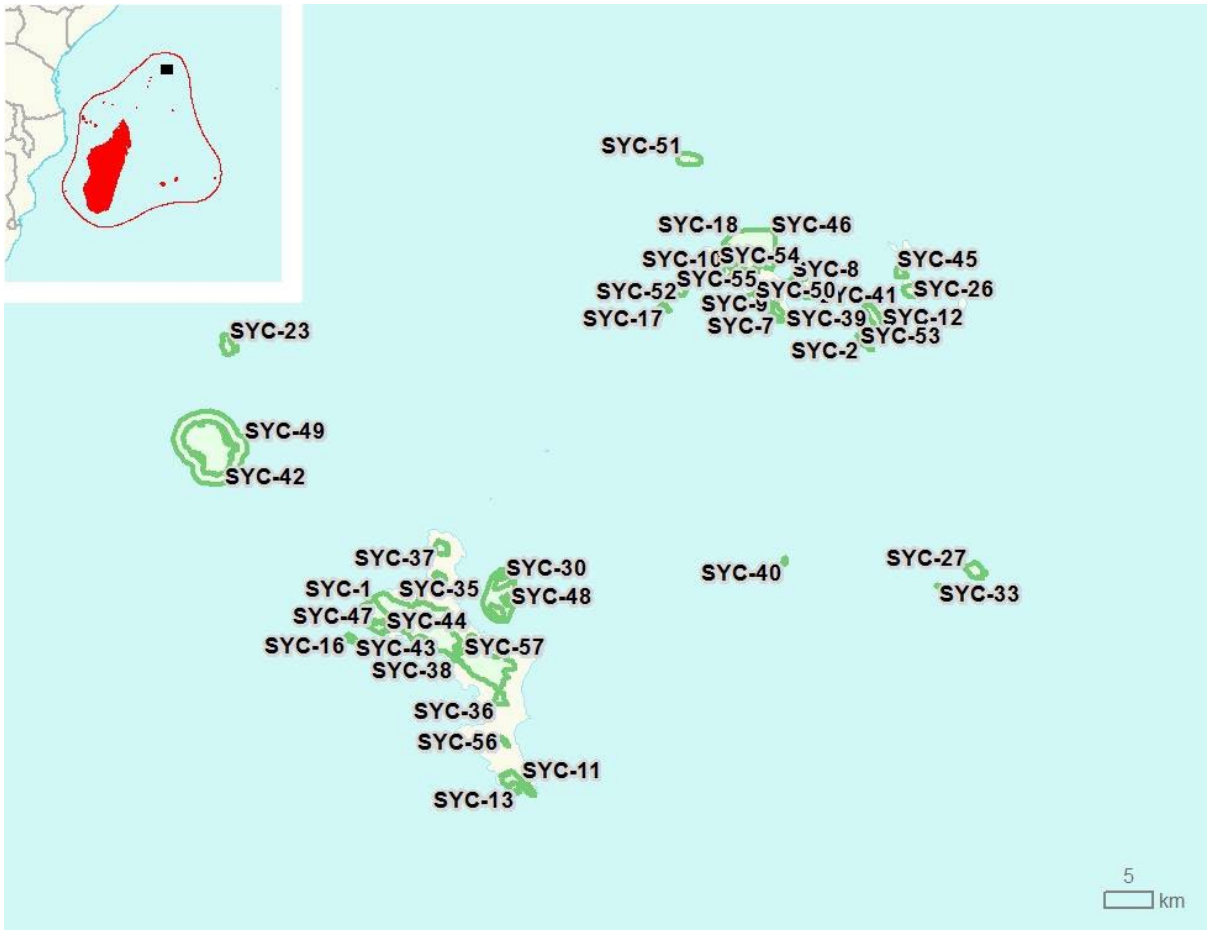


*Figure 16. Key Biodiversity Areas in the Seychelles (detail for the Granitic Islands)*




For the Republic of Mauritius, KBAs were determined in the Ecosystem Profile first on the basis of already identified IBAs (BirdLife, 2001) and by joining adjacent similar and complementary sites of highly threatened biodiversity instead of dividing into smaller biological areas. In many cases, Conservation Management Areas (CMAs) or other legally protected sites are usually better surveyed than adjacent areas, while species are often found in surrounding areas. For instance, important mountain endemic species could be found in areas close to the Mount Cocotte area, outside of the Black River Gorges National Park. Therefore, KBAs were defined as including not only the site already under formal protection, but also the adjacent buffers deemed critical for the survival of species occurring in the area. This approach led to the identification of 17 KBAs: one in Saint Brandon, three in Rodrigues and thirteen in Mauritius. Due to the high level of endemism and the rarity of many species, it is certain that some other, smaller sites could have qualified as KBAs on the sole criteria of presence of endangered species. The study does not deny the importance of these sites, but the choice was made to consider a smaller set of larger areas, which host the largest part of the endangered Mauritian biodiversity.

*Figure 17. Key Biodiversity Areas on Mauritius Island*

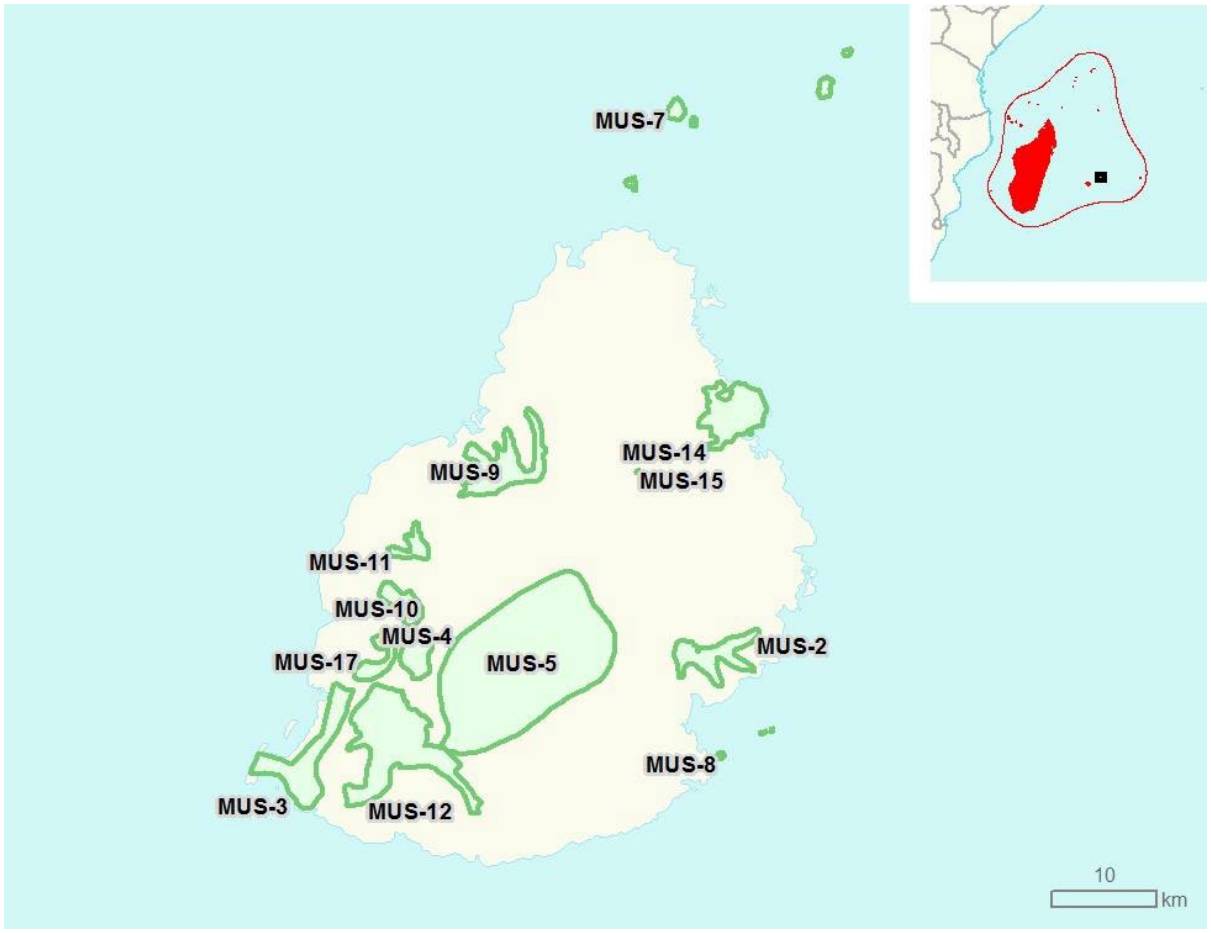
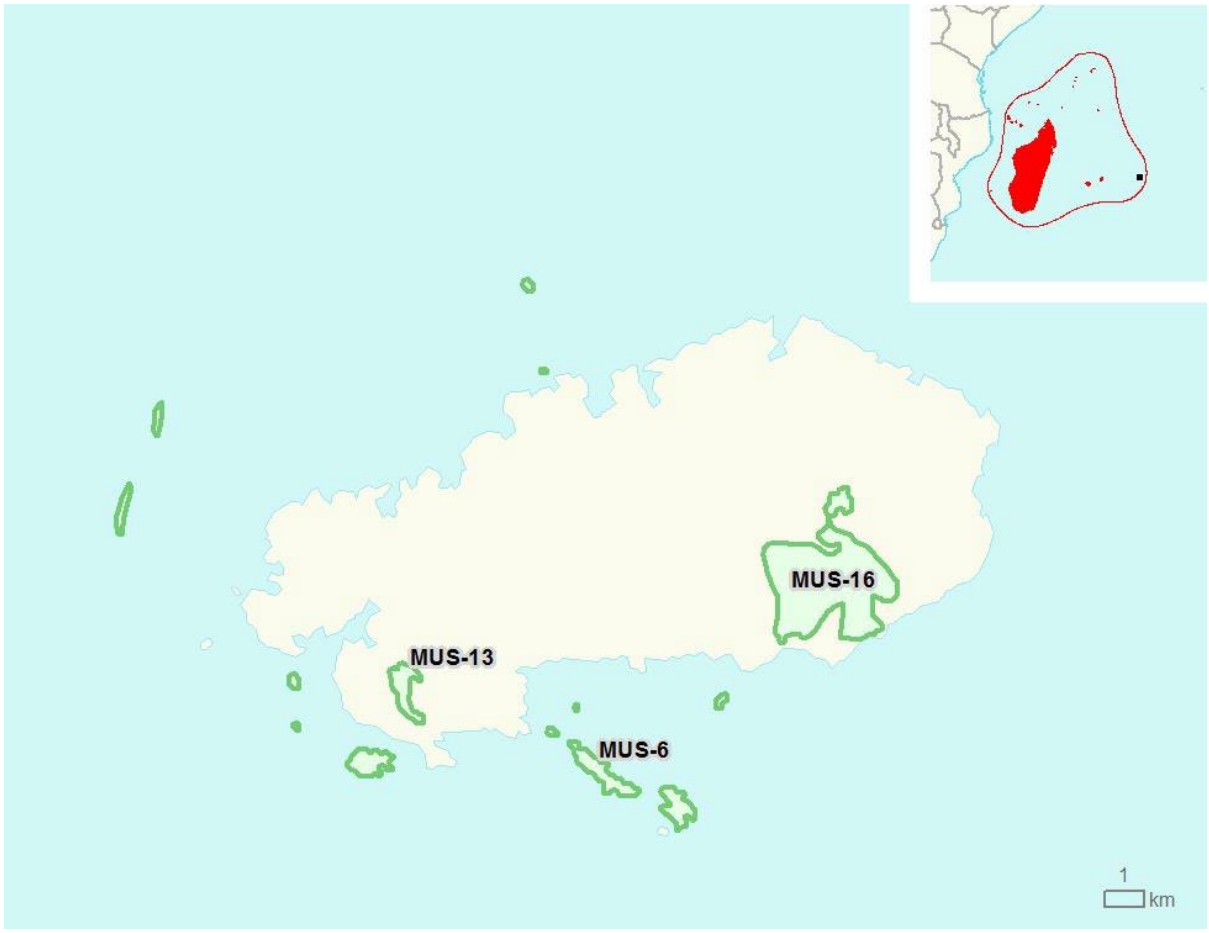

MUS-7
MUS-14
MUS-15
MUS-9
MUS-11
MUS-10
MUS-4
MUS-17
MUS-5
MUS-2
MUS-8
MUS-3
MUS-12
10
km

*Figure 18. Key Biodiversity Areas on Rodrigues Island*



# 5. Socio-economic profile of the Madagascar and Indian Ocean Islands Hotspot

The hotspot is home to about 29 million people, with very high population densities on the islands outside of Madagascar. However, population densities hide significant variations at the local level. On the volcanic islands, the landscape leads people to gather on the coastal areas, and in Seychelles, almost all of the population live on the three main islands. In Madagascar, the overall population density is 35 inhabitants per $km^2$, but they are unevenly distributed across the territory: the southwest and southeast are under-populated areas, while the central and eastern coasts are home to more than half of the Malagasy population on approximately 30 percent of the total island area.

Statistics related to human development and economic growth show a gap between Madagascar and Comoros on the one hand, and Seychelles and Mauritius on the other, as shown in Table 6. Madagascar's population growth is particularly high: almost 2 million in 1900, the population reached 5 million in 1958, 10 million in 1985, 20.7 million in 2010, and is estimated as 26.9 million in 2019 (UNDP, 2019). With an annual growth of 2.65 percent, it is estimated that the population of Madagascar will be approximately 35.3 million by 2030. This growth rate is relatively higher than that of other sub-Saharan countries (2.4 percent on average) and of the Indian Ocean islands (except –the Republic of Comoros at 1.97 percent and Mayotte at 2.7 percent), and in the current context, it leads to increased pressure on natural ecosystems and biodiversity.

*Table 6. Summary of Key information for hotspot countries*[10]

| Country | Land area ($km^2$)[a] | Coastline (km) | Population size[b] (2019 estimates) | Human Development Index (Global Rank) – 2019 | GDP (USD billions)[d] | GDP (USD per capita) | GDP composition by sector[c] |
|---|---|---|---|---|---|---|---|
| **Comoros** | 2,235 | 340 | 850,886 | 0.538 (156) | 1,179 (173) | $1,600 (2017 est.) | Agriculture 47.7% Industry 11.8% Service 40.5% |
| **Madagascar** | 587,041 | 4,828 | 26,969,307 | 0.521 (162) | 12,550 (132) | $1,600 (2017 est.) | Agriculture 24% Industry 19.5% Service 56.4% |
| **Mauritius** | 2040 | 177 | 1,198,575 | 0.796 (66) | 14,391 (123) | $22,300 (2017 est.) | Agriculture 4% Industry 21.8% Service 74.1% |
| **Seychelles** | 455 | 491 | 97,739 | 0.801 (62) | 1,644 (169) | $29,300 (2017 est.) | Agriculture 2.5% Industry 13.8% Service 83.7% |

Notes: a) Includes inland water bodies; b) 2019 population estimates by Population Division of UN Economics and Social Affairs c) estimate for 2017;d) source: IMF, 2019

[10] Data summarised from CIA World Factbook and references except where noted otherwise. https://www.cia.gov/library/publications/the-world-factbook/ Accessed 18 Oct. 2019

The questions of when the first settlers from Asia and the Pacific arrived in Madagascar, or when the East African Bantus arrived in the Comoros Islands before spreading on the coast of Madagascar, are still debated among the scientific community. Some archaeological evidence suggests that Austronesian communities settled in Madagascar as early as 2,000 B.C., while other communities (Bantus, Persians of Shiraz, Arabs) arrived on the island from the middle of the first millennium.

The cultural richness of the Indian Ocean countries comes from the mixing of populations. Being a link between the islands, the Indian Ocean is an ancient maritime contact zone—a rich cultural venue for meetings and exchanges between European, African, Arab and Asian civilizations. From the 18th century on, slavery and the slave trade shaped the islands' populations. Europeans had forced Africans and Malagasy people to develop the land. After the abolition of slavery by England and then by France, thousands of workers were recruited on the Indian coasts in the mid-19th century to work in the sugarcane plantations. Most of them have stayed. Then Muslim traders from Gujarat, Chinese from Canton, and others came. These successive waves of immigrants often led to a mixing of languages and produced a multiculturalism and multilingualism that are common in the region (COI, 2012).

Linguistically, the former colonial languages (French and English) remain the official languages in all hotspot countries, but the recognition of the local languages and Creole is also strong. In addition to the specific dialect of each ethnic group, Madagascar has its unique language, Malagasy, spoken and taught throughout the island; Malagasy was recognized as an official language in the 2010 Constitution.

The various waves of settlement in the hotspot also left their religious mark. Christianity, coming from European colonization and migration, dominates Seychelles and Réunion, and is practiced by about half of Madagascar's population. Hinduism prevails in Mauritius (49 percent of the population) and is present in Réunion. Islam is the state religion of the Islamic Republic of Comoros, where 97 percent of the population practices Sunni Islam, also represented in Mayotte, in Madagascar (8 percent), and in Mauritius (17 percent). In Madagascar, the common cultural heritage, based particularly on respect for ancestors, is also ubiquitous without excluding the monotheistic religions (COI, 2012).

The Malagasy population counts 18 ethnic groups distributed throughout the country. However, the concept of indigenous people, in the sense of a minority population having different cultural, economic and social characteristics that differ from those of the dominant society, does not apply in this country[11]. The preamble to the 2010 Malagasy Constitution further affirms the equality of citizens regardless of region, origin, or ethnicity.

### *Human Development Measures*

#### Human Development Index and Poverty

The human development index calculated by UNDP (see Table 6) shows a significant dichotomy between Madagascar and Comoros, the "least developed countries (LDCs)" and Mauritius and Seychelles (upper-middle income economies).

[11] An exception being the small Mikea group confined to the Mikea region of southwest Madagascar.

According to UNDP global reports, **Madagascar** had gained six positions in the world rankings between 2001 and 2005: its HDI rose from 149th to 143th (out of 177 countries at the time), and at that point Madagascar was ranked among the countries with medium human development. It has fallen in the ranking since then, however, reaching the rank of 151st in 2011 (0.480 of HDI), 169th in 2012 (0.482 of HDI) and is listed as 162nd in the latest 2019 calculations of HDI (UNDP, 2019). The HDI level is not uniform throughout the country. At the national level, more than three out of four people (76.5 percent) lived below the poverty line in 2010, and more than one of two people (56.5 percent of the population or 11 million people) lived below the extreme poverty line (INSTAT, 2011). The rural area (62.1 percent of the population) is more affected by extreme poverty than the urban area (34.6 percent).

In **Comoros,** nearly 45 percent of the population lives below the poverty line, but the incidence of poverty varies considerably from one island to another. It is generally higher in rural areas and Anjouan.

In Mauritius and Seychelles, the level of extreme poverty is low, and in no way comparable to the levels in Comoros and Madagascar. However, some segments of the population may be in precarious situations. The Mauritius traditional fishing communities, for example, face financial difficulties to access education, and their chances of entering the labor market in other sectors are thus limited. Population growth is leading to an increase of the number of fishermen, putting more pressure on coastal fish stocks (Sobhee, 2004).

### Health and Vulnerability to Pandemics

Access to health services is generally satisfactory in the Mauritius and Seychelles, while Comoros and Madagascar are among the least developed in terms of medical coverage. For comparison, in 2012, health expenditures did not exceed $19 per capita in Madagascar, compared with $510 in Mauritius, or $4,952 in the whole of France (including neighboring Reunion) (WHO, 2012).

In this context, traditional medicine is an important element in Madagascar, with significant use of medicinal plants. This ecosystem service provided by plant biodiversity, though little studied today, is undoubtedly of great importance for people‘s well-being, especially in rural areas.

The western region of the Indian Ocean, at the crossroads of human and animal routes linking three continents (Africa, Europe, and Asia), is also an emerging area of pathogenic elements both for human populations as well as domestic animals or wild animals, affecting animal health and the economy, and generating conservation and biodiversity maintenance problems (Bastien, 2012). The hotspot region has recently experienced several pandemics (dengue, chikungunya, Rift Valley fevers, and West Nile virus). Madagascar also has regular outbreaks of the Plague. Factors facilitating the emergence of infectious diseases in this region include the proximity to territories where infectious agents are common—such as the East African countries for chikungunya *(Diallo et al.,* 1999) or Rift Valley fever (Bird *et al.,* 2007)—the frequent exchanges with three different continents, the presence of a diversified wildlife with a high rate of endemism as in Réunion (Kon-Sun-Tack, 2006), or ecological disturbances (Altizer *et al.,* 2011).

### The Economy

As elsewhere, the countries in the region were hit by the financial and economic crisis of 2008, which was marked by a general slowdown in their economies. The decline in global activity resulted in a tourism slowdown, a major foreign revenue earner in Mauritius, Seychelles and Madagascar, and a decrease in raw materials demand that have affected the economies of the region, including Mauritius. In Madagascar, these effects were combined with political instability that plagued the country from the time of a coup d 'état in 2009 until democratic elections in 2014. In many respects, the country is still recovering from the effects of this political instability. The importance of tourism to the Region makes it's economies particularly vulnerable to novel pandemics that would impact travel plans.

Mauritius has experienced the highest growth rates over the last two decades. The growth strategy of the middle-income countries (Mauritius and Seychelles) has been based on the development of foreign direct investment (FDI). The economic growth of these countries derives mainly from the service sector, namely tourism, information technology, communication, financial services and other offshore services, and fisheries for Seychelles.

Regarding the low-income countries (Madagascar and Comoros), the development strategy has long been dominated by the agricultural sector. The low added value of the agricultural sector explains the investment weakness in these countries as well as the low share of income distributed to its inhabitants. Recently, Madagascar has seen an increase in FDI development, especially in Export Processing Zones, which explains the relatively high growth during the last decade (5 percent per year). However, this growth remains fragile and dependent on political and economic crises. After an average growth rate of 6 percent between 2001 and 2008, the 2009 crisis reduced the economic growth rate to -3.3 percent. Subsequently GDP growth remained low before recovering slightly from 2014. This increase is mainly due to FDI (mining industries, EPZ exports) and tourism resumption. As far as Comoros is concerned, the industrial sector is almost nonexistent and the economy is still dominated by the primary sector. Growth is consistent, but the GDP per capita remains very low.

### The Main Economic Sectors

#### Agriculture

Agriculture is the pillar of **Madagascar**'s economy: it employs 80 percent of Malagasy households, distributed over 2.5 million acres of farms, and accounts for 27 percent of the GDP and 47 percent of the primary GDP (MAEP, 2007; INSTAT, 2007). Although the farm area is small in size of agricultural land (on average 0.87 ha), the potential areas for crops, grazing and ranching are estimated at more than 35 million hectares. Despite its great potential, the poor performance of the sector is a major cause of rural poverty. This performance is attributable, among other things, to structural weaknesses, environmental degradation, use of traditional and low-intensity technologies, low use of agricultural inputs, low level of equipment, difficult access to land and insecure land tenure, exposure to natural disasters, and locust invasions.

Production of rice, the staple food, accounts for 70 percent of the total agricultural production. The country imports 5 percent to 10 percent of the national consumption. The System of Rice Intensification (SRI) and the Improved Rice Cultivation System (SRA), advocated to significantly

increase the production and the productivity, take only 0.34 percent of the area. Irrigated agriculture represents 70 percent of agricultural production and 88 percent of rice production (APRM, 2010), resulting in a strong dependence of the sector on water resources. In addition to subsistence farming, there are some export crops (e.g. litchi, vanilla, cocoa) that earn significant foreign exchange but are restricted to very localized areas of the country, thereby adding to geographic inequalities in revenue. Madagascar remains below its potential for various agricultural products (e.g. especially for essential oils, spices, fruits, and vegetables).

The expansion of the traditional slash and burn agriculture, called "Tavy", is a major cause of deforestation and biodiversity loss. Due to population pressure, lack of access to land, and land degradation in areas currently being exploited, the agricultural frontier continues to grow at the expense of primary forests, also in remote areas, in the high-altitude lands, and on hitherto spared steep slopes. This situation is particularly acute in the regions of Vatovavy Fitovinany and Atsinanana (MAEP, 2007). Land conversion for farming is also a major cause of natural habitat loss, especially in dry forest ecosystems and the xerotic scrubland of southern Madagascar.

**Comoros'** agricultural situation is similar to that of Madagascar in many ways. It is the main economic sector, it contributes about 40 percent of the GDP and income comes essentially from exports. Agriculture employs 70 to 80 percent of the country's workforce. Animal husbandry, the traditional and complementary activity to agriculture, is well developed, with ruminants and domestic poultry. A total of 234,000 head of livestock were recorded in 1996, of which three-quarters were sheep. An activity long considered as local level/subsistence, agriculture is in a transitional phase due to international support for various projects and programs. Producers have been encouraged to organize themselves into groups, and a National Union of Comoran Farmers (SNAC) has been formed to defend the producers' interests. Even so, progress remains slow and insufficient to generate adequate income for the growing rural population. Unsustainable practices and the expansion of agriculture and ranching at the expense of the natural areas make this sector a major driver of biodiversity loss on the island.

Dominated by sugar cane farming for a long time, this industry in **Mauritius** is in decline, especially after the reforms of preferential trade agreements with the European Union. Once completed, it is expected that the sugar sector reform would have led to a decrease in workers involved in operations and field work by 7,200 people. In **Seychelles,** agriculture is economically marginal—it represents only 3 percent of the GDP of Seychelles (NSB, 2006). Production of copra oil from coconut used to be the only cash crop of economic importance, and now it is largely non-existent. Subsistence farming (vegetables and fruits), in some cases associated with poultry and some cattle, is still well represented. Cash crops (bananas, papayas, pineapples, vegetables and flowers) have continued to decline although contributing to the hotels' supply of fresh products.

### Forestry

Forestry remains an important economic sector only in Madagascar, and to some extent in Comoros in the informal sector. In Mauritius, as in Seychelles, people marginally use non-timber forest products, but logging operations do not generate significant income, neither from timber nor from fuelwood (see section on energy). Mauritius' and Seychelles' forests are natural forests (dominated

by exotic species but very important for water resources and biodiversity conservation) most often protected, located on the mountains, and are not used for production.

In Madagascar, on the contrary, and despite rapid deforestation, 12 percent of the national territory, or 9 million hectares, is estimated to be covered by a range of forest ecosystems (e.g. dry forests, rain forests and azonal forests). Timber and non-timber products meet the daily needs of the growing population, and contribute to the livelihoods of 80 percent of the population. A 2001 study estimated the contribution of the forestry sector to the GDP at 20.5 percent, comprised of timber (9.9 percent), fuelwood (9.3 percent), CITES and Non-CITES plants and animal species (1.2 percent), and ecotourism (0.08 percent) (Ramamonjisoa, 2001).

For wood products, Madagascar's annual consumption was estimated in 2006 at 21 million $m^3$, 80 percent of which are for wood energy (JariAla *et al.,* 2006). In the mid-2000s, the government set an objective of reforesting 25,000ha/year, which was reached for the period from 2006 to 2008, but then dropped to 12,671 ha in 2009 (MEF, 2012). The forestry sector, despite efforts made for over several decades, is still dominated by informal operations, often illegal. Thus, many civil society actors have noted since 2009 the increase in illegal logging for precious woods, in particular rosewood *(Dalbergia spp.)*. The promotion of the Forest Stewardship Council (FSC) system has been initiated by Initiative for Certifying Forest in Madagascar (ICFM), but adoption is still small scale. The sustainable management of forest resources still remains one of the country's top priorities and it is a key part of the country's climate change startegies both for mitigation and adaptation (MEDD, 2019). According to a review initiated in 2010, forest governance remains significantly lower than the international standards (AVG, 2010).

In Comoros, industrial logging came to an end in 1987 after a century of operations. However, logging continues in the informal sector along the peripheral villages in forest areas. Some forests have been emptied of their valuable timber. It is difficult to estimate the importance of this operation due to its informal nature, but field observations verify that has a serious and permanent impact. Some endemic tree species have become rare or even unseen in some forests. For example, the forest in Grille (Grande Comore) has been stripped of its mahogany *(Khaya comorensis).* Deforestation is largely due to the expansion of agriculture and the use of wood for energy.

### Fisheries and Aquaculture

The fisheries sector is one of the economic pillars of the hotspot, especially in the region's islands. The traditional fishing activity provides a significant proportion of protein to the populations, living obviously on small islands, but also in Madagascar where about 34 percent of the population lives within 100 km of the coast (REEM, 2012). Marine catches are between 200,000 and 250,000 tons of fish throughout the hotspot (FAO, 2013).

In **Madagascar** alone, approximately 256,000 people work in the fisheries sector, 62,000 of which are direct jobs (including people seasonally engaged in fishing and aquaculture) (Andrianaivojaona, 2010). The situation is similar in **Comoros,** where fishing is a key economic sector and essential to food security in the coastal areas. However, unsustainable fishing methods are practiced by the traditional fishermen, such as dynamite fishing or use of poison such as from *Tephrosia candida,* in spite of the

existing regulation (UNEP, 2008). These practices put at risk the sustainability of the local fisheries resources and are damaging to marine ecosystems, particularly coral reefs.

In **Seychelles**, more than 15 percent of the total formal employment sector is based on the fishing industry, and the sector contributes from 10 to 30 percent of the GDP per year. Tuna fishing is the main fishing activity and Victoria Harbor is the largest port for landing tuna in the Indian Ocean (26 percent of the tuna catches in the Indian Ocean). Tuna fisheries alone account for the majority of the country's exports. A significant decline in tuna landings occurred after 2008 because of Somali piracy, which remains an ongoing risk in the region. International and local efforts to fight against piracy and systematic protection of vessels by guards or soldiers on board, however, helped to address this situation. In some years, fishing exceeds tourism in terms of annual revenues in foreign currencies (e.g. 42 percent in 2010).

Fishing production in **Mauritius** is declining after reaching the peak in the mid-1990s. The government has actively promoted the seafood sector and offered a series of incentives to work on the vast exclusive economic zone of 1.9 million $km^2$, which is potentially rich both in terms of stock and commercial species diversity.

Aquaculture in freshwater and in brackish and marine waters has boomed in Madagascar since the 1990s. The shrimp industry (fishing and aquaculture) has been a promising sector and source of foreign currencies (for example USD $106, 70, and 60 million respectively for 2007, 2009, and 2012, contributing to 9.24 percent, 7.15 percent, and 4.81 percent of the total exports in those years) (INSTAT, 2013). This operation represents an important source of local jobs and income for local people, but also caused environmental problems, including clearing of mangroves to install the farms (ANGAP, 2007). The sector is currently going through a crisis because of the decrease in activity due to the appearance of white spot virus, and is struggling to remain competitive.

### Tourism

Because of its climate and the natural beauty of the countries that compose it, plus its hotel infrastructure and hosting structures, the hotspot is a very popular tourist destination. The major tourist orientations differ among countries and territories: mass beach tourism in Mauritius; smaller scale and higher end tourism in Seychelles; sport, discovery and nature tourism in Madagascar. Natural heritage and biodiversity are major assets for seaside and nature tourism in the hotspot.

Mauritius, Réunion, Seychelles, Madagascar, Comoros and Mayotte Islands launched in 2010 the Vanilla Islands concept, with the objective of increasing tourism exchange between the islands, establishing a common marketing strategy based on the uniqueness of the Indian Ocean destination, and developing a tourist market benefitting from the variation and complementarity of the different experiences the region has to offer. In September 2013 the Maldives joined this regional initiative, thereby increasing the potential to attract tourists to this part of the Indian Ocean islands.

**Madagascar's** tourism sector has experienced strong growth since the early 2000s, and in 2008 the tourism industry was the second largest source of foreign currency, after the shrimp industry, with USD $78 million (Ministry of Tourism, 2013). The socio-political crisis of 2009 and the rise of insecurity (MEF, 2012) reduced by about half the arrivals on the island but numbers have since recovered to about 300,000 visitors per year.

Tourism is one of the major economic sectors of **Mauritius**, contributing at 7.8 percent to the GDP and accounting for about 9.7% of employment in 2016 (Ministry of Tourism website, accessed Nov. 2019). The market is dominated by seaside tourism by European visitors (75 percent, mostly French), and from South Africa (45pprox.. 13 percent) (Lallchand, 2013; Ministry of Tourism website). Tourism has been important for more than 25 years and increased from about 420,000 visitors in 1995 to a little over 1.2 million in 2016 (Ministry of Tourism website, accessed Nov. 2019). The challenge of the island lies in preserving the environmental quality and the integrity of natural habitats for the sake of tourism industry development. **Rodrigues** aims to broaden the basis of its tourism projects and create more jobs in this sector.

Tourism is the main economic sector of **Seychelles**, representing 15 percent of direct jobs (40 percent including indirect jobs), contributing to 20-25 percent of the GDP and over 50 percent of foreign exchange inflows. Visitors reached over 361,000 in 2018. The main markets are from Europe – mostly France, the United Kingdom, Germany, and Italy, representing 66 percent of total visitors to the country. The "Seychelles Strategy 2017" national policy recognizes tourism as one of the major engines of growth for economic development. The tourism operators may play a direct role in biodiversity conservation actions—especially on the privately managed islands—for example by funding programs eradicating invasive species and restoring habitats.

### Energy

On energy issues, the hotspot countries are clearly divided into two groups. The first, composed of Mauritius and Seychelles has relatively high levels of per capita energy consumption, excellent access to electricity by the population and a heavy dependence on imported fossil fuels. The policies of these countries/territories are aimed at developing renewable energies. In the second group, composed of Comoros and Madagascar, energy consumption is lower, access to electricity is lower, especially in rural areas, and their people depend heavily on fuelwood and charcoal to meet their energy needs (Table 7).

*Table 7. Fuelwood and Charcoal Production in the Hotspot, by Country*

| **Charcoal Production (tons, FAO Estimates)** | | | | | | |
|---|---|---|---|---|---|---|
| | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
| Madagascar | 989,100 | 1,028,500 | 1,067,880 | 1 194 970 | 1,194,970 | 1,186,806 |
| Comoros | 36,400 | 37,500 | 38,572 | 39,710 | 40,804 | 41,928 |
| Mauritius | 300 | 300 | 50 | 50 | 50 | 50 |
| Seychelles | 0 | 0 | 0 | 0 | 0 | 0 |
| **Fuelwood Production ($m^3$, FAO Estimates)** | | | | | | |
| Madagascar | 13,100,000 | 13,100,000 | 13,100,000 | 13,100,000 | 13,100,000 | 13,044,951 |
| Comoros | 245,026 | 251,789 | 258,750 | 265,913 | 272,740 | 279,754 |
| Mauritius | 3,000 | 3,000 | 1,700 | 4,000 | 2,200 | 2,000 |
| Seychelles | 3,160 | 3,160 | 3,160 | 3,160 | 3,160 | 3,160 |

In Madagascar, the wood (and charcoal) energy sector represented 92.64 percent of the energy sources used by the Malagasy population in 2011, against 7.36 percent for imported oil products. Renewable energies made up only a very small portion of the country's energy sources (WWF *al*., 2012). Charcoal production places significant pressure on forest resources, owing to increasing energy needs arising from population growth and persistence of non-efficient practices. Even in urban areas,

charcoal is used by 17.1 percent of households. Production is carried out by thousands of coal producers scattered across the island (INSTAT, 2011; Montagne *et al.*, 2010). Data on fuelwood consumption are less available for Comoros, but the situation seems comparable. Wood energy comes from pruning fruit trees, secondary formations (coppice type of guava, invasive species) in peri-urban areas, but also in natural forests. Charcoal production, once produced only from coconuts, tends to spread to other species. Since 2000, an FAO report highlighted the unsustainable use of wood products and the need to develop and disseminate improved stoves and alternative energy (Abdourahaman, 2000).

Madagascar has significant potential to produce solar and wind energy, as well as bioenergy. Currently however, alternative energy production is very low. Various pilot projects and initiatives have been carried out, but scaling up is quite difficult (GT-CC, 2011; WWF *et al*., 2012).

### Extractive Industries

Madagascar is rich in mineral deposits (e.g. bauxite, iron, limonite, precious stones). However, the sector's contribution to the GDP was less than 1 percent in 2012 (REEM, 2012) and has been slowly growing. In the past, mining was mainly focused on small-scale operations (gold, semi-precious, and precious stones) but the country is going through a transitional period, with the development of industrial production, illustrated by several big projects: ilmenite mining by QMM in the Anosy Region (southeast), the nickel-cobalt mining by Ambatovy, where production began in 2012, and the production of chromium by Kraoma. About 500,000 people work in this sector, and these are for the most part artisanal miners or employed to wash gold (World Bank, 2010).

Mining activities can be classified in three categories: large-scale mining as mentioned earlier, artisanal small-scale mining with little or no mechanical equipment, and finally mining that responds to a "mining rush" in which individuals or small groups of miners take advantage of a mining opportunity. Activities carried out with extreme rapidity following the discovery of minerals are informal and often illegal, resulting in social, economic and environmental disasters. These include, for example, deforestation, water pollution, conversion of rice fields, spontaneous creation of villages, school drop-off of children, and sexual exploitation. The western part of the country has experienced the most impact from this phenomenon.

Mining obviously poses risks to natural resources, biodiversity and the associated ecosystem services. Individual and small-scale mining activities, often in the informal sector, are difficult to control and their direct and indirect impacts on the environment can be significant. Industrial mining is better controlled, but its size also entails major risks for the regions. The mining sector is the first sector in which each step (research and exploitation) is subject to a study of environmental impacts—for both artisanal and industrial operations. However, the means available to the structures and the authorities in charge of monitoring and control are limited. An ongoing issue of importance lies in the overlap of legal mining permits within protected areas.

There is no producing oilfield in the hotspot yet, but exploration licenses have been issued by some countries (Madagascar, France and Seychelles) and oilfields are being developed in Madagascar. As in mining, overlap problems between potential oil blocks and terrestrial and marine protected areas exist in Madagascar and may arise (mainly offshore) in other countries.

# 6. Climate Change Policies and Strategies in the Programme Countries

*Madagascar and the Indian Ocean Islands Hotspot*

## Madagascar

*Administrative Framework*

Over the last three decades there have been several government reorganizations of the ministry responsible for the Environment and Forests. Currently it is the Ministry of Environment and sustainable Development that is responsible for defining the national environmental policy, ensures its implementation and integration in the country's economic development. Within this Ministry a Climate Change and REDD+ Coordination Office (BNCCCREDD+) has been established.

The mission of the BNCCCREDD+ is to coordinate all actions related to the fight against climate change, including: (1) to promote, in Madagascar, a resilient economy, adapted to climate change, (2) to promote sustainable development with low carbon emissions and other greenhouse gases that cause climate change and (3) develop sustainable financing mechanisms to combat climate change.

Duties of the BNCCC:

• Implement and coordinate all adaptation and climate resilience actions for the most vulnerable communities and for climate resilience in economic development sectors;

• Implement and coordinate all climate change mitigation actions for sustainable development;

• Facilitate the country's access to the various funds that finance the fight against climate change, including the Green Climate Fund (GCF);

• Strengthen the integration of the Climate Change Dimension at all levels;

• Promote carbon markets for sustainable development, for the benefit of the Malagasy population;

• Develop a global framework on climate change and develop other instruments including sustainable financing instrument for actions to combat climate change in Madagascar;

• Develop strategic documents related to national commitments in the framework of the ratification of the United Nations Framework Convention on Climate Change (UNFCCC) and the Paris Agreement, such as National Communications, Biennial Reports, National Determined Contributions (NDC), Strategies, Programs and Adaptation Plans; Strategies, Programs and Mitigation Plans; other documents required by the UNFCCC Secretariat;

• Manage all databases (sectoral and non-sectoral) related to climate change;

• Manage information, techniques and technologies related to the fight against climate change;

• Supervise all projects working in the fight against climate change and having MEDD as an institutional anchor.

The Ministry also supervises administratively and technically some bodies of importance to the Programme, including:

- *Madagascar National Parks* (MNP), an associative structure that manages a network of 52 protected areas of equivalent to IUCN categories I, II and IV;
- the *Office of the National Environment* (ONE), responsible for guidance and approval of environmental impact assessments;
- the *National Association of Environmental Actions* (ANAE) and the *Service for the Management of the Environment* (SAGE), parastatal associations involved in the fields of the environment, the development, and community capacity building.

An environmental unit is placed within each Ministry to ensure environment consideration in policies, programs, and projects of the concerned sector. The effectiveness of these units varies according to the Ministries. Pursuant to the decentralization policy established in 2006, the ministry has 22 Regional Directions of Environment and Forests (DREF) to ensure that forest and environmental policy is implemented at the Regional level, in collaboration with the decentralized Regional and local authorities, the private sector, civil society, the communities, and the technical services of the central government.

The decentralization of the natural and forest resources management is one of the major reforms initiated in the sector. One of the successes is the application of the natural resources management transfer that allows the legal management transfer empowering local grassroots communities who have voluntarily requested it. This decentralization has also led to a better participation of the Communes (municipalities) in environmental management. Civil society organizations (NGOs, associations, grassroots communities) also play a prominent role in protected areas management in Madagascar and some have at least co-management responsibility for large area of natural ecosystems (see also chapter on civil society). The policy and legal framework allowing civil society to play a major role in natural resources management is therefore in place for Madagascar.

### Climate change Policies and Strategies

The importance of environmental issues is recognized in the Malagasy constitution and the country has ratified most of the major international environmental conventions including the Climate Change Convention (ratified in 1998) and some of its key agreements such as the Kyoto Protocol (ratified in 2003), the Doha amendment to the Kyoto Protocol (ratified in 2014) and the Paris Accord (signed on April 22, 2016)[12]. Madagascar has developed a variety of official documents related to climate change, many of which are specifically related to the UNFCCC. However, some Ministries and/or sectors have developed their own documents that are intended to inform future planning.

The key government climate change policy documents that have been developed are:

- The National Action Plan for Adaptation (*Programme d'Action National d'Adaptation CC/ PANA*) published in 2007 ;

[12] http://www.un.org/sustainabledevelopment/blog/2016/04/parisagreementsingatures/

- The National Policy for Action on Climate Change (*Politique Nationale de Lutte contre les CC/PNLCCC (2010*);
- The list of Nationally Appropriate Mitigation Actions/NAMAs published in 2010;
- The Intended Nationally Designated Contributions/INDCs *(Contributions Prévues Déterminées au Niveau National*) published 2015 ;
- The National Adaptation Plan (*Plan National d'Adaptation*) was approved in late 2019 and should now be considered the main document guiding adaptation policy and strategy (ecosystem-based adaptation is identified as one of the country's priority strategies to pursue);
- Three National Communications to UNFCCC.

Various REDD+ preparation documents have also been produced following the Forest Carbon Partnership Facility process that already provide elements of a REDD+ strategy and a clear indication of how Madagascar is trying to develop a national strategy in stages progressing from a project-based, then an eco-regional approach before a national REDD+ strategy.

### Other relevant Environmental Policies and Strategies

**Malagasy Environment Charter.** The importance of biodiversity, ecosystem services and the role of well-managed protected areas in protecting these is enshrined in the Malagasy Environment Charter.

**National Strategy for Biological Diversity and NBSAP.** The Programme will make an important contribution to protecting globally and nationally important biodiversity. The Programme will also improve the management effectiveness of important areas for biodiversity and for ecosystem services, which is a key objective of the country's NBSAP.

**Policies and legislation on Environmental Impact Assessments**: In 1999 the MECIE Act (subsequently amended 2004) on rendering investment compatible with the environment was promulgated. The MECIE process considers the participation of various actors in environmental management decision-making. The process includes a step for evaluation of the EIA by the public, thereby allowing for participation by civil society.

**Policy on Research and Integration of Science in Decision-making:** Since 2013, Madagascar has a National Scientific Research Strategy, which was developed to meet the new needs of sustainable development, in which the fight against poverty plays a major role.

## Mauritius

The Ministry of Environment, Solid Waste Management and Climate Change is the main ministry for territory planning and environment at large. It is directly involved in environmental protection by identifying environmentally sensitive areas, and administering environmental impact assessments (EIAs) and activities to reduce pollution. It assumes the role of national focal point for the Convention on Biological Biodiversity.

Within the Ministry responsible for environment (named the Ministry of Environment and Sustainable Development at the time), the Climate Change Division was established in March 2010 to lead efforts

in response to the challenges of climate change faced by the country. Through its work, the Division aspires to enhance the country's resilience to climate change.

The Division is responsible for the development, coordination and implementation of climate change adaptation and mitigation policies, programs and initiatives. In addition to the above, the Division also follows regional and international climate negotiations and ensures compliance with international commitments taken by Mauritius under the United Nations Framework Convention on Climate Change and the Kyoto Protocol.

Notable responsibilities include:

- Develop a climate change mitigation and adaptation framework;
- Coordinate national, regional and international projects in relation to climate change and sea level rise;
- Conduct and report greenhouse gas (GHG) emission inventories;
- Preparation of the (Intended) Nationally Determined Contributions to the UNFCCC;
- Preparation and submission of Third National Communication on climate change to UNFCCC;
- Development of a Mauritius 2050 Pathways Calculator;
- Devise and coordinate the implementation of an inter-sectoral climate change monitoring program and its reporting;
- Identify and coordinate Research & Development priorities associated with climate change and sea level rise;
- Follow up on matters pertaining to climate change in national, regional and international fora;
- Contribution in Public Outreach Program.

The Ministry of Agro-Industry and Food Security is also extremely important in the management of natural resources, as this ministry supervises:

- the Forestry Unit, responsible for the management of state forest lands, whether planted or natural forest, this unit principally manages the natural reserves;
- the National Parks and Conservation Unit, established in 1994, is responsible for terrestrial biodiversity protection and preservation, and management of national parks.

A National Commission on the Environment, chaired by the prime minister, manages the work of the Ministry of Environment and the National Development Unit by setting national goals for environmental protection. However, this inter-ministerial body is not currently very active. The advisory board of national parks and wildlife and the council for the natural reserves are consultative structures, bringing together actors beyond administrative services, advising the Ministry of Agro-Industry on issues related to fauna, national parks or reserves. Other informal advisory committees exist, such as the committee on invasive alien species and the committee for threatened endemic plants.

In Rodrigues, organizations involved in biodiversity conservation are under the supervision of the chief commissioner's office (Environment Unit, Division of Forestry and Marine Parks) or the office of deputy chief commissioner (Unit for Water Resources, Agriculture, and Food Production and Quarantine Services). In addition to the environmental impact assessment studies (EIA), all decisions pertaining to environmental issues can be made independent of the central government of Mauritius.

NGOS and the Private sector play an important role in the management of some natural ecosystems. Some nature reserves, such as the islands called Ile aux Aigrettes or Ile Ronde in Mauritius, are co-managed with NGOs such as the Mauritian Wildlife Foundation, or with companies with a mix of public and private investors, like Discovery Rodrigues on Coco Island. Some private entities also play a very positive role in nature conservation by establishing private reserves and engaging in active policies of habitat restoration and endangered species conservation (e.g. Vallée de Ferney and Vanille Reserve in Mauritius, François Leguat Reserve in Rodrigues) in collaboration with the Mauritian Wildlife Foundation, the University of Mauritius, and the international scientific community.

### Climate change Policies and Strategies

Some of the key legislative and policy measures regarding climate change include the following:

- A National Climate Change Adaptation Policy Framework was developed in 2012. The key objectives of this framework are to foster the development of policies, strategies, plans and processes to avoid, minimize and adapt to the negative impacts of climate change on the key sectors and also to avoid or reduce damage to human settlements and infrastructure and loss of lives caused by climate change. Besides, the framework aims to integrate and mainstream climate change into core development policies, strategies and plans of Mauritius.
- A National Disaster Risk Reduction Strategic Framework and Action Plan was developed to identify riverine vulnerable coastal communities exposed to inland flooding, coastal inundation and landslides;
- Technology Action Plan for an enhanced Climate Change Adaptation and Mitigation. Technology Action Plans to implement feasible technologies that reduce greenhouse gas emissions and support adaptation to climate change that are consistent with national development priorities has been completed. 12 technologies have been prioritized following a thorough assessment from an initial list of 128 technologies for enhanced climate change mitigation in the Energy sector and adaptation in the Agriculture, Water and Coastal Zone sectors. EbA activities of dune and vegetation restoration and wetland protection were prioritized in the coastal Zone.
- The National Disaster Risk Reduction and Management Centre (NDRRMC) was set up in 2013 to ensure risk reduction and preparedness planning at all levels;
- A Climate Change Information Centre (CCIC) was established in July 2013. This Centre provides consolidated information on climate change which is accessible to students, researchers, private sector organizations, NGOs and to the general public. This Centre aims to become a regional Climate Change Information Hub for the Eastern African Region in the near future.;
- A Landslide Management Unit to carry out investigations and propose remedial mitigating measures for specific areas prone to landslides;
- The setting up of a Land Drainage Authority under the Land Drainage Authority Act (2017) ;

- A National Disasters Scheme (NDS) was prepared in 2015;
- Amendment of the Local Government Act (2018) to establish penalties of up to 500,000 rupees for any person who undertakes development works without a Building and Land Use Permit

### Seychelles

#### Administrative

The Ministry of Environment, Energy and Climate Change (MEECC) plays an important role in environmental protection and planning for sustainable development. Through various mechanisms and tools, it regulates and controls the pollution and the negative impact of human activities. The Ministry has two departments: Environment and Energy and Climate Change Departments. **The Environment Department** is composed of two divisions; Waste, Enforcement and Permit Division and Biodiversity and Conservation Management Division. **The Energy and Climate change** Department has the responsibility for Energy, water and other related issues pertaining to Climate change. It consists of two divisions, namely Energy Division and Climate Change Division.

The Climate Change Division has the responsibility to coordinate climate change issues, implement the National Climate Change Strategy, the Seychelles Sustainable Development Strategy and the international climate change cooperation and global Negotiations. It is made up of 5 different sections- Climate Adaptation Management, Climate Mitigation Management, Climate Science and Data Management, National Meteorological Services and International Climate Negotiation sections.

Additionally, the Ministry of Environment, Energy and Climate Change encourages the population to adopt positive behavior toward the environment. The MEE is also responsible for implementing the country's commitments to the Convention on Biological Diversity.

Many parastatal organizations play important roles in nature protection issues:

- *The Seychelles National Parks Authority (SNPA):* the national parks authority, which manages the protected land and marine areas (national parks and equivalent), with the exception of the reserves and special reserves (among which Aldabra, Aride and Cousin Islands special reserves)
- *The Seychelles Fishing Authority (SFA):* the authority in Seychelles for fisheries: management of fisheries and fisheries reserves.
- *The Seychelles Islands Foundation (SIF):* Association managing two reserves declared as UNESCO World Heritage: Aldabra (more than 30 percent of Seychelles areas), and the Vallée de Mai. The members of the Board of Directors are composed of scientists and local and foreign dignitaries, and are appointed by the president of the republic.
- *The Islands Development Company (IDC):* The company oversees management and development of the outer governmental islands (except Aldabra and D'Arros-St. Joseph) and the Silhouette Island.

### Climate change Policies and Strategies

The **Seychelles National Climate Change Strategy** developed in 2009 remains the main national document addressing climate change adaptation. EbA is firmly rooted in this strategy through one of its supporting principles, which states that ecosystem-based adaptation needs to be further developed to decrease Seychelles' vulnerability to climate change. In general, higher priority is given to climate change adaptation compared to mitigation in the Seychelles. This is reflected in the emphasis it is given the National Communications to UNFCCC and also the Nationally Determined Contributions (Etongo, 2019). The National Climate Change Strategy is currently being updated (pers comm. CC Division) to reflect the current highest priorities for climate change work.

The MEECC has also recently completed a Coastal Management Plan and is working a setback policy of important relevance to EbA:

- **Coastal Management Plan (2019-2024**). Recognizing the growing threat of hazards, the Government of Seychelles is adopting an integrated approach to sustainable development by placing more emphasis on and investing in the various adaptation strategies to be able to cope. This is the country's first Coastal Management Plan (CMP), and it addresses the hazards affecting Seychelles' coastal zones The CMP consolidates risk information and provides a framework for its use for coastal management, adaptation, and risk management. It aims to help maintain and protect the coastal zone to reduce coastal risk, support healthy ecosystems, and enable sustainable coastal economic development.
- **Coastal setback policy** – This is to establish regulations about development close to the seas shore. It is at the consultation stage and includes a proposal for a no build zone close to the high tide mark.

Other relevant policies for the Programme are:

- **Seychelles' Protected Areas Policy (2013).** The policy summarizes best practices for management planning of PAs, for measuring management effectiveness, sustainable financing, capacity development and for stakeholder and public involvement in PAs. It introduces and outlines the concepts of co-management and proposes templates for co-management agreements for PAs in Seychelles.
- **Seychelles' National Biodiversity Strategy and Action Plan (2015-2020).** The strategic goals and objectives of the NBSAP mainstream the CBD's strategic plan by directly reflecting the 20 Aichi Biodiversity Targets. The NBSAP has a 6-year duration (2015-2020) with a mid-term (3-year) review built in. It is intended to be a living document and hence also incorporates an adaptive mechanism whereby stakeholders can develop, submit and approve additional projects for inclusion in the NBSAP portfolio.

#### *Environmental Conventions*

The countries of the hotspot participate in numerous environmental conventions as summarized in the table below. The number of international conventions ratification is particularly high for this region. However, active participation is sometimes limited by the human resources allocated by

governments, especially for small island states. Effective implementation may also be limited by financial resources available to governments, particularly for Madagascar and Comoros.

*Table 8. Participation in major international and regional environment-related conventions*

| | Madagascar | France | Mauritius | Seychelles | Comoros |
|---|---|---|---|---|---|
| **Conventions, international agreements and initiatives** | | | | | |
| Convention on Biological Diversity (CBD) | X | X | X | X | X |
| Convention on International Trade of Endangered Species (CITES) | X | X | X | X | X |
| United Nations Framework Convention on Climate Change (UNFCCC) | X | X | X | X | X |
| United Nations Convention on the Fight against Desertification | X | X | X | X | X |
| Convention on Migratory Species Conservation | X | X | X | X | |
| Convention on Wetlands of International Importance, RAMSAR | X | X | X | X | X |
| UNESCO Convention concerning the Protection of World Cultural and Natural Heritage | X | X | X | X | X |
| Cartagena Protocol on Biosafety | X | | X | X | X |
| International Treaty on Phylogenetic Resources for Food and Agriculture | X | X | X | X | |
| International Whaling Commission | | X | | | |
| United Nations Convention on the Law of the Sea (UNCLOS) | X | X | X | X | X |
| United Nations Forum on Forests (active members) | X | X | | | X |
| United Nations Action Program on Sustainable Development of Developing Small Islands (Barbados Action Program) | | | X | X | X |
| *International Coral Reef Initiative* | X | X | | X | |
| **Conventions, Agreements, and Regional Initiatives** | | | | | |
| Convention for the Protection, Management, and Development of the Marine and Coastal Environment of the Western Indian Ocean Region (Nairobi Convention) | X | X | X | X | X |
| International Convention on the Conservation of European Wildlife and Natural Habitats | | X | | | |
| African Convention on Nature and Natural Resources Conservation, called Alger's Convention | X | | X | | |
| African Conference of Ministers of the Environment | X | | X | X | X |
| Libreville Statement on Health and Environment | X | | | | |
| Memorandum of Understanding on the Conservation and Management of Marine Turtles and their Habitats in the Indian Ocean and in the South East Asia Area | X | X | X | X | X |

Source: CEPF, 2014.

# 7. Programme Description and Implementation Arrangements

Note that this chapter is also included in the Full Proposal but is included here so that this document can be read as a stand-alone document. Additional information is provided on CEPF staffing that is not included in the Full Proposal document.

## 7.1 Programme Description

In the four Programme countries, the Programme will address the key barriers noted in section B.2 by using tried-and-tested tools developed by CEPF since its inception in 2000 to engage civil society actors in ecosystem conservation. Under this Programme, CEPF's model will be modified to direct investments to geographic and thematic areas of highest priority for EbA. The Programme will work through CSOs, help to build their capacity, and help them develop partnerships with private and public sector actors to achieve EbA. The Programme will also ensure long-term sustainability and replicate best practice during the Programme and also in the long term across the hotspot. The tools and approaches developed under the Programme will be designed to allow replication of EbA by other organizations, but also by CEPF, for whom this Programme will be important support towards integrating EbA more systematically into its global portfolio of grants to CSOs. The Programme has three components, described below:

**Component 1: Developing strategic plans for EbA in the small island biodiversity hotspot that are well aligned with national climate change strategies.**

Expected Programme outcome (see section E5):

*Strategic plans identifying critical ecosystem services prepared, necessary actions costed, and financing plans elaborated*

Under this component, detailed plans will be developed to guide CEPF investment in the hotspot and ensure that it is well aligned both with national climate change strategies and major investments by other donors. These strategic documents will explicitly identify the priority climate adaptation challenges in each Programme country, as well as the specific EbA actions needed to address them. For the hotspot, several documents will be developed with distinct, complementary purposes.

As mentioned in its Operational Manual (Annex 21), CEPF's investment in a hotspot is guided by an 'Ecosystem Profile': a five years investment strategy framed by an analysis of the environmental, economic and political context for conservation of biodiversity, including an in-depth analysis of conservation priorities, and threats to biodiversity and their drivers. Each ecosystem profile is developed through an extensive consultation process involving a wide range of stakeholders, from academic institutions, NGOs, government agencies, donors, indigenous people's organizations, community groups and private companies. In this way, priorities for CEPF investment are established in a bottom-up manner, establishing a foundation for future collaboration, and paving the way for the partnerships that are the hallmark of the fund's approach.

An Ecosystem Profile for the hotspot focused on biodiversity conservation was published in 2014. It needs to be updated, both to take account of the evolving context and to establish priorities for investment in EbA. This will be done by CEPF through extensive consultation processes, involving stakeholders from civil society, government, private sector and the donor community. The updated

document will consider the gender implications of climate change, including how men and women may be impacted in different ways, and how they can best be engaged in developing and implementing EbA activities under Component 2. Another key exercise will be to identify priority areas for support to EbA activities. The existing Ecosystem Profiles identify priority sites for CEPF investment based on Key Biodiversity Areas (KBAs): sites that contribute signficantly to the global persitence of biodiversity. This analysis will be extended to incorporate ecosystem service values, to focus site-level investments at coastal, freshwater and terrestrial ecosystems that play critical roles in provision of ecosystem services. This so-called "KBA+" methodology has been piloted in Madagascar (see Chapter 8), and will be updated and replicated in the other Programme countries.

The KBA+ methodology assesses the value of KBAs and their surrounding areas for ecosystem services, thereby identifying geographical areas that contain natural ecosystems of high importance for biodiversity as well as for provisioning, regulating and cultural services. For example, in the KBA+ pilot for Madagascar, areas were identified on the basis of their importance for food provisioning, freshwater provisioning, climate mitigation, disaster risk reduction and cultural values. These multiple ecosystem services from terrestrial and freshwater ecosystems were then combined based on the results to give an overall prioritization of KBAs in terms of their ecosystem service provision. Once the KBA+ sites have been identified, they will be prioritized for investment by CEPF through the consultation process mentioned above so as to arrive at a broad vision shared by the different stakeholders regarding the priorities for CEPF funding of EbA.

*Table 9. Types of Ecosystem services and the measures used for the KBA+ pilot in Madagascar*

| **Provisioning services** | **Measures of Ecosystem Services** |
|---|---|
| Food provisioning | Average landed values of fish catch; number of food insecure people living within 10km of mangroves or coral reefs; number of food insecure people living within 10km from natural terrestrial and freshwater ecosystems |
| Freshwater provisioning | Relative importance of KBAs for freshwater for domestic use; relative importance of KBAs for freshwater for irrigation; relative importance of freshwater for hydropower |
| **Regulating Services** | |
| Climate change mitigation | Average biomass carbon stock per hectare; potential avoided carbon emissions from deforestation |
| Disaster risk reduction | Number of people vulnerable to climate change-driven increases in storm surges that are potentially protected by mangroves; relative importance for flood risk protection |
| **Cultural Services** | |
| Cultural values | Number of visitors to protected KBAs |

The updated Ecosystem Profile will guide CEPF investment during the first five-year phase of the Programme, and then be updated again, by CEPF, before the second five-year phase, to take account of the evolving project context and lessons learned in the first five years. Ecosystem Profiles provide a detailed strategy for investment in conservation and restoration of critical ecosystems over a short timeframe but, in order to plan CEPF investment into the long-term and to allow for eventual transition to other sources of support, a "long-term vision" will be developed.

Long-term visions recognize that CEPF should not be a permanent presence in each hotspot but, rather, should define and work towards an end point where local civil society transitions from its support with sufficient capacity, access to resources, and credibility to respond to future ecosystem conservation challenges. CEPF's experience shows that reaching such a point will take more than five years. Thus, the long-term vision will set clear transition targets that individual investment phases (typically of five years) will work towards, guided by the Ecosystem Profile. The long-term vision will be developed along with a financing plan for the Ecosystem Profile as a whole, describing the funding requirements for their implementation (i.e. the best estimate of the funding needed to achieve the transition targets). This financing plan will inform fundraising efforts by CEPF and other donors, and will explore potential sources of long-term financing for EbA activities led by civil society, including from non-traditional sources, such as the private sector. This is critical to achieve a successful exit strategy (see section B.6).

In addition to sustainable financing, other avenues for ensuring that EbA approaches developed in the hotspot are continued and replicated beyond the end of the Programme will be explored. In particular, the Programme will promote the uptake of effective EbA approaches demonstrated by CSOs into public policy, including but not limited to national climate change strategies and adaptation plans. To this end, opportunities for mainstreaming EbA into public policies will be identified in consultation with relevant government agencies in each country and integrated into the Ecosystem Profile and long-term vision (with related CSO subprojects being supported under Component 2). The Programme will also promote uptake of EbA approaches by private companies in sectors with a large footprint on coastal and terrestrial ecosystems, such as agriculture, fisheries, forestry and tourism. Strategies for CSO engagement with leading companies in these sectors will be developed and incorporated into the long-term vision for the hotspot.

AFD and CEPF's experience is that Ecosystem Profiles, long-term visions and the accompanying financing plans are very useful planning tools broadly used by other donors, national governments, and various other actors engaged in activities related to sustainable management of natural resources. Updating these documents with a strong EbA component will indirectly impact all the different actors who will take into account these documents. To do this effectively, they must be well aligned to national climate change strategies and adaptation plans. Currently, the Programme countries differ greatly in the level of detail of their strategies for EbA. Where detailed national (or subnational) EbA strategies exist already, this component will draw on them rather than creating new or competing visions for EbA. This component of the Programme will be funded by co-financing from CEPF.

The outputs and activities of this component are:

*Output 1.1 Ecosystem Profile updated in the hotspot to identify and prioritise EbA actions by CSOs.*

Activity 1.1.1 Identification of important Ecosystem Services and areas for EbA.

Activity 1.1.2 Stakeholder consultation to set priorities for CEPF investment in EbA.

Activity 1.1.3 Develop and publish updated Ecosystem Profile for the hotspot.

*Output 1.2 Long-term Vision for civil society enagagement in Ecosystem-based Adaptation developed for the hotspot with participation of government, civil society, donor and private sector actors.*

Activity 1.2.1. Use multi-sectoral participatory processes to collect data needed for the long-term vision.

Activity 1.2.2. Define targets for CSO capacity building for the hotspot.

Activity 1.2.3. Develop and publish Long-term Vision for the hotspot.

*Output 1.3 Financing Plan developed for the long-term vision document.*

Activity 1.3.1. Establish financial targets for identified EbA actions.

Activity 1.3.2. Develop financing plan for the hotspot.

*Output 1.4 Sector and/or development policy targets set for addressing key drivers of ecosystem service loss in the hotspot.*

Activity 1.4.1. Identify opportunities for CSOs to engage in mainstreaming EbA into government policies (results are integrated into Ecosystem Profile and Long-term Vision; support to CSOs to be provided under Component 2).

*Output 1.5 Strategies for engagement with private sector actors for mainstreaming EbA into business practices of industries driving ecosystem service loss completed for the hotspot.*

Activity 1.5.1 Identify opportunities for private sector partnerships with CSOs to deliver EbA (results are integrated into Ecosystem Profile and Long-term Vision; support to CSOs to be provided under Component 2).

**Component 2: Supporting EbA activities through grants to CSOs.**

Expected Programme outcomes (see section E5):

*Critical ecosystem services are maintained and enhanced through EbA activities in priority areas*

*EbA impacts are quantified through application of cutting-edge science*

The majority of Programme activities will take place under Component 2. Under this component, grants will be provided by CEPF during the Programme implementation period (10 years) to CSOs to undertake EbA activities aligned with the geographic and thematic priorities identified in the Ecosystem Profile updated under Component 1. CEPF uses a very broad definition of civil society, to encompass all organizations that are not government entities. To be eligible to apply for CEPF grants, government-owned enterprises or institutions are eligible only if they can establish i) that the enterprise or institution has a legal personality independent of any government agency or actor, ii) that the enterprise or institution has the authority to apply for and receive private funds, and iii) that the enterprise or institution may not assert a claim of sovereign immunity. Applications for grants from CSOs will mainly be generated through open calls for proposals, based on the priorities defined in the Ecosysystem Profile. These calls for proposals will be widely advertised through online and mainstream media, as well as a local dissemination of the information. If persistent gaps emerge in the grant portfolio, they may be addressed through targeted use of grants by invitations (see section 4 of Annex 21 – CEPF's Operational Manual for details of grant management process). The grant selection process will involve external peer reviewers and be supported by a Regional Implementation Team (RIT) for the hotspot (with CEPF retaining responsibility for grant approvals). The RIT will be hosted at an established CSO in the region, selected through a competitive process, and will provide detailed knowledge of the local context. As well as supporting the grant selection process, the RIT will have important roles in monitoring and oversight of grants, capacity building for grantees, and ensuring that the CEPF grant portfolio remains well aligned with national strategies and other initiatives in the climate adaptation space. An important part of CEPF's objective, and an important

task for the RIT, is to strengthen local CSOs, most of which are small or medium sized and so CEPF grants tend to be relatively small. For the Programme, grants to CSOs are expected to be in the range of USD 200,000 on average and for a period of 2 to 4 years.

*Eligibility criteria*

The grant selection process will have an important emphasis on ensuring that proposed EbA activities are gender sensitive and that women are equitably engaged in the activities supported. In addition, CSOs applying for grants will need to demonstrate how vulnerable people (such as migrants and young adults with limited opportunities) are considered and integrated into Programme activities. As part of the grant selection process, all proposals will be screened against CEPF's environmental and social safeguard policies, which are consistent with, and fulfil the requirements of, GCF's policies. Detailed information on the grantmaking process is provided in CEPF's Operational Manual - Annex 21. To access funding from CEPF, prospective grantees will need, at minimum, to demonstrate that their subprojects:

- Are in line with EbA thematic and geographic priorities identified in the Ecosystem Profile developed under Component 1;
- Contribute to achieving the GCF's investment criteria;
- Demonstrate that the proposed EbA activity addresses vulnerability based on a clear climate change risk;
- Adopt EbA approaches that increase the resilience of ecosystems and ecosystem services that are critical to local or national populations;
- Reflect on the climate change mitigation potential of the subproject;
- Address priorities identified in national climate change policy or strategy documents;
- Avoid or fully mitigate negative environmental and social impacts[13];
- Meet the requirements of GCF environmental and social safeguards and all relevant GCF policies
- Meets the due diligence requirements of CEPF (included in Annex 21, Operational Manual);
- Demonstrate positive gender impacts;
- Demonstrate effective and efficient use of funds;
- Demonstrate a clear strategy for achieving financial sustainability;
- Will be implemented during the Programme period.
- Grants cannot be used for:
- The purchase of land.
- The removal or alteration of any physical cultural property (including those with archaeological, palaeontological, historical, religious or unique natural values).
- The relocation of people or any other form of involuntary resettlement.
- The capitalization of trust funds.

Priority will be given to subprojects that are the closest fit to the investment strategy set out in the CEPF ecosystem profile. Preference will also be given to subprojects that demonstrate a leading role for local organizations and/or an explicit focus on capacity building for local civil society. Subprojects that show that they will coordinate with other organizations to prevent duplication of efforts are preferred, as are subprojects that work with partnerships and alliances.

[13] To ensure consistency with CEPF's existing environmental and social safeguard policies and a category C Environmental and Social safeguard designation according to GCF's criteria.

Other considerations that will strengthen an application include:

- Endorsement from relevant government authorities
- Clear plans for continuing the subproject after the CEPF funding is complete
- Support for indigenous and local communities in community-based or co-management activities for EbA and actions that enhance local communities' tenure and resource use rights

CEPF maintains a public subproject database (https://www.cepf.net/grants/grantee-projects) that can guide applicants on the types of subprojects that have been successful in securing funding in the past.

In addition, all grants for site-based EbA activities must be located at priority sites identified in the updated Ecosystem Profile, following the KBA+ methodology. It is expected that these sites will be concentrated in coastal ecosystems, given the nature of climate change threats to small islands, but freshwater, forests and other terrestrial ecosystems will also be considered, based on their critical role in supporting climate resilient livelihoods and the delivery of essential ecosystem services. Because many communities have livelihood strategies that depend on coastal and terrestrial resources, particular attention will be given to sites that present opportunities for "ridge-to-reef" approaches to conservation and restoration of ecosystems and ecosystem services.

Through this process, a portfolio of grants to CSOs will be developed in each country that aims to increase the resilience of local communities to climate change through restoration and improved management of ecosystems and ecosystem services that are critical for local or national populations. There will be variation within and among countries with regard to the specific EbA approaches adopted but these are likely to include interventions to:

- Protect and restore wetlands, mangroves, coral reefs and seagrass meadows that deliver protection against storms and sea level rise, and provide food and income to coastal communities.
- Protect and restore watershed forests that perform critical flood prevention, soil stabilization and catchment protection functions.
- Pilot and replicate climate-resilience agroforestry models, using native plant species for shade, ground cover and nutrient fixing.
- Preserve and restore traditional and indigenous knowledge and natural resource management practices, including ones related to building materials, wild foods and traditional medicines.
- Diversify, strengthen and protect livelihood assets and strategies, including through sustainable fisheries management, nature-based tourism, value chains for natural products, etc.
- Restore small island ecosystems through eradication and control of alien invasive species.

This component also recognizes that work on the science underpinning EbA approaches is needed within the biodiversity hotspot, which will be particularly relevant for associating academic institutions with the Programme. Applied research activities will be supported during the Programme implementation period to improve understanding of the role of specific ecosystems and to test the effectiveness of promising EbA techniques. The research will generate important information to guide policy decisions about EbA in the Programme countries and globally. This component will also include activities to ensure rigorous, science-based quantification and verification of the impacts of the grant portfolio on ecosystem services. As specified in CEPF's standard grant agreement (provided in the

Operational Manual - Annex 21), intellectual property of any creative work developed as a result of CEPF funding will remain with the grantee. However, the funding sources (including the GCF) would have rights to publish or use any works for non-commercial purposes.

The outputs and activities of this component are:

*Output 2.1. Priority EbA activities by CSOs supported in priority areas as defined in the Ecosystem profile.*

Activity 2.1.1. Select and contract Regional Implemention Team (RIT).

Activity 2.1.2. Manage the grant making process.

Activity 2.1.3. Administer EbA grants for CSOs.

Activity 2.1.4. Supervision, Monitoring and evaluation of grant portfolio.

*Output 2.2 EbA action impacts quantified through cutting-edge science.*

Activity 2.2.1. Support applied research activities to improve understanding of the role of specific ecosystems and to test the effectiveness of promising EbA techniques.

Activity 2.2.2. Support research activities that provide quantification and verification of the impacts of grant portfolio on ecosystem services.

**Component 3: Ensuring long-term sustainability and replicating success through knowledge products and tools for EbA.**

Expected Programme outcomes (see section E5):

*Success replicated through use of EbA knowledge products developed by the Programme*

*Financial and institutional sustainability of EbA programs strengthened, including through enhanced public and private partnerships*

This component aims to replicate success through knowledge products and tools and ensure the financial and institutional sustainability of the Programme for ecosystem-based adaptation, including through enhanced public and private partnerships.

Component 1 of the Programme includes development of the Ecosystem Profile, and it is at this stage that CEPF will identify the topics for knowledge products that would be most useful to change the course of EbA in the hotspot and beyond.

In Component 2 of the Programme, grants will be awarded to CSOs to adopt and demonstrate successful EbA activities in the hotspot.

In Component 3, CEPF will take the successful models and tools developed and demonstrated under the first two Programme components, and produce innovative knowledge products that will allow wider replication of these best practices by other organizations and also by CEPF in other hotspots where it is active (currently 9 hotspots).

Globally, CEPF manages a grant portfolio of approximately USD 16 million per year and therefore there is enormous potential for the Programme to create leverage, both during the Programme period and beyond, by helping CEPF to systematically integrate EbA into its global grant-making.

Knowledge products will be innovative and varied, and tailored to deliver to a specific audience, which will affect the format of the knowledge product. A knowledge product could be a manual, guidebook, video, website/portal, drama, webinar or other approprate means to share best practice to stimulate its uptake elsewhere in the hotspot and in other hotspots globally. Means of delivery can go beyond the actual product, or even be "the product", and could include learning exchanges, partnerships between CSOs and private sector actors, a demonstration event for pilot activities, or informative panel discussions, among others. Knowledge products developed under this component will include at least one related to gender and at least one on the role of local communities in EbA. Emissions-free approaches to share lessons will be prioritized and, to this end, exchanges will use teleconferencing where possible. The ultimate goal is to ensure that best practice for EbA activities is documented, shared and replicated both in the hotspot and beyond, enabling learning by CEPF grantees as well as by organizations that may not be current partners of CEPF. GCF funds will not be used for the replication work outside of the four Programme countries and CEPF costs for this have not been included in co-finance or parallel finance for the Programme.

The second part of this component is to ensure financial and institutional sustainability of action on EbA in the Indian Ocean hotspot, via several means, including: creation of a long-term implementation structure; building the capacity of civil society; and developing resource mobilization strategies and innovative models for private sector finance to support CSO EbA actions in the hotspot. The aim of a long-term implementation structure is to become the steward of the long-term strategic vision for the hotspot, able to coordinate and support civil society organizations, connect them with government and private sector partners, and help them prepare for future challenges. This entity must be able to perform all functions of the current Regional Implementation Team (the custodian of the Ecosystem Profile), as well as build a resilient civil society capable of understanding the global context and trends, and charting a course to meet the challenges of the future. Both the RIT and the long-term implementation structure aim to enable conservation-focused civil society actors in the biodiversity hotspot to achieve sufficient levels of capacity, credibility and resourcing to ensure they remain effective agents of change, unreliant on continued external funding support. This objective will guarantee they have both the capacity and the access to resources necessary to respond to emerging challenges, to demonstrate effective EbA models, and become trusted, long-term advisors to government and private sector actors in EbA.

This component will also include development of a resource mobilization strategy for EbA projects in the hotspot and innovative models for private sector finance of EbA. Private sector finance models will be innovative and varied, and could for example be modelled on biodiversity offsets, where a company provides long-term financial support to an area not currently managed for conservation to compensate for the residual impacts of its operations that could not be fully avoided or mitigated. Several examples of this exist with mining companies in Madagascar, and could serve as models to learn from. These activities will form an important part of the long-term strategy to sustain the Programme's impacts.

The outputs and activities of this component are:

*Output 3.1 Models, tools and best practices developed under the Programme are widely available and inform other actors developing and implementing EbA actions globally.*

Activity 3.1.1 Develop innovative knowledge products documenting models, tools and best practices developed under the Programme (including at least 1 on gender and 1 related to local communities).

Activity 3.1.2 Support the replication of successful policy demonstrations.

Activity 3.1.3 Support the replication of EbA action through innovative partnerships between CSOs and the private sector.

*Output 3.2 Ensuring the financial and institutional sustainability of multi-sector programs for EbA, including through enhanced public and private partnerships.*

Activity 3.2.1 Support the creation of long-term implementation structures to serve as a steward for the hotspot's Long-term Vision.

Activity 3.2.2 Build organizational and technical capacity of CSOs for EbA in the hotspot.

Activity 3.2.3. Develop resource mobilization strategies to generate additional revenues for EbA programs in the hotspot.

Activity 3.2.4. Develop innovative models for private sector finance to support CSO EbA actions.

The Programme is proposed to have a duration of 10 years. This will cover two five-year phases of investment in the hotspot. Based on CEPF's long experience working with CSOs in the biodiversity hotspot, a duration of three to five years is too short to achieve sustainability. A longer duration will provide sufficient time to build capacity among CSO partners to implement EbA actions, develop a robust scientific basis for quantifying impacts, and achieve technical and financial sustainability. A 10-year duration will also allow successful approaches to EbA to be refined if necessary, documented and amplified, through replication by other CSOs and integration into government policies and programmes.

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## 7.2 Implementation Arrangements

AFD is the GCF Accredited Entity. It is a long-standing member of the CEPF Donor Council. Since its first contribution to the CEPF in 2007, AFD has granted it with a total of USD 58 million. It is actively involved in the Indian Ocean Region and aims at strengthening its actions to preserve, restore and sustainably manage biodiversity, improve living conditions for vulnerable people and to strengthen the capacity of the population to mitigate and adapt to the effects of climate change.

The CEPF is the unique Executing Entity of the Programme from a technical point of view (hosted by Conservation International, the signatory of the Agreement with the AE (AFD)).

CEPF was established in 2000 as a mechanism to enable Civil Society Organizations (CSOs) to support conservation of critical ecosystems within biodiversity hotspots. CEPF is a joint initiative of l'Agence Française de Développement (AFD), Conservation International (CI), the European Union, the Global Environment Facility (GEF), the Government of Japan and the World Bank. Legally, CEPF is a program of Conservation International Foundation (CI). Conservation International Foundation is a non-profit public benefit corporation organized under the laws of the State of California, U.S.A. Conservation International is one of CEPF's global donor organizations. It hosts the CEPF secretariat (a team of around 25 conservation, finance, grant management and communications professionals) and provides supporting legal and financial services but the CEPF has its own governance system and its own specific sub account into CI main bank account (see the CEPF's Operational Manual - Annex 21).

Since its inception, CEPF has granted more than USD 232 million to over 2,300 CSO grantees in 24 biodiversity hotspots. Since its establishment in 2000, CEPF has adopted a targeted approach to biodiversity conservation, focusing on the most threatened species (following the IUCN Red List), the sites important for them (following the Key Biodiversity Area (KBA) standard), and the corridors that connect them. With a small fraction (less than 0.5%) of funding for biodiversity conservation in developing countries, CEPF has had a disproportionately high impact. It has helped: address threats to 6% of globally threatened vertebrates (550 of 9,013 species); strengthen the protection of 4% of KBAs (691 of 16,000 sites) covering 46 million hectares; and expand protected area coverage by 15.3 million hectares (equivalent to 7% of the expansion of terrestrial protected areas in developing countries). Within the target countries of the project, CEPF has supported the creation and expansion of protected areas covering 1,587,400 hectares and strengthened the management of biodiversity within production landscapes covering 971,085 hectares[14].

The Programme will be executed through CEPF's well established procedures described below (summarized in Figures 4 and 5 and detailed in the CEPF's Operational Manual - Annex 21). The Programme will make use of CEPF's existing structure, governance arrangements, CSO networks, procedures and tried-and tested tools for engaging CSOs in EbA actions.

The CEPF Secretariat (hosted by Conservation International and based in Arlington, USA) will be responsible for the Programme execution. It will be accountable to the AFD for the GCF funding it receives under the Programme, and also to the CEPF Donor Council[15], for contributions from its global donor partners. The flow of funds for the Programme is indicated on Figure 4 by the solid arrows. The Donor Council will function as the Programme Steering Committee (PSC). The Donor Council is the key governance mechanism for CEPF, with authority to select hotspots for investment, allocate budgets for grant making, and approve changes to CEPF's Operational Manual. Decision making by the Donor Council is by consensus, meaning that decisions related to the Ecosystem Profile approval / RIT selection require the favourable votes of both AFD and CI Technical staff representing the global

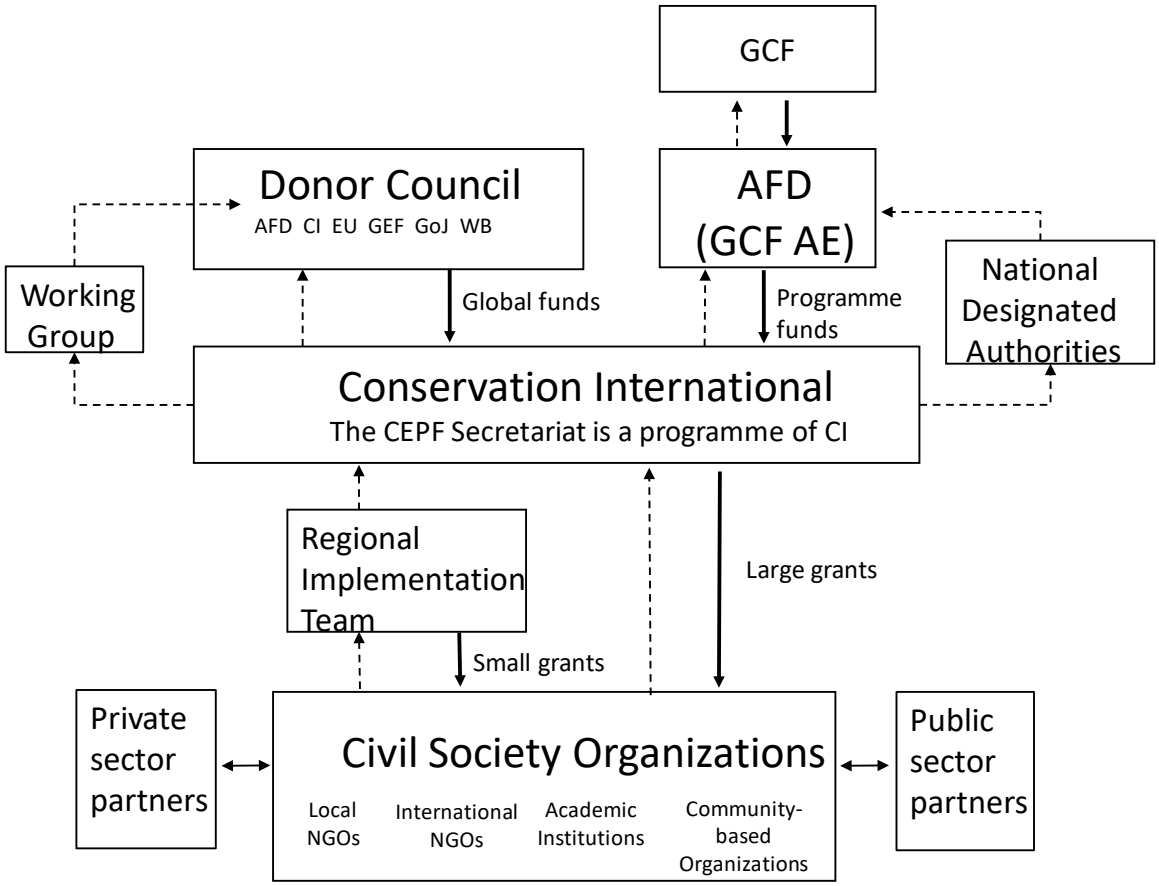
[14] CEPF's website, www.cepf.net includes reports on CEPF's impact, evaluation reports and other important resources for prospective and current CSO grantees such as Ecosystem Profiles, case study documents, a grants database and information on applying for funding for subprojects.

[15] The Donor Council consists of representatives from CEPF's donors: AFD, Conservation International, the European Union, the Global Environment Facility, the Government of Japan and the World Bank.

donors form the CEPF Working Group, which reports to the Donor Council and provides technical guidance to the CEPF Secretariat.

The Programme will be executed by the CEPF Secretariat (see section 7.3 for information on CEPF structure and staffing). The CEPF Secretariat supports and oversees grant-making in the hotspots, ensuring compliance with donor policies, and monitoring and communicating results. Coordination and support in each hotspot are provided by a Regional Implementation Team (RIT), based locally, selected through a competitive process. The NDAs in each country will also be involved in the selection of CSO subprojects (with country-specific arrangements to be put in place), ongoing monitoring and evaluation of Programme progress, and will participate in supervision visits made by AFD and CEPF.

*Figure 19. Proposed governance structure for the Programme showing the relationships between the different entities involved.*




**Reporting (dashed arrows), Funding (thick arrows) and Partnership (two-way arrows)**

The majority of Programme activities will be executed via subprojects funded by grants to CSOs.

Grants to CSOs will be of three types.

First, a grant will be used to contract a Regional Implementation Team (RIT) for the hotspot. The RIT will be selected, based on an open call for proposals for the hotspot (see Annex 21 section 4.2 for

terms of reference of the RIT and description of the RIT selection process). Approval of selection of the RIT is done by the CEPF donor council. The RIT is in charge of supporting and coordinating the CEPF activities on the ground. It is usually an NGO of middle size or even composed of a consortium of NGOs. The RIT will become responsible for managing the grant-making process within the hotspot. It acts under the supervision of CEPF. The RIT will receive training in the Manual's policies and provisions within 90 days of appointment. It is also in charge of managing the small grants (see below).

Next, two types of grants will be made for implementation of subprojects consistent with the investment strategy set out in the Ecosystem Profile for the hotspot:

- Large grants refer to grants above a threshold amount of USD 50,000;
- Grants below the threshold amount are referred to as small grants.

Approval of all grants will be done by CEPF. Typically, large grants are used to engage international and larger, more established local CSOs, while small grants are used to engage local CSOs with less experience of receiving international donor funding, such as grassroots NGOs and community-based organizations. All grants awarded and activities supported with CEPF funding must be in compliance with the policies and procedures outlined in the CEPF Operational Manual (Annex 21), including all financial protocols. The CEPF procedures conform to the requirements of all its donors (and GCF) in terms of anti-terrorism screening, risk analysis, procurement procedures. Despite the complexity of the requirements, CEPF has developed specific tools and tailored its grant-making processes to facilitate access to funding by small CSOs. AFD has modified its own programmes destined for NGOs with inspiration from CEPF's tools and procedures. Financial audits of CEPF are conducted annually but the World Bank also commissions periodic institutional assessments[16] which have shown that CEPF funds are used in conformity with the procedures in place and that CEPF's funding is particularly important for small NGOs.

Funding disbursements

Regarding disbursements, the following details have been specified in the Term sheet:

From GCF to AE: Two disbursements will be made from GCF to the AE.

A first disbursement will be requested after the signature of the AFD/GCF Agreement by the AE to the GCF. This demand will be based on a spending plan prepared by CEPF and approved by the AE for the first 5 years of the Programme (approximately USD 19 million based on the budget – see Annex 4). This spending plan will include projections for sub-grant awards and disbursements to sub-grantees, as well as costs related to CEPF Secretariat operations.

The second disbursement (anticipated at Year 5 of the Programme), will be requested by the AE to the GCF once 70% of the first installment is committed by the EE.

From the AE to the EE: Two disbursements will also be made from the AE to the EE, once the AE get the funds from GCF (see above).

CI will ask for a first installment after the signature of the AE/EE Subsidiary Agreement, on the basis of an approved spending plan, for the first 5-year period (approximately USD 19 million based on the budget – see Annex 4).

[16] For example, https://www.cepf.net/sites/default/files/cepf_institutional_assessment_report_comissioned_by_the_world_bank.pdf

Trying to do the minimum of disbursements is the approach that AFD currently uses to fund CEPF after more than 15 years of Experience with CEPF. It reduces management costs and it is more efficient.

Once CI has committed 70% of the first tranche of funding, they will submit a spending plan to cover the remainder of the Programme implementation period. In case there is a limited appetite for subproject funding under calls for proposals in the first five-year phase, the spending plan for second five year phase would be revised downwards and AFD would disburse less funding to CI for the CEPF programme.

The maximum cumulative amounts that would flow to the RIT are estimated to be USD 3 million (over 10 years) for implementation of the RIT grants, plus an additional USD 3 million (over 10 years) for regranting through the small grant mechanism. These figures are indicative given the difficulty of projecting costs 10 years into the future.

Grant cycle

The typical grant cycle for CEPF will be followed and is indicated in Figure 4 below. Further details are provided in Section 4 of Annex 21 and at https://www.cepf.net/grants/before-you-apply/life-cycle-of-grant. The grant cycle comprises the following steps:

**CEPF opens a Call for Proposals**. Calls for Proposals will be advertised on CEPF's website and through local media in the Programme countries.

**Submit a Letter of Enquiry**. Prospective grantees will submit a letter of enquiry to CEPF (for large grants) or the RIT (for small grants). See section 4.3.1 of Annex 21 for details of content of a letter of enquiry.

**Prepare Full Proposal (Large grants only).** Based on the letters of enquiry, prospective grantees for large grants will be invited to proceed to develop a full proposal. In addition to the proposal, documents such as anti-terrorism screening, financial questionnaires and supporting documentation and cash flow estimates for the initial months of the subproject will be requested to allow due diligence.

**Additional information (Small grants only).** Successful small-grant applicants will not need to submit a subproject proposal in addition to the letter of enquiry. However, the RIT will request additional information relevant to the subproject (e.g., detailed budget, work plan, financial questionnaire, bank details, etc.) and they will be required to the same set of screenings and checks, including anti-terrorism screenings, environmental and social safeguards as for large grants (refer to Annex 21 for details of checks).

**Prepare safeguard documentation (if required).** All subprojects (large and small) will be screened against the CEPF safeguard policies (which address GCF safeguard policies – see Annex 6). If a project triggers one or more safeguard policies, the grantee will be asked to prepare the relevant safeguard document(s) and incorporate related measures into the subproject's design. Safeguard documents will be prepared by the grantee in parallel with proposal design and must be approved prior to approval of the subproject.

**Applicant signs grant agreement**. Successful applicants for large grants will sign a grant agreement with CEPF. Successful applicants for small grants will sign a grant agreement with the RIT for the hotspot.

**Orientation training**. Large-grant recipients will be required to attend a CEPF online orientation training within the first three months of their subproject's start date. Details on this training will be provided shortly after countersigning the grant agreement. All small grant recipients will benefit from a new-grantee orientation, either by completing the online course or by participating in a training organized by the RIT.

**Gather baseline monitoring information**. New grantees need to submit baseline monitoring information within three months of the start date of their grant. The precise information required will depend upon the purpose of the grant, and will need to include relevant indicators in the Programme's Monitoring and Evaluation Plan (Annex 11), but the following tools are commonly required:

- Gender mainstreaming tracking tool – required for all grantees (one per organization)
- Civil society organizational capacity tracking tool – required for all grantees registered in one of the countries of the hotspot where the project will take place (one per organization)
- Management Effectiveness Tracking Tool (METT) – required for grantees working to strengthen management of protected areas (one per protected area)

**Implement and report on subproject**. Recipients of large grants must submit financial reports each quarter and progress reports every six months through CEPF's online grants management software, ConservationGrants. Additional reports may also be requested for compliance with financial and safeguard policies. The reporting requirements for small-grant recipients will vary depending on the subproject, and will be outlined in the grant agreement. All small-grant recipients will be required to provide interim and final technical and financial reports, either online, or through the RIT. They will also be required to complete the same tracking tools and safeguard monitoring reports as large grantees. The frequency of report and requirements supporting documents will vary among sub-grantees, and be defined in the individual sub-grant agreements.

**Site visits**. Members of the CEPF Secretariat and the RIT will perform financial supervision missions and programmatic site visits to selected grantees each year. Members of AFD, the AE, will also take part in these visits (AFD has regional staff based in Comoros, Madagascar and Mauritius – also responsible for covering AFD's programmes in Seychelles).

**Address delays and challenges**. CEPF recognizes that due to unforeseen challenges, subproject delays may sometimes happen. When this occurs, grantees may request an extension to the duration of the grant ("no-cost extension") or other changes to the deliverables or budget. CEPF and the RIT will try to accommodate reasonable requests supported by adequate justifications; however, they do reserve the right to reject any amendment request and no extensions will be made beyond the end of the Programme period.

*Figure 20. Typical Grant cycle for CEPF subprojects*

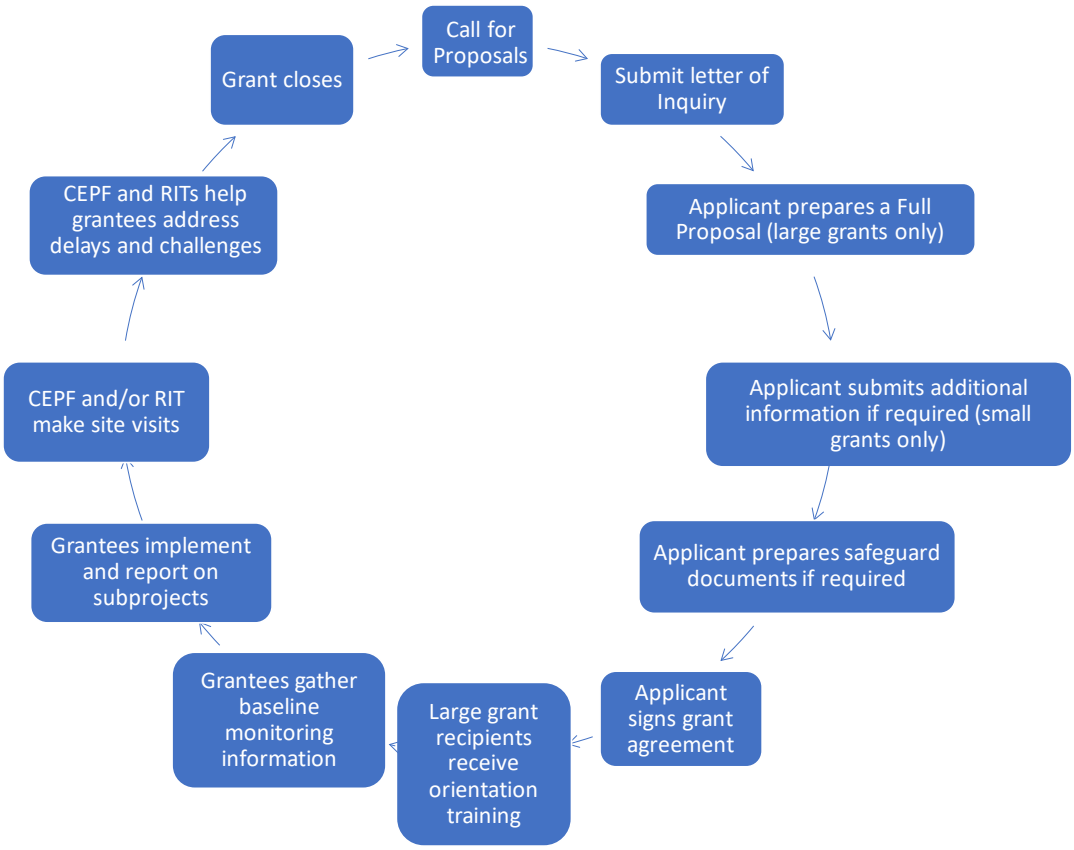



*Table 10. Role and responsibilities of key entities involved in the Programme*

| Entity | Role | Programme responsibilities |
|---|---|---|
| AFD | GCF Accredited Entity | Overall responsibility for ensuring that the Programme is implemented in accordance with GCF requirements. |
| NDAs | National Focal Point | Ensure that the Programme addresses national adaptation priorities by coordinating government technical agencies' participation in the activities of Component 1, including development of the investment 'Vision' and 'Ecosystem Profile' documents (which will also require NDA endorsement), financing plans and identifying opportunities for CSOs to contribute to public policy and opportunities for partnerships between CSOs and the private sector. Monitoring and evaluation of Programme progress on behalf of governments of the Programme countries, including subproject site visits (country-specific arrangements to put in place). Participate with CEPF and/or RIT with the selection of CSO subprojects. |
| CEPF | Executing Entity | Programme execution – responsibility for the delivery of the Programme results through financial management and planning, oversee development of grant portfolio development and management (including contracting, risk assessment, oversight of |

| | | |
|---|---|---|
| | | administrative compliance by grantees), overall monitoring of results, dissemination of results and oversight of RIT. |
| RIT | Regional representative of CEPF | Regional oversight of grant portfolio within the biodiversity hotspot including contracting for small grants (with CEPF retaining responsibility for grant approval) and technical monitoring of all grants. |
| CSOs | Grantees | Development of grant proposals, execution of EbA grant activities |

CEPF will use its existing tools to manage the Programme: the ecosystem profiling process; the grants management procedures; and the monitoring systems. These are useful for developing and promoting the strategies for hotspots, managing a large and dynamic portfolio of grants, and tracking progress in grant-making and achieving goals. These tools will enable CEPF to focus on achieving EbA impacts on the ground.

CEPF carries out its mission through a gender equity lens. This means that staff of the CEPF Secretariat, Regional Implementation Teams and grantees will understand and take into account the different roles of men and women in CEPF-related activities at all scales (e.g., Regional Implementation Team training, proposal design, Programme implementation and reporting). See Annex 8 for a Gender Assessment covering the Programme countries and the Programme's Gender Action Plan. Gender issues and considerations will be actively incorporated throughout the grant-making process and progress on gender-related outcomes will be monitored using CEPF's gender mainstreaming tracking tool (see section 4.4.4 of Annex 21).

## 7.3 CEPF Secretariat staffing for the Programme

CEPF technical staff involved in execution of the Programme include the following individuals, whose roles are briefly described:

Technical Experts (1.0 Full Time Equivalent (FTE)): Responsible for execution of the Programme deliverables, including stakeholder engagement; design of investment strategies; creation of pipeline and development of investment portfolio providing support, technical assistance, networking, and capacity building to CSOs; ensuring Programme sustainability and replication; and ensuring an overall impact of the portfolio that is greater than the sum of its parts.

Grant Manager (1.0 FTE): Provide daily support to the Technical Directors (technical experts) in their work and primary liaison with CSOs regarding operational and capacity building issues. Provide capacity building and technical assistance to subgrantee partners via training and guidance, and review of risks from organizational policies and practices to establish improved procedures to mitigate risks identified.

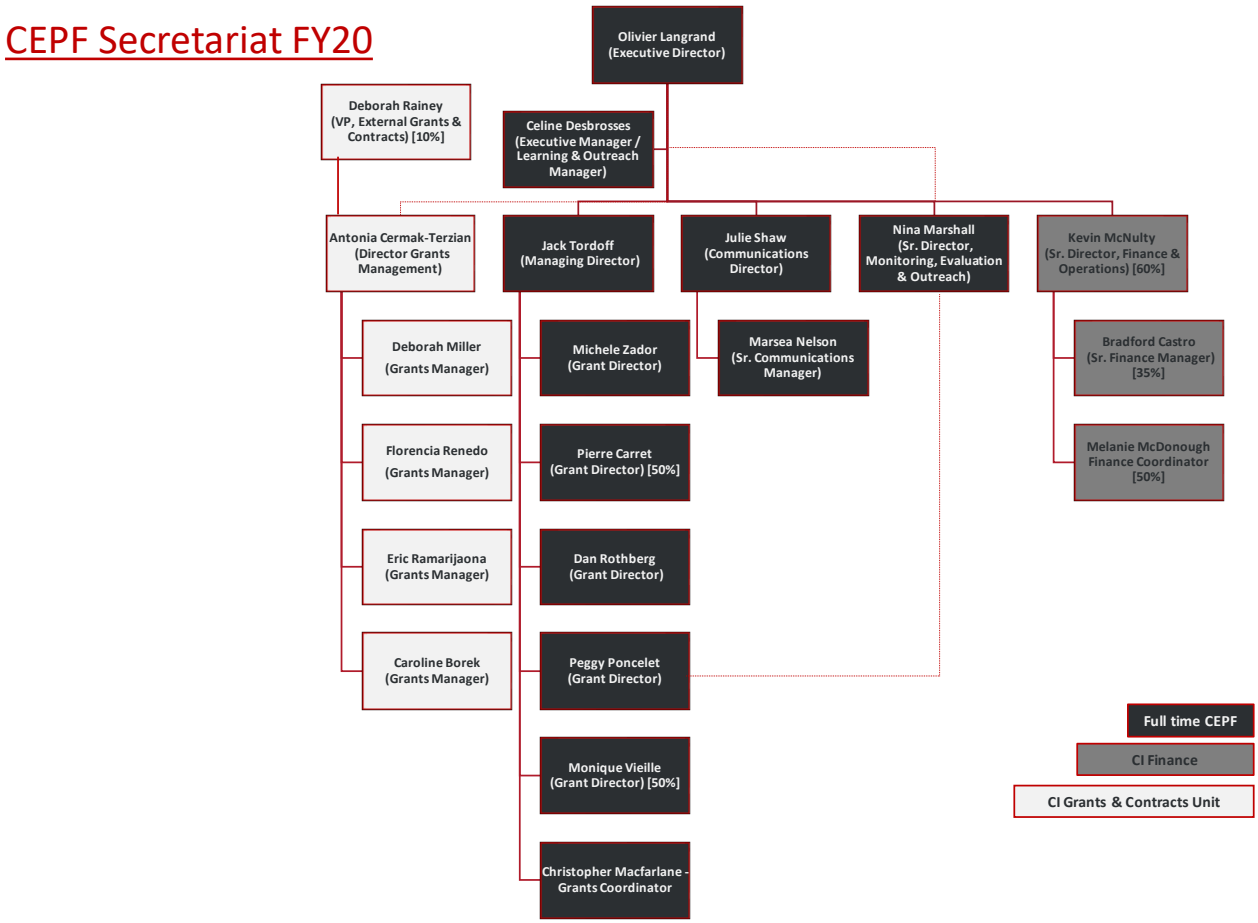
Grant Management Director (0.10 FTE): Direction and oversight of Grant Manager work, primary lead for the design and implementation of CSO operational capacity building aspects of training and learning modules.

Monitoring, Evaluation, & Learning Expert (0.10 FTE): Programme lead for monitoring of Programme safeguards, impacts, as well as planning and execution of workshops aiding in the replication and sustainability of Programme deliverables.

Communications Specialist (0.20 FTE): Design and production of relevant Programme materials, tools, and other communications that will aid in the sustainability and replicability of the Programme.

These staff are critical to Programme success and work across all activities of the Programme.

*Figure 21. CEPF Secretariat Structure*



# 8. Key Biodiversity Areas and Ecosystem Services (KBA+)

Priority setting of the areas where CEPF will invest in EbA action will be undertaken as part of Component 1 of the Programme. The underlying basis of the priority setting will be the identification of threatened areas of natural ecosystems that are important for the provision of ecosystem services to vulnerable people. These areas will be identified using the KBA+ methodology that CEPF has piloted in Madagascar. This chapter describes the methodology as it was applied in Madagascar (this chapter is extracted from the current Ecosystem Profile for the Madagascar and Indian Ocean islands hotspot). The same methodology will be applied in the Programme with some refinements – notably an increased emphasis on including coastal habitats and choice of appropriate ecosystem services for analysis based on each country's context. Once the KBA+ areas have been identified, the priority areas for CEPF investment will be determined through stakeholder consultations in each country. The consultations will serve to confirm the importance of the areas identified, make adjustments if deemed necessary and to understand where there is currently inadequate investment. The resulting priority KBA+ areas for CEPF investment will become the basis for determining the geographic focus of the Programme's investments. CSOs will then be invited to apply for funding for Projects focused on these priority KBA+ areas.

## 8.1 Importance of Ecosystem Services in Madagascar

*Ecosystem services* are the contributions of ecosystems to benefits used in economic and other human activity (European Environment Agency 2013). The Common International Classification of Ecosystem Services (CICES, EEA 2013) includes three categories of ecosystem services:

- *Provisioning services*, all nutritional, material and energetic outputs from living systems.
- *Regulating and maintenance*, the ways in which living organisms can mediate or moderate the ambient environment that affects human performance; and
- *Cultural services*, all the non-material, and normally non-consumptive, outputs of ecosystems that affect physical and mental states of people

The people of Madagascar, particularly its rural and poorer populations, are highly dependent on natural resources and have a strong relation to nature and environment (Kiefer *et al*. 2010). Natural ecosystems play a key role in food security, by providing wild sources of food (fisheries, e.g. Le Manach *et al*. 2012, and wildlife hunting, e.g. Brashares *et al*. 2011) as well as ecosystem services that support agriculture, such as freshwater for irrigation (e.g. Bakoariniaina *et al.*, 2006), soil quality, climate regulation, pest and pathogen control, and pollination (e.g. Bodin *et al.*, 2006).

Mangroves are particularly important for making fishing traps, canoes, processing prawn and fish catch, and for domestic use including fencing, housing, and fuel for cooking (Rasolofo 1997). They also provide nurseries and hatcheries for fish. There is mounting evidence that mangroves may provide protection from storm surges generated by cyclones (Jones 2013), the frequency and intensity of which are projected to increase in the future under climate change (IISD 2011, World Bank 2013). Coral reefs provide critical sources of food and income that can help coastal populations cope with climate impacts (Cinner *et al.,* 2009).

Madagascar's largest lake ecosystem, Lake Alaotra, supports the country's most fertile and productive rice fields (Bakoariniaina et al 2006). Natural ecosystems also provide energy: wood energy is used daily by more than 90 percent of the population and accounts for over 75% of primary energy consumption in the country (Ministry of Environment and Forestry, cited in Rabarison 2013).

Natural ecosystems also provide flows of freshwater for domestic use, irrigation, and energy. Many households in Madagascar, particularly the poorest households, are reliant on unimproved sources of freshwater (i.e. rivers, streams, ponds, and lakes; Razafindralambo *et al.*, 2004). Hydropower produces approximately 70 percent of the electricity in Madagascar.

Madagascar's remaining forests play a key role in carbon sequestration and storage, which are important for mitigating the impacts of climate change (Portela *et al*., 2012). Upland forests can reduce the impacts of small- and medium-sized floods (Kramer *et al.*, 1997).

Madagascar's biodiversity and natural beauty is its largest draw for tourists, providing aesthetic and recreational values for the tourists themselves as well as a large portion of the country's overall economic activity. Tourism accounts for 15 percent of Madagascar's GDP, and in 2011 it provided 31,207 jobs (Rabarison 2013). The cultural identity of certain ethnic groups is also tied closely to their natural environment. For example, the Ankodida protected area in southeastern Madagascar includes a forest sacred to the Tandroy tribe (Gardner *et al.*, 2008).

Past studies have explored ecosystem service values at the national scale, with a specific focus on the links between ecosystem services and biodiversity priority areas. For example, there is an existing assessment of the relative priority of unprotected KBAs based on data on human related threats, ecosystem services, and biological values (Rogers *et al.*, 2010). The study focused on 70 KBAs that were unprotected at the time. The authors found that 16 key biodiversity sites emerged as particularly important for both biodiversity and ecosystem services. This assessment focused only on hydrological services (provision of drinking water to downstream populations and irrigation of rice paddies), thus our current KBA+ analysis substantially adds to this past work by including numerous additional ecosystem services.

## 8.2 Objectives, Methodology and Limitations

With the support of the Critical Ecosystem Partnership Fund (CEPF), Conservation International's (CI) Betty and Gordon Moore Center for Science and Oceans (MCSO) and CI-Madagascar collaborated to assess the value of KBAs and their surrounding areas for ecosystem services in Madagascar. The pilot analysis presented in this chapter used existing data on ecosystem services, covering provision of fresh water, disaster risk reduction / climate adaptation, climate mitigation, food provision, and cultural services. A more comprehensive report on the methodology and results is presented in the full report (Neugarten *et al.*, 2014), available on the CEPF website.

This KBA+ pilot analysis focuses on the island nation of Madagascar to develop a conceptual framework and guidance materials that can be applied throughout the Madagascar and Indian Ocean Islands (MIOI) hotspot and refined for future CEPF ecosystem profiles.

This pilot relied primarily on a literature review, limited desktop analyses using existing data and methodologies, and targeted engagement with key experts to gather relevant information and validate results. In total, 125 articles were reviewed, consisting primarily of scientific papers and some unpublished reports. Low availability of up-to-date data at the national scale required for the analysis was overcome by using available global data. Experts from CI-Madagascar and partner organizations were consulted throughout this process, including during workshops in Antananarivo. The literature review and expert engagement highlighted a set of "key" ecosystem services considered the most important in Madagascar (**Error! Reference source not found.**Table 11), which in turn informed the set of services to be included in the desktop analyses.

*Table 11. Key Ecosystem Services in Madagascar, Organized Using the Common International Classification of Ecosystem Services (CICES) Framework*

| Section | | Division | Ecosystem Service |
|---|---|---|---|
| **Provisioning** | | Nutrition | *Food (fish; bushmeat; edible plants);* medicinal plants; *water flows for domestic use; water flows for irrigation* |
| | | Materials | Construction materials (wood, thatch); materials for artisanal products (wood, sedges); water flows for mining |
| | | Energy | Fuelwood; charcoal; *water flows for hydropower* |
| **Regulation & Maintenance** | | Mediation of waste, toxics and other nuisances | Water quality for household use; water quality for irrigation; water quality for hydropower |
| | | Mediation of flows | *Flood regulation;* drought regulation |
| | | Maintenance of physical, chemical, biological conditions | *Carbon storage and sequestration; protection from cyclones;* genetic material |
| **Cultural** | | Physical and intellectual interactions with ecosystems and land-/seascapes | *Ecotourism;* existence value (biodiversity) |
| | | Spiritual, symbolic and other interactions with ecosystems and land-/seascapes | Cultural and spiritual identity |

*Notes: Services in italic are included in the analysis*

It was not possible to complete analyses for every ecosystem service considered important in Madagascar due to either lack of data or complexity of the analysis; instead, a minimum of two key services in each category (provisioning, regulating, and cultural) were addressed. Geographic information systems (GIS) were used for all analyses.

For each ecosystem service, the following information was analyzed:

- Whether each KBA provided the service (yes, no, or data deficient); and
- The relative importance of each KBA for providing the service, when possible. The definition of "relative importance" varied depending on the service; e.g. more tons of forest biomass carbon stored, or a larger number of people potentially protected from cyclones. Each KBA was assigned ranks based on their relative importance.

A multi-criteria analysis to identify KBAs most important for providing multiple services was also conducted. Sufficient data was available to run a multi-criteria analysis for terrestrial and freshwater ecosystem services only.

The analyses included in this report were based on many assumptions about the benefits provided by natural ecosystems to people (such as protection from storms provided by mangroves). Simplistic mapping rules such as proximity of people to ecosystems were used. These analyses should be considered a first iteration, and would be strengthened by ground-based sampling to validate the assumptions and test our results. In particular, updated mapping of agricultural areas, better understanding of the links between natural ecosystems and food security, additional research on the benefits of ecosystems in terms of mitigating climate-related events, and more complete inventories of cultural and spiritual values would all improve this analysis.

For more details on the literature review, data sources, methods, and detailed tabular results, see the full report (Neugarten *et al.*, 2014) on CEPF website.

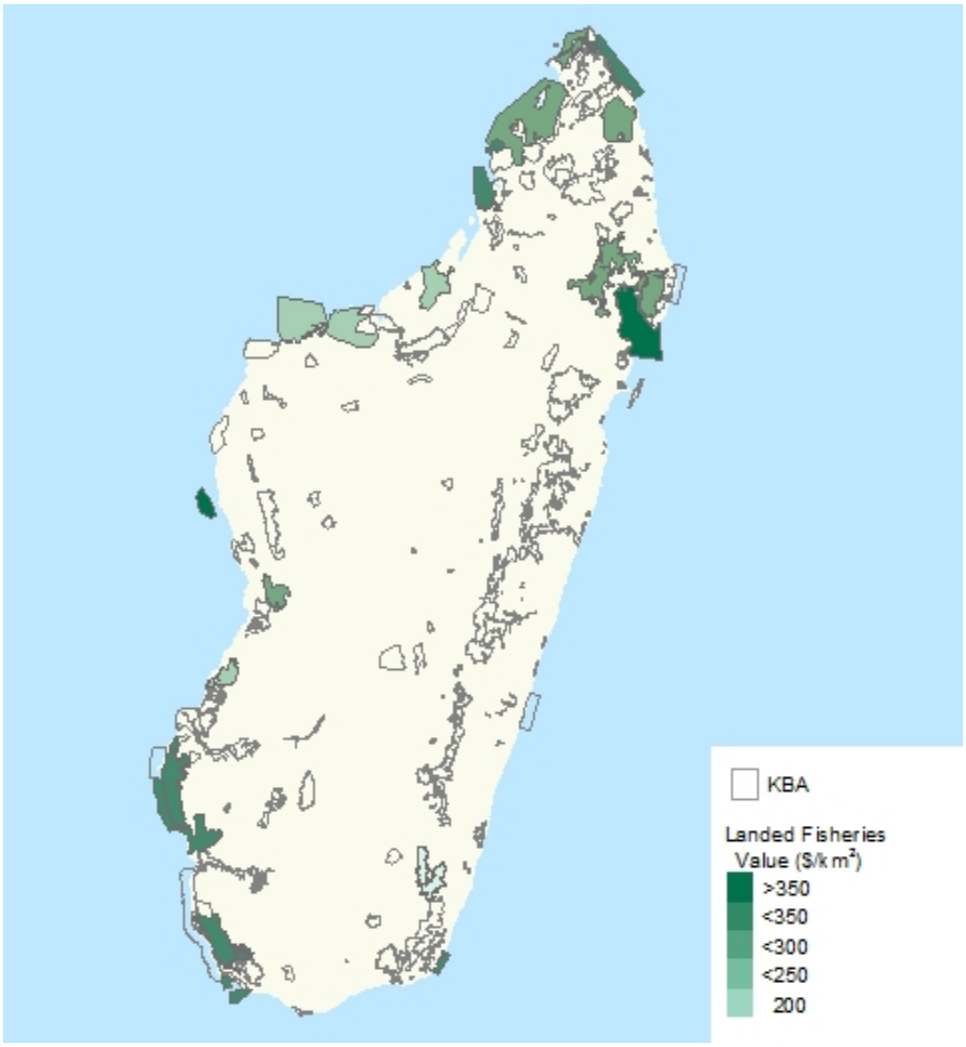
## 8.3 Results

### *Provisioning: Food*

#### Commercial Fisheries: Average Landed Values of Fish Catch

Our analysis shows that 21 coastal/marine KBAs provide landed fish values (Figure 22). Certain KBAs in the northeast, northwest and west of Madagascar exhibited relatively higher values, including Antogil Bay, Barren Islands, Iranja-Ankazoberavina-Russes bays, Ambodivahibe Bay, and PK32-Ranobe. These sites could be prioritized and carefully managed to avoid overharvest.

*Figure 22: Landed Value of Fish in KBAs, Expressed as USD/km²*



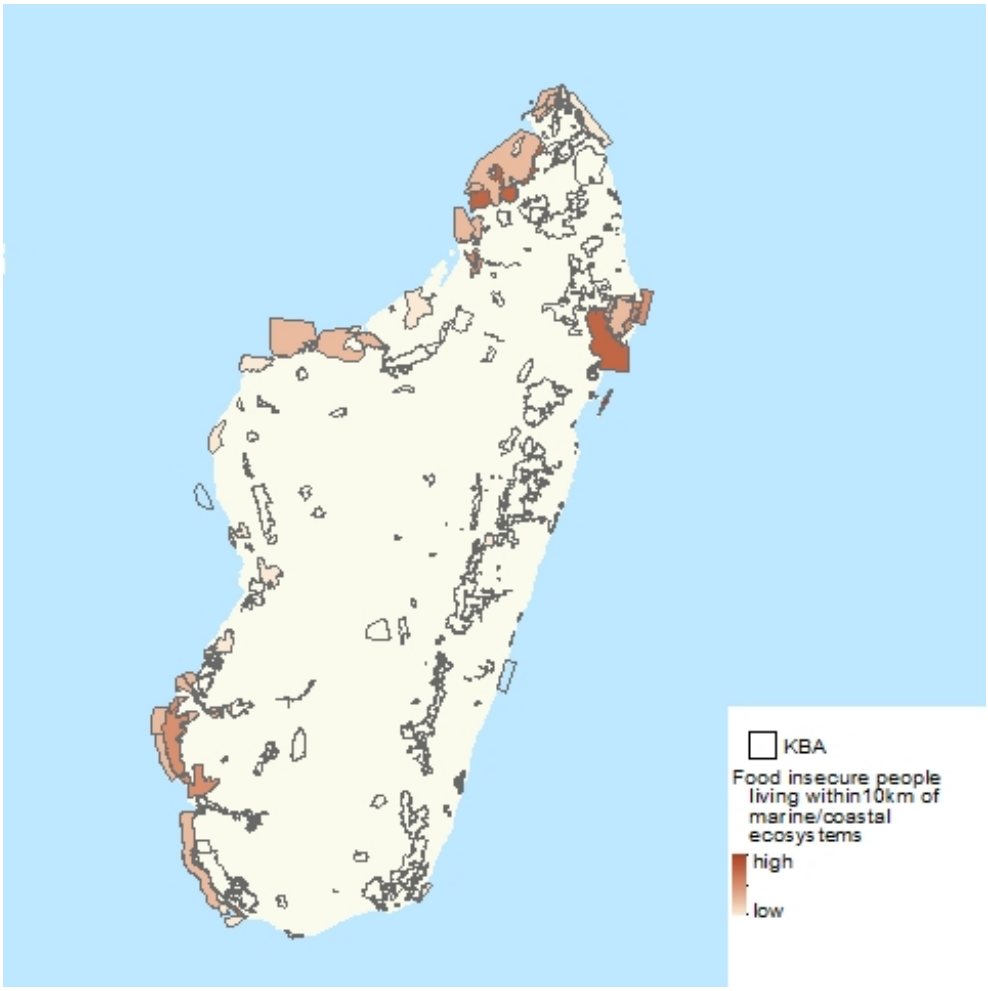

*Data: Swartz et al. 2012*

#### Small-Scale Fisheries: Number of Food-Insecure People with Access to Coastal/Marine Ecosystems

Many coastal/marine KBAs contain ecosystems (coral reefs and mangroves) that may serve as important sources of food to food-insecure populations (Figure 23). A subset of those KBAs contain ecosystems that are accessible (within 10km) of relatively large numbers of food-insecure people.

Examples include Sainte Marie Island (Ambohidena), Three Bays complex, Antogil Bay, Southwestern Coastal Wetlands and Nosy Manitse Future SAPM Marine, and Ampasindava/Rigny Bay (Est). These sites could be prioritized and carefully managed to avoid overharvest.

*Figure 23: Number of Food Insecure People Living within 10km of Mangroves and Coral Reefs*

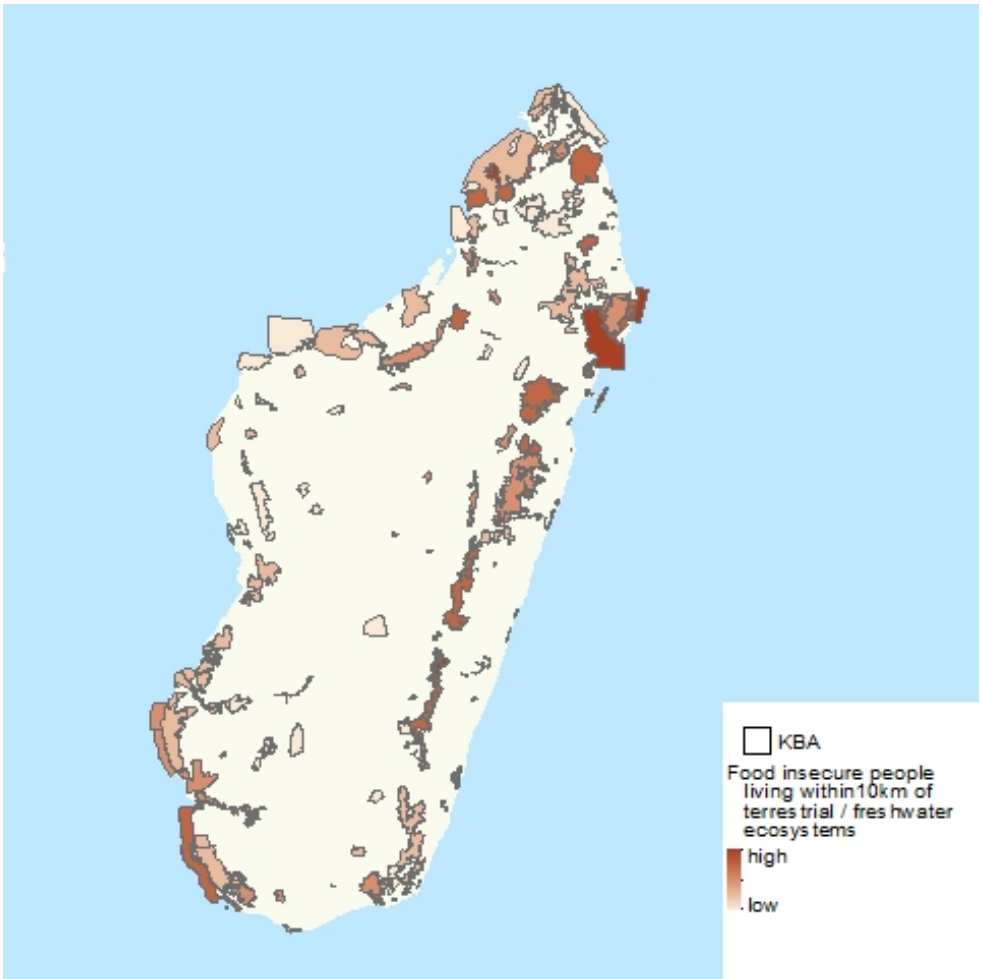



*Data: mangrove data from Giri et al. 2011, coral reef data from WRI Reefs at Risk Revisited (Burke et al. 2011); population data from Landscan; food insecurity data from Moser et al. 2008)*

### Wildlife Hunting and Non-timber Forest Products (NTFPs): Number of Food-Insecure People with Access to Terrestrial and Freshwater Ecosystems

All terrestrial KBAs contain ecosystems (forests, mangroves, wetlands, and water bodies) that may serve as sources of food or non-timber forest products (NTFPs) to food-insecure populations (Figure 24). A subset (77 out of 212) contain ecosystems that are accessible (within 10km) of large numbers of food-insecure people. Examples include: Nankinana (Ambodibonara-Masomeloka), Manjakatompo-Ankaratra Massif, Namorona-Faraony River, Anja community Reserve, and Ankavia-Ankavana River (Antalaha). These sites might be prioritized if there is an interest in investing in sites that are potentially providing food and NTFPs to local communities. Such sites should be carefully managed to avoid overharvest. Mangroves were included in this analysis as well as the analysis above, as they cross the terrestrial/marine boundary.

*Figure 24: Number of Food Insecure People Living within 10km Terrestrial and Freshwater Ecosystems*



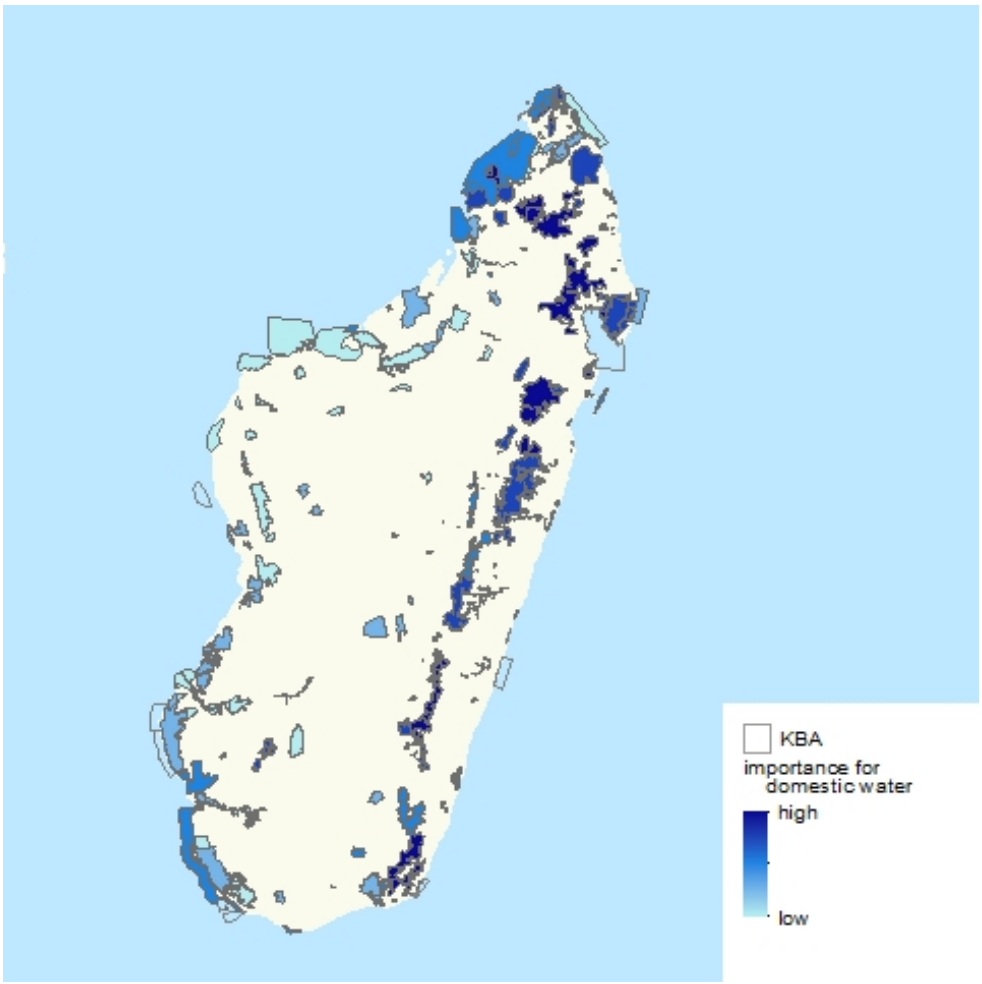

*Data: ecosystems data from Kew Royal Botanic Gardens 2007; protected area data from CI; population data from Landscan; food insecurity data from Moser et al. 2008*

*Provisioning: Fresh Water*

### Relative Importance for Providing Fresh Water for Domestic Use

Most KBAs (203 of 212) are upstream of people and are likely to provide freshwater for drinking and other domestic uses (Figure 25). "Relative importance" for domestic freshwater was estimated using the average annual water availability in a KBA as a proportion of the overall water availability of a watershed, weighted by estimated water demand downstream. The demand was calculated from number of people living downstream and average estimated water use per person (42.3 L/day, or 15.2 $m^3$/y) (Razafindralambo *et al.*, 2004). KBAs in the highlands, upstream of the largest numbers of people, and KBAs in the arid northeast and southwest, where water is most scarce, appear to be relatively more important. Throughout the rest of the country, the importance of KBAs for providing water is variable.

*Figure 25: Relative Importance of KBAs for Fresh Water for Domestic Use*

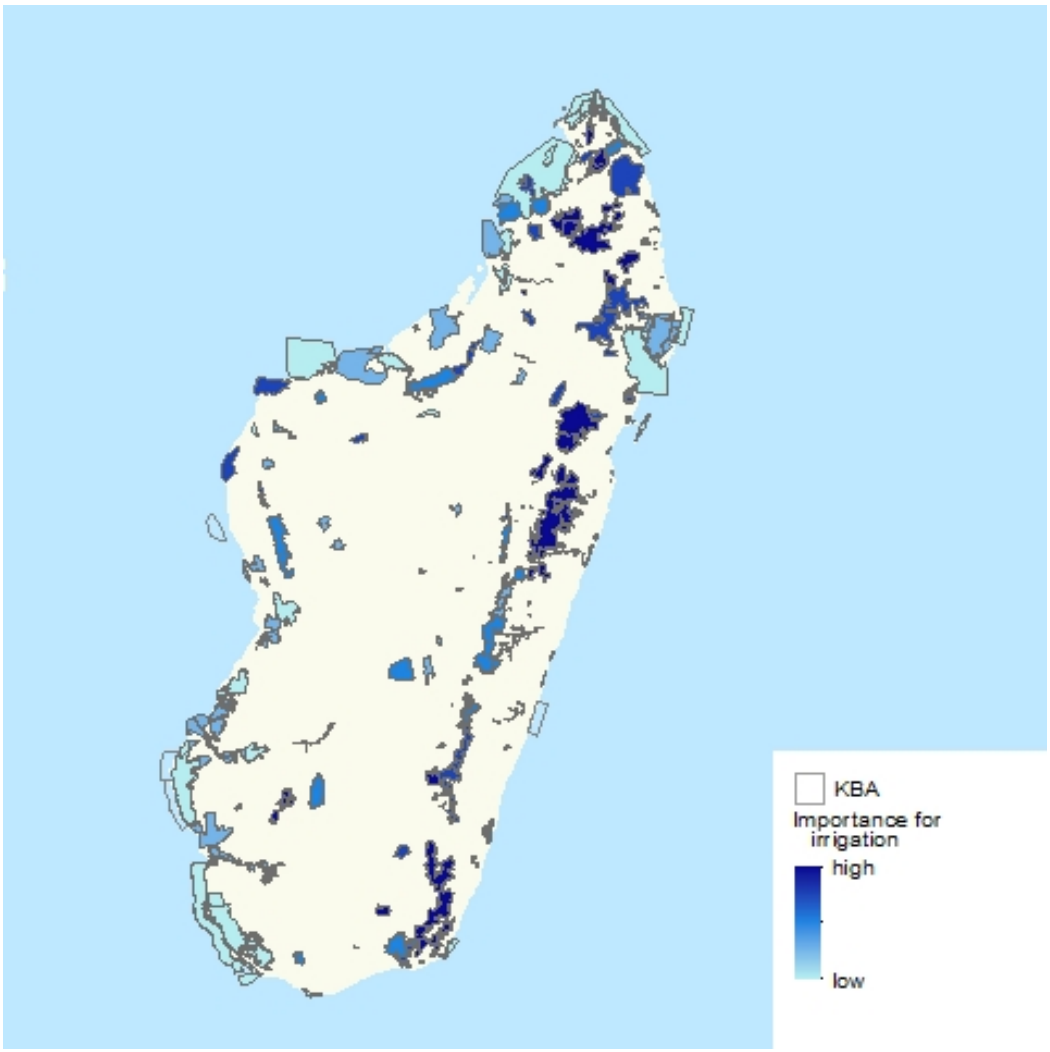



*Data: WaterWorld (Mulligan 2013), Landscan*

### Relative Importance for Providing Fresh Water for Irrigation

Similarly, "relative importance" of a KBA for water for irrigation was estimated using the average annual water availability in a KBA as a proportion of the overall water availability of a watershed, weighted by estimated irrigation demand. The demand was estimated based on area of irrigable agriculture downstream and estimated water demand per hectare per year, adjusted for annual rainfall. Most KBAs (184 of 212 total) provide fresh water for irrigation (Figure 26). Those with the highest relative importance were again located in the eastern highlands, where the largest number of people and highest concentration of irrigated rice agriculture occurs. But there are also relatively important areas in the eastern, northern, and western areas of Madagascar, regions characterized by larger areas of irrigated rice, as well as areas of higher aridity and lack of rain.

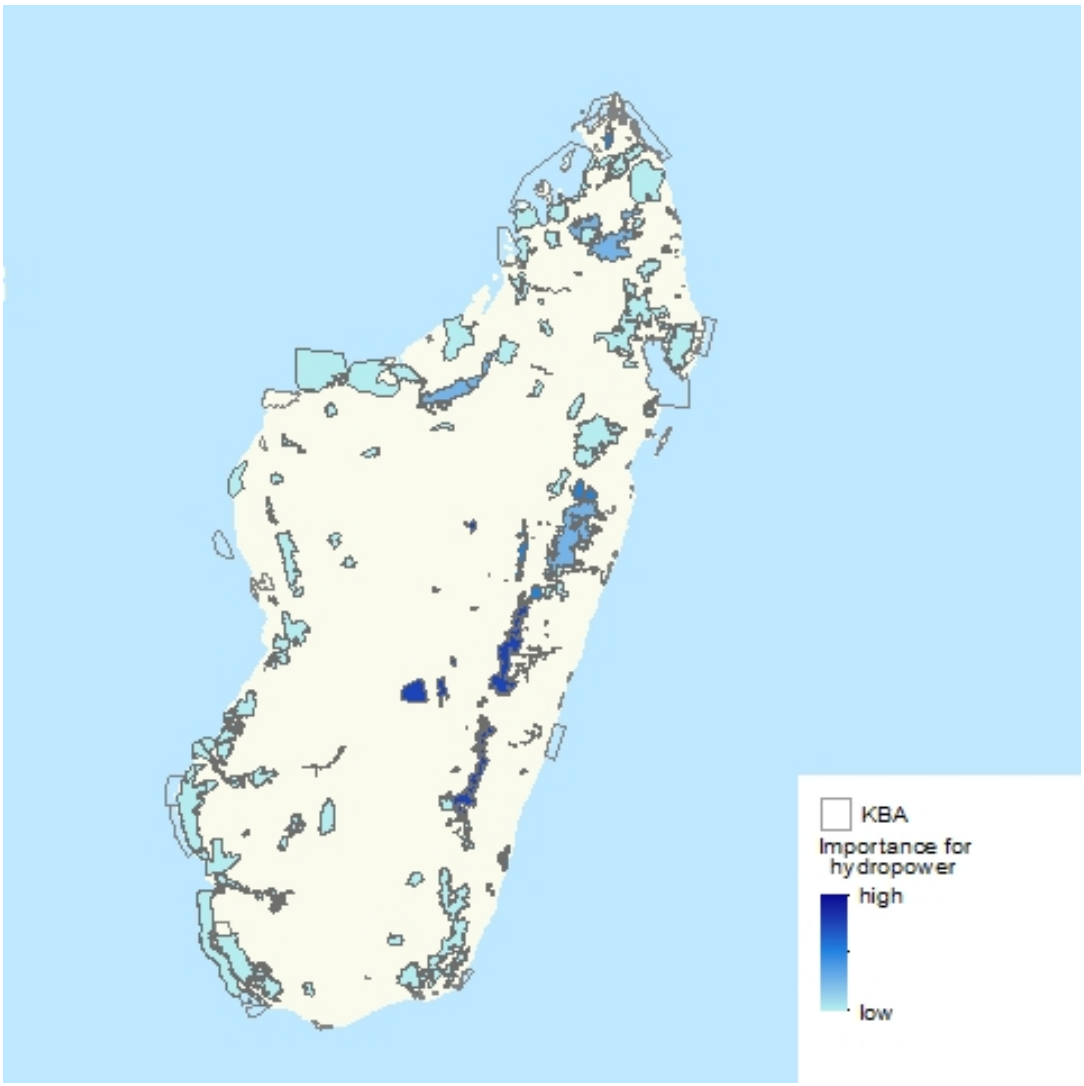
*Figure 26: Relative Importance of KBAs for Fresh Water for Irrigation*



***Relative Importance for Providing Fresh Water for Hydropower Dams***

Relative importance of KBAs in terms of providing freshwater for hydropower was estimated using the KBA's contribution to the overall water balance in each watershed, weighted by demand for hydropower downstream (Figure 27). Cumulative power generated by hydropower plants (MHW) was used as a proxy for water demand (data supplied by JIRAMA). Several KBAs in the east, north, and northwest were relatively important for freshwater for hydropower. These included: Angavokely Forestry Station, Tsarasaotra Lake, Ankafobe, Manjakatompo-Ankaratra Massif, and Efatsy (Farafangana).

*Figure 27: Relative Importance of KBAs for Fresh Water for Hydropower Dams*

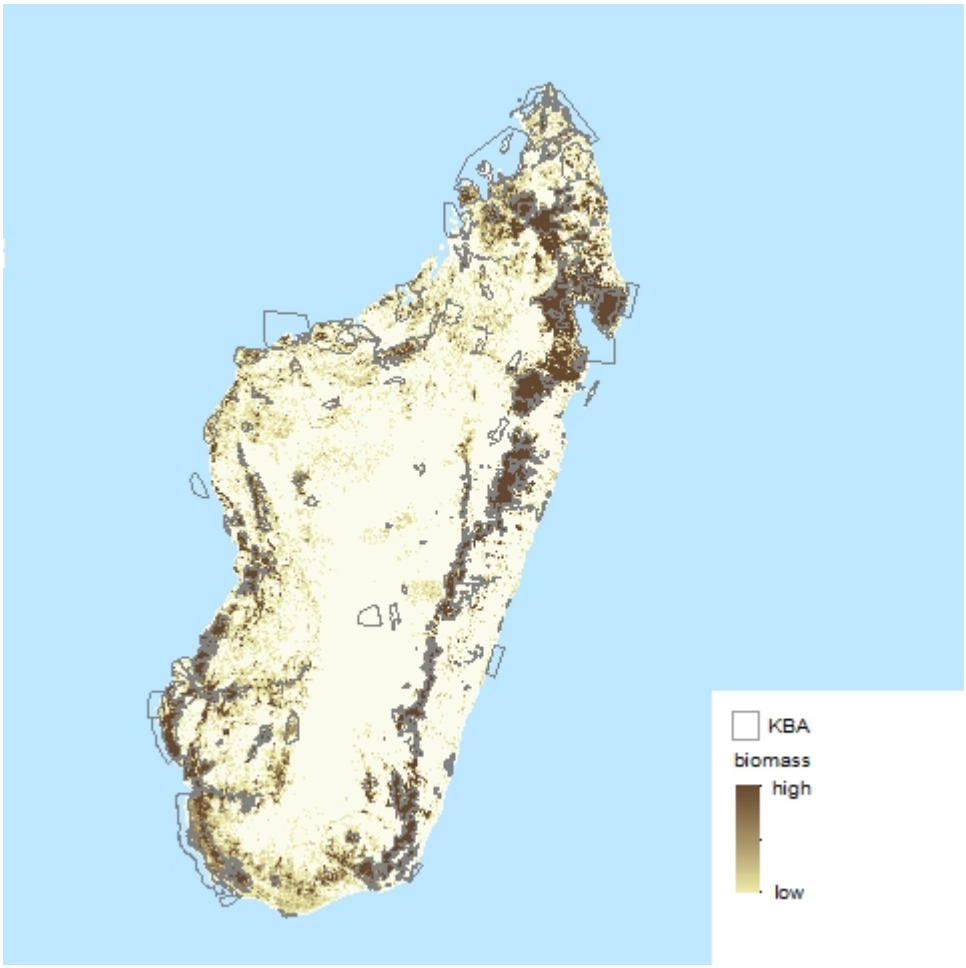


*Regulating: Climate Mitigation*

### Long-Term Carbon Storage: Average Biomass Carbon Stock per Hectare

Virtually all of Madagascar's remaining forest is contained within KBAs; thus these areas in relative terms contain significant value in terms of forest biomass carbon stock compared to the rest of the land (Figure 28). All terrestrial forested KBAs (180 out of 212 total KBAs) contain varying amounts of biomass carbon stock.

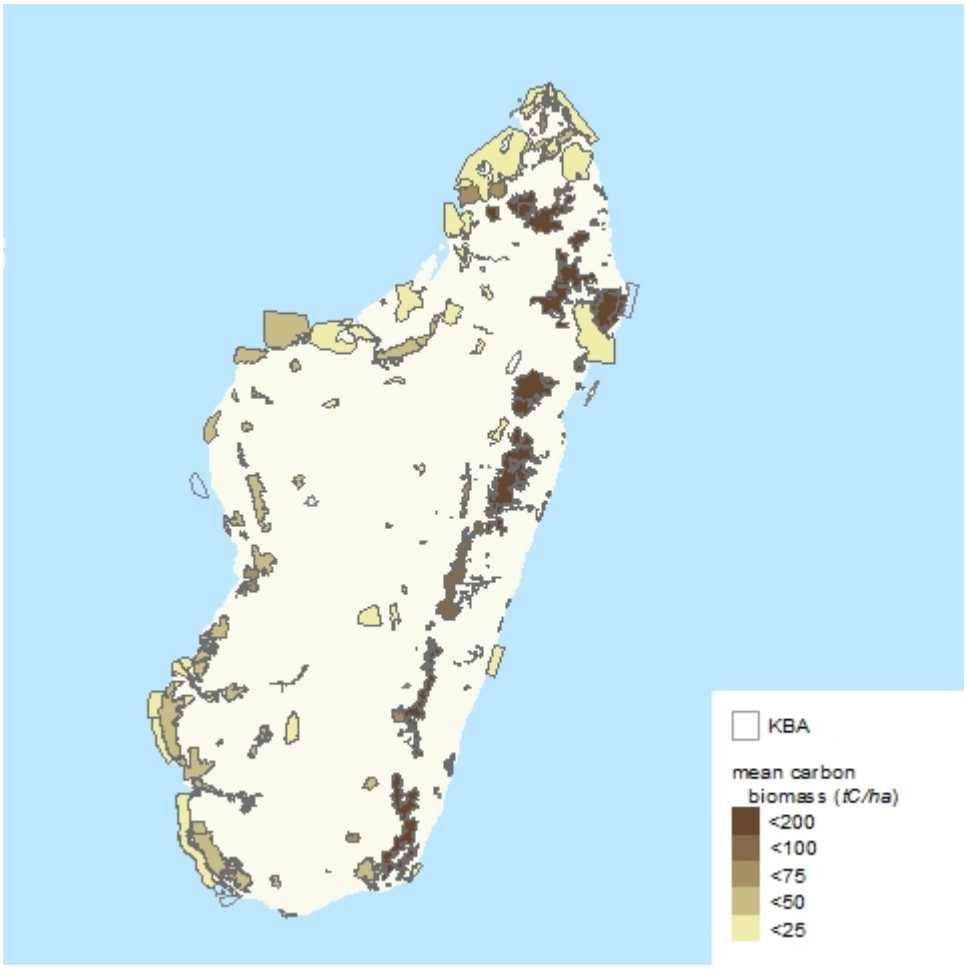
*Figure 28: Total Biomass Carbon in Madagascar, Overlaid with Key Biodiversity Areas (KBAs)*




*Note: Most of the remaining forest is contained within a KBA, and therefore most of the remaining biomass carbon stock exists within KBAs. (Data source: Saatchi et al.)*

Some KBAs contain forest with comparatively high biomass carbon density as measured in tC/ha. The highest values are found in KBAs containing humid forest, particularly in the eastern highlands (Figure 29). Examples include Mananara-North National Park, Vohibe Ambalabe (Vatomandry), Ambatovaky Special Reserve, Analamay-Mantadia Corridor, and Masoala National Park.

*Figure 29: Average Biomass Carbon per Hectare within KBAs (tC/ha)*

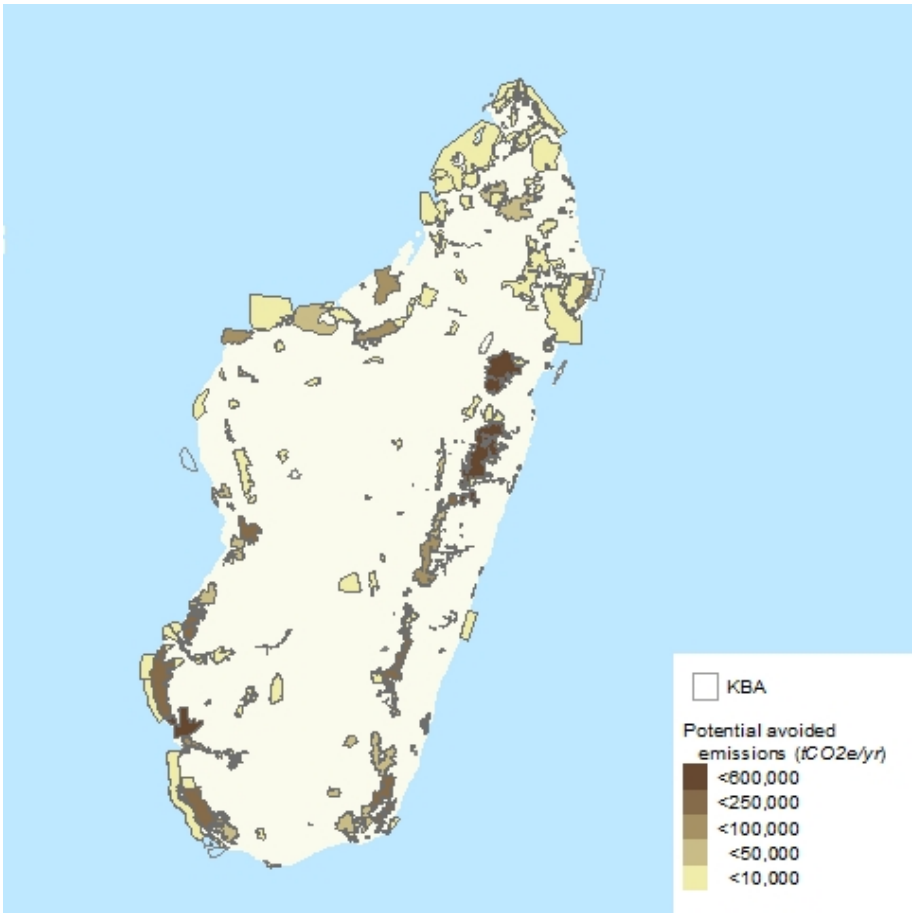



*Data source: Saatchi et al.*

## Potential Avoided Carbon Emissions from Deforestation

Many KBAs (92 of 212 total) contain forest and have experienced historic deforestation. If conserved, these sites may have the highest estimated maximum potential for avoiding future carbon emissions from deforestation (Figure 30). This "estimated maximum potential" is based on the assumption that deforestation is completely stopped. Feasibility studies must be conducted if there is an interest in estimating the *actual potential* of sites for Reduced Emissions from Deforestation and Degradation (REDD+). Examples of KBAs with relatively higher estimated levels of potential avoided emissions are: PK32-Ranobe, Bidia-Bezavona Classified Forest, Ankeniheny-Lakato Future SAPM, Zahamena-Ankeniheny SAPM, and Mahafaly Plateau North Future SAPM.

*Figure 30: Potential Avoided Emissions within KBAs, Estimated Based on Historic Deforestation Rates within KBAs*



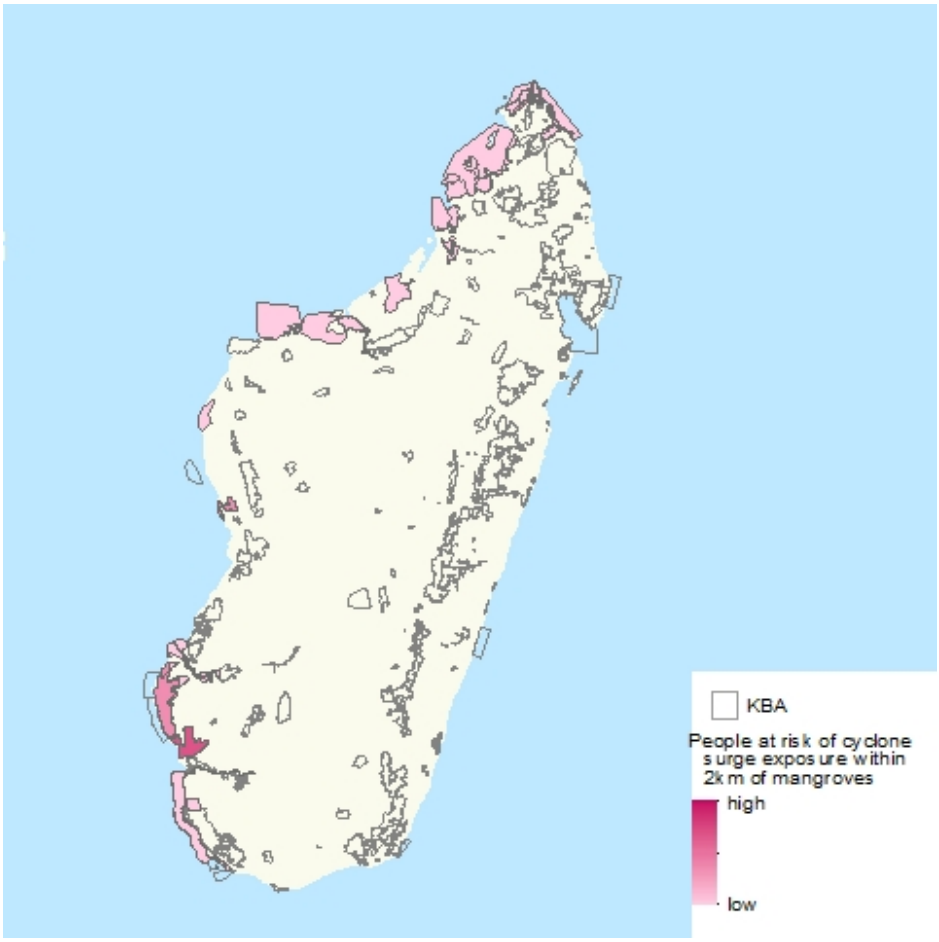

*Data: Historic deforestation from Conservation International and biomass data from Saatchi et al.)*

### *Regulating: Disaster Risk Reduction and Climate Adaptation*

#### Number of People Vulnerable to Climate Change-Driven Increases in Storm Surges that are Potentially Protected by Mangroves

Sixty-three KBAs contain mangroves that are within 2 km of people that are considered vulnerable to storm surges, based on historical cyclone events (Figure 31). This analysis uses historical occurrence of cyclones as a proxy for future risk, and assumes that proximity to mangroves provides some protection. Examples of KBAs that contain mangroves within 2km of people who are vulnerable to cyclone surge include Amoron'i Onilahy et Onilahy River, Three Bays complex, PK32-Ranobe, Mikea Forest, and Diégo Bay. In Madagascar, cyclones primarily hit from the east and north; however remaining mangrove habitat exists primarily in the west. More research is required to understand the actual protection provided by mangroves, and the potential for mangrove restoration in the eastern part of the country.

*Figure 31: Number of People Vulnerable to Climate-Change Driven Increases in Storm Surge, within 2km of Mangroves*

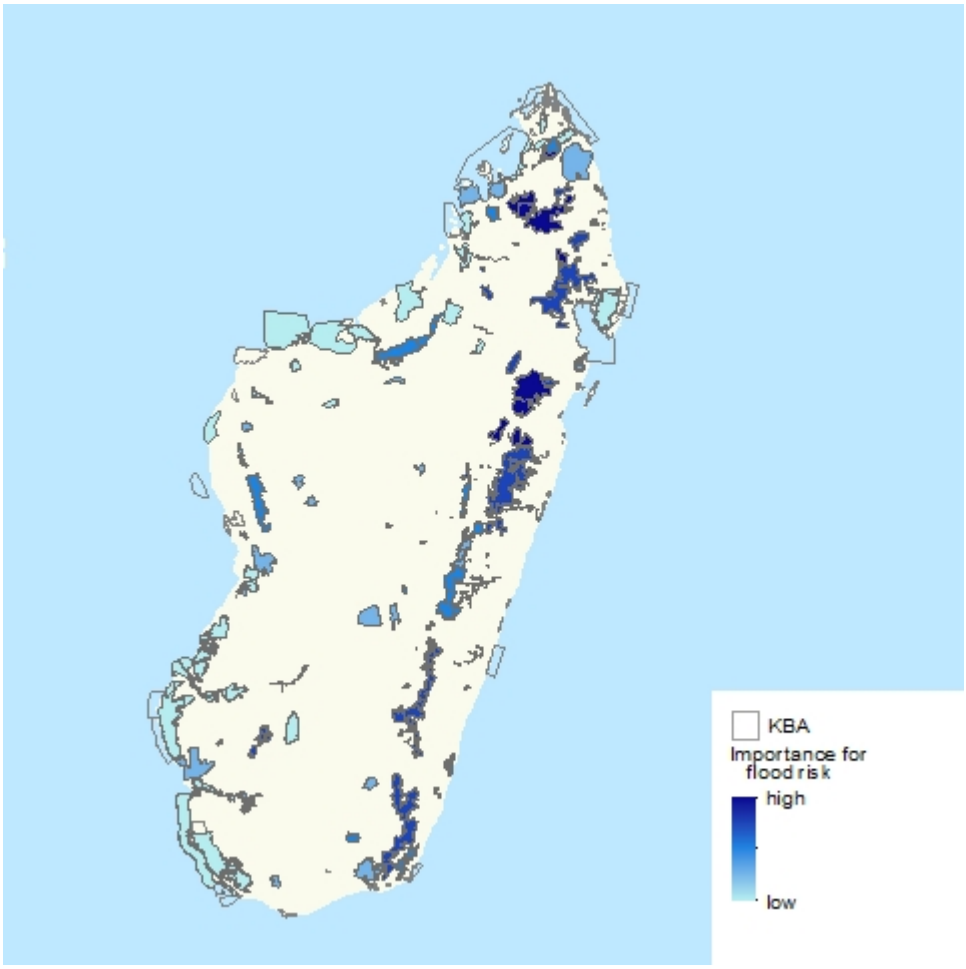



*Data: Human exposure to cyclone surge data from UNEP GRID, data on mangroves from Giri et al. 2011).*

## Flood Risk Reduction

Relative importance of KBAs for flood risk reduction was estimated using each KBA's contribution to the overall water balance in each watershed, weighted by the number of people vulnerable to flooding downstream (Figure 32). KBAs in the eastern and northeastern highlands showed up as relatively more important in terms of flood risk. These include: Anjanaharibe Sud Special Reserve, Analalava-Analabe-Betanantanana (Ambatosoratra), Ambohipiraka, Angavokely Forestry Station, and Lake Alaotra. This analysis assumes that forest ecosystems provide some protection from flooding; however, more research is required to better understand the role of ecosystems in reducing floods in Madagascar.

*Figure 32: Relative Importance of KBAs in Terms of Flood Risk Protection*



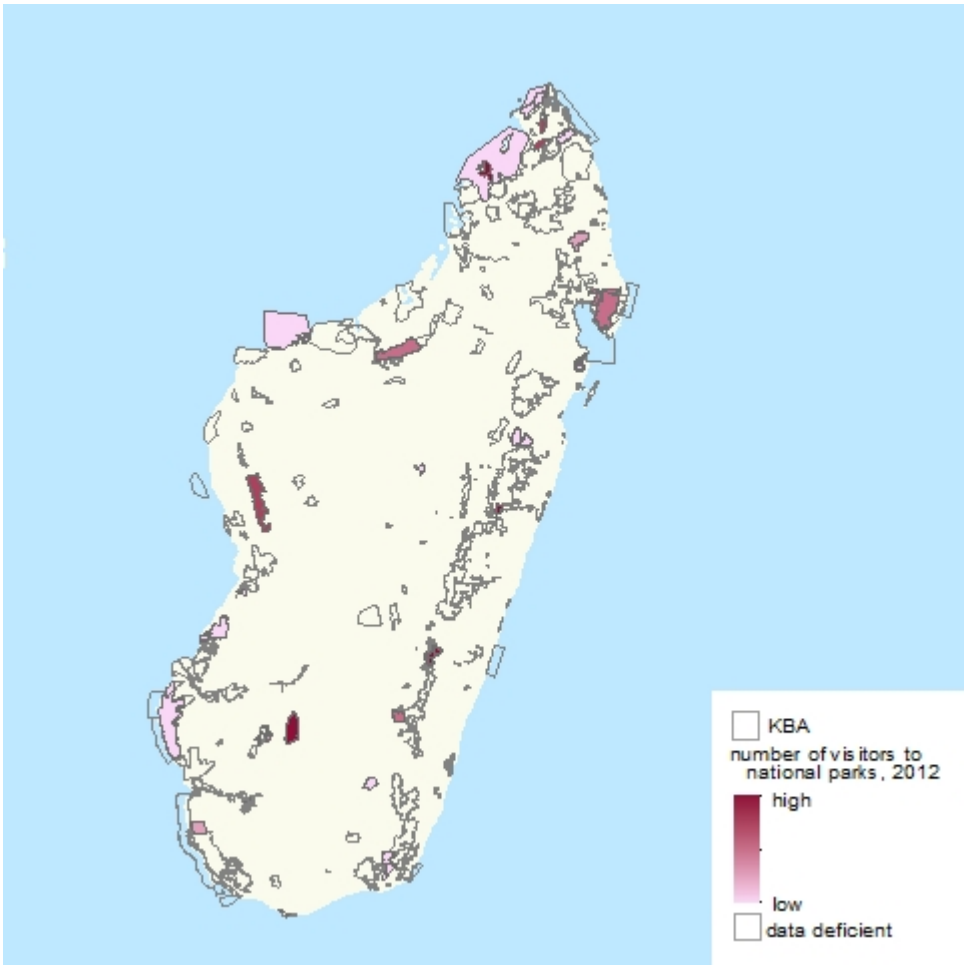

*Data sources: human exposure to flooding data from UNEP GRID, water balance data from WaterWorld*
*Note: based on relative importance of an area to regulate water weighted by number of people vulnerable to flooding downstream*

## *Cultural Values and Ecotourism*

### Ecotourism: Number of Visitors to National Parks in 2012 (data limited)

Data on ecotourism was only available for 32 protected KBAs managed by Madagascar National Parks. KBAs that had the largest number of visitors in 2012 include Isalo National Park, Mantadia National Park and Analamazaotra Special Reserve, Ranomafana National Park, Nosy Be and Satellites Islands (Nosy Tanihely), and Ankarana Special Reserve (Figure 33). Note that this data is limited to only certain sites and is for only a single year. However, most ecotourism in Madagascar is centered on the national park system, thus while this dataset is incomplete, national parks do have relatively high values for ecotourism.

*Figure 33: Number of Visitors to Protected KBAs Managed by Madagascar National Parks in 2012*




*Data: Madagascar National Parks*
*Note: just because a site is data deficient does not mean that there were no visitors in 2012.*

### Cultural/Spiritual Values (data limited)

For this ecosystem service, data was only available for 14 out of 212 KBAs. These 14 sites were included in an inventory of community heritage areas of Madagascar (Conservation International 2011). The sites included: Ambodivahibe Bay, Andrafiamena, Bongolava Classified Forest (Marosely), Fandriana Marolambo Corridor, Ibity Future SAPM, Itremo Vakinakaratra Future SAPM, Manjakatompo-Ankaratra Massif, Montagne des Francais, Nosivolo Wetland, Vondrozo Classified Forest and surrounding areas, Zahamena National Park and Strict Reserve, and Zahamena-Ankeniheny SAPM. However; many sites throughout Madagascar have important cultural values, but were not included in this inventory. Thus a map of sites of known cultural/spiritual importance was not included because any such map would be incomplete. Additional investments in research are required to better understand the value of KBAs for providing cultural and spiritual services.

### *Multiple Terrestrial/Freshwater Ecosystem Services*

Multiple ecosystem services from terrestrial/freshwater ecosystems were combined in a multicriteria analysis based on several of the above results: 1) biomass carbon stock, 2) number of food-insecure people with access to terrestrial/freshwater ecosystems, 3) relative importance for providing

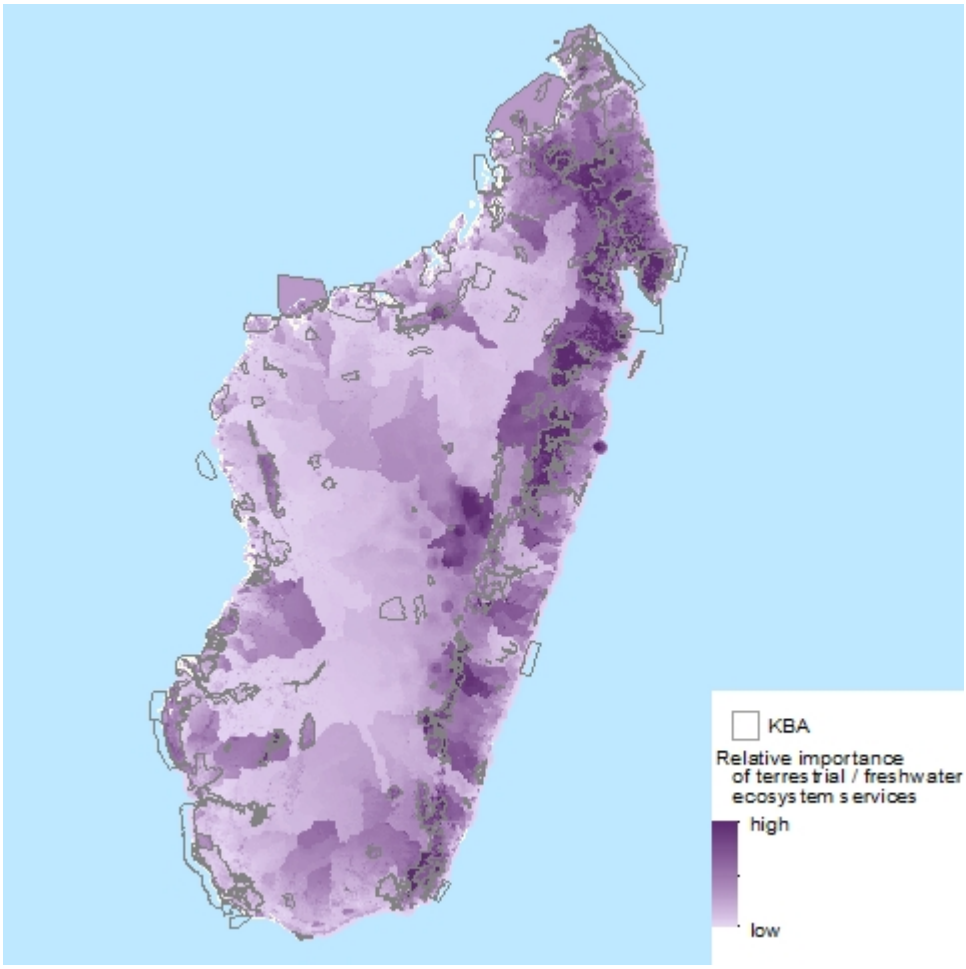
freshwater for i) domestic use, ii) irrigation, iii) hydropower, 4) flood risk reduction, and 5) ecotourism (Figure 34). The weights assigned to each of the values in the multi-criteria analysis were established with expert input; the weights are shown in Table 12.

*Table 12. Weights Given to Each of the Terrestrial and Freshwater Ecosystem Services Included in the Multi-Criteria Analysis*

| **Variable** | **Weight (out of 100)** |
|---|---|
| Total biomass carbon stock (tC) | 30 |
| Food provision (# of food insecure people within 10km of unprotected terrestrial & freshwater ecosystems) | 30 |
| Ecotourism (# of visitors to Madagascar National Parks in 2012) | 10 |
| Relative importance for fresh water (FW) (total): | 30: |
| Relative importance of FW for domestic use | 7.5 |
| Relative importance of FW for irrigation | 7.5 |
| Relative importance of FW for hydropower | 7.5 |
| Relative importance of FW for flood protection | 7.5 |
| **TOTAL** | **100** |

The highest value areas were found in the northeast and eastern highlands, with additional high-value areas on the southeastern side of the island. Examples include: Zahamena National Park and Strict Reserve, Mananara-North National Park, Andohahela National Park - Parcel I, Mantadia National Park and Analamazaotra Special Reserve, and Marojejy National Park. Note that this analysis includes only terrestrial and freshwater services, it does not include coastal protection, commercial fisheries, or small-scale fisheries. This map should be presented in combination with the above maps of coastal/marine services for a more complete picture. Note that areas important for providing multiple services are not necessarily “more important” than areas that are important for a single service. Thus, this analysis may help to combine the above analyses, but it should not be presented in isolation.

*Figure 34: Results of a Multi-criteria Analysis of Terrestrial and Freshwater Ecosystem Services*




The same analysis was repeated for the above services, but carbon was excluded, in order to focus on places important for "local" terrestrial and freshwater ecosystem services (food provision, ecotourism, and freshwater). Weights assigned to each service are shown in Table 13.

*Table 13. Weights Given to Each of the "Local" Terrestrial and Freshwater Ecosystem Services Included in the Second Multi-criteria Analysis*

| **Variable** | **Weight (out of 100)** |
|---|---|
| Total biomass carbon stock (tC) | 0 |
| Food provision (# of food insecure people within 10km of unprotected terrestrial & freshwater ecosystems) | 30 |
| Ecotourism (# of visitors to Madagascar National Parks in 2012) | 10 |
| Relative importance for fresh water (FW) (total): | 60 |
| Relative importance of FW for domestic use | 15 |
| Relative importance of FW for irrigation | 15 |
| Relative importance of FW for hydropower | 15 |

| | |
|---|---|
| Relative importance of FW for flood protection | 15 |
| **TOTAL** | **100** |

This analysis indicates that again, areas in the eastern and northeastern Madagascar are important for multiple terrestrial and freshwater services, but also highlights some regions in the northwest and southwest (Figure 35). Values were then averaged for each KBA (Figure 36). Examples of sites that are important for multiple "local" terrestrial and freshwater ecosystem services include: Zahamena National Park and Strict Reserve, Tsarasaotra Lake, Marojejy National Park, Angavokely Forestry Station, and Ankavia-Ankavana River (Antalaha). Again, note that this analysis doesn't include coastal/marine ecosystem services, and that areas important for multiple services are not necessarily "more important" than areas that are important for a single service. Thus, this map should be presented in combination with the above maps for a more complete picture.

*Figure 35. Multi-criteria Analysis of Fresh Water, Food Provision, and Ecotourism Ecosystem Services*

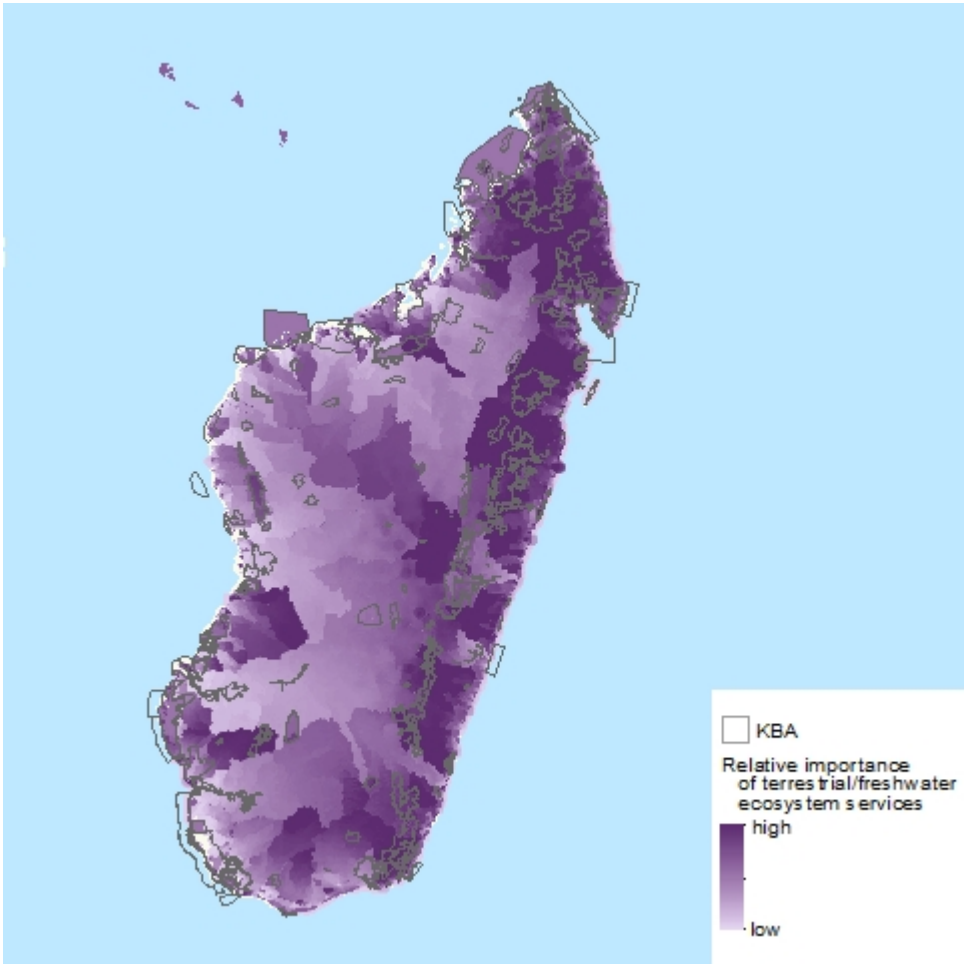
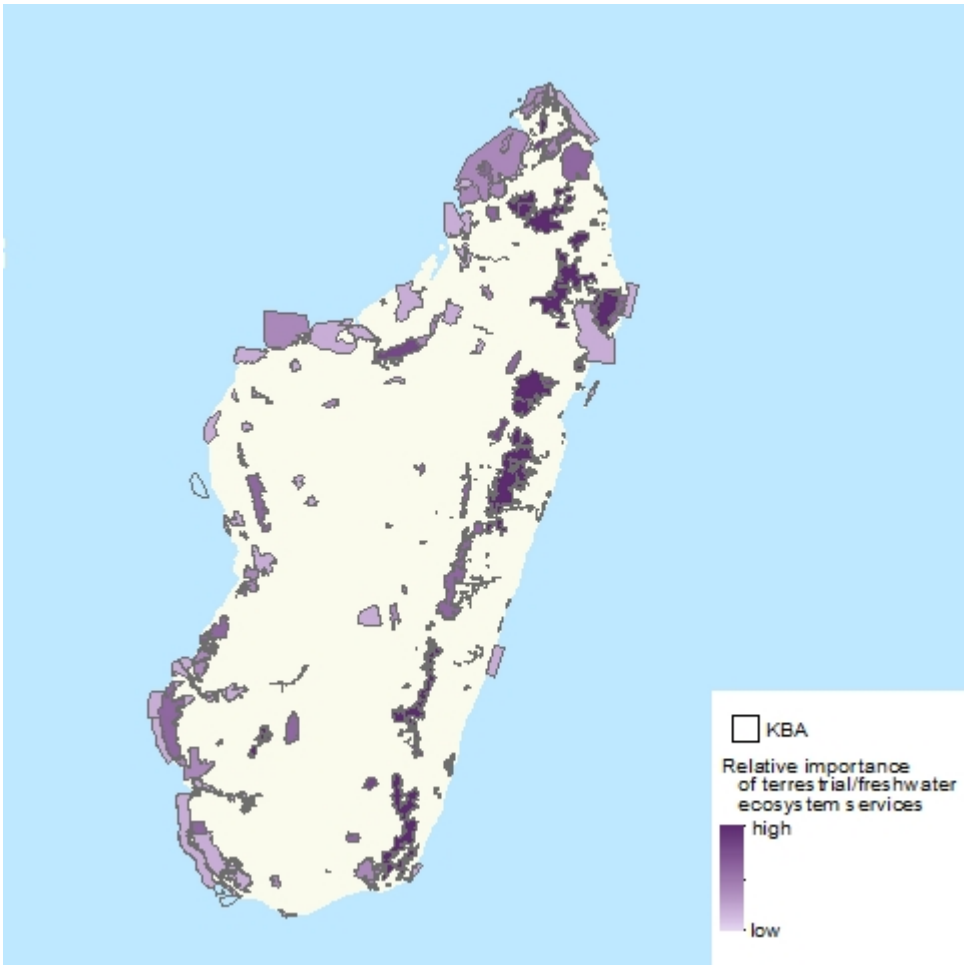


*Figure 36: Multi-criteria Analysis of Freshwater, Food Provision, and Ecotourism Ecosystem Services, Averaged for Each KBA*




## 8.4 Conclusions

Different KBAs are important for providing different ecosystem services. Coastal and marine KBAs provide commercial fisheries, as well as mangrove and coral reef ecosystems that protect coastal areas from storms and support small-scale fisheries. The humid, dense forests of the eastern highlands are important for both climate mitigation and freshwater for domestic use, irrigation, and hydropower. However, KBAs in the more arid north and southwest of the country are also important for freshwater for domestic use and irrigation in these water-scarce regions. Dry and spiny forest ecosystems are extremely threatened in Madagascar, and have been under-represented in past conservation investments. Thus, while they may not appear at the top of the list in terms of the provision of services, these ecosystems are critical for biodiversity conservation. Additionally, the coastal areas of the east are extremely important because of the amount of services they could provide in terms of resilience to climate-related events. Ecosystems that are currently unprotected are likely providing important services to people who are food-insecure, such as hunting, fishing, and fuelwood collection. KBAs in Madagascar's national park system provide important ecotourism values, supporting local livelihoods and the country's economy.

# 9. Other Ecosystem-based Adaptation Projects in the Hotspots and Programme Countries

A number of recent and current projects are of relevance to EbA and are listed in this chapter for each country. These provide opportunities for collaboration and complementarity in a number of areas. The provision of funding for CSOs through CEPF to engage in EbA will create opportunities to strengthen existing projects and develop partnerships between CSOs and other actors. However, there is also the potential for duplication of effort. This is most acute for other initiatives that are under development or consideration and may or may not come to fruition. The extremely high levels of interest in climate change mean that there is currently a situation with multiple donors and agencies trying to develop climate change projects. This situation further emphasizes the importance of developing a common investment strategy as planned under Component 1 of the Programme. Further, the simultaneous development of multiple climate change initiatives reinforces the need to develop the Programme's investment strategy as part of the Programme itself so that the priorities are not outdated by the time that GCF funding is available to disburse to CSOs.

In addition to the major projects listed in this chapter there are many smaller initiatives, often punctual initiatives, particularly where CSOs are able to raise funding from philanthropic and private sources. The availability of specific funds for EbA through CEPF would further leverage other fundraising that CSOs are able to do.

## *Madagascar and the Indian Ocean Islands Hotspot*

### Projects in the Comoros

| **Enhancing Adaptive Capacity and Resilience to Climate Change in the Agriculture Sector in Comoros** | | | |
|---|---|---|---|
| **Implementing Organization** | **Funding source** | **Period** | **Budget** |
| UNDP | GEF | | USD 9M +$35M co-finance |
| Agriculture is the mainstay of the economy, contributing over 90% towards Comoros's exports earnings. Despite the crucial role of agriculture in the economy and for employment, the domestic agricultural sector is struggling to provide the food needs of the population. The project's objective therefore, is to strengthen the capacities of vulnerable communities to cope with the additional risks posed by climate change as well as the variability on agro-sylvo-pastoral systems through training and dissemination of information. | | | |
| **Adapting Water Resource Management in Comoros to Increase Capacity to Cope with Climate Change** | | | |
| **Implementing Organization** | **Funding source** | **Period** | **Budget** |
| UNDP | GEF-LDCF | 2011-2015 | $13M |
| The project worked on the three islands that constitute the territory of the Comoros with a focus on improving water resources management to increase water supply and quality under changing climatic conditions. To achieve this, the following outcomes were included: | | | |

- Institutions at a national and community level strengthened to integrate climate change information into water resources management
- Water supply and water quality improved for selected pilot communities to combat impacts of climate change
- Awareness and knowledge of adaptation good practice increased for continued process of policy review and development

**Ensuring climate resilient water supplies in the Comoros Islands**

| Implementing Organization | Funding source | Period | Budget |
|---|---|---|---|
| UNDP | GCF | 2019-2027 | $60M |

The project will strengthen water resources management and environmental monitoring, improve groundwater management and preservation, expand hydrological and meteorological monitoring infrastructure, protect ecosystems and regulate stream flow, and integrate local populations into water resources management. The project will work in 32 watersheds and reach over half of the people living in the Comoros directly (450,000), and 9 out of 10 people indirectly, ensuring children have water to drink, farmers can grow successful crops and feed their families, and the Small Island Developing State of Comoros can adapt its economy and society to the catastrophic risks brought on by climate change.

**Support to the Union of the Comoros for Strengthening Resilience to Climate Change (GCCA)**

| Implementing Organization | Funding source | Period | Budget |
|---|---|---|---|
| Ministry of Finance DGEF/MPEEIA | EU -GCCA+ | 2015-2019 | Euros 3M |

The objective of the project is to influence national and local actors to consider climate change in strategies, projects as well as planning, coordination and monitoring mechanisms. This objective will be achieved through:

- The establishment of mechanisms and tools for data management, capitalization and dissemination of information on climate change.
- Strengthening the capacity of key stakeholders. The objectives of the project are aligned with these of the NAP process. NAP interventions will need to build on and be complimentary to the GCCA actions (for instance by looking at other areas for pilot actions and complementary training).
- Supporting the integration of climate change into development strategies, at national and local level; and implementing local pilot actions to improve resilience and the living conditions of vulnerable populations.

**Projects in Madagascar**

**Improving Adaptation and Resilience to Address Climate Change in the Rural Communities of Analamanga, Atsinanana, Androy, Anosy and Atsimo Andrefana**

| Implementing Organization | Funding source | Period | Budget |
|---|---|---|---|
| UNDP | GEF-LDCF | 2016-2021 | $5M + $56M co-finance |

The project is designed to reduce the vulnerability of populations in 5 administrative regions of Madagascar facing the adverse effects of climate change and severe weather events. The project aims to lift the barriers identified in the target areas, such as human pressure on natural resources, lack of financial and technical resources, limited access to credit, limited water and sanitation

| | | | |
|---|---|---|---|
| infrastructure, lack of agro-meteorological and climatic information, lack of awareness among decision-makers as well as lack of coordination between the most affected sectors. | | | |
| **GCF Ecosystem Based Adaptation Programme in the Western Indian Ocean** | | | |
| **Implementing Organization** | **Funding source** | **Period** | **Budget** |
| KfW; execution by Blue Action Fund | GCF | Approved Nov. 2019<br>2020-2026 | €30M + €25M cofinance<br>(For Madagascar: €6.49M + €5.31M) |
| This multi-country Program is a special funding window under the Blue Action Fund (BAF). It concentrates on the promotion of Ecosystem based Adaptation approaches (EbA) in one of the most vulnerable regions affected by sea level rise, enhanced storm intensity, recurrent storm surges and coastal erosion: the Mozambique Channel / West Indian Ocean (WIO). Country selection (Madagascar, Mozambique, Tanzania and South Africa) is guided by criteria such as vulnerability to climate effects, urgent need for implementation of climate adaptation measures, and the relevance to coastal populations of ecosystem services from coastal, marine and freshwater ecosystems. Special attention is given to the alignment between the Program approach and national priorities as well as existing strategies and policy frameworks.<br>The Program's objective is to enhance, through coastal zone management based on the conservation and sustainable use of coastal ecosystems, ecosystem services that contribute to reducing climate change-related risks for vulnerable coastal communities. The outcome will increase the resilience of vulnerable coastal populations to climate change.<br>The Blue Action Fund (BAF) is an independent non-profit foundation and currently the only global institution exclusively funding local level initiatives in the marine/coastal conservation and sustainable fisheries sectors. It funds NGOs to strengthen the resilience of coastal populations against climate change. | | | |

### Projects in Mauritius

| | | | |
|---|---|---|---|
| **Climate Change Adaptation in Mauritius' Coastal Zone** | | | |
| **Implementing Organization** | **Funding source** | **Period** | **Budget** |
| UNDP | Adaptation Fund | 2012 – 2017 | USD 19M |
| This project will help coastal communities fight the adverse effects of climate change through the implementation of climate-resilient development measures. It aims to increase communal and livelihood climate resilience in coastal areas in Mauritius. This objective will be achieved through a series of initiatives: by applying adaptation measures to protect currently vulnerable coastal ecosystem and community features (at three priority sites on the island of Mauritius); by developing and implementing an early warning system for incoming surges; through trainings promoting compliance with climate-proofed planning, design, and location guidelines; by mainstreaming policies; and finally by disseminating and managing knowledge to ensure that the benefits from the project are replicated in other areas at risk. | | | |
| **Restoring marine ecosystem services by restoring coral reefs to meet a changing climate future** | | | |
| **Implementing Organization** | **Funding source** | **Period** | **Budget** |
| UNDP | Adaptation Fund | 2018-2023 | USD 10M (USD2.5M directly for Mauritius, plus part of USD3.2M for capacity building) |

| |
|---|
| The project will work in Mauritius and Seychelles to develop sustainable partnerships and community-based, business-driven approaches for reef restoration, establish coral farming and nursery facilities, and actively restore degraded reefs. On a regional and global level, the project will improve understanding on how to use coral reef restoration as a tool for climate change adaptation, provide models for sustainable management of reef ecosystems, and build capacity for long-term restoration and management of these precious habitants. |

## Projects in the Seychelles

| **Ecosystem-based adaptation to climate change in Seychelles** | | | |
|---|---|---|---|
| **Implementing Organization** | **Funding source** | **Period** | **Budget** |
| UNDP | Adaptation Fund | 2014-2020 | USD 6,455,750 |
| This project seeks to reduce the vulnerability of the Seychelles to climate change, focusing on two key issues—water scarcity and flooding. The project works on spearheading ecosystem-based adaptation for climate change risk management—restoring ecosystem functionality, enhancing ecosystem resilience and sustaining watershed and coastal processes in order to secure critical water provisioning and flood attenuation ecosystem services from watersheds and coastal areas. | | | |
| **Global Climate-Change Alliance** | | | |
| **Implementing Organization** | **Funding source** | **Period** | **Budget** |
| UNDP | EU-GCCA+ | 2016-2019 | USD 1,285,131 |
| The project aims at supporting adaptation to climate change to increase coastal and flood protection in the vulnerable areas of La Digue Island, through integrated shoreline management in place, enhanced stream channel and wetland productivity and flood buffering capacity, enhanced shoreline protection, and mitigation of saltwater contamination. Cost-effective EBA methods are being used, in combination with various engineering technologies to address site-specific issues and opportunities enhancing climate change resilience to coastal flooding. | | | |
| **Ecosystem-based adaptation through South-South cooperation** | | | |
| **Implementing Organization** | **Funding source** | **Period** | **Budget** |
| UNEP/MEECC | GEF | 2013-2017 | USD 5 M across three countries |
| The project aims to restore essential ecosystems within Seychelles' coastal wetlands, which buffer against flooding and enhance the security of coastal livelihoods. Targets: restoration of 29 ha of mangroves; stabilization of 500m of national highway using mangrove restoration; 2km channel desilting; construction/replacement of 7 culverts | | | |
| **Restoring Marine Ecosystem Services by Rehabilitating Coral Reefs to Meet a Changing Climate Future** | | | |
| **Implementing Organization** | **Funding source** | **Period** | **Budget** |
| UNDP | Adaptation Fund | 2018-2023 | USD 10M (USD2.5M directly for Seychelles, plus part of USD3.2M for capacity building) |
| - See Mauritius section above for project description | | | |

### Regional Projects

In addition to the country specific EbA projects noted above, there is a new 10 million Euro regional project funded by AFD and FFEM - "Resilience des Zones Côtières de l'Océan Indien – RECO". The project is led by the Indian Ocean Commission and will work in all four Programme countries. The objective of the project is to reinforce the resilience of coastal populations and the ecosystems where they live to the effects of climate change and extreme weather events. The project will provide important complementarity to the GCF/CEPF Programme by strengthening regional and national governance related to marine and coastal ecosystems, developing regional cooperation and scientific expertise, as well as supporting a number of pilot projects. Programme sites have been pre-identified at Morondava in Madagascar, Flic-enFlac in Mauritius and on the main islands on Seychelles and Comoros. With well identified pilot sites, the GCF/CEPF Programme will be able to plan interventions in alternative areas during the priority setting in Component 1.

# 10. Civil Society in the Hotspots and Programme countries

This section is based on the information gathered for the 2014 CEPF Ecosystem profile for the hotpot (CEPF 2014) with some edits, updates and additional information added from the public consultations. Further details on CSOs is also provided in the 2014 Ecosystem Profile and its annexes.

## *Madagascar and the Indian Ocean Islands Hotspot*

### Madagascar

Up-to-date information on the overall Civil Society Organization sector is lacking in Madagascar.

In 2013, 680 NGOs and associations were registered with the Ministry of Population, 30 percent of which are partially or fully involved in the field of environment. More than half (54.85 percent) were based in the capital (Ministry of Population, 2013).

In 2011, UNDP commissioned CIVICUS to undertake an assessment of civil society in the country. Some of the main findings were:

- Weaknesses of the legal framework are obsolete and inadequate laws governing civil society.
- Lack of knowledge or even ignorance, on the part of CSOs themselves, of civil society regulations and fundamental values. Consequently, (i) breach of the apolitical nature of associations and (ii) non-compliance with legal requirements is frequently observed. For example, some associations operate like cooperatives or economic interest groups.
- It appears that civil society has a good reputation in Madagascar: 84.4 percent of the population trusts them. In terms of self-assessment of their impact, only 28.7 percent of CSOs said that civil society in general has had a tangible impact on local / national policies in the country, while 39.7 percent of CSOs advocated for the adoption of a policy.
- Despite the population‘s trust, nearly half of the CSOs find that the social impact of CSOs‘ interventions in general has not turned out as well as they might have (53.8 percent). Areas where these impacts are noticeable are social development, education, and health.
- The audit also highlighted the weakness of cooperation between the government, CSOs, and other stakeholders, as well as low citizen‘s mobilization and low civic engagement across the country.
- The majority of national civil society organizations (associations and NGOs at all levels - local regional, and national) face funding problems. To carry out their mission, CSOs depend largely on international financial partners to carry out their operations. The financial situation of many organizations worsened because of the political situation between 2009 and 2013, and the suspension of several international cooperation programs. Many donor programs have started again although several important philanthropic foundations that had funded CSOS to undertake environmental work have disassociated from Madagascar during the political crisis (notably the MacArthur Foundation and Helmsley Charitable Trust).

### International NGOs

International NGOs in Madagascar work at different scales by the presence of antennas at national, regional, and local levels and the development of partnerships with national civil society organizations and other small NGOs / international associations.

*Table 14. International Environment-focused Organizations active in Madagascar*

| | | |
|---|---|---|
| **Conservation International** | CI | Collection and analysis of data on biodiversity and environmental services. Support to the creation and management of Protected Areas. Training experts in conservation. Capacity building of partner organizations (from associations and local communities to national and international organizations). Support for the definition and implementation of environmental policy in the country |
| **Blue Ventures** | BV | Focus on marine biodiversity. Scientific expeditions and monitoring with support from international volunteers. Support for local projects of fishery resources management, of locally managed marine protected areas. |
| **BirdLife International** | BL | No presence in the country, but support for its national partner organization - Asity. Identification of Important Areas for Birds Conservation (ZICO) |
| **Durrell Wildlife Conservation Trust** | Durrell | Support for community-based sites management, strengthening local organizations. Focus on critically endangered species (birds, turtles) |
| **Union International pour la Conservation de la Nature** | UICN | No presence in the country (regional office in Nairobi). Support for the definition of prioritization tools (Red Lists, KBA). Participation in and information on regional issues (invasive species, payment for environmental services) |
| **Missouri Botanical Garden** | MBG | Focus on plant conservation. Identification of Important Areas for Plant Conservation. Collection, analysis, and dissemination of botanical data. Support for site management and capacity building. |
| **Muséum National d'Histoire Naturelle** | MNHN | Scientific expeditions (Atimo Vatae, 2010, treetop raft, 2001), biodiversity data collection and analysis (flora and fauna, marine areas). Training in partnership with the Universities of Antananarivo, Toliara, and Mahajanga. Site management: bio-cultural pilot project in Antrema. |
| **The Peregrin Fund** | TPF | Focus on raptors. Support for community conservation programs, for backup programs of species safeguarding. Training and research. |
| **Royal Botanical Gardens, Kew** | RBG | Support for the implementation of the Durban Vision and the Global Strategy for Plant Conservation. The work covers: taxonomic and systematic research in botany, species and habitats conservation with a focus on plant species. |
| **Wildlife Conservation Society** | WCS | Support for the conservation of Madagascar's unique flora and fauna. Training for protected areas managers, educating local community on forests and marine ecosystems protection. |
| **World Wide Fund for Nature** | WWF | Biodiversity preservation on priority land and marine landscapes with support for the system of Madagascar's protected areas and sustainable management of natural resources. |

Source: CEPF, 2014

In general, the main international NGOs work in collaboration with national and local organizations, and communities. These organizations manage and are associated with programs and projects related to conservation or sustainable management of natural resources, including projects related to protected areas and the protection of ecosystem services.

### NGOs and National Associations

NGOs and national associations perform critical functions in the environmental sector. They work in the creation and management of protected areas and other important areas for ecosystem services, inventories, ecological monitoring and evaluations, research, alternatives activities to deforestation, awareness campaign and training, natural resources development, capacity building, natural resource management transfer, as well as mobilization and social structuring. National organizations often intervene as implementing agencies for various projects of technical and financial partners (government, international NGOs, bilateral and multilateral donors or foundations). The proximity of national NGOs with the local population has woven links between these two actors and fostered a better understanding of environmental and social problems leading to innovative approaches or projects.

*Table 15. Main National NGOs and Associations in the field of Environment in Madagascar*

| Acronym | Name of the organization | Main activities |
|---|---|---|
| ACCE | Arongampanihy Communication Culture Environnement | Conservation of fruit-eating bats of Madagascar and other endemic species, through research, education and communication |
| AED Action | Association des Etudiants en Didactique en Action | Multidisciplinary organization with a focus on environment and sustainable development through research, sensitization and communication |
| AIFM | Association des Ingénieurs Forestiers de Madagascar | Professional association of Forestry Engineers, working on protection and sustainable use of forests |
| AIM | Association Intercoopération de Madagascar | Development organization supporting rural communities in their social and economical development, and strengthening their role as active stakeholders for the development of the country |
| AJE | Association des Journalistes Environnementaux | Professional association of journalists in the field of environment, working on advocacy and sensitization of the Malagasy population |
| ANAE | Association Nationale Pour l'Action Environnementale | Promotion of community driven natural resources management, with focus on territorial planning |
| Ankoay | | Improvement of the livelihood of the members, contribution to rural development and protection of the environment |
| APMM | Association des Populations de Montagne du Monde ou Tambohitravo Malagasy | Improvement of the livelihood of the communities of the mountainous areas, through improvement of their rights on land and land management |
| APPA | Association des Pêcheurs et Producteurs d'Alevins d'Andapa | Protection of the environment, in particular in mainland freshwater, and protection of endemic fish |
| ARSIE | Association Réseau du Système d'Information Environnemetale | Network for the production of environmental metadata, introduction of information sharing policies and practices, and capacity building on database management |
| ASITY | ASITY | Preservation and valorization of biodiversity, for Man and Nature to live in harmony |
| AVG | Association Voahary Gasy | Network (plateforme) for advocacy, information sharing, capacity building and social innovations |
| BCM | Biodiversity Conservation Madagascar | Conservation of biodiversity in some specific sites in Madagascar |
| CEL | Centre Ecologique Libanona | Training center on environment and biodiversity conservation |
| CETAMADA | | Protection of the Indian Ocean marine mammals and promotion of related ecotourism |
| DELC | Development and Environmental Law Center ou Mizana Maitso | Creation of a legal framework for a balance between natural resources conservation and economic development |
| Fanamby | Fanamby | Biodiversity conservation and sustainable human development based on a regional approach of environmental problems in priority areas |

| | | |
|---|---|---|
| FAPBM | Fondation pour les Aires Protégées et la Biodiversité de Madagascar | Foundation for the sustainable funding of conservation activities in Madagascar |
| Fondation Tany Meva | Fondation Tany Meva | Mobilization of financial resources to promote sustainable management of the environment and to contribute to the global challenges, though the engagement with local communities |
| Foniala | Foniala | Protection of the Environment and improved natural resources management for a sustainable development |
| GERP | Groupe d'Etude et de Recherche sur les Primates de Madagascar | Research on lemurs and their habitats and advocacy for recognition of their importance in the economic development strategy of the country |
| GSPM | Groupement des Spécialistes de Plantes de Madagascar | Representing the IUCN Plan Specialist Group in Madagascar, to revise the conservation status of plants and promote their protection |
| Koloharena | Koloarena | Network of Farmers' Association promoting sustainable and improved agriculture for the benefit of the environment |
| LRA | Laboratoire de Recherches Appliquées | Multidisciplinary organization with a focus on environment, forestry and development |
| MATE | L'Homme et l'Environnement | Sustainable development and biodiversity conservation through the engagement of local communities in poverty |
| Ma-Voa | Madagasikara Voakajy | Provide support for the conservation of endemic mammals in line with the national environmental policy |
| MBP | Madagascar Biodiversity Partnership | Protection of forest where lemurs are present, while improving the livelihood of the population dependent on natural resources |
| MICET | Madagascar Institut pour la Conservation des Ecosystèmes Tropicaux | Participation to the environmental program Ranomafana and conservation actions in other sites in the areas of Vatovay Fitovinany, Haute Matsiatra, Amoron'i Mania and Atsimo Antsinanana |
| Mitsinjo | | Improvement of the livelihood of the population through the sustainable development of local communities and sound management of natural resources |
| PENSER | | Protection of the environment and sustainable development through improved education, in particular for women |
| Reniala | | Strengthening the public health system at community level, including through the protection of the environment |
| SAF FJKM | Sampan'Asa momban'ny Fampandrosoana FJKM | Association of botanists for the protection of the environment, and more specifically of the plants |
| SAGE | Service d'Appui à la Gestion de l'Environnement ou Fampandrosoana Maharitra | Association affiliated to the church, working in social and economic development in all the country, including environment protection activities |
| Tandavanala | | Promotion of sustainable development through better governance and improved management of natural resources |
| Vahatra | | Promotion of sustainable development and management of forest ecosystems in Madagascar, with a focus on the COFAV corridor |
| Velondriake | | Association for the development of research on biodiversity and ecosystems, and for scientific training in Madagascar |
| VIF | Vondrona Ivon'ny Fampandrosoana | Network for the sustainable use of natural resources through education and awareness raising of communities on marine ecosystems and promotion of livelihood activities alternative to fishing |
| Voahary Salama | Voahary Salama | Protection of the environment and community development through local management and capacity building |
| Voarisoa | Voarisoa | Network working on integrating Health, Population and Environment |
| C3 Madagascar | Community Centred Conservation Madagascar | Awareness raising to mitigate the risks of chemicals use on the environment |

Madagascar National Parks (MNP), the Service d'Appui à la Gestion de l'Environnement (SAGE) and the Association Nationale des Actions Environnementales (ANAE) represent civil society associations that are parastatal as they remain under the tutelage of the Ministry responsible for the Environment.

One of Madagascar's peculiarities is that the management of almost all protected areas is ensured by the civil society. MNP or Madagascar National Parks manages a network of 51 protected areas of IUCN Classes I, II and IV. Other national and international CSOs are involved as promoters or managers of the New Protected Areas (NPA), created since the push for protected area expansion since 2002. These NPAs tend to have broader management objectives and have less focus on biodiversity conservation and more focus on broader ecosystem service protection objectives and sustainable use of renewable natural resources (equivalent to categories III, V and VI under IUCN's international classification system). Among the most important promoters are Conservation International (12 KBA covering 715,000 ha), WWF (12 KBA for 767,000 ha), MBG (10 KBA, but smaller, covering 40,000 ha) and WCS (6 KBA, but for 1,023,000 ha). Among the national promoters FANAMBY (6 KBA for 532,000 ha) and Asity (5 KBA for 467,000 ha) are larger than other national organizations, which usually manage one or two smaller sites.

### Community-Based Organizations

Since 1996, local communities have been involved in natural resources management through the introduction of a policy of Natural Resource Management Transfer (*Transfert de Gestion des Ressources Naturelles* - TGRN), through which the departments responsible for management of natural resources delegate management responsibility to local associations. Approximately 750 management transfer contracts (all resources) have been signed, covering an area of more than 1 million ha (Elison, 2011). To benefit from a TGRN, local communities are required to be declared as a legal organization, under the status of —Communauté de Base (Grassroots Communities) known under their acronym of COBA. The TGRN have enhanced participation of local communities in protected areas and the management of their buffer zones. The phenomenon is amplified with the New Protected Areas, which usually include TGRN zones within them. The involvement of COBAs is often in partnership with national or international NGOs who provide technical and financial support.

The effectiveness of these community-based management initiatives is hampered by lack of skills, means, and resources at governmental level (for evaluation, monitoring, and supervision), and at the municipal level for conflict resolution. Further, there is a lack of support organizations, which presents a challenge because continuous support for these grassroots communities for at least the first three years before contract renewal, is optimal. Support is also needed for COBA for implementation of the simplified management plan that they create as the basis for managing the transferred resource.

### Women's Organizations

In general, the national policies, strategies and programs for development and for sustainable management of natural resources (forests, water catchment and irrigation, preparation of the REDD strategy, climate change, land use, food security, risk and disaster management...) take into account the gender dimension. In spite of difficulties, women are taking an increasing leadership in the environment sector in Madagascar.

A few civil society organizations focusing on gender are also involved in the promotion of biodiversity conservation, climate change and sustainable management of natural resources, such as the Réseau Genre et Développement de Madagascar (Awareness raising on climate change, sustainable agriculture) and the Plateforme Nationale Femme Développement Durable et sécurité alimentaire (FDDSA), which supports women entrepreneurs in the field of agro-ecology and sustainable agriculture in Madagascar and the Comoros (with support from the Indian Ocean Commission - IOC).

### Research Institutions and Universities

Madagascar has various institutions that are partially or fully involved in training and research activities related to biodiversity conservation and climate change. Among them are the Faculty of Science with its Departments of Animal Biology, Plant Biology and Ecology (at three Universities: Antananarivo, Mahajanga, and Toliara), the l'Institut Halieutique des Sciences Marines, which trains and conducts research in fisheries, aquaculture, and marine and coastal environment, and the Department of Water and Forestry of the l'Ecole Supérieures des Sciences Agronomiques (ESSA - Forestry), which operates in the fields of forest and water resources, especially in forestry and development, ecology, biodiversity, water and soil management, economics and natural resources management policy. The mission of the Centre National de Recherche pour l'Environnement (CNRE) is to conduct research on biodiversity and its preservation, and on improving the livelihoods of rural and urban communities. Many NGOs and national and international associations conduct research on both sites and species.

International institutions are also involved in research. The Institute for Research and Development (IRD) conducts research on climate change, biodiversity and soil functioning in agro-systems and population. The NGO GRET (Groupe de Recherches et d'Echanges Technologiques) works in sustainable management, local land governance, and watershed protection. The Centre de Coopération Internationale pour la Recherche Agronomique pour le Développement (CIRAD) focuses on forests and biodiversity areas, and cultivation and sustainable rice growing systems such as the direct-seeding on plant cover or agroecology.

### Foundations

There are two national foundations working specifically on biodiversity conservation and climate change issues in Madagascar.

The Tany Meva foundation, created in 1996, working for the community, is involved in the sustainable management of natural resources, mitigation and adaptation to climate change, fight against desertification, and the environmental awareness. Tany Meva is currently serving as the Regional Implementation Team (RIT) for CEPF's current investment phase.

The objective of the Fondation pour les Aires Protégées de Madagascar (FAPBM), created in 2005, is to sustain funding for protected areas management. It is also involved in activities or projects related to protected areas, species conservation, and ecological habitats. In 2018, FAPBM disbursed, from its Trsut Fund, roughly USD 2.4 million per year to CSOs for protection of biodiversity and natural ecosystems. The Trust Fund was valued at USD 80.7 million in 2018 (FAPBM 2018 Annual Report).

### Private sector

In recent years, private sector organizations have begun to engage in environmental issues in Madagascar. The mining sector is the pioneer, through large mining firms participating in biodiversity

offset programs, such as the nickel-cobalt extractive program in the East-central part of the country (Ambatovy), as well as the ilmenite extractive program in the south-east (QMM). Companies investing in these programs orient their environmental activities towards collaboration with local communities and through environmental education activities, reforestation, and land restoration activities. The TELMA Foundation, a charity organization linked to the Malagasy telecommunications company, has sponsored some small initiatives, generally focused on renewable energy and environmental awareness.

### Comoros

Civil society organizations working on environmental conservation and protection are represented by village or neighborhood associations, NGOs, and professional networks.

#### Village or Neighborhood Development Associations

Associations exist in each Comoros village. In the 1960s, sociocultural associations appeared and participated in social and community events. In 1990 and 1991, associations for environmental protection were created respectively in most villages of Anjouan and Grande Comore. Everywhere, reforestation and cleaning and awareness actions were undertaken in the communities. Very often, these associations are spontaneously created within the communities, as an initiative of the youth who want to take care of their natural resources and their environment, especially in cases where the authorities do not provide consistent and sustainable measures for environmental protection. However, despite their enthusiasm, these local organizations have limited capacity and are not always stable in the long term as they are often dependent on individual commitments. The Programme of Support Fund for Community Development funded by the World Bank helped to institute "steering committees" and to strengthen some of these legally-constituted village associations.

Some of these organizations have developed some specific biodiversity-oriented activities. These include the Ndudju Association in the Chindini Village, affiliated with the Megaptera Indian Ocean NGO, which educates fishermen and organizes whale watching for tourists, and the Association for Social Development in Itsamia Mwali, whose logo is the Green Turtle. This organization educates the population on the importance of endangered or endemic species, and works to protect the bird colonies of Rocher Mchako, the Lake Boundouni slopes, and sea turtles.

#### Non-Governmental Organizations and Professional Networks

The Association for the Preservation of Gombesa (APG) or Gombesa NGO is grouping together a dozen villages in the south-western coast of Grande Comore and wishes to contribute to sustainable development by protecting the Coelacanth, *Latimeria chalumnae*, its marine environment and the nearby coasts where the species lives. The NGO works to raise awareness in communities and encourage sustainable fishing.

The Association of Intervention for Development and Environment (AIDE), created in 1997, is supported by the Environmental National Section through the IOC Environmental Regional Program funded by the European Union. AIDE's mission is to contribute to sustainable development of Comoros

through research activities and environmental protection. The objectives of AIDES are to monitor the natural environments, to build environmental capacity, to conduct awareness campaigns and environmental education, and to develop socioeconomic alternative activities.

The Anjouan HTC NGO, created in 2003 by young professionals involved in sustainable development, works in marine resources management and protection, tourism promotion, and agricultural resources management and protection.

The Anjouan Action Comores NGO aims to contribute to the Livingstone flying fox and the Anjouan forest conservation. It regularly conducts general biodiversity inventories and awareness campaigns for Comoros' sustainable environmental management. Among other activities are the fight against upstream soil erosion and the promotion of the island's ecotourism.

The Dahari NGO develops work programs in the south of Anjouan on Moya forest management, its biodiversity, and the ecosystem services it provides.

The Federation of Comoran Consumers (FCC) fights for consumers' protection and for the citizens so that they benefit from the technical, economic, and social progress of the community. The FCC works through training, information, awareness actions, lobbying, campaigns, and when necessary through legal public events. It participates in national debates on issues related to Comoros' environment, organizes hiking for the public to show the biodiversity and landscape richness of the archipelago, and encourages the public to work for its conservation and valorization.

The National Federation of Comoran Farmers and Women Farmers work to develop the agriculture and livestock sectors by promoting its activities and protecting its interests. It wants to be a unifying movement aiming to reorganize the "union and professional body" of agricultural operators through associations, groups, unions, or any other natural or legal entity.

### Research institutions

The National Research Institute for Agriculture, Fisheries and Environment (INRAPE) is tasked, among other things to design and conduct programs and research, to conduct agricultural, fishery, and environmental studies, to maintain relationships with research organizations in the field of agriculture, fisheries, and environment, and to promote techniques and methods that would increase the productivity of agriculture, fisheries, and environment preservation. It also works to participate in the evaluation of the technical implementation of agricultural projects, fisheries, and environment. INRAPE has an unreliable and insufficient budget as well as staffing problems, and faces serious difficulties in fulfilling its objectives.

The National Center for Documentation and Scientific Research (CNDRS), a Comoran public institution, conducts wide range of activities, such as museology, documentation, and information dissemination to the public and specialists, the National Archive, scientific research, geological and spatial mapping, observation of the Karthala, cultural promotion, dissemination and popularization of scientific information, organization of seminars, production of documents with academic connotation, for both researchers and the public. It is a reference point for all those interested in history, geography, geology, literature, tradition, wildlife, flora, religion of Comoros, and the environment of the archipelago, in and around the Indian Ocean, without omitting aspects of Bantu civilization. Today, empowered with administrative, financial, and management autonomy, CNDRS is soon going to adopt

rules of procedure and establish a high-level Scientific Council. It intends to further consider the need for organic or functional integration of various existing training and research institutions so that it can fulfill its mission.

### Mauritius

Although nearly 6,000 organizations are registered in Mauritius, it is estimated that about 300 NGOs are actually active, but very few are interested in conservation.

The *Mauritian Wildlife Foundation* is probably the best-known NGO working on terrestrial environment issues in Mauritius and Rodrigues. Established in 1984 with support from the *Durrell Wildlife Conservation Trust*, MFW is particularly interested in the protection of endangered animal species (birds, reptiles, mammals) and plants. MWF works closely with the Mauritian authorities especially in bird conservation programs on the islands (such as Round Island). The Foundation also became responsible for managing the private reserve of Mondrain in August 2013, although its involvement spans 30 years. MWF is the only organization to intervene in terrestrial ecosystems in Rodrigues, where it has been active since 1985. It co-manages the sites of Grande Montagne, Anse Quitor, Ile aux Cocos and Ile aux Sables.

Many environmental NGOs have worked in marine environments and have been active since the 1970s. The most important one is the *Mauritius Marine Conservation Society* (MMCS), which is involved in advocacy and awareness, it is involved in scientific programs of monitoring dolphins, whales, and sea turtles, and is conducting marine conservation activities (e.g. creation of artificial reefs). Reef Conservation Mauritius, newer and smaller, conducts similar activities. Others include Forever Blue and Lagon Bleu in Mauritius or Shoals of Rodrigues, and Rodrigues Underwater Group in Rodrigues, they are involved in awareness outreach to residents and tourists, and provide scientific oversight and conduct protection activities on a few sites.

### Seychelles

The role of civil society role has increased considerably in Seychelles over the past 15 years. The number of organizations was estimated in 2012 to be about 85 across all areas (Government of Seychelles, 2012). This is a ratio of about one organization per one thousand inhabitants. Most of organizations are registered with the *Liaison Unit for Non-Governmental Organizations* (LUNGOS), a national platform representing civil society.

The main civil society organizations involved in environmental issues and biodiversity conservation are listed below.

*Table 16. Major Civil Society Organizations Involved in Biodiversity Conservation in Seychelles*

| Associations, Foundations, and ONGs | Community-Based Organizations |
|---|---|
| Green Island Foundation (GIF) | Roche caiman district group |
| Island Conservation Society / Fondation pour la Conservation des Iles (ICS ) | Port Glaud Environment Club |
| Marine Conservation Society of Seychelles (MCCS) | Bel Ombre Action Team |
| Nature Protection Trust of Seychelles (NPTS) | **Private Sector Organizations** |
| Nature Seychelles (NS) | North Island, |
| Plant Conservation Action group (PCA) | Cousine Island, |
| Sustainability for Seychelles (S4S) | Ephelia Resort, |
| Seychelles Farmers Association (SFA) | Denis Island, |
| The Ecotourism Society of Seychelles (TESS) | Bird Island, |
| Terrestrial Restoration Action Society of Seychelles (TRASS) | Aride Island, |
| TAGGS (Association gathering all public, private and NGO partners involved with marine turtle monitoring) | Fregate Island, |
| Wildlife Club of Seychelles (WCS) | Banyan Tree Resort Seychelles, |
| **Public Foundations and Trust Funds** | Lemuria Resort, |
| Seychelles Islands Foundation (SIF) | Chalets Anse Forbans. |
| Environment Trust Fund (Government) | |
| Seychelles Botanical Gardens Foundation | |

These various actors play complementary roles in nature protection. Some foundations and associations play the role of a financial mechanism able to channel funds from various sources to carry out conservation actions on some islands (Silhouette, Alphonse, and Desroches). The *Seychelles Islands Foundation,* whose members are appointed by the President of the Republic, is parastatal in its operations, it works in the same way in Aldabra and the Vallee de Mai. The *Seychelles Botanical Gardens Foundation* for botanical gardens is also parastatal. Many NGOs conduct ecosystem restoration activities on islands that belong to them (Cousin, Aride) or work on private islands with their owners (14 of 20 Seychelles' granitic islands are private - hence the important role of the private sector in conservation).

The University of Seychelles, although only inaugurated in 2010, has developed an environmental science degree course that includes conservation and staff conduct research programs. It could be called upon to play an important role at the national and regional levels to build capacity and to mobilize expertise.

Community-based organizations, which would educate and mobilize citizens around activities in favor of biodiversity, are still poorly represented, and are present only on a few islands. Collaboration between different NGOs, knowledge exchange, and knowledge sharing are still relatively undeveloped.

# 11. Conclusion

The Madagascar and Indian Ocean Islands Hotspot is among the biological wonders of the world, with globally significant levels of diversity and endemism. Its ecosystems provide millions of people with fresh water, food and other ecosystem services that are essential to their survival. Despite their wealth in natural resources, the pace of action in conservation appears insufficient to ensure the hotspot inhabitants will sustainably benefit from their environment and the ecosystem services it provides for generations to come. The Programme will provide a source of funding in the hotspot that is designed to reach civil society in a way that complements funding going to government agencies and catalyzes innovative EbA and conservation actions, in particular those that demonstrate the link between ecosystem health and sound development. By using an integrated approach to pursue EbA and sustainable development goals, and by providing funds to mainstream EbA into government plans and policies as well as private sector initiatives, the Programme will augment efforts to address the immediate threats of poverty and unsustainable development, and contribute to long-term resilience to climate change of the people of the hotspot.

EbA has been identified as a priority in the various climate change strategies of all the Programme countries. All of the countries are concerned about the state of their natural ecosystems and the quality and quantity of ecosystem services that their people depend upon. Other EbA initiatives have been started in all the Programme countries meaning that there is already a wealth of experience to build upon, replicate and expand both within government and within CSOs. Despite the existence of other EbA initiatives, there is widespread recognition that much more needs to be done beyond the few existing pilots. The Programme will give an opportunity to a broad range of organizations to use their existing technical capacity on EbA and to build it further.

There are a large number of CSOs operating in the Programme countries and they vary enormously in their capacity, ranging from newly created community-based groups to large international NGOs that manage multi-million-dollar projects. The larger NGOS (both international and national ones) are also able to mobilize expertise and play important advocacy roles with government and the private sector. By contrast, national and local NGOs have lower capacities to conduct fundraising activities and have difficulties in accessing available funding which is needed to carry out their field activities in the long term. Nevertheless, there are also many examples of larger and smaller NGOs partnering so that smaller NGOS benefit from the capabilities of the larger organizations. There are also many examples of regional collaboration and exchange between the CSOs in both hotspots and these can be further capitalized upon by the Programme to benefit from the strengths and expertise in particular countries. In addition to the environmentally-focused CSOs that CEPF has traditionally worked with, the focus on EbA in this Programme opens up new opportunities for collaboration with organizations more focused on the human development aspects of climate change. As demonstrated during the stakeholder consultations for the Programme, there is a large pool of CSOs who are interested in developing EbA subprojects for whom this Programme will provide an opportunity for accessing funding that is otherwise beyond their reach.

Over the last 20 years, the CEPF has demonstrated that it fills an important niche within global biodiversity conservation through its focus on CSOs. Over that time, it has developed a suite of policies, procedures and operating systems that are simple enough to allow even small community-based CSOs

to benefit from funding while at the same time providing the rigor needed by its donors such as the World Bank, EU, GEF, Govt. of Japan and AFD. CEPF defines its investment priorities using an inclusive participatory process involving national, subregional and expert consultations. The results, encapsulated in an Ecosystem Profile, provide a common vision developed by government agencies, donors, CSOs and the private sector that allows CEPF's investments to be targeted at high priorities (whether thematic or geographic) while avoiding duplication with other donor and/or government investments. CEPF's tried-and-tested approach that has worked so well for biodiversity conservation is easily transferable to support Ecosystem-based Adaptation. CEPF is also ideally positioned to support concrete regional collaborations among the civil society organizations of the hotspots, maximizing the wealth and diversity of experiences developed and fostering the emergence of a regional EbA community.

# Appendix 1. Note on estimation of the number of beneficiaries for the Programme

Based on CEPF's past experience of funding ecosystem conservation work by CSOs in the hotspot, CEPF has estimated that with the requested budget of USD 38M from GCF and USD 11.2M co-finance, the Programme will be able to improve the provision of ecosystem services for 610,360 people, which equates to 2.1% of the total population of the four countries where the Programme will invest. The calculation of indirect beneficiaries is based on assuming that the investment will provide indirect benefits for 12.6% of the population in each of the countries, except for Madagascar where it is expected to be 1.26% of the total population. Due to the size of Madagascar, CEPF expects that the regions where priority EbA investments will be considered will include 10% of Madagascar's population, of which 12.6% will be beneficiaries. These figures can be updated once the priority themes and areas for investments have been identified under the Ecosystem Profiling activities planned as part of Component 1.

**Estimated indirect beneficiaries of the Programme**

| Country/Region | Population estimate (2019)[1] | Estimated indirect beneficiaries |
|---|---|---|
| Comoros | 850,886 | 107,212 |
| Madagascar | 26,969,307 | 339,813 |
| Mauritius | 1,198,575 | 151,020 |
| Seychelles | 97,739 | 12,315 |
| TOTAL | | 610,360 |

1. Based on UN Population Division estimates.

Regarding indirect beneficiaries, CEPF currently uses a Monitoring framework that includes tracking of several indicators related to human well-being (see Annex 11 – Monitoring and Evaluation plan for details of CEPF's monitoring framework), including the numbers of direct beneficiaries from CEPF funded grants. Based on past experience of CEPF's investments in the hotspot and the funding requested for this Programme, CEPF estimates that the number of direct beneficiaries will be 88,200 for the Madagascar and Indian Ocean Islands hotspot. To obtain the number of direct beneficiaries per country as required in Annex 17 (the Multi-country Programme information form), the number of beneficiaries for the hotspot has been split between the countries based on the targeted split of funding (see table below).

**Estimated direct beneficiaries of the Programme**

| Country/Region | Estimated direct beneficiaries for the hotspot[2] | Proportion of the hotspot's funding targeted to the country | Estimated direct beneficiaries |
|---|---|---|---|
| Comoros | 88,200 | 17% | 14,700 |
| Madagascar | 88,200 | 50% | 44,100 |
| Mauritius | 88,200 | 17% | 14,700 |
| Seychelles | 88,200 | 17% | 14,700 |
| TOTAL | | | 88,200 |

2. Based on CEPF's previous investments in the hotspot and the total funding for the Programme

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