ECOSYSTEM PROFILE

HOTSPOT OF

MADAGASCAR

AND THE ISLANDS OF THE INDIAN OCEAN

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EXECUTIVE SUMMARY

Founded in 2000, the *Critical Ecosystem Partnership Fund (*CEPF) is a program that supports civil society actors in their efforts to conserve the world's most severely threatened ecosystems (*Biodiversity Hotspots*). CEPF is a joint initiative of the French Development Agency (AFD), the World Bank, the European Union, the Global Environment Facility, the Government of Japan and Conservation International. Green Climate Fund (GCF) funding has been made available to CEPF for Madagascar and the Indian Ocean Islands through AFD as an accredited agency to the GCF.

The fundamental purpose of conserving ecosystems is to enable them to perform their various functions, called ecosystem services, for the benefit and needs of people: food security, water supply, energy supply, health security, material and economic comfort, and the maintenance of cultural values and social cohesion.

However, for years, especially in recent decades, in the face of the massive and accelerated exploitation perpetrated by humans to satisfy these needs, ecosystems have undergone transformations tending towards forms of degradation that risk being irreversible, because the rate of exploitation largely exceeds the capacity and the cycle of regeneration that these ecosystems should normally have.

This trend of irreversible degradation is exacerbated in a context where other factors have come into play: climate change, on the one hand, and recently, COVID-19 and other possible unexpected health hazards, on the other. As a result, the pressure on ecosystems is increasing, at the risk of losing their functions and at the expense of the development and well-being of the population.

Ecosystem Profile Development Process

The Madagascar Hotspot and other Indian Ocean islands have often been considered a priority among other global hotspots. As a result, this Hotspot has already benefited from CEPF, 20 years ago.

The first phase of CEPF investment in the Hotspot ran from 2001 to 2006, supporting 40 projects implemented by 18 organizations in Madagascar alone. Following this phase, the CEPF Donor Council approved a consolidation phase, which was implemented between 2009 and 2012.

Then, in 2012, the Madagascar and Other Indian Ocean Islands Hotspot was recognized by the CEPF Donor Council as an eligible region for the development of an ecosystem profile. Thus, an ecosystem profile was prepared in 2013-2014, led by Conservation International in Madagascar.

In general, the preparation of the Ecosystem Profile is carried out through desk studies, as well as consultations with relevant stakeholders: researchers, conservation and/or development actors, local communities. An assessment of biological priorities and the underlying causes of biodiversity loss in given ecosystems is then made. These two elements are combined with an inventory of existing investments in conservation and other key elements. Thus, each profile highlights the most relevant priorities for conservation and for CEPF investment.

An important step is to assess the results of previous conservation efforts and to define the conservation goals to be achieved in order to prevent biodiversity loss (habitats, fauna, flora). CEPF's niche and investment strategy is based on the results of these efforts, first to ensure that investments are well targeted, and second to be able to evaluate the success of these investments. On the other hand, consideration of the impacts of climate change cannot be ignored, or even be given a prominent place, given their influences on the life of biodiversity in general, as well as on the development of communities. The relatively recent involvement of the Green Climate Fund in the CEPF initiative reflects this obvious need to integrate the fight against climate change (mitigation and adaptation) into conservation approaches. As a result, the intervention logic of the GCF and the strategic investment directions of CEPF must be consistent with each other.

By specifically targeting civil society, CEPF provides a flexible and adaptable mechanism for these structures to implement concrete actions to protect biodiversity in the Hotspot. The idea is also to be complementary to government efforts (policies, strategies, funding) by ensuring links between government authorities and policy makers, community groups, non-governmental organizations, academic institutions and the private sector, thereby identifying and building on each entity's own capacity and avoiding duplication of effort. CEPF encourages transboundary cooperation when biodiversity-rich areas are shared by several countries, and to encourage the exchange of experiences between neighboring countries.

The whole process, which is an update of the profile document finalized in 2014 - without adding new Biodiversity Conservation Areas (KBAs) -, is led by the consortium Conservation International- Missouri Botanical Garden- ASITY Madagascar- Biotope, with the support of consultants recruited in Madagascar and in the other Indian Ocean Islands throughout the process.

The national and regional consultations were also the main source of information for filling and analyzing the competencies and needs of civil society organizations, for drafting the chapter on threats to biodiversity, as well as the root causes and barriers to conservation. This chapter is crucial for defining the niche and investment strategies. Finally, data on conservation investments were collected mainly through literature reviews.

The development of the updated Ecosystem Profile is a participatory process, and collective consultations have been organized with the participation of various ministries, national and international NGOs, associations, universities and research centers.

In Madagascar, a total of 187 stakeholders and 112 institutions were consulted.

In Comoros, consultation workshops were organized twice in Grande Comore, the second on a national scale, with the participation of 15 and 11 people respectively, and in Anjouan with the participation of 12 people, from the public sector, academia, NGOs and associations.

In Mauritius, the consultation workshop brought together all stakeholders, represented by 20 people from the Government (mainly from the Ministry of Agro-Industry and Food Security), parastatals, the private sector and the main active NGOs.

In the Seychelles, a consultation workshop was also held with 30 participants.

The Hotspot of Madagascar and Indian Ocean Islands

The Hotspot of Madagascar and the Indian Ocean Islands includes Madagascar, Mauritius and Rodrigues, the Comoros and the Seychelles. The land area of the Hotspot is about 600 000 km^2 , of which 592 040 km^2 are represented by the island of Madagascar alone. The evolution of a diversity of fauna and flora with a very high rate of endemism at the level of species, genera, and even families, within the Big Island is striking. The terrestrial biological diversity of the other archipelagos is closely linked to that of Madagascar; nevertheless, although of a small land area, the other island groups of the western Indian Ocean contribute much to the biological diversity of the Hotspot, also with important rates of island endemism. The African influences are especially marked in Comoros, and the Asian ones especially in Seychelles. Although the Hotspot is defined in terms of terrestrial biodiversity, marine biodiversity is also exceptional, both in terms of levels of endemism (corals, coastal species and marine trenches) and in terms of the international importance of populations of certain widely distributed species, such as cetaceans and marine turtles.

In terms of original extent of naturally vegetated habitats, Madagascar and the other Indian Ocean Islands represent the 10ème of the 34 priority areas for biodiversity identified by Conservation International. They rank 8ème among the priority areas in terms of habitats remaining intact (about 10% of the original area), according to the most recent estimates of tropical forest cover.

The Hotspot covers a set of extremely varied habitats, resulting from climatic variability linked to latitudes, altitudes, and steep relief which, associated with foehn effects linked to the trade winds, concentrate precipitation on the eastern slopes of the massifs. The geological and pedological differences (granitic base, ancient or recent volcanism, atolls and sandy formations, sedimentary formations) add to the diversity of habitats.

Investment niche and strategic directions

The approach to identifying the investment niche was based on the combination of themes (priority areas for conservation, ecosystem services, ecosystem-based adaptation) and geographical areas, in order to maximize impacts and reduce the risk of duplication with initiatives already underway. This, without forgetting that it also aims to strengthen the participation of civil society (community groups, non-governmental organizations), academic institutions and private companies, in the actions of biodiversity conservation and the fight against climate change in the Hotspot.

Strategic Directions	**Investment priorities of the Madagascar and Indian Ocean Islands Hotspot**
1- Empower communities and civil society to implement actions to improve the resilience of species, ecosystems, and human populations to climate change in priority KBAs	1.1 Implement Ecosystem-based Adaptation (EbA) actions, including agroforestry and “climate smart agriculture”, eradication of invasive species, restoration of degraded watersheds and coastal ecosystems (including wetlands, mangroves, reefs and seagrass beds), and promotion of sustainable management of coastal and terrestrial ecosystems. Priority will be given to the following approaches: ix. Promoting resilient agroforestry and developing “Climate Smart Agriculture x. Promote the sustainable management of freshwater, wetlands, and marine and coastal ecosystems (mangroves, coral reefs, seagrass beds) xi. Strengthen watershed management of intact forest ecosystems through the implementation of protected area management plans in collaboration with local communities xii. Enhancing resilience and adaptation through ecosystems xiii. Restore degraded coastal ecosystems (wetlands, mangroves, coral reefs, sea grass beds) xiv. Restore watersheds of degraded forest ecosystems xv. Promote the control and eradication of invasive alien species xvi. Strengthen the capacity of local communities in participatory ecological monitoring of target species in KBAs and their habitats

Strategic Directions	**Investment priorities of the Madagascar and Indian Ocean Islands Hotspot**
	1.2 Support the establishment and development of economic models that improve the resilience of local communities to climate change and support value chains for natural products, while strengthening ecosystem services that contribute to EbA
2- Support local communities and civil society to strengthen the integration of the EbA approach, ecosystem resilience and biodiversity conservation into political and economic decision-making processes and education	2.1 Develop engagement strategies with private sector actors for the integration of EbA into their activities, and also for the conservation and sustainable use of biodiversity and renewable natural resources
	2.2 Support civil society to disseminate information and influence political and economic decision-making processes in favor of biodiversity conservation priorities, ecosystem services and EbA
	2.3 Support civil society in the development and implementation of disaster risk reduction measures
3- Strengthen the capacities of local communities and civil society at the regional and local levels to enhance adaptive capacity and reduce exposure to climate change risks	3.1 Strengthen the technical, administrative and financial capacities of local civil society organizations with missions related to the environment and the fight against climate change
	3.2 Promote of exchanges and partnerships between civil society organizations (at the national and regional levels) to strengthen technical, organizational, management and fundraising capacities working in the priority KBAs
	3.3 Support the emergence of a new generation of conservation professionals and organizations by providing small grants for technical and practical training
4- Support research and ensure the dissemination of results for the promotion and improvement of knowledge on EbA actions and related good practices	4.1 Support applied research activities that improve understanding of the role of specific ecosystems and test the effectiveness of promising EbA techniques
	4.2 Support research activities that measure and verify the impact of the grant portfolio on ecosystem services
	4.3 Support civil society to promote public awareness and education on biodiversity, conservation priorities, climate resilience, ecosystem services and EbA
5- Provide strategic leadership and effective coordination of CEPF investment across the hotspot through a regional implementation team	5.1 Build a broad constituency of civil society groups that work across institutional and political boundaries to achieve the shared conservation goals outlined in the ecosystem profile
	5.2 Improve operational and monitoring processes and coordination of CEPF grant resource allocation to ensure effective implementation and strategic guidance in an accountable and transparent manner that is fit for purpose on a country-by-country basis

Based on the identification of the investment niche according to the targeted themes and geographical areas, the strategic directions for this ecosystem profile document for Madagascar and the Indian Ocean Islands are set out in the preceding table.

- **CEPF Geographic Priorities**

The following steps were adopted to determine the rank of ecosystem services, based on their importance in providing benefits to the population:

- Standardization of ecosystem services

- Aggregation of ecosystem services in KBAs

- Aggregation of ecosystem services, according to the importance given by experts and stakeholders.

In addition, the spatial weighting of the KBAs was done by overlaying the vulnerability of ecosystem services to climate change and the capacity to adapt to climate change. The vulnerability to climate change and the potential to adapt to climate change stressors were derived from a study conducted by WHO.

The transformation of ecosystem service values into relative values (proportion), combined with weighting, and followed by stakeholder assessment, results in the identification of the highest ranked contributors to EbA, respectively 31 KBAs for Madagascar, 10 KBAs for Comoros, 10 KBAs for Mauritius and Rodrigues, and 28 for the Seychelles

Since the main objectives of the process are to find areas where EbA activities can be implemented, some of the KBAs initially placed at the top of the list have been removed. These are, for Madagascar :

. KBAs that do not have a manager, project partner or institutional structure to support the implementation of EbA activities: Mangoky River, Lake Itasy, Mahatsara (Mahambo Foulpointe), Ivoloina River, North Pangalane, Maevatanana-Ambato-Boeni wetlands, Ankafina (Ambohimahasoa), Mananjary River, Angavokely Forest Station, Ambila-Lemaitso wetlands.

. KBAs, whose ecosystem services have been degraded beyond reasonable recovery efforts. KP 32 Ranobe ranks first in this category.

Priority sites for CEPF investment

KBA code	**KBA name**	**Multi-criteria score**	**Rank**
MADAGASCAR			
MDG-199	Mangoro-Rianila River	4.75	1
MDG-110	Sahafina Forest (Anivorano-Brickaville)	4.18	2
MDG-097	Analamay-Mantadia Forest Corridor	3.43	3
MDG-131	Wetlands Nosivolo	3.29	4
MDG-066	Amoron'i Onilahy and Onilahy River	3.17	5
MDG-098	Fandriana Marolambo Forest Corridor	3.11	6
MDG-094	Ambositra Vondrozo Corridor (COFAV)	3.11	7

KBA code	KBA name	Multi-criteria score	Rank
MDG-179	Special Reserve Mangerivola	2.88	8
MDG-164	Betampona Integral Nature Reserve	2.80	9
MDG-095	Zahamena-Ankeniheny SAPM	2.79	10
MDG-230	Ramsar site of Nosivolo	2.61	11
MDG-027	Belalanda	2.58	12
MDG-154	Zombitse-Vohibasia National Park	2.52	13
MDG-011	Tsinjoriake-Andatabo	2.48	14
MDG-128	Vohibe Ambalabe (Vatomandry)	2.43	15
MDG-089	Lake Ihotry-Mangoky Delta Complex	2.42	16
MDG-072	Analavelona	2.41	17
MDG-152	Ranomafana National Park and extension	2.37	18
MDG-217	Faraony Headwaters	2.26	19
MDG-056	Makay	2.21	20
MDG-070	Analalava Foulpointe	2.20	21
MDG-106	Vohibola classified forest	2.17	22
MDG-091	Mangoky-Ankazoabo forest complex	2.14	23
MDG-045	Great Reef of Toliary	2.06	24
MDG-200	Namorona-Faraony River	2.02	25
MDG-088	Mahafaly Plateau Forest Complex	2.01	26
MDG-033	Three-bay complex	1.97	27
MDG-175	Reserve Speciale Beza-Mahafaly	1.97	28
MDG-053	Lake Tseny	1.97	29
MDG-187	Special Reserve of Ivohibe Peak	1.97	30

KBA code	KBA name	Multi-criteria score	Rank
COMOROS			
COM-7	Mount Ntringui (Ndzuani Heights)	0.54	1
COM-5	Karthala Massif	0.45	2
COM-20	Coelacanth Zone	0.43	3
COM-1	Moya Forest	0.27	4
COM-14	Domoni area	0.25	5
COM-4	Massif de la Grille	0.22	6
COM-8	Ex-Marine Park of Moheli	0.21	7
COM-12	Bimbini area and Ilot de la Selle	0.19	8
COM-19	Pomoni area	0.18	9
COM-16	Moya area	0.17	10
MAURITIUS			
MUS-2	Bamboo Mountain Range	0.66	1
MUS-5	Relict Forests of the Central Plateau	0.55	2
MUS-14	Plaine des Roches - Bras d'Eau	0.54	3
MUS-12	Black River Gorges National Park and surrounding areas	0.52	4
MUS-3	Chamarel - Le Morne	0.50	5
MUS-8	Mauritius South-Eastern Islets	0.40	6
MUS-16	South Slopes of Grande Montagne	0.36	7
MUS-17	Yemen-Takamaka	0.35	8
MUS-11	Montagne Corps de Garde	0.34	9
MUS-6	Rodrigues' Islets	0.31	10
SEYCHELLES			
SYC-43	Morne Seychellois National Park	0.72	1
SYC-38	Planneau Mountain (Grand Bois-Varigault-Cascade)	0.63	2

KBA code	KBA name	Multi-criteria score	Rank
SYC-41	Praslin National Park	0.59	3
SYC-42	Silhouette National Park	0.56	4
SYC-36	Burnt Mountain-Piton de l'Eboulis	0.50	5
SYC-50	Aldabra Special Reserve	0.47	6=
SYC-47	Port Launay Marine National Park and coastal wetlands	0.47	6=
SYC-15	Bird Island (Ile aux Vaches)	0.47	6=
SYC-5	Cosmoledo	0.45	9
SYC-51	Aride Island Special Reserve	0.45	10=
SYC-52	Cousin Island Special Reserve	0.45	10=
SYC-48	Sainte-Anne Marine National Park (SAMNP)	0.44	12
SYC-20	St. Denis Island	0.43	13
SYC-46	Curieuse Island Marine National Park	0.41	14=
SYC-32	Saint-François and Bijoutier Islands	0.41	14=
SYC-3	Astove	0.40	16
SYC-18	Curieuse Island	0.39	17
SYC-19	D'Arros Island and Saint Joseph Atoll	0.38	18
SYC-6	Farquhar - South Island and islets	0.38	19
SYC-9	Fond Ferdinand	0.35	20

1. INTRODUCTION

Natural ecosystems, because of their multiple components and functions, are at the heart of the social and economic development of humanity, thus justifying the need to preserve them. However, since the beginning of time, and particularly in the last decades, ecosystems have been constantly transformed because of the uses and modifications that men and women make to meet their different needs: food, health, money and energy, as well as for their comfort.

As a result, the original foundations of ecosystems and the services they provide (healthy soils, fresh water resources, clean air, a climate favorable to the development of all forms of life) are tending to disappear progressively, a disappearance that is all the more threatening with the phenomenon of global warming and, more recently, the Covid 19. As a corollary, the disappearance of ecosystems inevitably implies that of species.

To reverse this trend, efforts to develop approaches and strategies have been made at all levels and at different scales for decades, and in recent years have systematically included consideration of the impacts of climate change on biodiversity. Within this framework, ecosystem-based adaptation (EBA) is the most appropriate approach. EBA consists of maintaining or strengthening the capacities of ecosystems to protect people and provide the services they are expected to provide, to improve infrastructure and to ensure the balance of biodiversity, particularly in "biodiversity hotspots".

The concept of "biodiversity hotspots" is one approach to prioritizing the world's most biodiverse and threatened regions (Myers *et al.* 2000)[1] . It is therefore important to focus these priorities in order to optimize the concentration of conservation investments. The latest analyses identify 35 biodiversity hotspots around the world (Mittermeier *et al.* 2004, Zachos and Habel, *eds*, 2011).

Founded in 2000, the *Critical Ecosystem Partnership Fund (*CEPF) is a program that supports nongovernmental organizations and the private sector in influencing and participating in the conservation of the world's most critical ecosystems. CEPF is a joint initiative of the French Development Agency (AFD), the World Bank, the European Union, the Global Environment Facility, the Government of Japan, Conservation International and other partners, and was recently joined by the Green Climate Fund (GCF).

CEPF provides grants to nongovernmental and private organizations to preserve biodiversity hotspots. Often, critical conservation areas are also places occupied by millions of people who are highly vulnerable socially and economically, and whose livelihoods depend heavily on healthy ecosystems. This convergence is even more evident in hotspots.

Twenty years ago, the Madagascar Hotspot already benefited from CEPF, followed in 2005 by the addition of the other islands: Comoros, Mauritius and Seychelles. This Madagascar-Comoros-Mauritius-Seychelles Hotspot has often been considered a priority among the other global Hotspots, due to its extreme diversity - with about 15,000 plant species, of which more than 12,000 are endemic - but also due to the high taxonomic level of endemicity, witnessing distinct evolutionary mechanisms linked to the Hotspot's isolation, and above all, due to the high level of threat on biodiversity.

The first phase of CEPF investment in the Hotspot ran from 2001 to 2006, with a total of $4.25 million supporting 40 projects implemented by 18 organizations in Madagascar alone.

1 To be classified as a biodiversity hotspot, a region must be home to at least 1,500 endemic vascular plant species AND have lost at least 70% of its primary vegetation.

At the end of this phase, and following a positive evaluation, the CEPF Donor Council approved a $1.4 million consolidation phase, which was implemented between 2009 and 2012.

In 2012, the Madagascar and Other Indian Ocean Islands Hotspot was recognized by the CEPF Donor Council as an eligible region for the development of an ecosystem profile that facilitates the identification of investments and reinvestments needed for biodiversity and ecosystem protection. Hence the existing ecosystem profile, prepared in 2013-2014, under the leadership of Conservation International in Madagascar.

In general, the preparation of the CEPF Ecosystem Profile is not limited to desk studies, but involves consultation with all relevant stakeholders in the region. An assessment of biological priorities and underlying causes of biodiversity loss in given ecosystems is then conducted. These two elements (biological priorities and underlying causes of loss) are combined with an inventory of existing conservation investments and other key elements. Thus, each profile highlights the most relevant priorities for conservation and for CEPF investment.

An important step in developing the profile is to assess the results of previous conservation efforts, and define the conservation targets that must be met to prevent biodiversity loss. CEPF’s niche and strategy are based on these results, first to ensure that investments are well targeted, and second to be able to evaluate the success of these investments, as the targets also provide the basis for monitoring.

Each ecosystem profile recommends strategic funding directions that civil society can implement to protect biodiversity in a hotspot. In doing so, CEPF provides a flexible and adaptable mechanism. In addition, efforts are also designed to complement strategies and frameworks established by regional and national governments. CEPF fosters alliances among government, community groups, nongovernmental organizations, academic institutions and the private sector, combining the unique capacities of each entity and avoiding duplication of effort, so that the conservation approach is as comprehensive as possible. CEPF encourages transboundary cooperation when biodiversity-rich areas are shared by several countries, and/or when a regional approach promises to be more effective than a national one, or to encourage the exchange of experiences between neighboring countries.

For the Madagascar and Indian Ocean Islands Hotspot (MADIO), if the different islands of the Hotspot share biogeographical specificities, they nevertheless compose a whole with a great disparity. This heterogeneity is evident in the relative weight of the different entities: the three island groups (Comoros, Seychelles, Mauritius) and other islands scattered in the western Indian Ocean are opposed by the mass of Madagascar, an island-continent that concentrates 95% of the land area and 98% of the population of the Hotspot. Disparities are also great at the economic level, the development of public services and land use planning. The Seychelles and Mauritius can be considered emerging economies, while Madagascar and Comoros are among the least developed countries.

On the other hand, compared to the profile of the previous period, i.e. from 2014 to the current period, the socio-environmental context in general has significantly evolved. If the consideration of biodiversity protection is still relevant, the pressures and threats to biodiversity have experienced great leaps, due to interrelated factors: climate change, stagnant if not declining economy, failing governance and politics, unfavorable social environment. On the other hand, civil society organizations have found themselves with more or less diminishing means and capacities. In addition, this context has had to deal with the impacts of the Covid-19 pandemic that emerged almost two years ago and continues to rage.

Thus, it is appropriate to update the ecosystem profile so that the next phase of CEPF investment can focus priorities, identify new opportunities, and be in line with other donors' investments, while taking into account the evolving context.

This update is part of the "Ecosystem-based Adaptation (EBA) in the Indian Ocean" program developed by the Green Climate Fund (GCF) - of which AFD is an accredited agency - within the CEPF. This program aims to reduce the vulnerability of island populations through the provision of essential ecosystem services that are necessary for their resilience to climate change.

It should be recalled that the CVF plays an important role in the implementation of the Paris Agreement, being the largest global climate fund. Its mandate is to support developing countries to implement their ambitions in terms of nationally determined contributions (NDCs) for greenhouse gas (GHG) mitigation and adaptation actions that strengthen resilience to climate change.

The involvement of the CVF is all the more crucial, following the alarming findings of the Intergovernmental Panel on Climate Change (IPCC) in its latest report (2022). Climate change is happening faster than expected, and impacts include: reduced availability of water and food resources (in Africa, Asia and small islands in particular), health impacts in all regions of the world, and halving the range of animal and plant species.

As a founding partner, Conservation International administers the global program through the CEPF Secretariat.

In the development of this document, Conservation International is also responsible for coordinating the CEPF Ecosystem Profile update process for the Madagascar and Indian Ocean Islands hotspot. However, the entire process is under the technical direction of the Conservation International - Missouri Botanical Garden - ASITY Madagascar - Biotope consortium.

2. CONTEXT OF THE STUDY

In 2012, the Madagascar and Indian Ocean Islands Hotspot was recognized by the CEPF Donor Council as an eligible region for the development of an Ecosystem Profile that facilitates the identification of investments and reinvestments needed to protect biodiversity and ecosystems. This resulted in the Ecosystem Profile prepared from June 2013 to January 2014, under the responsibility of Conservation International in Madagascar, with specific inputs from the *Moore Center for Science and Oceans* for the analysis of ecosystem services, and the consulting firm Biotope for island states.

Today, the ecosystem profile needs to be updated to reflect the ever-changing realities. The consideration of climate change, particularly adaptation to climate change, is central to this update, given the importance of this issue in the face of threats of ecosystem loss and species extinctions. CEPF's strategic directions will emerge from the updated profile, providing the information needed to prioritize investments under the CVF program. Improving climate resilience of local communities will be anchored by ecosystem-based adaptation (EbA) actions in CEPF investment areas, where civil society can add value to biodiversity conservation investments. To this end, the capacity of civil society organizations will be used and leveraged by CEPF in the implementation of EbAs in the Union of Comoros, the Republic of Madagascar, the Republic of Mauritius, and the Republic of Seychelles.

The process is structured around three work packages (WP):

Workpackage 1: Identification and prioritization of ecosystem services important to human populations in target countries and priority areas for Ecosystem-based Adaptation activities.

Workpackage 2: Conducting stakeholder consultations (academic institutions, NGOs, government agencies/key sectors, donors, community groups, private sector). Particular attention is given to involving the Designated National Authorities (DNAs) for the VFC in the consultation process, for their ownership of the CEPF investment strategy.

Workpackage 3: Drafting the updated Ecosystem Profile. It is critical that emerging trends be reflected in the updated Ecosystem Profile, with particular emphasis on considering the impacts of the Covid 19 pandemic.

The overall goal of the updated Ecosystem Profile is to serve as a strategic reference for CEPF, guiding investments in the Hotspot, for the period 2022- 2027.

2.1 Process and approach for updating the Ecosystem Profile

The update is being led by the Conservation International-Missouri Botanical Garden-ASITY Madagascar-Biotope consortium, with support from consultants recruited in Madagascar and other Indian Ocean islands throughout the process.

The method for identifying ecosystem services (ES) important to KBAs described by Neugarten et al in 2014 is adopted[2] . However, the analysis requires an update of the ES in terms of the datasets to be used and in terms of relevance to the identification of EbA areas

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2 As a reminder, the KBA+ methodology consists of seven steps: 1) Frame key ecosystem service values in and around KBAs; 2) Develop a narrative description of the service values; 3) Identify criteria for evaluating important areas; 4) Apply criteria to identify and map important areas in and around KBAs; 5) Summarize ecosystem service values for KBAs; 6) Evaluate and refine the results; 7) Formulate recommendations and integrate them into the CEPF profile.

in the funding program, without redoing the entire identification process. This methodology was validated by CEPF through orientation meetings held in September-October 2021.

For the definition of biological priorities, data from the Global Red List of Threatened Species (IUCN, 2018 and 2020) were mainly used. However, additional data were obtained from experts and specialized organizations when necessary, such as the Missouri Botanical Garden, the *Moore Centre for Science and Oceans*, in close collaboration with CI-Madagascar

- Literature reviews on biodiversity and ecosystem services to complement available data sets,
- Data update: consultation and collection of data, as well as the different variables for the final list of KBAs,
- Geographic Information System (GIS) analysis using existing global and national datasets for ecosystem service mapping, followed by KBA tabulation,
- Develop a list of five to ten critical ecosystem services (ES), followed by an overlay to the KBAs for the purpose of developing ecosystem adaptation activities,
- Prioritization of ES based on the importance of their contribution to human resilience to climate change using a multi-criteria analysis approach. The results of this analysis are presented in the form of a set of maps.

Information and analysis for the chapters on the socioeconomic context, political context, and civil society context are drawn primarily from the research and bibliography conducted by the profiling team, with targeted interviews.

The national and regional consultations were also the main source of information to fill and analyze the competencies and needs of civil society organizations, to draft the chapter on threats to biodiversity, as well as the root causes and barriers to conservation. This chapter is crucial for niche definition and investment strategies. Finally, data on conservation investments were collected mainly through literature reviews.

2.2 Consultation process

The development of the Ecosystem Profile is a participatory process, and collective consultations have been organized with the participation of various ministries, national and international NGOs, associations, universities and research centers.

In Madagascar, a total of 187 stakeholders and 112 institutions were consulted.

Table 1 Main steps in the development of the updated Ecosystem Profile for Madagascar and the Indian Ocean Islands

September 2021 - March 2022	Literature review and preparation of work plans
September 2021	First information workshop with stakeholders
December 2021	Launch workshop and national consultation
March-July 2022	National Consultations Regional Consultations First draft (preliminary report) Validation Workshop: Madagascar and Indian Ocean Islands
April 2022	Finalization

In Comoros, consultation workshops were held on March 3, 2022 in Grand Comore, March 5, 2022 in Anjouan and the national workshop on March 10, 2022 in Grand Comore, with the participation of 40 people from the public sector, academia, and NGOs and associations.

In Mauritius, the consultation workshop that brought together all stakeholders was held on October 15, 2021. In total, about 10 people participated, representing the government (mainly the Ministry of Agro-Industry and Food Security), parastatals, the private sector, and the main active NGOs.

In Seychelles, a consultation workshop was held in Victoria on March 9, 2022. In total, approximately 30 people participated in the consultation.

3 PAST CEDF INVESTMENTS AND LESSONS LEARNED

3.1 Previous investments

This ecosystem profile has been prepared to guide the next phase of CEPF investment in the Madagascar and Indian Ocean Islands Hotspot for the next five years. The investment strategy is based on the results of recent research and consultations conducted during the update process, as well as on previous investment phases, taking into consideration achievements and lessons learned since 2000, when CEPF first intervened in the region.

The first phase of CEPF investment, which took place between December 2000 and December 2005, followed by a consolidation period between 2009 and 2012, focused exclusively on the island of Madagascar. CEPF supported 45 grants to 18 civil society organizations, amounting to US$4.250 million for the initial investment and US$1.4 million for the consolidation period. The projects covered a wide range of topics, from promoting conservation corridors and implementing natural resource management plans to integrating environmental protection and community economic development activities.

At the beginning of the investment in 2000, Madagascar's biodiversity was facing immense threats. Nearly 80% of the island's primary forest cover had been lost, and erosion had been exacerbated. The population, estimated at 15 million, was already growing at a rate of 3% per year, adding to the pressures, and the poverty rate was very high. At the time, major threats included agricultural expansion (particularly for *slash-and-burn* rice production, resulting in an annual loss of about 2,000 km^2 of forest), overgrazing, unsustainable charcoal production, mining, hunting, logging, and unregulated international trade in wild plants and animals.

Due to a lack of capacity, civil society was still insufficiently prepared to respond to these threats, which have grown over the years. Information and knowledge on biodiversity remained limited, alongside a government presence that had neither sufficient capacity to protect natural resources and manage them in a reasoned manner, nor the political will for firm governance to deal with them, despite the ongoing implementation of environmental programs (EPs) within the framework of the National Environmental Action Plan (NEAP) at the time. These threats were compounded by poverty, the impacts of recurrent climatic hazards and insufficient access to education and information in general. On the other hand, while the depletion of natural resources was proceeding at an exponential rate, measures to address it were far from being concrete. These factors presented a complex set of challenges that needed to be addressed if Madagascar's natural capital was to be preserved for the benefit of its people.

CEPF's 2000-2005 investment strategy for this region focused on six points[3] : 1. Integration of local groups and individuals in the management of protected areas and reserves. 2. 2. private sector conservation initiatives 3. Training programs in biodiversity conservation and management. 4. Public awareness and advocacy. 5. Small grants program (Biodiversity Action Fund) 6. Creation of a participatory monitoring and coordination network.

The 2009-2012 period, with an allocation of US$1.4 million, was intended to consolidate gains. This consolidation phase built on the achievements and lessons learned in the first five years and focused on three investment priorities: a) developing the NODES mechanism implemented by Conservation International, linking biodiversity conservation and improved livelihoods for local populations; b) improving community-based natural resource management mechanisms and local governance structures; and c) launching local and national awareness campaigns highlighting the importance of sustainable natural resource

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3 https://www.cepf.net/sites/default/files/madio-five-year-assessment-2006-english.pdf.

management and its socio-economic impacts. The consolidation phase was designed to take advantage of the opportunities generated following the adoption of the "Durban Vision"[4] and to complement the activities of the National Environmental Action Plan (NEAP) Phase 3 (PEIII) and other ongoing initiatives, such as the GEF Small Grants Program (GEF/SGP).

Between 2012 and 2014, there was a growing recognition by both civil society partners and donors that there were strengthening needs on the one hand, and opportunities on the other (capacity, competence, commitment, willingness), in the face of changing ecosystems and stakeholder circumstances. A new phase of investment was therefore warranted. However, the first ecosystem profile prepared in 2000 could no longer serve as a reference to guide CEPF investments, both because of changes in the region and because of the evolution of CEPF over the previous 13 years. The Council also took the opportunity to ask the CEPF Secretariat to prepare a regional profile, covering the entire Madagascar and Indian Ocean Islands hotspot.

Thus, the ecosystem profile was developed for the current second phase (2015 to June 2022), which is being completed, with four strategic directions, implemented at three levels (local, national, regional): (*i) Empowering local communities to protect and manage biodiversity in Key Biodiversity Priority Areas; (ii)* Supporting civil society to strengthen the integration of biodiversity protection into political and economic decision-making processes*; (iii) Strengthening civil society capacity at the regional and local levels through training, exchanges, and regional cooperation actions; and (iv) Providing strategic leadership and effective coordination of CEPF investment through a regional implementation team.*

3.2 Results

CEPF support has played an important role in supporting local civil society and NGOs to participate effectively in conservation activities and in building the technical capacity of Malagasy resource persons. CEPF also helped support the initiation of the Durban Vision and its implementation. CEPF's support enabled the participation of a wide range of local actors, many of whom had never had the opportunity to stand on their own two feet, and also allowed better-known organizations to take risks to engage in conservation actions with uncertain outcomes.

During the first five-year investment period, CEPF played a strategic role in supporting civil society-led activities that would add value in addressing threats at the national level. At least $5.6 million in additional resources were mobilized to achieve conservation goals. Specifically, the evaluation of this first phase[5] revealed that CEPF's investment in Madagascar has :

- contributed to laying the groundwork for the Durban Vision, spearheading the Malagasy government's policy for biodiversity conservation and for the integration of local communities in the conservation and management of new protected areas through the development of the Madagascar Protected Areas System (SAPM);
- Over 1 million hectares of KBAs were identified, leading to a formal commitment by the government to protect these areas. Some of these areas have also had management plans put in place. During the consolidation phase, CEPF strengthened the management of 1,574,435 hectares of KBAs;
- significantly enhanced the role of local NGOs and community groups in biodiversity conservation;

4 Madagascar's commitment at the World Parks Congress to triple the surface area of its Protected Areas, which at the time (2003) was just over 2 million hectares.

5 CEPF 2006 "Assessing Five Years of CEPF Investment in the Madagascar and Indian Ocean Islands Biodiversity Hotspot - Madagascar. A Special Report"

- supported several grantees to address the financial sustainability of the current and future protected area system. In particular, CEPF supported CI-Madagascar's advocacy efforts to finance the Madagascar Biodiversity and Protected Areas Fund (FAPBM), with a capitalization target of US$50 million at the time;
- supported many local communities to manage and benefit from their natural resources through community-based management contracts. During the consolidation phases, six NODES programs awarded 339 micro-grants to 236 community associations;
- improved the livelihoods of local communities around several protected areas: during the consolidation phase, a total of 790 communities received socio-economic benefits from CEPF-funded actions;
- supported scientific studies leading to the discovery of 120 species new to science;
- Improved the scientific and technical capacity of over 60 people;
- developed conservation actions on several emblematic species, such as the Madagascar fish eagle, Bernier's teal or the olive rail.

As for the second phase covering both Madagascar and the other Indian Ocean Islands, the investments have contributed to the following cumulative results [6][7][8] :

- the creation and/or extension of 1,608,020 ha of protected areas;
- Improved management of 3,159,544 ha of Key Biodiversity Areas (KBAs);
- The improvement of the management of landscapes totaling 1,573,474 ha, for production, and by ricochet, to the improvement of the living conditions of the basic local communities;
- the creation of the first atlas of reptiles and amphibians in the Comoros;
- The increase to 67% of civil society organizations that have strengthened their capacity in conservation, and the increase to 73% of civil society organizations that have integrated gender considerations in the preservation of the hotspot;
- the release of 11 legal texts aimed at improving the governance of the hotspot;
- 20 private sector members adopting environmentally friendly practices in their operations;
- the introduction of tree species from the dry forests of Madagascar in the "Red List of the Trees of Madagascar".

This data and information may not be final and may be revised upwards, as the investment portfolio is not yet closed at the time of finalizing this profile.

3.3 Experiences and Lessons Learned

As mentioned above, there have been two investment phases preceding this profile: Phase 1 from 2000 to 2005, followed by a consolidation phase, and Phase 2 from 2015 to 2022, which is currently being completed. The proposed third phase, which is the subject of this updated profile, builds on the lessons learned in terms of approaches, impacts, and stakeholder considerations from the previous phases. Taking into account the new KBAs identified, taking into account the ecosystem services that have evolved at the level of the four islands, the emergence of the ecosystem-based approach to climate change adaptation (EBA), gradually leading to a rethinking of the policies and strategies for implementing

6 CEPF (May 2020) "Mid-term Assessment CEPF Investment in Madagascar and the Indian Ocean Islands Hotspot
7 Emerald Network Ltd, report for CEPF (January 2022) "Evaluation of Lessons Learned to Inform Reinvestment in the Madagascar and Indian Ocean Islands Biodiversity Hotspot".
8 https://www.conservation.org/about/global-conservation-fund

actions, as well as further reflection on the increasingly important roles to be attributed to civil society

At the end of the first phase, an evaluation was conducted (2006) and for the second phase, a mid-term evaluation (May 2020) and a lessons learned evaluation to inform reinvestment in the hotspot (January 2022) were conducted.

In addition to assessing the progress achieved against targets and gaps in the CEPF grant portfolio, and determining priorities for the remainder of the investment period (January 2020 - June 2022), the Phase 2 mid-term evaluation report drew on the experience, lessons learned and project reports generated by civil society and CEPF grant implementing organizations. It also incorporates the findings of evaluation workshops held in October and December 2010, which were attended by more than 100 representatives of CEPF grantees, local authorities and donor partners.

The January 2022 evaluation focused on the challenges, opportunities, and lessons learned associated with the roles of the Regional Implementation Team (RIT). It allows future RIT applicants to be better informed about the experiences and results achieved, and creates a more competitive environment for future RIT applicants. This evaluation is separate from a final evaluation that addresses the results of the Hotspot investments.

3.3.1 Lessons learned and experiences from the period 2000-2012: First investment phase and consolidation[9][10]

The main experiences and lessons learned are:

- Local conservation groups need capacity building, and can indeed have a significant impact when their capacity is improved;
- In terms of strengthening communities within the framework of the transfer of natural resource management to local grassroots communities, it is recalled that grassroots communities can call upon the technical support of the deconcentrated services of the State[11] .
- Supporting partner organizations that can provide micro-grants to community groups, while assisting them with day-to-day implementation, is an approach that is proving successful on the ground;
- The indispensable relationship to be established and implemented between conservation activities and the improvement of living conditions, in order to obtain the commitment of the communities;
- The difficulty of engaging with the private sector on the one hand, and the lack of expertise and experience of civil society groups in working with the private sector on the other;
- The lack of a solid base of conservation actors armed with sufficient skills and expertise to have long-term impacts and ensure the sustainability of conservation efforts in Madagascar.

These last two points highlight the need for capacity building and awareness raising.

During this period of initial CEPF investment, it was recognized that there was a lack of national and local nongovernmental organizations in Madagascar and that civil society in general had limited capacity to directly implement projects under CEPF funding. As a result,

9CEPF (2006) "Assessing Five Years of CEPF Investment in the Madagascar and Indian Ocean Islands Biodiversity Hotspot - Madagascar. A Special Report"
10 CEPF (2014) "Ecosystem Profile of the Madagascar and Indian Ocean Islands Hotspot".
11 Law 96-025 on the local management of renewable natural resources (GELOSE), Article 55

the majority of funds were channeled to international non-governmental organizations. However, funds did reach community-based organizations through Conservation International's pilot small grants program, through the pioneering efforts of the NGO FANAMBY in Daraina, and through the actions of ASITY Madagascar in the Mahavavy-Kinkony wetlands.

In addition, the Durban Vision, which paved the way for the integration of local communities in the management of protected areas and the sustainable use of natural resources in these areas, created the opportunity for increased local community engagement in conservation. Thus, the NODES approach, where locally-based organizations provide funding for integrated conservation and development activities in new protected areas, was seen as an effective method that could continue to be scaled up with additional funding.

CEPF's experiences during the initial phase provided the basis for the development of the consolidation investment, and the experiences gained from the subsequent 10 years of funding helped define and refine the profile strategy established in 2014, with improved framing and new strategic directions and orientations.

3.3.2 Lessons learned and experiences from the 2015-2022 period: Second investment phase[12][13]

From 2015 to the present, CEPF investments have not only reinforced the previous experiences cited above, but have also strengthened nationals' knowledge and experience in research: biodiversity, spatial analyses, information systems, database management, community-based approaches, etc., while improving interdisciplinary collaborations.

Overall, Madagascar has experienced many notable positive conservation impacts during CEPF investment periods. CEPF projects have contributed to building confidence in local NGOs and strengthening partnerships, and have also contributed to increased collaboration among organizations operating in the country. However, the emergence and development of local NGOs and local talent remains the main legacy of CEPF, which has led to the most significant impacts over time.

In the other islands, the investments allowed for the identification and refinement of knowledge about KBAs, on the one hand, and the limitations regarding the involvement of NGOs, which is different from that encountered in Madagascar, on the other hand (see the related chapter).

The mid-term evaluation report found that the second phase of investment in the Madagascar and Indian Ocean Islands Hotspot has progressed very well: Balanced development of the grant portfolio with over 90% of the spending authority already granted and good progress in achieving 25 of the 29 indicators in the portfolio's logical framework.

However, this mid-term evaluation was conducted late (after five and a half years of implementation out of a total of seven and a half years), when the portfolio was already too far along in terms of allocations. As a result, there was not much room left to reorient the portfolio.

Furthermore, out of 867 letters of intent received since the beginning of the phase, 81 projects have been awarded through December 2019, resulting in an award rate of 9.3%, which is too low.

12 CEPF (May 2020) "Mid-term Assessment CEPF Investment in Madagascar and the Indian Ocean Islands Hotspot

13 Emerald Network Ltd, report for CEPF (January 2022) "Evaluation of Lessons Learned to Inform Reinvestment in the Madagascar and Indian Ocean Islands Biodiversity Hotspot".

Responsibility for the RIT was assumed by the Tany Meva Foundation, which, during the first half of the investment phase, experienced significant staff turnover due to governance issues (team leader, project manager, executive director). At the CEPF level, there was also a change in the grants director for the Madagascar and Indian Ocean Islands Hotspot. All of these changes at different levels had impacts on the RIT, as new staff members had to familiarize themselves with their roles and the mechanism, and working relationships with stakeholders had to be re-established many times. Also, in June 2018, a high-level oversight mission to the RIT and its board was conducted by CEPF (Executive Director and Chair of the CEPF Donor Council), the purpose of which was to clarify roles and responsibilities between the RIT team leader and the Tany Meva Foundation board.

However, despite these limitations and changes, the portfolio is on track to meet most of its goals, and overall performance is strong. Already in 2020, most grants have been awarded.

From these findings, lessons learned were identified during this evaluation that will help improve the next phase of CEPF investment in the hotspot:

These include the need to strengthen the RIT’s presence beyond Madagascar to the Indian Ocean islands and to improve communication throughout the hotspot to foster regional networking and collaboration. It is recommended that a stronger and more established presence in all countries be put in place early in the next investment period to avoid delays. In addition, while staff changes are largely beyond the control of the RIT, delays in processes need to be identified and reported more quickly to minimize the effect on portfolio development. This is also true for the mid-term evaluation, which should ideally be conducted before the majority of grant allocation has occurred and any necessary adjustments can be made at the portfolio level.

In addition, the low award rate in relation to the letters of intent received should be addressed in the next phase. This may have a deterrent effect on potential applicants. In order to increase the approval rate, more direct support should be provided to potential applicants after submission of the LOI, for example through an in-country outreach workshop.

Given the size of the portfolio, another recommendation is the potential benefits of geographic investment priorities to be considered in the next ecosystem profile, such as maximizing efficiency through more concentrated project locations.

In addition, as noted earlier, evaluation exercises should be conducted in a timely manner to maximize opportunities for necessary shifts and/or enhancements. For example, if the portfolio had not been so far along, it might have been possible to consider focusing more on the conservation of IUCN red-listed species or concentrating additional efforts on funding Strategic Direction 3 and building networks. In fact, the majority of allocations went to strategic direction 1 (strengthening local communities), followed by strategic direction 2 (strengthening civil society capacity). A minority was allocated to strategic direction 3 (Strengthening civil society capacity at the national and regional levels through training, exchange and cooperation).

Finally, having an integrated local organization in Madagascar has brought many benefits, including strengthening the relationship between CEPF and the Tany Meva Foundation, deepening the understanding of the local context in Madagascar in particular, and improving the capacity of this local organization, which is a CEPF goal.

4 BIOLOGICAL IMPORTANCE OF THE HOTSPOT

The Hotspot of Madagascar and the Indian Ocean Islands is a true natural sanctuary, including Madagascar, Mauritius and Rodrigues, the Comoros and the Seychelles. The terrestrial surface of the Hotspot is about 600 000 km^2 , of which 592 040 km^2 are represented by the island of Madagascar alone, which has seen the evolution of an original and distinct fauna and flora, with a very high rate of endemism at the level of species, genera and even families. The terrestrial biological diversity of the archipelagos is closely linked to that of Madagascar. African influences are especially marked in the Comoros, and Asian influences especially in the Seychelles. On the other hand, although with a small land area, the other island groups of the western Indian Ocean contribute a lot to the biological diversity of the Hotspot, also with important rates of island endemism. Although the Hotspot is defined in terms of terrestrial biodiversity, marine biodiversity is also exceptional, both in terms of levels of endemism (corals, coastal and sea-pool species) and in terms of the international importance of populations of certain widely distributed species, such as cetaceans and marine turtles.

In terms of original extent of naturally vegetated habitats, Madagascar and the other Indian Ocean islands represent the 10ème of the 34 biodiversity hotspots identified by Conservation International (Mittermeier *et al.* 1997, Myers *et al.* , 2000; Brooks *et al.* , 2006). They rank 8ème among the priority areas in terms of habitats remaining intact (about 10% of the original area), according to the most recent estimates of tropical forest cover .

4.1 Geography, geology and climate

The Hotspot comprises a vast group of islands in the southwestern Indian Ocean, included in a quadrilateral of about 1700 km on each side, whose peaks would be to the north the coral islands of Denis and Bird in the Seychelles, to the west the Comoros, to the east the island of Rodrigues and to the south the tip of Madagascar. The Comoros form the closest part of the Hotspot to the continent, being less than 300 km from the African coast, while the Mozambique Channel brings Madagascar to a distance of about 400 km from Africa in its narrowest part. The distance to other land masses is greater on the other side of the Hotspot: the Seychelles are about 2000 km from the Maldives and nearly 1700 km from the Chagos Archipelago.

Figure 1 General presentation of the Hotspot

The island of **Madagascar** extends over more than 1500 km from north to south and 500 km from east to west in its greatest width. Its coastline extends over 5000 km. The basal basement of the island is formed by a Precambrian crystalline formation which constitutes the whole ridge of the central highlands, covering two thirds of the territory and culminating at 2 643 m. Five main bioclimatic zones have been identified, namely humid, subhumid, montane, dry and subarid bioclimates (Ramananjanahary *et al.* , 2010). Each of these bioclimates corresponds to a natural formation with a particular faunistic and floristic biodiversity (Ministry in charge of the Environment, 2002).

The Comoros archipelago is located at the northern entrance to the Mozambique Channel, between East Africa and northwest Madagascar. The three islands that make up the country, in the context of this report, cover a total area of 1,862 km² distributed unevenly over three islands: Grande Comore (1,148 km²), Anjouan (424 km²), Mohéli (290 km²). They are isolated from each other by deep sea trenches.

The Republic of Mauritius includes the following islands: Mauritius, Rodrigues, Agalega and Saint Brandon (or the Carajos Shoals). Mauritius and Rodrigues are part of the Mascarene Archipelago (with Reunion Island, a French territory). The Republic of Mauritius has a large Exclusive Economic Zone (EEZ), which covers approximately 2.3 million km^2 (NBSAP 2017). The land area of Mauritius, Rodrigues, Agalega, Saint Brandon and the islets cover about 2000 km2. At present, coastal protected areas represent 11.9% of the land area and 0.006% of the EEZ[14] . Mauritius is a volcanic island, although, like Rodrigues, there is no longer any volcanic activity. These two islands are located in the cyclone belt of the Western Indian Ocean basin, receiving on average one cyclone per year.

The Seychelles archipelago consists of 115 main granite and coral islands and atolls (155 individual islands being listed in the Constitution). The total land area is approximately 455 km², spread over the vast EEZ of 1,374,000 km².

The four main inhabited granitic islands are, in order of size: Mahé (152.5km²), Praslin (27.6km²), Silhouette (20.0km²), and La Digue (10.1km²). The "Plateau" of Mahé, the center of the central archipelago, is about 244 km², where 99.5% of the Seychellois population (about 99 0200 inhabitants) live. The outer coral islands (about 211 km²) are either atolls or sandy cays.

4.2 Biomes, habitats and ecosystems

The Hotspot covers a set of extremely varied habitats, resulting from climatic variability related to latitudes, altitudes, and steep relief which, associated with foehn effects related to the trade winds, concentrate precipitation on the eastern slopes of the massifs. The geological and pedological differences (granitic base, ancient or recent volcanism, atolls and sandy formations, sedimentary formations) add to the diversity of habitats. In a simplified way, we find on most of the islands a staggering of habitats, with grassy formations and deciduous forests of low altitude, deciduous and evergreen forests of medium altitude, mountain forests, and high altitude vegetation with ericoid on the highest points, above 1800 m of altitude at least (Reunion, Madagascar and Grande Comore).

In granitic or volcanic islands, the relief has often isolated natural areas within these ecosystems, creating the conditions for speciation and leading to the presence of species with a very restricted distribution and a very localized endemicity.

[14] https://www.nairobiconvention.org/mauritius-country-profile/marine-and-coastal-resources-governance-mauritius-country-profile

The coral islands of the Hotspot - Eparses islands, external islands of the Seychelles in particular - of low altitude and subjected to marine influences, present mainly littoral plant formations (mangroves, halophyte herbaceous formations, brackish steppes, mediolittoral herbaceous and shrubby formations, supralittoral herbaceous to shrubby formations). These are accompanied, for the largest of the islands, by inland plant formations (mangrove ad littoral tree formations on karst, ad littoral herbaceous and shrubby formations on karst, coconut tree formations, brackish herbaceous formations of the pond, CBNM, 2013). These islands are home to colonies of seabirds, and sometimes some spectacular species (Aldabra tortoise). But in general, their fauna is weakly diversified.

Wetlands (lakes, lagoons, marshes, mangroves, rivers, bays, estuaries and deltaic zones...) are particularly important in terms of endemic biodiversity (plants, fish, amphibians, water birds, crustaceans, odonates...) and for the environmental services they provide.

Finally, three large marine ecosystems border the Hotspot. The marine ecosystem of the Agulhas Current is characterized by warm waters (20-30ºC), low primary productivity, except for a few points of high productivity linked to small upwelling areas and oceanic turbulence. This marine ecosystem is spectacular for its marine biodiversity since it includes the majority of the coral reefs of the western Indian Ocean. To the north is the large marine ecosystem of the Somali Current, which is dominated by an intense seasonal upwelling system of cold water along the Somali coastline, driven by the northeast monsoon. This system is extremely productive, although less rich in species. To the east of these two ecosystems is the Mascarene Plateau, a distinctive granitic ridge of continental origin extending between latitudes 2ºS and 22ºS, with an average sea depth of only 100m. The Mascarene Plateau links the Seychelles, Mauritius and Reunion Islands, and is suggested as a large marine ecosystem in its own right. This Mascarene ecosystem is characterized by a low level of productivity while its biodiversity seems high.

4.2.1 Madagascar

Madagascar has the greatest diversity of ecosystems by size and is divided into three major biomes with fifteen terrestrial ecosystem types (Moat and Smith, 2007).

Table 2 Types of terrestrial ecosystems in Madagascar and their area

Types of ecosystems	Total area (km²)	of land coverage
1-Mosaic grassland formation / wooded grassland formation of the plateau	246 687	41,67
2-Grassy wooded formation / bushy formation	135 739	22,93
3-Degraded wet forest	58 058	9,81
4-Wet forest	47 737	8,06
5-Western dry forest	31 970	5,40
6-Cultures	23 522	3,97
7-Southwestern dry thorny forest	18 355	3,10

8-Wetlands	5 539	0,94
9-Degraded thorny forest of the Southwest	5 427	0,92
10-Western Subhumid Forest	4 010	0,68
11-Mangroves	2 433	0,41
12-Coastal bush formation of the south-west	1 761	0,30
13-Forest of Tapia	1 319	0,22
14-Coastal forest	274	0,05
15-Western Wet Forest	72	0,01

Source: MBG, 2013. *Reference: A. Shapiro, D. Randriamanantena, H. Kuechle, F. Razafindramasy 2019. Mangroves of Madagascar: Area, condition, and evolution 2000-2018 //. The mangroves of Madagascar: Cover, status and trends 2000-2018. WWF Germany, Berlin, and WWF Madagascar, Antananarivo (39 p).*

The habitats of Madagascar's coastal areas include estuarine and lagoon systems, mudflats, beach, pebbled or dune cordon vegetation, as well as mangroves that cover nearly 390,853 ha (MEDD, 2018) distributed mainly among the regions of Diana, Sofia, Boeny, Melaky, Menabe and Atsimo Andrefana, etc. The marine levels are characterized by the importance of reef formations; about 3450 km of Madagascar's 5600 km of coastline have reef formations including 1130 km of fringing reefs, 557 km of coral banks, 1711 km of submerged reefs (Cooke *et al.,* 2012) with a high coral diversity: 380 species recorded (Veron and Turak, 2002). Reef formations are distributed in the western and northeastern part of Madagascar, with more accentuated formations in the western part. In addition to reefs, Madagascar is also characterized by the presence of large seagrass beds. The big island shelters some of the most extensive sea grass beds of the Indian Ocean with twelve recorded species: *Cymodocea rotundata, Cymodocea serrulata, Cymodocea serrulata*, *Enhalus acoroides*, *Halodule uninervis, Halodule wrightii*, *Halophila ovalis*, *Halophila stipulacea*, *Ruppia maritima*, *Syringodium isoetifolium*, *Thalassodendron ciliatum*, *Thalassia hemprichii*, and *Zostera capensis* (Gullstrom *et al.,* 2002; Green & Short, 2003). These seagrass beds are more represented in the northwestern and southwestern coastal areas compared to the eastern area (Hantanirina & Benbow, 2013). These marine and coastal areas serve as habitat, and spawning area for a wide diversity of fish, invertebrates, marine turtles - five species are observed in the marine area of Madagascar -, sharks and rays, etc.

Table 3 Marine and coastal habitats with estimates of their extent (km²) for Madagascar

Marine and coastal habitats	**Madagascar**
Beaches and dunes	nd
Sea grass beds	3000 km² of land
Vessels	nd
Mangroves*	2100 km² of land
Coral reefs	5076 km² of land

Source: Red List of Ecosystems, 2020; (*) Shapito et al. 2019
Note: nd=not defined

4.2.2 Comoros

Three types of ecosystems are present in Comoros: terrestrial, lacustrine, marine and coastal.

The terrestrial ecosystem of the Comoros is mostly made up of dense evergreen rainforests that have long been subject to various forms of anthropic and natural pressure. They are located on the volcanic massifs of the three islands.

Table 4 Terrestrial ecosystems in Comoros

Ecosystem	**Sub-ecosystem**
Dense rainforest	Dense and humid high altitude or ridge forest
	Dense evergreen mid-altitude rainforest associated with banana plantations or other crops
	Dense evergreen valley forest (gallery forest)
	Mid-altitude open and humid forest associated with crops
High altitude wooded steppe	
Dry forest of medium to high altitude	
Pioneer vegetation on sand and remnants of calcined formation	
Mosaic of degraded lowland forest with cultivation and *Psidium cattleyanum* coppice	
Cultivation field	
Reforested areas, usually with Eucalyptus	

On a global scale, Comoros is one of the 20 islands or archipelagos characterized by a remarkable specific endemism of their biodiversity" (Caledecott et al, 1996) and is also a high priority center of biodiversity and plant endemism in the framework of global biodiversity (WWF and IUCN, 1995). Comoros is also classified as one of 221 endemic areas considered essential globally for the conservation of avifauna diversity and endemism (ICBP, 1992). The Comoros represent the extreme case of islands with a very high biodiversity rate, reinforced by an altitudinal factor of (- 3000 to 2361 m). However, this biodiversity potential is still poorly known, and therefore poorly managed and protected. The only floristic list for the Comoros published to date dates from the beginning of the last century and is that of Voeltzkow in 1917 with 935 vascular plants cited, of which 416 are considered indigenous and 136 endemic to the archipelago (i.e. 14.5 percent). Exotic plants thus represent one third of the vascular plants with 383 species. (P. Vos, 2004).

The lake ecosystems found in the Comoros are Lake Dziani-Boundouni (Moheli - 30 ha), Lake Salé in Niamaoui (northeast of Grande Comore - 5 ha), Lake Dzialandzé (in the center of the island of Anjouan between the relict forest of Mount Ntingui and that of Mount Trindrini - 2 ha), and Lake Hantsogoma on the northern slope of the Karthala forest - 0.15 ha). In general, lake ecosystems are not well known. This can be seen as a way to increase the number of people who are able to participate in the development of the Creative City concept.

The marine and coastal ecosystem in Comoros includes the following units: mangroves, coral reefs, islets, sandy beaches and dunes.

Table 5 Marine and coastal ecosystems of the Comoros

Ecosystem	Size/number (3 islands combined)
Mangrove	117 ha
Coral reef	80% of the coastline of the 3 islands with a flat area of 10,000 ha
Islands	8 islets in Moheli, 1 in Grande Comore and 1 in Anjouan
Beach and dunes	40 nesting beaches for marine turtles (*Chelonia mydas* and *Dermochekys imbricata*)
Underwater caves	On 97 km of coastline in Grande Comore
Seagrass areas	Not determined
The sea bed	Not determined

The interest in preserving the biodiversity of the Comoros also stems from the need to ensure the stability of the ecosystem and the fact that many as yet unknown species have potential for science, agronomy or the pharmaceutical industry as well as the maintenance of certain priority ecosystem services.

4.2.3 Mauritius

Mauritius was an almost entirely forested island prior to human colonization, which began in 1638 A.D. After human colonization, the ecosystems rapidly degraded and were destroyed. Today, only remnants of original vegetation covering about 2% of the island's surface can be found; all have been invaded by exotic species (Lorence and Sussman 1986; Florens et al. 2012; Hammond et al 2015; Norder et al 2017). The native vegetation of Rodrigues had been almost completely cleared or destroyed by forest clearing for agriculture and livestock, forest fires, and consequent soil erosion.

A particularity of the Mauritian rainforest is the extremely high density of trees (reputed to be the highest in the world), which was reported long before invasive plants spread in these forests. This density is explained by adaptation to cyclones, many species with buttress roots, and the low representation of lianas in the ecosystem. We also note a rapid recolonization of scree slopes and forest openings by native species, and the mass flowering/fruiting of many endemic trees following cyclones.

The upland marshes are dominated by sedges and hydrophytic grasses mixed with drier rocky soil clumps occupied by Erica heath forest transitioning into *Sideroxylon* thickets (Vaughan & Wiehe 1937), having significant biological value due to the restricted area, and the number of endemic plants, particularly in the genus *Pandanus* (the Pandanetum sensu Vaughan & Wiehe 1937). Due to the cooler conditions in the upper part of the island, many native plants found in this habitat type are found in only a few places in the world and, as a result, are now extremely rare components of upland swamp areas.

Natural and artificial lakes constitute another type of inland freshwater ecosystem. These are found on Mauritius, no significant lake or reservoir is located in Rodrigues. Only two of these lakes have been formed entirely by natural processes in Mauritius. These are Bassin Blanc and Grand Bassin, which were formed in volcanic craters after the collapse of the underlying magma chambers. Since they are located at the top of the watershed, little water arrives by surface runoff or exposure to the water table.

The coastal habitats of Mauritius, Rodrigues and Agaléga have been heavily impacted due to the long history of land use. For example, the sand dunes in the west of the country (e.g. Albion, Flic en Flac) have been completely exploited. Coastal wetlands are also in steep decline, due to development pressure.

Table 6 Estimated coverage (in ha) of different coastal and marine habitats for Mauritius and Rodrigues (from NWFS & STEM 2008)

Marine and coastal habitats	Maurice	Rodrigues
Beach and dune sands	2885	8
Herbarium	3279	17765
Vases	919	656
Mangroves	145	24
Coral reefs	6303	7005

Dunes and beaches cover almost the entire coastline of Mauritius. In Rodrigues, apart from Ile aux Sables and Ile aux Cocos, which are entirely composed of sandy deposits, sandy beaches are found in limited areas on other islets (e.g. on Gombrani Island and Ile aux Crabes).

Total mangrove cover along the Mauritian coast is limited, estimated at about 145 ha. Mangroves are mainly monodominant (*Rhizophora mucronata*), with occasional plants of *Bruguiera gyymnorhiza* found in the brackish water areas upstream of Pointe Lafayette, Trou D'Eau Douce, Ferney and Mahébourg. The presence of a third species reported in some studies has yet to be confirmed. The fern *Acrostichum aureum* is found in the upstream regions strongly influenced by fresh water. Today, most of the mangroves in Mauritius are planted or enriched. All the mangroves around Rodrigues today are plantations designed to control the siltation of the lagoon and belong to the species *Rhizophora mucronata*.

Intertidal mudflats around Mauritius occur mainly at the mouths of major rivers or along the coastline as at Case Noyale. The largest and best known mudflat is located at the Rivulet Terre Rouge Estuary Bird Sanctuary (RTREBS) about 3 km north of Port Louis, a 26 ha RAMSAR site that supports about 14 species of migratory birds (up to 35 bird species including occasional and very rare visitors - Cheke *et al*. 2020).

Small patches of seagrass beds formed by species such as *Halophila ovata*, *Halodule uninervis* and *Syringodium isoetifolium* are common towards the northeast and on the east coast. Larger areas of seagrass beds are found near Les Salines, between the estuaries of the Grande Rivière Noire and Petite Rivière Noire, which continues to the lagoon of Ile aux Bénitiers (ICZM 2009). In Rodrigues, seagrass beds are represented by only two species, *Halophila ovalis* and *H. stipulacaea*, which coexist and also form assemblages with other macroalgae.

Throughout the lagoons of the Republic of Mauritius, coral reefs exist in different abundances, structures and species. These are among the eleven marine hotspots of the world (Roberts 2002). This hotspot encompasses about 1000 km2 of reefs surrounding the Mascarene Islands (mainly Mauritius and Rodrigues). Fringing reefs protect vast shallow lagoons almost all around the islands.

4.2.4 Seychelles

Seychelles is endowed with a rich diversity of terrestrial and marine flora and fauna, recognized as being of international importance. The relative and long-term isolation (1300 km from Africa) of the central archipelago (which separated more than 65 million years ago from other land masses) and the emergence of new islands during geological episodes of volcanism have resulted in a unique biodiversity characterized by a high degree of endemism. Natural processes, including evolutionary changes, have resulted in a rich variety of unique terrestrial and marine plants and animals, some of which are found nowhere else in the world and are therefore endemic to Seychelles. Endemism is highest among the terrestrial species of the granitic islands. The flora of Seychelles is characterized by about 1760 plant species of which about 777 are native, with about 24% of the native vascular plants considered endemic to Seychelles (133 species out of 545, mainly located in the national parks), and over 980 are introduced plant species. The terrestrial fauna (300 species) is characterized by many flagship endemics: 15 species and 15 subspecies of birds, 5 species of bats, 1 giant tortoise and 1 to 2 subspecies of tortoises, more than 15 endemic lizards and chameleons, and 3 snakes, 7 cecilians, 5 frogs, 2 freshwater fish. With a minimum of 3500 native species of which 60% are endemic, the terrestrial invertebrates show the great diversity of insects (by far the most diverse group), scorpions and spiders, crustaceans, myriapods and mollusks. Similarly, the marine environment is diverse with more than 1000 species of fish, 400 of which are confined to the reef, more than 30 species of marine mammals and reptiles, 300 corals, 55 species of sea anemones, 150 species of echinoderms and 350 species of sponges, 165 shrimps, 450 species of bivalves and 350 of macro algae, totaling a minimum of 3000 marine species (Bijoux et al., 2003)

Due to its geological history, African and Indo-Malaysian elements can be found in the terrestrial ecosystems of Seychelles. The terrestrial habitats are very much related to the geological origin of its two types of islands (granitic and coral). In the main islands, two main characteristics can be noticed:

- The terrestrial landmass, mainly covered by secondary forest of new growth with 40,600 ha of forest, representing 90% of the total land area.
- More than 45% of forest areas located in terrestrial protected areas.

The forest can be divided into six categories: coastal and lowland forests (up to 200 m altitude), intermediate forests (200 to 500 m altitude), mountain forests (more than 500 m altitude), palm forests, Inselbergs and riparian forests (Fourth CBD report).

Inland waters are divided into three categories, upland wetlands, lowland wetlands and rivers and streams.

Marine ecosystems are extremely important for the socio-economic development of the Seychelles islands (tourism and fisheries are the two main economic sectors), although they are not as well known as terrestrial ecosystems.

They can be divided into nine different habitats, and the main species are listed below: Beach ridge and beach (and open interiors or seagrass beds of coral islands), Rocky shores, Mudflats and Mangroves, Seagrass beds, Reef flat, Coral reefs (including: reef ridge, slope, patch reefs, etc.), Mahé Plateau, Pelagic, Seabed

4.3 Specific diversity and endemism : Terrestrial biodiversity

4.3.1 Madagascar

. Birds /Madagascar

Four families of birds are endemic to Madagascar: the mesites (*Mesitornithidae*), the ground-rollers (*Brachypteraciidae*), the asities (*Philepittidae*) and the Malagasy warblers or tetrakas (*Bernieridae*).

. Mammals/Madagascar

221 of the 231 known native mammal species are endemic to Madagascar.

Table 7 Number of native mammals and rate of endemism/Madagascar

	MADAGASCAR	**% ENDEMISM**
Rodentia	28	**100%**
Afrosoricida (Tenrecs)	39	**100%**
Primates	109	**100%**
Carnivora	9	**100%**
Chiroptera	46	**80%**
Total	**231**	**96%**

Sources: Goodman 2018; IUCN, 2022.

Madagascar is home to 20% of all primate genera in the world, represented by five families unique to this island, with 109 species and subspecies. The Lemurs of Madagascar comprise five families and 15 genera[15] : *Cheirogaleidae* (5 genera; 42 species), *Lepilemuridae* (1; 26), *Lemuridae* (5; 21), *Indriidae* (2; 19) and *Daubentoniideae* (1; 1). Species numbers in parentheses are current provisional maximum species estimates.

Madagascar also has 28 species of endemic rodents, such as the giant jumping rat (*Hypogeomys antimena*, EN), nine species of carnivores, such as the fosa (*Cryptoprocta ferox*, VU), the main natural predator of lemurs, 37 of Madagascar's bats, such as *Neoromicia malagasyensis* (EN) (cited as VU in IUCN 2016, but a re-evaluation EN in 2018 in S. Goodman et al. 2018). Endemic tenrecs, the only insectivorous mammal family, occupy the same ecological niche as shrews and moles.

. Reptiles/ Madagascar

As of 2018, approximately 420 species have been identified with 98% endemic, including extinct species such as *Voay robustus, Aldabrachelys abrupta and A. grandidieri* (Glaw & Raselimanana, 2018), The region is an important center of diversity for chameleons, with several dozen species in Madagascar which is home to nine species of turtles, including five endemics that are all classified as critically endangered (*Astrochelys radiata, Astrochelys yniphora, Erymnochelys madagascariesnis, Pyxis arachnoides, Pyxis planicauda*) (Glaw & Raselimanana, 2018).

. Amphibians/ Madagascar

Madagascar is home to a high diversity of amphibian species, frogs (Anura). 341 species (Vences et al., 2018) and approximately 200 additional candidate species have been identified (Perl et al., 2014). With the exception of three introduced species (*Hoplobatrachus tigerinus, Duttaphrynus melanostictus, and Ptychadena mascareniensis*), all Malagasy amphibians are endemic, as well as an endemic family consisting of the *Mantellidae*. Among the emblematic and most impressive species are the tomato frog (*Dyscophus antongili*), of bright red color as its name indicates, met only on a very restricted area in the northeastern part of Madagascar, the harlequin frog (*Mantella cowani*) and the golden mantella (*Mantella aurantiaca*).

15 Tattersall, I. & Cuozzo, F. 2018. Systematics of the extant Malagasy lemurs (order Primates)/Systemématique des lémuries malgaches actuels (ordre des Primates) *in* Les Aires Protégées de Madagascar: Leur histoire, description et biote /The Terrestrial protected areas of Madagascar: Their history, description, and biota eds. S. M. Goodman, M.J. Raherilalao & S. Wolhlhauser, pp. 403-424. Association Vahatra, Antananarivo.

. Freshwater fish/ Madagascar

Madagascar's freshwater ichthyofauna has a high level of endemism. Currently, Madagascar has 183 native freshwater fish species (Froese & Pauly 2017), of which 50% are endemic to the island, 37% are native and 13% are introduced/exotic species.

Invertebrates/Madagascar

In Madagascar, the total known species richness of macroinvertebrates, according to a recent review of Madagascar's natural history, is about 5800 species (with 2500 pending description), 86% of which are endemic to the island (Goodman, 2008).

The following Table provides an overview of the diversity and recognized endemicity rates for some of the best-studied invertebrate groups in Madagascar. (Diversity is found on other Hotspot islands, such as the Seychelles, where 3,795 species have been recorded, with an estimated total of more than 5,100 species and an estimated 60% endemism rate (Senterre *et al.* , 2010).

Table 8 Number of species and endemicity rate for some groups of invertebrates in Madagascar

Groups	**Number of species**	**Endemism rate**
Land snails	651	100%
Scorpions	40	100%
Dragonflies and damselflies	181	73%
Chrysopes	163	73%
Beetles	148	100%
Lepidoptera	300	70%
Ants	1 317	98%
Crayfish *Astacoides*	7	100%
Shrimp *Atyidae*	26	77%
Spiders	459	85%

Sources: Goodman, 2008, Fisher, 2019; Djikstra, 2021

When taxa have been well studied, the results in terms of diversity and endemism are remarkable. When Brain Fisher began studying the ants of Madagascar in 1993, 319 species and subspecies of ants in 35 genera were known.

Freshwater mollusks

In Madagascar and the surrounding Indian Ocean islands, freshwater molluscs are represented by ten families of gastropods and four families of bivalves. Freshwater gastropods represent about 85% of all freshwater mollusks in the hotspot, of which about 50% are endemic. Freshwater bivalves represent about 15% of the freshwater mollusc fauna of Madagascar and the Indian Ocean Islands hotspot with 35% endemism.

Decapods

The freshwater decapod fauna of Madagascar and the Indian Ocean Islands hotspot (Comoros, Rodrigues, Mauritius, Reunion and Seychelles) includes 72 species of freshwater crabs, crayfish and shrimps divided into four families: 20 species of freshwater crabs (*Potamonautidae*), 45 species of freshwater shrimps (*Atyidae* and *Palaemonidae*) and seven species of crayfish (*Parastacidae*). Levels of endemism are high (100% at the genus and species level for freshwater crayfish and crabs, and 62% of species and 33% of genera for freshwater shrimp),

Odonates (freshwater insects)

Dijkstra (2021) indicates that a total of 172 species of dragonflies and damselflies (Odonata) are known in Madagascar, of which 93% of Zygoptera (damselflies), and 65% of Anisoptera (dragonflies) are endemic.

Plants/Madagascar

The island of Madagascar is known for its rich indigenous flora, characterized by a high specific diversity and endemicity, both at the species level, with about 90% of vascular plants endemic to the island, and at the family level (5 endemics). More than 11,399 species of vascular plants are currently known (MBG, Madagascar Catalogue, 2022) and it is estimated that at least 3000 species remain to be discovered or described (GSPM, 2021).

According to current knowledge, Madagascar has about 350 plant families, including 249 vascular plant families, five of which are strictly endemic: *Asteropeiaceae, Barbeuiaceae, Physenaceae, Sarcolaenaceae* and *Sphaerosepalaceae* (MBG, Madagascar Catalogue, 2022).

Table 9 Number of families and genera of vascular plants in Madagascar

Group	**Families present**	**Endemic families**	**Genres present**	**Endemic genera**
Bryophytes	101	0	275	0
Pteridophytes	34	0	113	0
Gymnosperms	2	0	2	0
Angiosperms	213	5	1632	309
TOTAL	**350**	**5**	**2022**	**309 (18%)**

Source: Madagascar Catalogue (MBG),
[http://www.http://legacy.tropicos.org/Project/Madagascar]. *Accessed : 2022*

Despite numerous multidisciplinary explorations of the island, bryophytes remain poorly known compared to other plant groups. The checklist of Marline et al. (2012) and Madagascar Catalogue (2021) reports 1144 species of bryophytes for Madagascar, including 751 mosses, 390 liverworts, and three anthoceroses, distributed in about 275 genera and 101 families. In relation to endemism, 33.82% of mosses and 18.97% of liverworts are unique to the island (Marline *et al.*, 2012

For Pteridophytes, 34 families are known, distributed in 113 genera and about 720 species, 53% of which are endemic (Flora of pteridophytes, *in press*, pers. com. F. Rakotondrainibe).

For trees and large shrubs, 103 families, including four endemics are known, with a total of 490 genera (including 161 endemics) and 4220 species (including 4032 endemics). In terms of tree diversity, Madagascar is the twelfth most species-rich country in the world with 3118 tree species, 93% of which are endemic (Beech *et al.*, 2021).

For Palms *(Arecaceae),* Madagascar is considered one of the richest territories in the world (8% of the global flora of the family in the world) with its 208 species, of which 204 are endemic, distributed in 17 genera, of which eight are endemic (Govaerts *et al.*, 2020, Rakotoarinivo et al., 2020). The family *Poaceae* includes 140 genera (10% endemism 593 (51% endemism; (MBG, Madagascar Catalogue, 2022).

More than 900 species of vascular plants comprising 400 genera and 120 families are known among the diversity of vascular plants of inselbergs in Madagascar*:* According to estimates, the actual number of species on inselbergs can reach well over 10% of the total number of the flora of Madagascar. Regarding the endemicity, 70% of the species and 10% of the genera are endemic. Two endemic families are also known from this habitat: *Sarcolaenaceae* and *Sphaerosepalaceae* (Rabarimanarivo et al., 2019). Madagascar's inselbergs form centers of diversity for succulents (including *Aloe*, *Euphorbia, Kalanchoe,* and *Senecio* species)*,* carnivorous plants (*Drosera* and *Utricularia* species), and revivalist plants (including *Xerophyta* Juss. species). The latter represent 16% (50 species) of the total estimated revivalist species on rock outcrops worldwide. These reviving plants are important elements for climate change as resources for future agriculture still unexplored in Madagascar.

Aquatic plants/ Madagascar

Of the 249 vascular plant families currently known in Madagascar (MBG, Madagascar Catalogue 2021), 89 plant families include at least one aquatic or semi-aquatic freshwater species, and 25 exclusively aquatic families, four of which are pteridophytes, including *Isoetaceae* (three species) and *Marsileaceae* (seven species), and 21 families of spermatophytes, including Aponogetonaceae (15 species), *Hydrostachyaceae* (14 species), *Podostemaceae* (six species), *Potamogetonaceae* (10 species) and *Nymphaeaceae* (two species).

Compared to terrestrial plants which have a high rate of endemicity, only 49% of the species recorded in wetlands are endemic.

Table 10 Diversity and endemicity of vascular plants of Madagascar

	Number of native species (estimated)	**Number of endemic species**	**Endemism rate**
Madagascar	11399	9329	82%

Source: Madagascar, MBG 2022

4.3.2 COMOROS

Like most tropical islands, the Comoros archipelago is well known for harboring remarkable biodiversity, characterized by numerous endemic species. For example, nine out of 96 of the archipelago's bird species are endemic (BirdLife International 2013), as are 14% of mammal species (Louette *et al.* , 2004), and 15% of plant species (Pascal *et al.* , 2001; Pascal, 2002).

However, except for vertebrates for which the inventory can be considered completed, this biodiversity remains very poorly known: for almost all invertebrates, which constitute more than 90% of the animal species, no complete list exists and most groups have not been the subject of any detailed study; it is therefore impossible to evaluate the rate of endemism (Louette *et al.*, 2004). The disparity of knowledge between groups is well illustrated by the number of publications concerning each taxon, taken from the bibliography of the main book on the fauna of the Comoros published in 2004: the least rich groups (vertebrates) are those that have been studied the most, and knowledge remains very fragmentary for most of the other taxa.

Table 11 Number of species for some groups of animals in Comoros

Faunal group	Number of species (native and introduced)
Mammals	21
Birds	116
Reptiles/amphibians	28
Mollusks	>166
Arachnids	undefined
Insects	undefined

Source: Louette (2004)

. Terrestrial fauna/ Comoros

The fauna of the Comoros is diverse and balanced; although poor in large mammals, all major zoological groups are represented.

Table 12 Summary of endemic fauna species of Comoros

TAXON	NUMBER OF SPECIES	ENDEMIC
Mammals	17	6 (chiropterans)
Avifauna	98	9
Reptile	25 natives	11
Insect	1200	30 à 60 %
Freshwater fish and shellfish	32	Undetermined

Source: Thys and Tengels 1980; Adjanohoun et al. 1982; Louette et al. 1988; Harcourt and Thornback 1990; Cole 1992; Clarke et al. 1992.

Birds/ Comoros

There are currently 96 species of birds, nine of which are endemic and threatened. The Comoros have the particularity of being located on the path of palearctic migrants. Some birds have a very small range. The most remarkable case seems to be that of *Zosterops mouroniensis* (Nyandrengwa), whose global habitat is reduced to the *Philippia sp.* zone, which extends from 1300 m to 1600 m of altitude on Karthala.

This is the only way to ensure that the Creative City concept can be understood and applied in the context of the Creative City concept. (Mberamoro), *Hipsopetes parvirostris mwaliensis* (Mtsove), *Tchitrea mutata* (Mberadjundu), *Lepsotomus discolor* (keukeu), *Nectarinia humblotii* (Shitsozi), *Mulvus migrans* (Bundi).

Among the endemic subspecies: the Comoros founingo (*Alectroenas sganzini*), the green pigeon located in Mwali, the black parrot (*Coracopsis vasa comorensis* "Gwendzu") (living between 800 m to 900 m altitude) and the large dark brown pigeon (*Columba polleni)* *(*around 1400 m altitude).

Mammals/ Comoros

Among the threatened species of global interest, we must mention the megachiropters.

Chiroptera

In total, the archipelago is home to 9 Chiroptera, including three megachiropters (giant bat *Pteropus livingstonii, Roussettus obliviosus or* "Little Comoros bat" *and Pteropus* *seychellensis comorensis)* and 6 microchiroptera, three of which are endemic), with an endemism rate of 66.67%.

Lemurs

Eulemur mongoz is a species of lemur endemic to Madagascar and introduced to the Comoros. It occurs in the relict forests of Anjouan Island and in the forests of the central ridge, as well as in the dry lowland forests of Moheli.

Insects/ Comoros

The knowledge on insects is fragmentary and deserves to be deepened. References are mostly related to research done in Madagascar. Specialists would have estimated a total of 1200 species of insects for Comoros with a relatively very important endemism, between 30 and 60%. Many species of arachnids are present. Currently, CNDRS and Oxford University are jointly conducting studies on lepidopterans. Many species are threatened, in particular the endangered large-tailed butterfly, as well as *Pseudacrealucretia comorana, Temnona pseudopylas latimargo, T. marginatacomoriana, Nepheleoenopion stictica, N. accentifera comorana, Tagiades samborana, T. insularis grandis, Coleiades ramanatek comoriana*.

Reptiles/ Comoros

According to specialists, there are at least 11 endemic species of reptiles (5 geckos, 2 chameleons, a skink and 3 snakes) among the 25 indigenous species identified. The rate of endemism would be 44%.

There are no poisonous snakes in Comoros. Some reptiles are threatened such as *Ebena viainunguis, Geckolopis maculata, Gehyra mutilata*.

The day gecko *Phelsuma* is sought after for export as a pet. Geckos live mainly in forests and coconut plantations while some species have adapted to live near houses and in fields.

Terrestrial mollusks/ Comoros

Fontaine et al. (2012) mention 184 species of mollusks, of which more than 50 are new to science. Among this fauna, only 13 species are introduced, and at least 130, or 70%, are endemic to the archipelago. The molluscs of the Comoros are composed of 24 families, among which those of Streptaxidae*,* carnivorous snails richly colored, particularly diversified (63 species collected, of which at least 29 are new for science).

Crustaceans and freshwater fish/Comoros

The list of freshwater fish and macro-crustacean species of the Comoros includes 32 species, including 20 fish and 12 decapod crustaceans. Of these, seven species are specific to the western Indian Ocean region, with one endemic to Comoros and one endemic to Madagascar and Comoros (Keith et al. 2006).

Only one introduced species was found. Overall, the number of indigenous species varies greatly from one island to another: 24 in Anjouan, including 15 species of fish and 9 of crustaceans, 30 in Moheli, including 18 species of fish and 12 of crustaceans), and two species in Grande Comore do not have a perennial river.

Table 13 Endemic species of freshwater fish and crustaceans of the Comoros

	Total on the 3 islands	Anjouan	Grande-Comore	Moheli
Number of species	878	608	805	318
Number of endemic species	127	67	93	41
Percentage of endemic species of Comoros	14,46%	11,02%	11,55%	12,89%
Species not harvested for over 100 years	34	23	24	8

*CO: endemic to the Comoros; *OOI: present only in the Western Indian Ocean Region;
*MC: present in Madagascar and Comoros; Nd: present in Anjouan; Mw: present in Moheli

. Land flora/Comoros

Floristic data remain very incomplete and deserve exhaustive studies. A great floristic diversity is observed, namely pioneer flora of lava flows, relics or traces of low deciduous forests of low altitude, a flora of primary rainforest, anthropized vegetation of agroforestry, semi-xerophilous vegetation and ericoid vegetation at high altitude only in the Karthala massif in Grande-Comores. This is the only way to ensure that a good understanding of the concept of the "human species" is not lost on the local population. However, this figure is far from being definitive, the work of determination being still in progress and corresponding only to the effort of inventory of an island on the four that counts the archipelago.

Vascular plant species/ Comoros

The list of species is based on the collections kept in the herbarium of the MNHN (P) including those during the mission carried out within the framework of the project *"Faunistic inventory of the rivers of the Comoros and botanical inventory" (P. KEITH, A. ABDOU and J.N. LABAT, October 2006).*

Table 14 Ecological distribution of plants in the Comoros

	Total 3 islands	Anjouan	Grande-Comores	Moheli
Number of species	878	608	805	318
Number of endemic species	127	67	93	41
Percentage of endemic species of Comoros	14,46%	11,02%	11,55%	12,89%
Species not harvested for over 100 years	34	23	24	8

A study conducted in 2006 shows that Pteridophytes with 208 species, are the first botanical family of the Comoros flora. They are followed by Fabaceae with 105 species. The Poaceae, 92 species, are well represented, but mainly by species with a wide distribution and often introduced and invasive. The Orchids, 81 species, constitute a family certainly well explored but whose revision by genus risks to bring new species but also synonymies.

The orchids

According to a data set made from herbarium specimens available in the Paris herbarium, this family is represented by 81 species in Comoros of which 18 are endemic and some are vulnerable. The three orchids *Cynorkis lilacina Ridl. var. boiviniana and Malaxis cardiophylla* (Rchb.f). Kuntze have not been observed for over 100 years.

Orchids are distributed according to species in ecosystems: open forest, shady and humid environment. They are generally epiphytes on large branching trees and sometimes terrestrial. The distribution is generalized in natural or anthropized environments.

Pteridophytes

The ferns have a widespread distribution in the Karthala forest, the Grille massif, the forests of Moheli (Miringoni, Mladjele and MzéKekoule), the relict forest of Moya and Ntringui in Anjouan. The western slopes of Karthala are particularly noteworthy for ferns (both terrestrial and epiphytic), with a maximum diversity of ferns that seems to coincide with their greatest abundance, around 1650 meters in the altitudinal gradient.
Of the taxa collected during MNHN, CNDRS and UDC missions, 20% of the species collected are very rare (observed only once) and nearly 50% are rare (observed less than five times) (Fontaine et al, 2010).

4.3.3 MAURITIUS

Due to its volcanic origin, its antiquity and its isolation, there is an important diversity of flora and fauna in Mauritius and Rodrigues, and a high degree of endemism (about 39.5% of the higher flora and 72% of vertebrates; for Mauritius and 31% and 87.5% respectively for Rodrigues). Agalega and Saint Brandon had no terrestrial endemic biodiversity.

In only about 370 years of human presence, Mauritius and Rodrigues, previously pristine islands teeming with endemic and often evolutionarily remarkable species, have been transformed into two of the most ecologically impacted places (Cheke & Hume 2008). Both islands are rather unique in that their biota were relatively well known from the beginning of human presence, due to their late discovery. Thus, aided by good fossil records, new extinct species are still being catalogued (e.g. Rijsdjik et al. 2009; de Boer et al. 2013 a, b; de Boer et al. 2014; Hume 2011, Hume 2015).

Mauritius is best known among conservation biologists for providing the world with the very symbol of human-induced species extinction, the remarkable dodo (*Raphus cucullatus*) (Turvey & Cheke 2008). Some other examples of extinct species from Mauritius are the giant parrot (*Lophopsittacus mauritianus*) and two species of giant tortoises (*Cylindrapsis triserrata* and *C. inepta*). Rodrigues had the Solitaire (*Pezophaps solitarius*), a relative of the Dodo, and two endemic species of giant tortoises (*Cylindrapsis vosmaeri* and *C. peltastes*).

Thus, 23 of the 50 native vertebrate species known on Mauritius (46%) and adjacent islets are now extinct. For Rodrigues, the percentage of extinct vertebrates is higher (55.5% or 20 species out of 36). Before the first settlers in the 17th century, only flying mammals lived in Mauritius and Rodrigues, but since then, many invasive exotic species have been introduced, resulting in the loss of much of the endemic and native flora and fauna. Agalega and Saint Brandon did not originally have mammals.

. Wildlife/ Mauritius- Rodrigues

Mammals/ Mauritius- Rodrigues

The only native mammals of Mauritius and Rodrigues are bats. Of the three species of fruit bats (*Pteropus niger*, *P. subniger*, and *P. rodricensis*) known to occur in Mauritius, only one remains (*P. niger*) and it is listed as Vulnerable on the IUCN Red List (Kingston et al 2018). Unfortunately, since 2015, near-annual mass culls of Mauritian fruit bats have occurred (Florens 2017, 2019; MWF 2021; www.mauritian-wildlife.org). *Pteropus subniger* is extinct, while *P. rodricensis* is still present in Rodrigues and listed as Endangered on the IUCN Red List (Tatayah et al 2017).

There are two species of insectivorous bats in Mauritius, the endemic *Mormopterus acetabulosus* (Goodman et al. 2008), and the native *Taphozous mauritianus*, which is also found in Reunion and mainland Africa (Hutson et al. 2008), but further study may revise the status of *Taphozous mauritianus.* Agalega and Saint Brandon have no native terrestrial mammals.

Table 15 Native and endemic species in selected biological groups (from Florens 2013a).

Taxonomic group	Total natives		Total endemic		Total extinguished		Extinct endemics	
	Maurice	Rodrigues	Maurice	Rodrigues	Maurice	Rodrigues	Maurice	Rodrigues
Angiosperms	691	150	273 (39.5%)	47 (31.3%)	61 (11.3%)	17 (11.3%)	30 (11%)	10 (21.3%)
Mammals	5	2	1 (20%)	0	2 (40%)	1 (50%)	0	0
Land birds	28	14	19 (67.9%)	13 (92.9%)	16 (57.1%)	11 (78.6%)	12 (63.2%)	11 (84.6%)
Reptiles	18	8	18 (94.1%)	8 (100%)	5 (29.4%)	8 (100%)	5 (31.3%)	8 (100%)
Butterflies	30	10	5 (16.7%)	0	4 (13.3%)	1 (10%)	1 (20%)	0
Snails	125	30	81 (64.8%)	16(53.3%)	43 (34.4%)	7 (23.3%)	36 (44.4%)	5 (31.3%)

Birds/ Mauritius- Rodrigues

Although Mauritius is relatively poor in species numbers, it has a large proportion of endemic taxa. Mauritius has one of the densest concentrations of threatened bird species in the world (Safford 2001).

Of the 28 landbird species that existed in Mauritius, 12 have escaped extinction, nine of which are considered threatened (Cheke & Hume 2008). In Rodrigues, the only two existing endemic landbirds: *Foudia flavicans* and *Acrocephalus rodericanus* are found in almost all wooded areas of Rodrigues, with their largest populations in the highlands.

The islets around the main island of Mauritius, especially the northern islets have a great abundance of seabirds. Eleven species nest there, including the red-tailed strawbird, the fouquet and the petrel (the highest population of these species in the Indian Ocean is found on the northern islets of Mauritius). Note an endemic petrel only known from the Round Island (*Pterodroma armijoniana*) and is the only known three-way hybrid vertebrate in the world.

Agalega was an important seabird station in the 19ème century (Cheke & Lawley 1983), but the last colonies were deliberately destroyed by fire in 1943. It is difficult to know what species were present because of rats, cats, fires and poor scientific equipment, but at least 10 species of birds existed at Agalega. In addition to migratory birds, only two species of native land birds have been recorded. No recent studies have been conducted (except for a partially reported, published MWF study - Griffiths and Tatayah 2006[16] , Griffiths and Florens 2006[17]) and major ongoing construction (airstrip, aircraft hangar, dormitories, houses, jetty, etc.) could affect breeding seabirds. Saint Brandon still supports large seabird colonies, ranging from five to nine species (Staub & Guého 1968, Williams & Rowlands

[16] Griffiths O L & Tatayah R V. (2006). Marine turtles of Agalega (Western Indian Ocean) including report on illegal killing of adults and harvest of eggs. Marine Turtle Newsletter 115.
[17] A Field Guide to the Non-Marine Molluscs of the Mascarene Islands (Mauritius, Rodrigues and Réunion) and the Northern Dependencies of Mauritius

1980, BirdLife International 2013). However, other research has confirmed that nine species breed on the islands (Evans et al 2016).

Table 16 Existing endemic species of land birds of the Mascarene Islands, Mauritius and Rodrigues

Sites	Species	IUCN status
Maurice	*Falco punctatus*	IN
	Nesoenas mayeri	VU
	Alexandrinus eques (Psittacula)	VU
	Collocalia francica	NT
	Coracina typica	VU
	Hypsipetes olivaceus	VU
	Terpsiphone bourbonnensis ssp desolata	LC
	Zosterops mauritianus	LC
	Zosterops chloronothos	CR
	Foudia rubra	IN
Rodrigues	*Acrocephalus rodericanus*	NT
	Foudia flavicans	NT

Reptiles/ Mauritius- Rodrigues

There are 18 species of endemic reptiles known to have once inhabited mainland Mauritius, of which: 13 species remain. Seven of these are restricted to the remaining populations on the offshore islets. The burrowing boa (*Bolyeria multicarinata) was* last seen in 1975 and is now considered extinct[18] . This is the last recorded extinction of a vertebrate in Mauritius (Cheke & Hume 2008), although local extinctions are still ongoing.

All endemic reptile species of Rodrigues have disappeared (Cheke & Hume 2008). The Indo-Pacific gecko *Lepidodactylus lugubris* is native to Asia and is still found in several parts of Rodrigues, although it has declined since the arrival of the Indian house shrew *Suncus murinus*. The island of Agalega has an endemic variety of a Phelsuma gecko derived from the Reunion species (*Phelsuma borbonica agalegae* Cheke, 1975). Its current status has not been assessed, although it is still present on the island.

Fish/ Mauritius- Rodrigues

The most recent comprehensive publication on freshwater fishes was carried out by the Agence Réunionnaise pour le Développement de l'Aquaculture currently "Hydro-Réunion"), which carried out the electrofishing sampling in 2002. In this sampling mission, 18 species of fish were identified, 13 native species of freshwater fish were found, including two endemic to the Mascarene Islands and two others endemic to the Mascarene-Madagascar region. The other species have a much wider distribution: five are Indo-African species and four are Indo-Pacific species. Compared to Reunion, the density of fish was much lower, but the eels were larger (*A. marmorata* & A. *mossambica*) According to Keith et al (2006), there are 31 species of fish, 11 species of crustaceans (1 extinct), of which 33 are native.

[18] Cole, N. 2021. *Bolyeria multocarinata. The IUCN Red List of Threatened Species 2021: e.T2864A13483086.* https://dx.doi.org/10.2305/IUCN.UK.2021-2.RLTS.T2864A13483086.en. Accessed on 07 June 2022.

According to Froese & Pauly (2015), there are 57 species of fishes in Mauritian freshwater, of which 22 are introduced, 34 native and one endemic.

Invertebrates

Mauritius has 39 native butterfly species; five of which are endemic, but only one of these still exists (Williams 2007). From Rodrigues, 12 butterfly species were recorded, including one subspecies considered extinct and one species probably introduced from Madagascar. On Agaléga, surveys revealed only five species.

There are 125 native land snail species described for Mauritius, most of which are endemic (64%). However, 43 are already extinct (34.4%) (Griffiths & Florens 2006). Several new species have been described recently (Griffiths & Florens 2004), but they are mostly extinct. Rodrigues has a much smaller land snail fauna (30 species) and a lower extinction rate (23%). Agalega has four species of land snails, while Saint Brandon has two species, all with a wider geographic distribution (Griffiths & Florens 2006).

The ant fauna is relatively well known in Mauritius (Fisher et al. 2005), with about 24 native species, mostly endemic (59%). Some samples are still being studied to determine their identity and whether or not they are native to Mauritius. Most of the species collected in Rodrigues are exotic.

Recently, a spider *Mascarenus remotus* (Gallon 2005) has been described from Serpent Island and is known to occur only on this islet off Mauritius. For this same islet, a new species of grass - *Brachiaria nodosa* - has also been described.

There are over 1,000 species of arthropods in Mauritius (including 38 endemic families) with an estimated 75% endemism at the species level (Motala et al. 2005). Some of the groups have been somewhat better studied such as the genera *Syzygops* (Williams 2000), *Cratopus* (Williams & Cox 2003), *Phasmatodea* (Hugel 2014, Hugel and Desutter-Grandcolas 2021), Ichneumonidae (Ganeshan and Madl 2016) but other groups lack in-depth knowledge.

There are ten species of freshwater macrocrustaceans in Mauritius belonging to two families (Atyidae, with six *Caridina spp.* and one *Atyoida*) and Palaemonidae (with two *Macrobrachium* and one *Palaemon*) (ARDA, 2003). Three of these species are endemic to Mauritius and one to the Mascarene Islands, while the others are of Indo-Pacific distribution. Most of these species are present at higher densities than in the corresponding habitats in Reunion. However, the edible 'camaron' (*Macrobrachium lar*) is now rather rare because of its exploitation.

. Flora/ Mauritius- Rodrigues :

Mauritius has six genera of endemic plants. The flora of Mauritius has a high degree of endemism, with 39.5% of flowering plant species endemic to Mauritius (273 species), the remaining species are endemic to the Mascarene Islands (143 species) (Baider *et al.*, 2010). About 9% of the native species are currently considered extinct. Concerning pteridophytes, there are about 200 taxa in Mauritius, of which 12 are endemic (Grangaud 2010). About 46 taxa are considered extinct, although for some (14 of them), their presence on the island has never been confirmed (Grangaud 2010). Ferns have also been relocated such as *Pellaea dura* (Pynée *et al.* 2013) and new records have been made (Pynée et al. 2012). For lower plants, there are at least 238 bryophyte taxa in Mauritius (Tixier & Guého 1997; Frahm *et al.* 2009), but studies on these groups are lacking and diversity is probably higher.

Rodrigues has three endemic plant genera and approximately 150 native angiosperm species, 31% of which are strictly endemic. The extinction rate of endemic species in Rodrigues is the highest among all the islands of the Western Indian Ocean (Baider et al. 2010). Concerning pteridophytes, there are 27 taxa in Rodrigues, five of which would be extinct on the island (Grangaud 2010). A total of 44 species of mosses are listed and only one species seems to be endemic (Mitten 1879, Een & Thingsgaard 1999). In the absence of complete surveys, it is difficult to know the status of these groups in Rodrigues.

The flora of Agaléga is documented to have 46 native species, three of which have not been seen recently (Guého & Staub 1983), and Saint Brandon has 17 species (Staub & Guého 1968). Both have no endemic species and are primarily composed of widely distributed species (MWF 2019 and unpublished reports).

4.3.4 SEYCHELLES

The Seychelles Islands, also due to their isolation, are characterized by a high degree of endemism, especially in the terrestrial sphere. The following table presents the main figures on terrestrial biodiversity (from Senterre *et al.* , 2010; 2013; and IUCN Red List database 2021). Approximately 4500 native species have been identified to date.

Table 17 Terrestrial biodiversity: endemism and threatened species in Seychelles

Taxonomic group	Nb of native species () = *introduced*	Nb of endemic species in Seychelles	Examples of threatened species (IUCN Status)
Plants	545 vascular [777] all (>980) all	133 vascular [147] all	Medusagyne *oppositifolia* CR, Ironwood *Vateriopsis seychellarum* CR, *Rothmannia annae* CR Wild balsam *Impatiens gordonii* CR Tidewater wood small leaf *Drypetes riseleyi* CR Bilembi maron *Colea seychellarum* EN Large woodland mangrove *Glionnettia sericea* EN Coco-de-mer *Lodoicea maldivica* EN *Deckenia nobilis* VU Wood snake *Psychotria pervillei* VU Blue hardwood *Tarenna sechellensis* VU Three-leaf cafoul wood *Allophylus sechellensis* VU River vacoa *Pandanus balfouri* VU

Taxonomic group	Nb of native species () = ***introduced***	Nb of endemic species in Seychelles	Examples of threatened species (IUCN Status)
Mammals (native = chiropterans)	6 (0)	5	*Coleura seychellensis* CR *Pteropus (s.) aldabrensis* VU *Mops pusillus* VU
Birds	272 (6)	13 sp. + 17 ssp.	*Terpsiphone corvina* VU *Copsychus sechellarum* EN *Zosterops modestus* VU *Otus insularis* CR *Falco araea* VU *Aerodramus elaphrus* VU *Coracopsis (nigra) barclyi* VU *Foudia aldabrana* EN
Reptiles and Amphibians		29	
Snakes	2 (1)	2	*Lycognathophis seychellensis* EN *Lamprophis geometricus* EN
Lizards, geckos & chameleons	6 (1) 7 (3) 2	4 7 2	Tiger chameleon *Archaius tigris* EN *Archaius scychellensis* EN *J. veseyfitzgeraldi* EN *Janetaescincus braueri* EN *Trachylepis wrightii* VU *Ailuronyx trachygaster* CR
Turtles	3	1	*Aldabrachelys gigantea* VU

Taxonomic group	Nb of native species () = *introduced*	Nb of endemic species in Seychelles	Examples of threatened species (IUCN Status)
Frogs	6	5	*Sooglossus thomasseti* CR *Sooglossus pipilodryas* CR *Sechellophryne gardineri* EN *Sechellophryne sechellensis* EN
Cecilians	7	7	*Grandisonia brevis* EN *Praslinia cooperi* EN
Wetland fish	20 (5)	2	
Wetland invertebrates	> 3500	> 2000 (60%)	
Insects	> 2900 (>135)	> 1670	*Delosia ornata* CR *Carausius scotti* CR *Pulposipes herculeanus* VU *Euploea mitra* EN *Allolestes maclachlani* EN *Nocticola gerlachi* EN *Graffaea seychellensis* EN *Amphinotus pupulus* & *A. nymphula* (Orthoptera) EN *Teinobsis alluaudi* (Odonata) VU *Phalangacris phaloricephala* (Orthoptera) VU
Arachnids	> 350 (15-30)	>200	*Phrynicus scaber* VU
Crustaceans	c. 70 (5)	c. 24	
Myriapods	c. 60 (3-13)	c. 34	*Sechelleptus seychellarum* EN

Taxonomic group	Nb of native species () = *introduced*	Nb of endemic species in Seychelles	Examples of threatened species (IUCN Status)
Mollusks	c. 67 (8)	c. 50	*Pachnodus oxoniensis*, *Conturbatia crenata*, *Dupontia levensonia*, *Glabrennea silhouettensis* and *G. thomassetti* CR *Stylodonta studeriana* and *Pachnodus fregatensis* EN

. Wildlife/ Seychelles

Mammals/ Seychelles

The only indigenous terrestrial mammals in Seychelles are bats: there are five species in total, two of which are endemic. All other mammals are introduced: domestic animals (cattle, pigs, goats, rabbits, hares, cats, dogs, guinea pigs), some of which have become wild, commensal rodents (*Rattus*, *Rattus norvegicus*, *Mus musculus*) or introduced species (*Tenrec ecaudatus*).

There are six species of bats, five of which are endemic. Only the Mauritian tomb bat *Taphozous mauritianus* is not endemic. The bat *Coleura seychellensis*, which is one of the rarest mammals in the world (about 60 individuals) is endemic to the granitic Seychelles; the Seychelles fruit bat *Pteropus seychellensis* is a large fruit bat endemic and typical of the granitic islands where it is abundant, while the Aldabra fruit bat *Pteropus seychellensis aldabrensis* is much rarer and with a more reduced distribution; hence its VU status *Mops pusillus* and *Triaenops sp.* have only recently been proposed as endemic to Aldabra (Goodman & Ratrimomanarivo, 2007; Goodman & Ranivo 2008; Bielsa et al. 2020).

Birds / Seychelles

In 2022, a total of 272 extant bird species were recorded in the Seychelles: 62 breeding species, 30 annual migrants and 180 vagrants, plus ten extinct species, four of which were introduced and established until eradicated or naturally extinct (Skerrett et al., SBRC website and com. per.).

Several species are known to have become globally extinct since man colonized the islands: Seychelles Yellow Zosterops and Seychelles Green Parakeet *Psittacula (eupatria) wardii* in the granitic islands, and Aldabra's Warbler *Nesillas aldabranus* is considered extinct, as it has not been seen since the 1980s. Seychelles is home to a large number of seabirds, both in the granitic and outer islands. Some colonies are home to more than a million birds and are among the largest in the Indian Ocean (e.g., frigatebirds and gannets on Aldabra and Cosmoledo atolls), and the largest in the world for some particular species (noddis and tropical shearwaters on Aride).

There are currently 30 endemic taxa: 15 species of birds endemic to Seychelles, most of which are globally threatened, and 15 endemic subspecies currently present in Seychelles.

Reptiles and amphibians / Seychelles

Approximately 25 species of terrestrial reptiles are present in Seychelles; 21 of these are native and 16 endemic to Seychelles.

Aldabra has the largest surviving wild population of giant tortoises in the world (over 100,000) and several (re)introduced populations of several dozen or hundreds of them exist on most of the granitic and coralline islands (the main ones being on Frégate and Curieuse). Two turtles described as endemic subspecies also occur in the Seychelles, the yellow-bellied pelusios turtle *Pelusios castanoides intergularis* and the black turtle *P. subniger parietalis*, although the latter is now considered an invalid subspecies and was eventually introduced for minor genetic differentiation with animals from Madagascar and Africa (Fritz et al. 2012). With the habitats of pond turtles declining on the larger developed islands of the Seychelles, two populations of *P. subniger parietalis* have been re-created on North Island (2008) and Arid Island (2012), and populations of both species have been enhanced on Silhouette (Gerlach 2013).

Seychelles also has the highest rate of endemism among amphibians of any island group in the world: 12 species out of 13 (92%): 7 endemic species of cecilians (blind, limbless burrowing amphibians), two of which are considered globally threatened, 5 endemic species of frogs, 4 Sooglossidae (an endemic family with close relatives in India), all of which are globally threatened, and the Seychelles tree frog *Tachycnemis sechellensis*.

Wetland and freshwater fishes / Seychelles

Approximately 25 species of freshwater fishes (Keith et al. 2006) exist in the Seychelles, although some species may live in both fresh, brackish or salt water at different stages of their life cycle (such as eels). Of these, only two species are considered endemic to Seychelles: *Pachypanchax playfairii* (Gobioidei) and Larkansyel *Parioglossus multiradiatus* (Ptereleotridae); neither is considered threatened.

Invertebrates / Seychelles

It is estimated that over 3500 species of native terrestrial invertebrates are present in Seychelles, of which about 60% are endemic, the most diverse group by far being insects. These endemic species are mainly found on the granitic islands and in the Aldabra group and some can also be found in the coral islands. Desroches Island (Amirantes) is the only known site for two endemic cockroach species (*Delosia ornata* and *Margatteoidea amoena*).

Endemic invertebrate flagship species include the giant Seychelles millipede *Sechelleptus sechellarum* (IUCN category EN; Gerlach 2014a), the Seychelles whip spider *Phrynichus scaber* (IUCN category EN; Gerlach 2014b), the leaf insect or Phyllie *Phyllium bioculatum*, given as non-threatened although extremely rare (G. Rocamora, pers. com.). The Giant Tenebrionid (IUCN category VU) is restricted to Frégate Island (Gerlach 2014c).

After insects, spiders are the group with the greatest biodiversity (about 350 native species, 60% endemic), followed by crustaceans (72 native species, 24 endemic) and mollusks (67 native species, 75% endemic). Insects and snails/slugs are the only terrestrial invertebrate groups for which globally threatened species have been identified in Seychelles; there are a total of 36 globally threatened insects (6 CR, 18 EN, 12 VU) and 53 globally threatened snails (21 CR, 30 EN, 2 VU).

4.4 Specific diversity and endemism: Marine biodiversity

More than 10,000 species of shallow-water marine animals have been identified in the western Indian Ocean, including more than 2,000 species of fish.

The western Indian Ocean is home to 211 species of chondrichthyans, including 128 species of sharks and 79 batoids (the rays, skates, sawfishes) and 4 species of chimaera (Kiszka & van der Elst 2015), or about 23.4% of the species globally. Eleven shark species are endemic to the western Indian Ocean (Kiszka *et al.* , 2009b).

Table 18 Endemic shark species in the western Indian Ocean

Species	Marine area
Squalus lalannei, Centrophorus secheyllorum	Seychelles
Chiloscyllium caeruleopunctatum, Halaelurus clevai, Narcine insolita, Dipturus crosnieri, Fenestraja maceachrani, Rhinobatos petiti	Madagascar
Scyliorhinus comoroensis	Comoros

Sources: Compagno, 1984; Bauchot and Bianchi, 1984; BIODEV, 2008

The southwestern Indian Ocean is home to five of the world's seven species of marine turtles (the green turtle *Chelonia mydas*, the hawksbill turtle *Eretmochelys imbricata*, the olive ridley turtle *Lepidochelys olivacea*, the loggerhead turtle *Caretta caretta*, and finally the leatherback turtle *Dermochelys coriacea*), and represents a major region, at the global level, for the reproduction and feeding of these five species (IFREMER, 2013). Particularly important nesting sites exist in the Comoros, Seychelles and the Spare Islands.

The western Indian Ocean is an important area for marine mammals, with eight "Important Marine Mammal Areas" (IMMA) identified[19] :

. The Mozambique Channel, the Seychelles Shelf and, to a lesser extent, the Mascarenes, were thus identified in a 2012 prospective study as areas of major importance for Pseudorca crassidens, Globicephala macrorhynchus and Grampus griseus (Tetley, Kiszka and Hoyt, 2012), as well as for other flagship species;

. The Central East Coast of Madagascar (including Baie d'Antongil, Ile Sainte Marie), the waters of the southern continental shelf of Madagascar and the Comoros Islands and its adjacent reefs for Megaptera novaeangliae ;

. The southwest of Madagascar and the Mozambique Channel, the Comoros Islands and its adjacent reefs for *Balaenoptera musculus intermedia, Balaenoptera bonaerensis*, *Balaenoptera physalus*, *Physeter macrocephalus* and *Sousa plumbea*.

Large cetacean populations are a tourist attraction in several coastal regions of the hotspot, such as Antongil Bay and Sainte-Marie Island in Madagascar, which are important breeding areas for *Megaptera novaeangliae.*

The distribution of cetaceans in the Madagascar and Indian Ocean Islands Hotspot is shown in Table 19.

As for marine invertebrates, the most recent assessment of the western Indian Ocean indicates that the region supports at least 8,627 species of shallow-water invertebrate macrofauna (Cooke, 2012). As with terrestrial invertebrates, data gaps remain, both at the species level and on their distributions or population trends.

Studies by Richmond (2001) report 419 species of echinoderms in the western Indian Ocean, 373 of which are distributed around East Africa and Madagascar; regional endemism is 81 species. For the marine areas around Madagascar alone, 1400 species of marine gastropods, 306 species of sponges and 650 species of cnidarians have been recorded (*in* Vasseur, 1981). On the reefs of the Toliara region alone, 779 species of crustaceans were recorded in 1978 (Thomassin, 1978). In the Seychelles, it is estimated that there are 450 species of bivalves, 350 species of sponges, 155 of echinoderms and 165 species of marine crustaceans (John Nevill, pers. com.). Marine invertebrates represent an important economic resource (fishing for sea cucumbers, lobsters, crabs, octopuses, etc.).

19 Marine Mammals Protected Areas Task Force: https://www.marinemammalhabitat.org/imma-eatlas/

Table 19 Presence of cetaceans in the Western Indian Ocean

		Delphinidae	Ziphiidae	Kogiidae and Physeteridae	Balaeno-pteridae	Balae-nidae	Total species
		Dolphins	**Beaked whales**	**Sperm whales**	**Whales**	**Right whales**	
Comoros	Great Comoros	8	1	1	1	0	11
	Moheli	8	2	1	1	0	12
Republic of Mauritius		6	1	1	3	1	12
Seychelles	Mahé	6	2	2	3	0	13
	Aldabra	8	2	1	3	0	14
	South Islands	7	2	1	4	0	14
	North Islands	7	2	1	4	0	14
	Seychelles Bank	7	2	1	3	0	13
	West	6	2	1	3	0	12
Madagascar	Toliara	7	0	2	1	1	11
	East Coast	7	0	2	1	0	10
	Northeast Coast	8	0	2	1	0	11
	West Coast	7	0	2	1	0	10
	South coast	8	0	2	2	0	12
	Southwest Coast	6	0	2	2	0	10

Sources: AIDE, 2008; Biodev, 2008; TAAF, com. pers, 2014

4.4.1 Madagascar

Madagascar is an island with a high potential for coastal and marine biodiversity. The main marine and coastal ecosystems include mangroves, coral reefs, lagoons, sandy beaches, pebble beaches and rocky outcrops.

The flora of mangrove ecosystems is composed of mangrove and back mangrove species, forming large stands. The plants of the reef areas include seaweeds and marine phanerogams.

The state of knowledge on the exploitation of marine and coastal resources is limited to censuses, distribution and stock assessments. The main targets of the fisheries are mainly crustaceans, including shrimps, lobsters and crabs. The potential of the mollusc resources has not yet been studied. Sea cucumbers are being overexploited in Madagascar without any precise evaluation. The exploitation of fish is rather well known.

The threats to Madagascar's marine biodiversity are related to the coastal and marine environment, but considered so far as relatively preserved. The main threats are fishing, pollution, deforestation of mangroves, coastal erosion and tourism.

Madagascar's marine and coastal ecosystems contain the largest community of living marine organisms. They are among the most biologically productive in the world, and their richness in species makes them one of the highest places of biodiversity on the planet.

The fauna is however rather poor. The animal populations consist of several classes varying from Madreporaria, Cnidaria and Molluscs to Echinoderms and Marine Mammals. Nevertheless :

- Madagascar is home to marine species that are endemic to it: *Chiloscyllium caeruleopunctatum, Halaelurus clevai, Narcine insolita, Dipturus crosnieri, Fenestraja maceachrani, Rhinobatos petiti* (*Compagno, 1984; Bauchot and Bianchi, 1984; BIODEV, 2008).*
- For marine invertebrates, the marine areas around Madagascar are home to 1400 species of marine gastropods, 306 species of sponges and 650 species of cnidarians have been listed (*in* Vasseur, 1981). Marine invertebrates represent an important economic resource from the point of view of economic and food security: sea cucumbers, lobsters, crabs, octopuses, etc.
- Regarding marine fishes: The 2017 list by Fricke et al. (2018) includes 137 new marine fish records for Madagascar, bringing the number to 1,540 species of actinopterygian marine fishes, including 30 endemics. These 1540 recorded species belong to 191 families and 29 orders. The Perciformes group 57.3% of the species, the next order in terms of number of species being the Anguilliformes (6.7% of species). The family with the most species is the Gobiidae, followed by the Labridae, Serranidae, etc.

Table 20 Marine fish species endemic to Madagascar, from Fricke et al (2018).

Ordre	Famille	Espèce
ANGUILLIFORMES	MURAENESOCIDAE	*Gavialiceps bertelseni* Karmovskaya 1993
	CONGRIDAE	*Ariosoma bauchotae* Karrer 1983
		Gnathophis leptosomatus Karrer 1983
		Parabathymyrus karrerae Karmovskaya 1991
SILURIFORMES	PLOTOSIDAE	*Plotosus fisadoha* Ng & Sparks 2002
OPHIDIIFORMES	CARAPIDAE	*Carapus* sp.
	OPHIDIIDAE	*Neobythites crosnieri* Nielsen 1995
LOPHIIFORMES	CHAUNACIDAE	*Chaunax flammeus* Danois 1979
	CHAUNACIDAE	*Chaunax hollemani* Ho & Ma 2016
ATHERINIFORMES	ATHERINIDAE	*Teramulus kieneri* Smith 1965
STEPHANOBERY-CIFORMES	MELAMPHAIDAE	Melamphaes shcherbachevi Kotlyar 2015
BERYCIFORMES	TRACHICHTHYIDAE	*Hoplostethus rifti* Kotlyar 1986
PERCIFORMES	SERRANIDAE	*Plectranthias maugei* Randall 1980
	PSEUDOCHROMIDAE	*Halimuraenoides isostigma* Maugé & Bardach 1985
		Pseudochromis madagascariensis Gill 2004
	PLESIOPIDAE	*Plesiops malalaxus* Mooi 1995
	APOGONIDAE	*Foa madagascariensis* Petit 1931
	LEIOGNATHIDAE	*Photoplagios antongil* Sparks 2006
	PEMPHERIDAE	*Pempheris andilana* Randall & Victor 2015
		Pempheris hollemani Randall & Victor 2015
		Pempheris rubricauda Randall & Victor 2015
	CEPOLIDAE	*Owstonia similis* Smith-Vaniz & Johnson 2016
	POMACENTRIDAE	*Pomacentrus atriaxillaris* Allen 2002
		Pomacentrus caeruleopunctatus Allen 2002
	PINGUIPEDIDAE	*Parapercis maramara* Sparks & Baldwin 2012
	URANOSCOPIDAE	*Xenocephalus* sp.
	CALLIONYMIDAE	*Draculo maugei* Smith 1966
	GOBIIDAE	*Acentrogobius decaryi* (Pellegrin 1932)
PLEURONECTIFORMES	SAMARIDAE	*Samariscus desoutterae* Quéro,Hensley &Maugé 1989
	SOLEIDAE	*Bathysolea lagarderae* Quéro&Desoutter 1990

- For marine mammals, nine marine species have been recorded, including two classified as VU *Physeter macrocephalus, Dugong Dugon* (REBIOMA, 2017).

- Madagascar is home to 72 species of sharks, including two endemic species *Bythaelurus clevai, Chiloscyllium caeruleopunctatum;* four species are Critically Endangered - *Pseudoginglymostoma brevicaudatum, Sphyrna mokarran, Sphyrna lewini, Carcharhinus longimanus*; 14 species classified as EN, including the whale shark (*Rhincodon typus*) and 21 species VU; 36 species of batoids including rays/sawfish are recorded in Madagascar, including three species classified as CR *Rhynchobatus australiae*, *Rhina ancylostom, Pristis pristis* , seven species classified as EN and eight species VU. (WCS, 2021, unpublished report).

4.4.2 Comoros

. Marine life/Comoros

The coastal and marine fauna of Comoros is rich and includes elements of global importance. However, there are many gaps in the knowledge of this richness. The species associated with coral reefs are very numerous (fish, crustaceans, mollusks, etc.), but they have not been systematically studied. It is estimated that there are nearly 820 species of marine fish (coastal and pelagic) in the Comoros combined.

Endangered marine species

Only one marine mollusk is recognized as endemic to Comoros: *Chiton comorensis*. *Cyprae spp.* mollusks (Porcelain or cowrie shells) are probably the most popular exotic shellfish for their monetary, ornamental, ritual and magical value.

Many species of mollusks are threatened with extinction by illegal and destructive fishing methods (dynamite, D6, "Uruva", *Theophrosia sp*, small mesh size of nets,). Crustaceans such as the green lobster *Palinurus sp.* and the coconut crabs *Birgus latro* appreciated by tourists are among the threatened species.

The Coelacanth

In 1938, *Latimeria chalumnae* or coelacanth was the most extraordinary discovery of the century. This crossopterygian "fossil-living" fish whose origins date back to about 370 million years ago is the predecessor of all terrestrial tetrapod vertebrates and probably of all airborne vertebrates. By its antiquity, the presence of the Coelacanth in the territorial waters of the Comoros is certainly one of the major elements of biodiversity of the region.

The coelacanth habitats are constituted by deep underwater caves (between 170 and 230 m) in the coastal waters of Grande-Comores: along the coasts from Salimani to Sima Mbwani with Itsundzu as the central area. The coasts from Moroni to Hahaya are also areas where catches have been reported. The coelacanth population in Grande-Comores is currently estimated at about 400 individuals.

Marine turtles

Four species of marine turtles frequent the waters of the Comoros: the green turtle *Cheloniamydas*, the hawksbill turtle *Eretmochelys imbricata*, the loggerhead turtle *Caretta* and the leatherback turtle *Dermochelys coriacea*. The green turtle and the hawksbill turtle are endangered species that are the only ones to nest on the islands' sandy beaches.

The strongest reproduction period is around May for the green turtle, and between November and March for the hawksbill turtle. These egg-laying sites are threatened by the increasing human activity in coastal areas (removal of materials such as beach sand for construction, urbanization) and by the predation that some people carry out on turtles for their meat, eggs, oil, carapace and scales, despite the ban.

On Grande Comore, marine turtles are observed in the coastal waters of the island. But only the beaches of Malé, Mbashilé, Maludja and Ivwani show relatively rare traces of egg-laying.

Of the 89 beaches of Mwali with a total length of 26.5 km, about 40% are obvious turtle nesting sites. These are mainly the beaches of Itsamia, Nioumachoua islets, northwest (Nyambo ya wamaoré, Domoni). These beaches benefit from some protection from village associations (Ulanga d'Itsamia, Nioumachoua and Hoani) and the few members of the Environment Department present on the island who carry out voluntary actions for the protection of the sites from sand extraction and turtle predators.

Observation and information units have been installed at Itsamia (Turtle House) and Hoani (small information center) to raise awareness of the need to preserve the species.

Whales and dolphins

In the waters of the archipelago, we meet at least 12 species of whales and dolphins, including one threatened with extinction (*Megaptera novaengliae*). The species *Eubalaena australis* and *Balenoptera edena are* also very often encountered.

The following dolphin species are also present in Comoros: *Soussa chinensis, Stenella longirostris, Tursiops truncatus, Delphinus delphis.*

Whales and dolphins can be found in the southeastern waters of Grande Comore, between Itsandra and Chandini, in the southwestern part of Anjouan off Pomoni and Moya, and in Moheli around the Moheli National Marine Park.

The whales are mainly observed between August and November, period when they come to reproduce.

The Dugong

In general, the dugong is observed between August and October. Its preferred habitat is a coastal lagoon where the coral provides shelter from the rough waters of the open ocean, and where the sandy bottom allows the development of seagrass beds.

Marine mollusks

Some marine shellfish are threatened by various fishing techniques used in Comoros. They are *Choriona tritonis*, *Cipraecassis rufa*, *Cassis cornuta*, *Lambis* sp., *Turbo marmorato*, *Tridacna squamosa*, *Tridacna maxima*, *Hippopus hippopus*, *Pinctada spp.* Only one species, *Chiton comorensis,* is endemic to Comoros.

The richest areas have not yet been inventoried, but they seem to be abundant in the most preserved areas such as Beit Salam in Itsandra, Grande Comore and the islet Mea in Mohéli.

Coastal fish

Coastal fish are species that live in coastal marine waters to a depth of about 200 m. The richness of coastal fish in Comoros is low compared to other countries in the region because of the narrowness of the continental shelf. About 820 species of coastal fish are currently known. The most frequent are : *Chaetodonspp.*, *Pomacanthurus imperator*, *Apolemichthys trimaculatus*, *Abudefduf saxatilis*, the surgeon *Acanthurus leucosternon*, scares, *Dascyllus trimaculatus*, lutjans, *Caesio xanthonotus*, *Pterois* spp, *Pteropterus radiata*, groupers (*Variola louti*), *Myripristis* sp., *Cephalopholis argus* (grouper), red mullet (*Priacanthus hamrur*), moray eels, trevally, and even tunas and sharks. The coelacanth is the only endemic species.

The vast majority of coastal fish live in coral reefs. Others live offshore and regularly come to the corals to feed on small fish.

Offshore fish

The most numerous deep-sea or pelagic fish in the Comoros are: sailfish (*Istiophorus platypterus*), blue marlin (*Makaira mazara*), king mackerel (*Acanthocybium solandri*), skipjack or skipjack tuna (*Katsuwonus pelamis*), yellowfin tuna (*Thunnus albacares*), bigeye tuna (*Thunnus obesus*); salmon comera (*Elagatis bipinnulata*), mackerel (*Selar crumenophthalmus*).

Offshore fish are found off the Comorian waters. They are often migratory fish which regularly come to hunt a few kilometers from the coast.

Octopuses

Octopus can be found in all the coral reefs of the Comoros. But the sites known for their abundance are Mitsamiouli, Chindini, Malé, Nioumachouoi Islands, Wallah, Itsamia, Pomoni, Moya and Ouani.

Sea cucumbers

Holothurians are found on all the sea beds of the Comoros where they are distributed in different zones. The outer slopes and passes are colonized mainly by *Holothuria nobilis*, *H. excellens*, *H. edulis*, *Thelenota ananas*, *Bohadschia argus* and *H. fuscogilva*. *Actinopyga miliaris*, *H. atra*, *H. coluber* and *H. leucospilota are* found on the inner reef flats and *H. cineracens*, *H. impatiens*, *A. mauritiana*, *A. echinites* and *Stichopus variegatus* on the outer reef flats. The outer lagoon is colonized by *B. maculisparsa*, *B. marmorata* and *H. fuscopunctata*. In the bays (mangroves), we find *H. scabra*, *B. vitiensis*, *B. similis* and *H. flavomaculata*.

Lobsters

Several species of lobsters live in the reefs of Comoros: *Palinurus japonicus*, *P. ornatus, P. versicolor* and *P. longipes*. This last species is the most coveted and exploited in Comoros.

The spiny lobster is mostly found on the external slope of the reefs, often taking refuge at the foot of large corals such as *Porites*. It tends to go up at night towards the flats where it easily becomes the prey of fishermen.

Lobsters are found on almost all the reefs of the Comoros.

. Marine flora/ Comoros

The marine flora of the Comoros seagrass beds is ecologically important, because it serves among other things as a support for many fixed organisms (algae, hydraires, bryozoans, ascidians) and as a refuge for many marine species such as gastropods crawling on the leaves, small crustaceans and fishes such as wrasses, scares, *Siganus sp.*, *Lethrinidae* captains swimming in the fronds.

The phanerogam meadows in the Comoros are located within lagoons.

The most frequent species of phanerogams observed on the Comorian coasts are: *Gracilaria, Jania, Lithotamnium, Padina, Ulva, Codium, Halimeda, Halodule, Halophylla, Porolithon, Thalassia, Zostera, Syringodium, Cymodoce sp., C. ciliata* as well as the brown algae *Turbinaria*, *Sargassum*. There are also many algae in this area, some of which are filamentous (turf alguae).

4.4.3 Mauritius

The marine biodiversity literature for the Republic of Mauritius is scattered. Knowledge of marine groups in Mauritius is lacking for many groups, or incomplete for others. Most of the known organisms are coastal dwellers. Little is known about pelagic and benthic groups (Bhikajee 2004). Even under these restrictions, compilations of the literature show that there are about 1700 known marine species in the Republic of Mauritius to date. A checklist of all species names (including synonyms and invalid names) for the different groups by island/atoll can be found on the MOI database (MOI 2007), however, in many cases some records are old and do not specify the sampling locality. Therefore, the distribution of species is, in many cases, only provisional.

. Marine mammals/ Mauritius- Rodrigues

Seventeen species of marine mammals have been recorded in Mauritian waters (Bhikajee 2004). In the territorial waters of the Republic of Mauritius, some whales can be easily observed during their migration to and from Antarctica for calving, such as humpback whales (*Megaptera novaengliae*) and sperm whales (*Physeter macrocephalus*). Some dolphins are resident in the Mauritian lagoon like the spinner dolphin (*Stennella longirostris*) and the bottlenose dolphin (*Tursiops truncatus*).

Dugongs (*Dugong dugong*), once common in the lagoons of Mauritius and Rodrigues, as evidenced by Dutch drawings from the 17th century, have now disappeared. It is possible that they are found in the territorial waters of the Republic of Mauritius, as they have been sighted in Aldabra (Seychelles) and are also present in Madagascar and the Comoros.

. Reptiles/ Mauritius- Rodrigues

Two species of sea turtles (*Chelonia midas* and *Eretmochelys imbricata*) are found in the waters of the Republic of Mauritius. Turtles still use St. Brandon and Agalega for nesting, but this is declining due to hunting, egg collection, and invasive species (Webster & Cadinouche 2013; Griffiths and Tatayah 2006; MWF 2019). Nesting in Mauritius is very rare.

. Fish/ Mauritius- Rodrigues

In the Republic of Mauritius, there are at least 1074 species of fish, of which 5 are endemic and 22 are introduced. 802 species are reef-associated, 73 are pelagic, 44 are deep-sea fishes. 203 are game fishes and 22 are commercial fishes.

In Rodrigues, 493 species of fish have been recorded, including nine new species, two of which are endemic (*Pomacentrus rodriguesensis* and the dotty back *Chlidichthys foudioides*) (Heemstra et al. 2004).

. Marine flora/ Mauritius- Rodrigues

In Mauritius, 435 algae and some 6 seagrass species have been described (Ramah et al 2013).

. Algae/ Mauritius- Rodrigues

Mauritius has a rich algal flora with more than 160 genera identified in the coastal waters. On Rodrigues, 60 red algae (de Clerck et al. 2004), 60 green algae and 18 brown algae have been recorded, but the algae of Rodrigues are considered as a poor flora compared to those of Mauritius (Coopejans et al. 2004).

. Coral reefs/ Mauritius- Rodrigues

The Republic of Mauritius has five types of reefs (fringing reefs, patch reefs, atolls, reef flats and barrier reefs). A total of 159 species of scleractinian corals have been recorded (Pillay et al. 2002), but this number is an underestimate as more species have been discovered recently. There are approximately 750 km2 of coral reef habitat on the whole of Mauritius, with about one-third of the total distributed in each of the following islands: Mauritius, Rodrigues and St. Brandon (Turner & Klaus 2005).

In Mauritius, 163 coral species have been recorded and Rodrigues has a very similar number (130 species including one endemic, *Acropora rodriguensis*) (Ferner et al. 2004). The monitoring of corals in Mauritius shows a strong reduction of the cover during the last years (up to 70%), and a much lower decrease for Rodrigues (Hamada et al. 2008).

Figure 2 Average coral cover on the reef slopes of the western Indian Ocean islands, with Mauritius in red and Rodrigues in yellow (from Hamada et al. 2008).

Crustaceans/ Mauritius- Rodrigues

Twenty-one species of crustaceans are found in Mauritius (Bhikajee 2004). Five species of shrimp of the genus Peneid can be found near the Mauritian coast (Bhikajee 2004; ICZM 2009). In Mauritius, 138 species of gammerid amphipods are known (similar to Hawaii and Fiji), of which 32% are endemic (Appadoo & Steele 1998).

Echinoderms/ Mauritius- Rodrigues

A high degree of endemism (38%) is recorded in Melitidae and Corophiidae for Mauritius. In Rodrigues, 74 species of echinoderms have been recorded, including three species of Crinoidea, 10 species of Asteroidea, 17 species of Ophiuroidea, 15 species of Echinoidea and 29 species of Holothurioidea (Rowe and Richmond 2004).

Mollusks/ Mauritius- Rodrigues

109 species of marine bivalves currently known from Rodrigues, including one endemic species of oyster (*Crassostrea edulis*) (Oliver et al. 2004), have been recorded. This level of diversity is similar to that of Mauritius and Seychelles (Oliver et al. 2004).

4.4.4 Seychelles

The marine biodiversity of Seychelles waters is still poorly studied and researched, especially considering the geographical extent and diversity of the habitats in question. The information contained here therefore considerably under-represents the occurrence of species both because of the lack of research but also because of the absence of authoritative compendia on the work undertaken to date. Marine life in the Seychelles is estimated at a minimum of 3000 species.

. Marine mammals/ Seychelles

There are 26 known cetacean species frequenting the waters around Seychelles, including "endangered" whale species such as the sei whale *(Balaenoptera borealis),* blue whale *(Balaenoptera musculus)* and fin whale *(Balaenoptera physalus),* and "vulnerable" species such as the sperm whale (*Physeter macrocephalus*) and 8 species of dolphins. There is a small but growing population of dugongs (Dugong dugon, classified as Vulnerable by IUCN) of 20-25 individuals found around Aldabra (SIF, in litt.). The dugong is the most threatened marine mammal in the Western Indian Ocean.

. Marine Reptiles/ Seychelles

Five marine turtles can be found in Seychelles waters, all globally threatened. The hawksbill turtle *Eretmochelys imbricata* CR and the green turtle *Chelonia mydas* EN are the most numerous locally, although much reduced compared to historical numbers, and nest on beaches (the former mainly in the granitic archipelago and the latter in the southern islands). Loggerhead turtle *Caretta caretta* EN, leatherback turtle *Dermochelys coriacea* CR and olive ridley turtle *Lepidochelys olivacea* VU (IUCN) do not breed in Seychelles and are occasionally found at sea. A native sea snake *Elasmis platura* is also occasionally found along the coastal seas of Seychelles.

Marine fish/ Seychelles

There is no definitive list of marine fishes for the Seychelles, but it is known that there are about 1,000 species identified to date. Endemism is low, assumed to be about 1%, for example the Seychelles clownfish (*Amphiprion fuscocaudatus*) and the black-eyed emperor (*Lethrinus enigmaticus).* However, there are various regional endemics present in Seychelles waters, such as: Seychelles barbel fish (*Parupeneus seychellensis),* Seychelles squirrel fish (*Sargocentron seychellense*), Seychelles soldier fish (*Myripristis seychellensis*) and Zanzibar butterfly fish (*Chaetodon zanzibarensis*). There are various endangered species, especially among the upper food chain species such as sharks and groupers.

Other marine invertebrates/ Seychelles

The Seychelles have rich marine invertebrates. 450 species of mollusks, 165 species of shrimps, 55 species of sea anemones, 155 species of echinoderms and some 350 species of sponges have been identified thanks to the limited research undertaken.

Table 21 Marine biodiversity: endemism and threatened species in Seychelles

Taxonomic group	Species	Endemic to the Seychelles	Endangered species
Flora			
Macroalgae	350		
Corals	300-350		
Scleractinian Corals	> 300 species (according to the distribution given by Veron in the Atlas of the World's Corals).		*Acropora roseni* EN (IUCN) *Acropora rudis* EN (IUCN) *Acanthastrea hemprichii* VU (IUCN) *Acanthastrea ishigakiensis* VU (IUCN) *Acropora aculeus* VU (IUCN) *Acropora anthocercis* VU (IUCN) *Acropora echinata* VU (IUCN) *Acropora hemprichii* VU (IUCN) *Acropora horrida* VU (IUCN) *Acropora microclados* VU (IUCN) *Acropora pharaonis* VU (IUCN) *Acropora polystoma* VU (IUCN) *Acropora spicifera* VU (IUCN) *Acropora verweyi* VU (IUCN) *Anomastraea irregularis* VU (IUCN) *Catalaphyllia jardinei* VU (IUCN) *Fungia seychellensis* VU (IUCN) *Horastrea indica* VU (IUCN) *Leptoseris incrustans* VU (IUCN) *Montastrea serageldini* VU (IUCN) *Montipora australiensis* VU (IUCN) *Montipora friabilis* VU (IUCN) *Montipora lobulata* VU (IUCN) *Montipora orientalis* VU (IUCN) *Pachyseris rugosa* VU (IUCN) *Pavona bipartita* VU (IUCN) *Pavona cactus* VU (IUCN) *Pavona danai* VU (IUCN) *Pavona venosa* VU (IUCN) *Pectinia africanus* VU (IUCN) *Physogyra lichtesteini* VU (IUCN) *Pocillopora indiania* VU (IUCN) *Turbinaria peltata* VU (IUCN) *Turbinaria stellulata* VU (IUCN)

Taxonomic group	Species	Endemic to the Seychelles	Endangered species
Octocorallian Coral (e.g. blue coral and soft coral)	> 70 species		
Marine Mammals			
Cetaceans	26		*Balaenoptera borealis* EN (IUCN) *Balaenoptera musculus* EN (IUCN) *Balaenoptera physalus* VU (IUCN) *Physeter macrocephalus* VU (IUCN)
Dugong	1		*Dugong dugon* VU (IUCN)
Reptiles			
Marine turtles	5		*Dermochelys coriacea* VU (IUCN) *Eretmochelys imbricata* CR (IUCN) *Caretta caretta* VU (IUCN) *Chelonia mydas* EN (IUCN) *Lepidochelys olivacea* VU (IUCN)
Sea snakes	1		
Marine fish	C. 1000		
Teleosts			
Associated reefs spp	400+	*Amphiprion fuscocaudatus* *Lethrinus enigmaticus*	*Albula glossodonta* VU (IUCN) *Thunnus obesus* VU (IUCN) *Bolbometopon muricatum* VU (IUCN) *Cheilinus undulatus* EN (IUCN) *Epinephelus lanceolatus* VU (IUCN)

Taxonomic group	Species	Endemic to the Seychelles	Endangered species
Elasmobranchs			
Shark	68	*Squalus lalannei*, *Centrophorus seychellorum*	*Sphyrna lewini* EN (IUCN) *Sphyrna mokarran* EN (IUCN) *Carcharhinus longimanus* CR (IUCN) *Carcharodon carcharias* VU (IUCN) *Carcharhinus obscurus* VU (IUCN) *Carcharhinus plumbeus* VU (IUCN) *Carcharias taurus* VU (IUCN) *Centrophorus granulosus* VU (IUCN) *Centrophorus squamosus* VU (IUCN) *Isurus oxyrinchus* VU (IUCN) *Nebrius ferrugineus* VU (IUCN) *Negaprion acutidens* VU (IUCN) *Pseudoginglymostoma brevicaudatum* VU (IUCN) *Rhincodon typus* VU (IUCN) *Sphyrna zygaena* VU (IUCN)
Stingray fish			*Aetomylaeus maculatus* EN (IUCN) *Manta birostris* VU (IUCN) *Himantura uarnak* VU (IUCN) *Rhinoptera javanica* VU (IUCN) *Taeniura meyeni* VU (IUCN) *Urogymnus asperrimus* VU (IUCN)
Guitar fish			*Rhynchobatus djiddensis* VU (IUCN) *Rhina ancylostoma* VU (IUCN)
			Pristis pristis CR (IUCN) - probably extinct in Seychelles waters
Seahorse			*Hippocampus histrix* VU (IUCN)

Taxonomic group	Species	Endemic to the Seychelles	Endangered species
Other			
Crustaceans			
Shrimp	165	*Eupontonia noctalba*[20] , *Jocasta platysoma, Periclimenaeus manihinei, Periclimenes compressus, Periclimenes difficilis.*	
Mollusc			
Bivalves	450		
Echinoderms	c.155		
Sea Urchins	33		
Star fish	32		
Sea cucumber	35		
Crinoides	10		
Ophiuroides	44		
Sponges	c. 350	18 species known only from the Seychelles[21]	

. Corals/ Seychelles

It is estimated that 300-350 species of corals occur in Seychelles, some of which are listed as "endangered", "vulnerable" or "near threatened" on the IUCN Red List. Prior to 1998, Seychelles coral reefs had good live coral cover, roughness and diversity of reef communities. However, the whole scenario changed with the severe ENSO-related bleaching event in 1998. Fast-growing Acroporas and Pocilloporas suffered the most and a phase change from living coral cover to coral rubble/macroalgal dominated reefs was initiated. The impact of coral bleaching has been most severe on the Mahé Plateau, with reefs there experiencing 80-90% mortality of living coral cover. The outer islands - and particularly the southern islands - were generally less affected, with less than 40% coral mortality, perhaps due to easier upwelling of cold water along the steep volcanic slopes and reduced anthropogenic stress around these islands and the atoll corals, as the lagoons naturally have greater temperature tolerance. It took 17 years for the coral reefs of the Seychelles inner islands to recover to pre-bleaching live hard coral cover. However, another mass coral bleaching event that occurred in early 2016 reduced the average coral cover to less than 10%. However, it appears that recovery from the 2016 event was faster than after 1998, a possible sign that corals are becoming more resilient.

20 Bruce A,J. (1971): *Eupontonia noctalba*, A new Pontoniinid Shrimp from Mahe, The Seychelles Islands. Crustaceana Volume 20, No. 3, pp 225-236.

21 GoS 1997: Seychelles National Biodiversity Assessment

5 CONSERVATION OUTCOMES

The Madagascar and Indian Ocean Islands Ecosystem Profile reflects CEPF's commitment to conservation outcomes, allowing it to measure the success of investments as the scientific basis for determining the geographic and thematic focus of its investment.

The profile can be defined at three levels: species, sites and landscapes simplifying a continuous hierarchical spectrum of ecological scales. These three levels are linked geographically, as landscapes contain the sites that support species. They are also linked logically: for a species to be conserved, the site that supports it must be protected, while landscapes or seascapes must be able to continue to provide the environmental services that are essential to them. When these objectives are met, they deliver proven results: "avoided extinctions" (at the species level), "protected areas" (at the site level) and "consolidated corridors" (at the landscape level).

The definition of conservation outcomes follows a bottom-up process, starting with species outcomes and then developing site outcomes and, finally, corridor outcomes. This requires detailed knowledge of the conservation status of each species. While this information has been collected for nearly 50 years in the Global Red Lists developed by IUCN and its partners, there are still gaps in knowledge about the population status of the most threatened species, especially for plants and invertebrates.

The IUCN Red List is widely recognized as the most comprehensive and objective global approach to assessing the conservation status of plant and animal species. It provides information on the taxonomy, conservation status and distribution of plants, fungi and animals that have been assessed globally using the IUCN Red List Categories and Criteria.

5.1 Species outcomes

The IUCN Red List is based on quantitative criteria to estimate the probability of extinction of each species. On the list, species classified as threatened have a high probability of extinction in the medium term. These are species in the categories of Critically Endangered (CR), Endangered (EN) and Vulnerable (VU).

Table 22 Status of threatened species in the MADIO hotspot (IUCN 2021-3, 27 June 2022)

Taxonomic group	Total species assessed	EX Species	EW Species	Species CR	Species EN	Species VU
ANIMALS	**5715**	**101**	**0**	**259**	**569**	**489**
MAMMIFERES	**288**	**5**	**0**	**35**	**64**	**47**
BIRDS	**515**	**37**	**0**	**7**	**35**	**36**
REPTILES	**476**	**14**	**0**	**28**	**64**	**76**
AMPHIBIANS	**329**	**0**	**0**	**23**	**85**	**44**
FISH	**2081**	**2**	**0**	**29**	**58**	**60**
INSECTS	**664**	**2**	**0**	**45**	**82**	**43**
MALACOSTRACA	**123**	**0**	**0**	**0**	**2**	**6**
ARACHNIDES	**213**	**9**	**0**	**40**	**82**	**40**

Taxonomic group	Total species assessed	EX Species	EW Species	Species CR	Species EN	Species VU
DIPLOPODES	**166**	**3**	**0**	**32**	**26**	**9**
MAXILLOPODA	**2**	**1**	**0**	**0**	**0**	**0**
HEXANAUPLIA	**2**	**1**	**0**	**0**	**0**	**1**
CHILOPODA	**10**	**0**	**0**	**3**	**5**	**1**
MOLLUSQUES	**385**	**26**	**0**	**17**	**54**	**45**
CNIDAIRES	**384**	**0**	**0**	**0**	**8**	**76**
ECHINODERMS	**76**	**0**	**0**	**0**	**4**	**5**
NEMERTIN	**1**	**1**	**0**	**0**	**0**	**0**
PLANTS	**5063**	**3**	**2**	**621**	**1462**	**944**
TOTAL	**10778**	**104**	**2**	**880**	**2031**	**1433**

5.1.1 Madagascar

Data on extinction risk comes from scientific publications, species recovery plans, the National Biodiversity Strategies and Action Plans (NBSAP) reference document, field guides, personal communications from researchers, specific work on certain taxa, such as the inventory of Important Plant Areas conducted in Madagascar with CEPF support in the previous phase, and the report "The International Biodiversity Assessment Tool or IBAT".

The species targets are for those that are globally threatened according to the IUCN Red List. As of December 2021, 3058 globally threatened species have been identified for Madagascar, including marine as well as terrestrial and freshwater species. Based on the available data, the level of threats at the specific level appears very high, with nearly 18% of the threatened species in critical danger of extinction. In addition, 14 species have already been declared extinct.

The taxonomic groups included in the definition of species outcomes are shown in the following table:

Table 23 Summary table of the number of species published in the official IUCN Red List (IBAT *08 March 2022*)

Taxonomic group	Total species assessed	Total known threatened species (CR, EN & VU)	EX & EW	CR	IN	VU	NT	LC	DD
ACTINOPTERYGII	1457	80	2	20	33	27	9	1248	118
AMPHIBIA	314	145	0	22	79	44	18	136	15
ANTHOZOA	342	66	0	0	3	63	105	151	20

Taxonomic group	Total species assessed	Total known threatened species (CR, EN & VU)	EX & EW	CR	IN	VU	NT	LC	DD
ARACHNIDA	7	2	0	1	0	1	0	5	0
AVES	279	37	2	2	16	19	20	220	0
BIVALVIA	19	4	3	1	2	1	0	8	2
CEPHALOPODA	37	0	0	0	0	0	0	25	12
CHONDRICHTHYES	72	36	0	7	9	20	13	10	13
CYCADOPSIDA	1	0	0	0	0	0	0	1	0
DIPLOPODA	125	49	0	27	16	6	42	27	7
GASTROPODA	159	31	0	4	18	9	3	110	14
HOLOTHUROIDEA	64	8	0	0	4	4	0	22	34
HYDROZOA	5	0	0	0	0	0	0	5	0
INSECTA	262	29	0	9	12	8	19	116	97
JUNGERMANNIOPSIDA	4	3	0	1	2	0	0	1	0
LILIOPSIDA	874	508	1	160	226	122	43	295	27
LYCOPODIOPSIDA	5	1	0	0	1	0	0	4	0
MAGNOLIOPSIDA	2885	1763	0	242	872	649	132	936	47
MALACOSTRACA	110	6	0	0	1	5	0	73	31
MAMMALIA	266	140	4	36	59	45	3	99	20
MAXILLOPODA	4	1	2	0	0	1	0	0	1
PINOPSIDA	8	5	0	1	4	0	2	0	1
POLYPODIOPSIDA	43	4	0	1	0	3	0	39	0
REPTILIA	395	140	0	25	54	61	47	164	42
TOTAL	**7737**	**3058**	**14**	**559**	**1411**	**1088**	**456**	**3695**	**501**

Taxonomic group	Total species assessed	Total known threatened species (CR, EN & VU)	EX & EW	CR	IN	VU	NT	LC	DD

Red List Categories: EX = Extinct; EW = Extinct in the Wild; CR = Critically Endangered; EN = Endangered; VU = Vulnerable; NT = Near Threatened; LC = Least Concern; DD = Data Deficient.

. Birds

The Madagascar Bird Red List Index has shown a significant decrease since 1988 in the number of species moving into higher threat categories than lower threat categories: Madagascar's birds are increasingly at risk of extinction (ASITY Madagascar and BirdLife International, 2021). Loss of their habitats due to deforestation is the common pressure.

Two species are extinct (EX), including *Tachybaptus rufolavatus* and *Coua delalandei*. *Aythya innotata,* while *Haliaetus vociferoides* are classified as Critically Endangered (CR). 16 species are endangered (EN), belonging to various families such as Vangidae (endemic to the big island), Anatidae and Rallidae. 37 species of land and wetland birds are threatened (IBAT, 2022). The rainforests of eastern Madagascar have the highest number of threatened birds, including the Madagascar snake eagle (*Eutriorchis astur*, EN) and the Madagascar red owl (*Tyto soumagnei*, EN). In the western part, we note the presence of the Madagascar eagle (*Haliaeetus vociferoides*, EN). The endemic birds of the island's wetlands are among the most threatened due to the loss of habitat linked to the expansion of rice cultivation. The establishment of the Madagascar Protected Areas System (SAPM) since 2004 has helped secure some sites for threatened species with restricted distribution. However, 91% of Malagasy birds are on a declining trend (IUCN, 2013).

. Mammals

53% of the known mammals in Madagascar are threatened, including 36 CR mammal species, 59 (EN) and 45 (VU). Primates are the most threatened and the importance of conservation is further reinforced by the uniqueness of this group as well as its exceptional endemicity: the 99 species (divided into 15 genera and 5 families) are all endemic to Madagascar.

. Reptiles

Madagascar has an immense diversity of reptiles with 395 species, of which 140 species are threatened: 25 CR, 54 EN and 61 VU. The two terrestrial and endemic turtles are considered among the most threatened vertebrates in the world (Rhodin *et al.* , 2011). Two snake species are likely extinct (Jenkins *et al.* , 2013): *Pseudoxyrhopus ankafinaensis,* whose habitat is mid- to high-altitude upland rainforest and of which only a few remnants remain: the fragment where the species was found, no longer exists for a long time (Raxworthy and Nussbaum, 1994) and *Compsophis vinckei* represented only by two individuals found in east-central Madagascar, outside protected areas (Jenkins *et al.* , 2013).

. Amphibians

Amphibian assessments were fairly comprehensive. More than 46% of the known amphibians in Madagascar are threatened, and therefore a priority for conservation: (22

CR, 79 EN and 44 VU). Six AZE sites in Madagascar were identified as such, due to the presence of critically endangered amphibians.

. Plants

Currently, 3820 plant species are assessed for their risk of extinction and almost 60% of Malagasy plants are in the threatened categories: 405 CR, 1105 EN and 774 VU (IUCN, 2022. The situation is very worrying for some taxa, such as orchids or palms.

The assessment focused on priority plant groups such as:

Trees that are assessed under BGCI's Global Tree Assessment program (https://www.bgci.org/our-work/projects-and-case-studies/global-tree-assessment/): Approximately 3118 tree species are found in Madagascar, of which 2904 are endemic and 1828 are considered threatened: 320 CR, 911 EN, 597 VU. The main threats to Madagascar are illegal logging, with impacts on 83% of Madagascar's endemic trees (Beech *et al.* 2021).

Aquatic plants, whose assessment results were used to define freshwater KBAs. Of the 169 species assessed for the IUCN Red List, 133 (79%) are threatened: 34 CR; 75 EN and 24 VU. Wetlands are one of the most fragile and threatened ecosystems. Pressures and threats to aquatic plants can be anthropogenic or natural. Anthropogenic activities such as agriculture, landfilling, filling, illegal collection, fires, and urbanization contribute to the degradation of wetlands and their flora (Balmford et al. 2017; Maharombaka et al. 2017). In addition, natural events, such as cyclones and drought, which are exacerbated by climate change, and invasion by exotic species are also major threats to freshwater habitats and species

5.1.2 Comoros

The IUCN has identified 157 species in its Red List of Threatened Species including flora, terrestrial and aquatic fauna. The species are classified in 3 categories according to the established criteria (see complete list of species in appendix) .

Table 24 Comoros: Summary of threat status by taxon according to IUCN (2021-3)

TAXON	CR	IN	VU	TOTAL
Plants	2	8	6	16
Mammals	2	2	4	8
Birds	0	13	3	16
Reptiles	1	1	7	9
Amphibians	0	0	0	0
Fish	4	12	14	30
Invertebrates	1	10	67	78
TOTAL	**10**	**46**	**101**	**157**

Generally speaking, the most serious threat to the conservation of Comorian fauna and flora, especially those endemic or threatened, is the destruction of their habitats.
However, other threats exist such as exploitation for food, commercial export, souvenir collection, etc.

In Comoros, no species has been extinguished. The 6 critically endangered species (CR) belong to 4 taxonomic groups:

- Plants: *Ravenea moorei* (PALMAE), a large palm of high altitude rainforests.
- Birds: They are all in the family of STRIGIDAE, of genus *Otus*. They are *O. capnodes, O. moheliensis and O. pauliani.* It should be noted that for this genus *Otus*, each of the three islands of the Union of the Comoros shelters an endemic species of the island and at the same time in critical danger. They can be observed in the highlands of the Karthala massif in Grande-Comores in the highlands of Mohéli and Anjouan.
- Reptiles: *Eretmochelys imbricata* (CHELONIIDAE). It is the green turtle, well present in the Comoros archipelago but highly threatened because of excessive poaching.
- Marine fish: *Latimeria chalumnae* (LATIMERIIDAE) or Coelacanth. Species present in the Indian Ocean, the Comoros have the privilege to host the main natural habitat of this species in the marine caves in the south of the island of Grande Comore where it has been counted about 400 individuals, a population that would be viable only in conditions of protection.

Only a few species are legally protected in Comoros: coelacanth, marine turtles, lemurs, shells and corals. The existing hunting, fishing and logging laws date from the colonial period and all of them should be revised. For example, the Livingstone dogfish was listed as a pest species.

5.1.3 Mauritius

The Republic of Mauritius has two of the most ecologically devastated islands in the world, with approximately less than 1.3% good forest cover in Mauritius (Hammond *et al.* 2015) and none in Rodrigues. Past deforestation, overexploitation, invasion by exotic species, and fire have resulted in high levels of extinction (Hammond *et al.* 2015; Norder *et al.* 2017). Although many species are not yet on the official IUCN Red List, the percentage of species threatened sensu IUCN (2001) is relatively well known for the different groups, based on distribution data and threats. Today, the majority of island endemic species are threatened. For example, Mauritius has one of the highest concentrations of threatened bird species in the world (Safford 2001). Mauritius also has one of the most threatened island floras in the world (Walter & Gillet 1998), with approximately 80% of the endemic flora of Mauritius and Rodrigues considered threatened (Baider et al. 2010).

Table 25 Number and percentage of threatened category according to IUCN Red List criteria (2022) for single island endemic species belonging to different taxonomic groups

Taxonomic group	Distribution	Off	Critically Endangered	In danger	Vulnerable	Total	Existing endemic species	% endangered species
Angiosperms1a	**Endemic to Mauritius**	**18 (including possible "off" status (E) and (W)**	**13**	**4**	**1**	**18**	**281 (evaluated)**	**84%**
Angiosperms1b	**Endemic to Rodrigues**	**18 (including one E(W) species)**	**11**	**3**	**0**	**14**	**33**	**88%**
Mammals2	**Endemic* Rodrigues-Mauritius**	**1**		**1**	**2**	**3**	**4**	**75**
Land birds2	**Endemic to Mauritius**	**12**	**0**	**0**	**0**	**0**	**9**	**78%**
Reptiles3	**Endemic to Mauritius**	**5**	**0**	**4**	**2**	**6**	**11**	**82%**
Butterflies4	**Endemic to Mauritius**		**0**	**0**	**0**	**0**	**4**	**25%**
Mollusks5	**Endemic to Mauritius**		**0**	**4**	**2**	**6**	**53**	**90%**
Mollusks	**Endemic to Rodrigues**		**0**	**4**	**1**	**6**	**8**	**50%**

. Mammals

The Mauritius-La Réunion endemic fruit bat *Pteropus niger has* been legally protected in Mauritius since the early 1980s. The species plays a disproportionately important key ecological role as the largest surviving frugivore on the island (Hansen and Galetti 2009; Florens et al. 2017; Albert et al. 2021), being the only surviving animal capable of dispersing the seeds of a number of native plant species. The species was downlisted from Endangered (Florens 2012a) to Vulnerable (Hutson & Racey 2013), based on population and roost site increases, and has reverted to Endangered following mass culls since 2015 (Kingston *et al.* 2018). This initial downgrade was attributed to population increases due to the lack of a major cyclone in the previous decade. However, the species has remained endangered due to the continued decline in the extent and quality of good native forest cover (Florens 2008; Florens *et al.* 2012); and because the species is highly vulnerable to stochastic events such as cyclones; and due to official culling programs (Kingston *et al.* 2018), which are supported by local fruit growers and the majority of the Mauritian population who perceive the species as a pest.

The endangered Mauritius-Rodrigues endemic fruit bat *Pteropus rodricensis* is the smallest living fruit bat in the Mascarene Islands and currently survives only in Rodrigues. The species has been elected one of the seven wonders of the Alliance for Zero Extinction (AZE) campaign. The main resting places are outside the protected areas.

. Birds

Although Mauritius is relatively poor in species numbers, it has a large proportion of endemic taxa, almost all of which are threatened. Mauritius has one of the highest concentrations of threatened bird species in the world (Safford 2001). All endemic threatened species are restricted-range species that belong to the *Mauritius Endemic Bird Area* (EBA 102), which covers the entire island. The Rodrigues Island Warbler (*Acrocephalus rodericanus*) and the Rodrigues Foudi (*Foudia flavicans*) are now considered as Near Threatened by the IUCN and belong to the Rodrigues EBA 103.

More recently, increased and successful attention has been given to two of the most threatened endemic passerines (Jones 2008), the Mauritius cardinal (*Foudia rubra*) and the spectacled bird (*Zosterops chloronothos*). Other landbird species such as the Mauritian Cookbird (*Coracina typica*), Mauritian Bulbul (*Hypsipetes olivaceus*), and Mauritian Woodcock (*Terpsiphone bourbonnensis ssp desolata*) are threatened by exotic predators, as well as poor and degrading habitat quality.

. Reptiles

In Mauritius, seven endemic reptile species are restricted to remaining populations on offshore islets, with some surviving on single islets. To rebuild the reptile community on the islets, conservation programs have been initiated since 2006 through the Mauritius Reptile Recovery Programme, a partnership between the Durrell Wildlife Conservation Trust, Mauritius Widlife Foundation and the National Park and Conservation Service.

A total of six endemic reptile species were re-established on the islets where they had been extirpated, increasing their abundance and distribution. The species are: Telfair's skink (*Leiolopisma telfairii)*, Gunther's gecko (*Phelsuma guentheri*), Round Island boa (*Casarea dusumieri*), Bojer's skink (*Gongylomorphus bojeri*), small nocturnal gecko (*Nactus coindemirensis*), and orange-tailed skink (*Gongylomorphus* cf *fontenayi*).

Telfair's skink and Gunther's gecko, which were only found on Ile Ronde, have been reintroduced on Coin de Mire and Ile aux Aigrettes. The current population of Telfair's skink (*Leiolopisma telfairii*) is estimated at about 56,202 individuals[22] , and Gunther's gecko (*Phelsuma guentheri*) at about 2347 individuals[23] .

Bojer's skink (*Gongylomorphus bojeri*) from Vacoas Island has been reintroduced on Ile aux Fouquets and Ile de la Passe, and the small nocturnal gecko (*Nactus coindemirensis*) from Vacoas Island on Marianas Island. Bojer's skink is currently found on Round Island, Pigeon Rock, Gabriel and Gunners Quoin Islands, Serpent Island, Vacoas Islet, Ile aux Fouquets, and Ile de la Passe and the population is estimated at 128,996 individuals[24] .

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[22] Cole, N., Goder, M., Roopa, P., Bachraz, V., & Mootoocurpen, R. (2018) *Leiolopisma telfairii*. The IUCN Red List of Threatened Species 2018: e.T11409A13482880. http://dx.doi.org/10.2305/IUCN.UK.2018-2.RLTS.T11409A13482880.en

[23] Cole, N., Outlaw, L., Vencatasamy, D. & Mootoocurpen, R. 2018. *Phelsuma guentheri*. The IUCN Red List of Threatened Species 2018.

[24] Cole and Payne 2015 Cole, N., Mootoocurpen, R., Roopa, P., & Ruhomaun, K. (2021) *Nactus coindemirensis*. The IUCN Red List of Threatened Species 2021: e.T40795A13482515

The Ile Ronde boa, restricted to Ile Ronde, was reintroduced to Coin de Mire in 2012, and an increase in abundance and distribution of this species was noted on the island following this intervention. The population on Ile Ronde and Coin de Mire is estimated at 1818 individuals[25] .

Gongylomorphus fontenayi is a reptile endemic to Mauritius. There are two forms: the highland macchabee skink and the lowland orange-tailed skink. The Macchabé skink is restricted to the humid highland region of the Black River Gorges National Park in the southwest of the island[26] . The range of the species in the Black River Gorges National Park is considered to be declining, as it is mainly restricted to native vegetation that is degraded by the invasion of non-native plants, particularly the guava *Psidium cattleyanum*.

The orange-tailed skink was only known naturally from Plate Island (2.53 km^2) after being discovered in 1995. Although the orange-tailed skink is treated as a separate management unit, it has not yet been formally identified and is currently considered to be a variant of the skink (*Gongylomorphus fontenayi)*. The Plate Island orange-tailed skink population (estimated at 25,000 individuals) disappeared in 2011, 15 months after shrews, an invasive predator of small reptiles, were detected on the island[27] . Skinks were reintroduced on Coin de Mire (where Ilot Gabriel is located) to save the population and prevent extinction. The population has increased considerably on Coin de Mire and the species is now established there, but few skinks have been detected on Gabriel Island.

. Invertebrates

Forty species of butterflies have been recorded in Mauritius, ten are non-resident, rare or even extinct. The remaining 30 species are common in Mauritius. In total, 25 species are widespread in Africa and elsewhere, and seven are unique to Mauritius or the Mascarene Islands (Williams 2007). 12 species of butterflies have been recorded in Rodrigues, and five in Agaléga.

Several new species of land snails have been described recently (Griffiths and Florens 2004), but they are mostly extinct. There are a few rare cases where extinct land snail species have been relocated (Florens and Baider 2007), although the populations of these species are small and therefore critically endangered.

. Plants

A preliminary IUCN red list compiled in 2005-2006 for about 50% of the higher plant taxa in Mauritius showed that 95.5% of the 353 taxa would be considered threatened, but these included species and subspecies and varieties endemic to the Mascarenes (Atkinson & NTPTC 2007). When only island endemics are listed, and adding more recent data, the percentage of threatened species was less than 82% in 2014 (table based on Baider & Florens, unpublished data). Nevertheless, nearly 20% of critically endangered species had fewer than 10 known individuals in the wild (17-18 taxa), some of which had only one plant left. In 2016-2017, as part of the IUCN Mascarene Islands Plant Specialist Group (MIPSG),

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[25] Cole, N., Hector, A., Roopa, P., Mootoocurpen, R., & Goder, M. (2018) *Casarea dussumieri*. The IUCN Red List of Threatened Species 2018: e.T3989A13482412. http://dx.doi.org/10.2305/IUCN.UK.2018-2.RLTS.T3989A13482412.en

[26] Cole et al. 2014; Cole 2021 Gongylomorphus fontenayi. The IUCN Red List of Threatened Species 2021: e.T9316A13482739

[27] Cole, N. (2021) *Gongylomorphus fontenayi*. The IUCN Red List of Threatened Species 2021: e.T9316A13482739

the endemic plants of Mauritius were reassessed in collaboration between MWF, NPCS, and the Mauritius Forestry and Herbarium Service. An unpublished assessment of the work is available. It shows a decline in the status of plants in Mauritius, despite some conservation actions.

Fortunately, on average, one native taxon that had not been seen for over a century and was thought to be extinct has been rediscovered in the last decade, including angiosperms and ferns. They include critically endangered species such as the endemic Malvaceae *Trochetia parviflora* (Florens *et al.* 2001), the endemic Pandanaceae *Pandanus iceryi* and *P.* cf. *macrostigma* (NWFS 2005), the endemic Acanthaceae *Dicliptera falcata* (Florens and Baider, unpublished data), the endemic Mascareignes Moraceae *Ficus densifolia* (Florens and Baider 2006), the endemic *Primulaceae Badula ovalifolia* (Florens *et al.* 2008), the endemic *Ixora vaughanii* (Baider and Florens 2011), the endemic *Pandanus pyramidalis* and the native orchid *Nervilia bicarinata* (Baider and Florens 2011), among others. In addition, new records of native species (Roberts *et al.* 2004, Baider *et al.* 2012) and new species are being discovered and described (Bosser and Guého 2002, Le Péchon *et al.* 2011, Pailler and Baider 2012, Baider and Florens 2013), but these are considered critically endangered (and in little or no cultivation). Recent quantitative surveys indicate that the remaining number of individuals of some endemic species is higher than previously thought, although they remain critically endangered (e.g., *Chasalia grandiflora*, *C. lanceolata* (Baider and Florens 2011), or *Pandanus pseudomontanus*, *Elaeocarpus bojeri*, *Tetrataxis salicifolia*, etc. (Florens and Baider, unpublished data), or *Roussea simplex*. In very few cases, improved knowledge has improved the overall conservation status (e.g., *Sideroxylon grandiflorum*, Florens and Baider 2006), including the relocation of species thought to be extinct in the wild (e.g., *Dombeya mauritiana*, Florens 2009).

The percentage of threatened species for Rodrigues is similar to that of Mauritius, as was the case in the previous ecosystem profile (CEPF 2014). However, proportionally, more species are known to be extinct. Unlike Mauritius, no presumed extinct species have been displaced, mainly because there are almost no remnants that have not been studied. On the other hand, many rocky valleys ("cascades") are dangerous to study and a number of plants are very small (e.g. *Hypoestes inconspicua*, *H. rodriguesiana* and *Ramphogyne rhynchocarpa*) and would be difficult to detect. In addition, fewer new species have been described (e.g. *Cynanchum guehoi* (Bosser and Marais 2005)). The percentage of endemic species with fewer than 10 individuals in the wild is higher (about 37%) compared to Mauritius, which has two endemic species, *Ramosmania rodriguesii* (Strahm 1989) (although there has been great progress in cultivation and reintroduction to reserves) and *Dombeya rodriguesiana* (Tatayah *et al.* 2021) (known from a single individual in the wild and not reproducing naturally), as well as a native liana *Gouania laxiflora* that was considered endemic until recently (*G. leguatii*, see Buerki *et al.* 2011).

Some of the wild-extinct Mauritian endemics, such as *Cylindrocline lorencei,* have been successfully propagated abroad, in France (Conservatoire Botanique de Brest) and the United Kingdom (Royal Botanic Gardens, Kew) and in France (Conservatoire Botanique de Brest), with some individuals repatriated, but effective reintroduction into the wild is still being attempted. The same is true for *Dombeya rodriguesiana* (Tatayah *et al.* 2021), which is in fact "extinct in the wild". In contrast, *Ramosmania heterophylla*, an endemic relative of Rodrigues coffee is on a better trajectory. Once considered extinct, the species is now cultivated in Rodrigues and Mauritius, as well as in a few other botanical gardens, including Kew (England).

The National Tropical Botanical Garden of Hawaii also has a number of endangered species from both islands.

5.1.4 Seychelles

Approximately 476 terrestrial species are considered globally threatened in Seychelles. The list includes 61 plants and 415 animals.

At least 22 endemic species have become extinct since 1900, including two vascular plants, sixteen terrestrial/freshwater invertebrates (snails), one reptile (*Pelusios seychellensis*), and three birds (*Nesillas aldabrana*, *Zosterops semiflavus* and *Psittacula wardi*). Between 1 and 3 additional reptile species (giant Seychelles tortoises and granitic island crocodiles) are known to have disappeared in the early 19th century, as well as probably several other bird or reptile species before they could be described (probably brought by early navigators), after humans and rats had colonized most of the islands in the 18th century. In addition, six other native plant species-some with subspecies endemic to Seychelles-appear to have become extinct in Seychelles (Senterre *et al.* 2013), but because they continue to exist in other places, they cannot be considered globally extinct.

Table 26 Number of threatened terrestrial species by category for each taxonomic group in Seychelles (adapted from IUCN Red List 2022-1)

	CR	**I**N	**V**U	**TOTA**L	**Of**f
Plants	17	13	31	61	2
Invertebrates	76	133	114	323	16
Fish	7	14	27	48	0
Amphibians	2	4	0	6	0
Reptiles	2	6	4	12	1
Birds	2	6	11	19	3
Mammals	1	2	4	7	0
TOTAL	107	178	191	476	22

Fourteen vertebrates are critically endangered, including: the Seychelles Emballonure bat, locally known as the banana bat (*Coleura seychellensis*), considered the rarest bat in the world (c. 60 ind. can only survive in 5-6 caves between Mahé and Silhouette); Thomasset's frog (*Sooglossus thomasseti*) and Seychelles palm frog (*Sooglossus pipilodryas*), whose distributions are restricted to the peaks of Mahé and/or Silhouette. Two rare turtles described as endemic forms (now questioned by genetic studies) *Pelusios castanoides intergularis* and *P. subniger parietalis* have sometimes been designated as critically endangered, but only at the subspecies level.

There are about 76 CR of terrestrial and freshwater invertebrates known to date (a minimum, knowing that many invertebrate species are yet to be discovered), among which several endemic snails: *Pachnodus oxoniensis*, *Conturbatia crenata*, *Dupontia levensonia*, *Glabrennea silhouettensis* and *G. thomassetti*. On Aldabra, the endemic snail *Rachistia aldabrae*, declared extinct in 2007 because it had not been found for about a century, was rediscovered in 2015 (SIF, pers. com.). There are also a large number of CR species (17) in plants: Medusa Wood (*Medusagyne oppositifolia*) or Iron Wood (*Vateriopsis sechellarum*), of which only a handful of mature trees are known, Lemon Wood (*Rothmania annae*), found only on Arid in the wild, two types of Banana Wood/Papaya Wood (*Gastonia sechellarum* var. *contracta/curiosae*), Wild Balsam *(Impatiens gordonii)*, Small-leafed Tidewood (*Drypetes reseleyi*), etc.

Endangered species include 2 birds endemic to Seychelles: the Seychelles Shama (*Copsychus sechellarum*) (about 350 individuals in 5 islands, increasing) and the *Foudia aldabrana*, and 2 species endemic to the western Indian Ocean: White Crab (*Ardeola idae*) and Malagasy Ibis (*Threskiornis bernieri*); five endemic reptiles: the Seychelles Chameleon (*Archaius tigris*) (Mahé and Praslin), plus a new species of *Archaius* recently identified from Praslin (Raxworthy *et al. in* prep.), the Seychelles wolf snake (*Lycognathophis seychellensis*), the Seychelles house snake (*Lamprophis geometricus*), and Vesey-fitzgerald's and Brauer's burrowing skinks (*Janetaescincus veseyfitzgeraldi* and *J. braueri*); as well as 4 endemic amphibians: Gardiner's frog (*Sechellophryne gardinieri*), Seychelles frog (*S. sechellensis*), Mahé's Cecilian (*Grandisonia brevis*) and Cooper's black Cecilian (*Praslinia cooperi*). A total of 133 threatened terrestrial and freshwater invertebrates include species such as the endemic snails *Stylodonta studeriana* and *Pachnodus fregatensis*, the butterfly *Euploea mitra* or the damselfly *Allolestes maclachlani*. Threatened vascular plants (13) include the emblematic Bilembi maron (*Colea seychellarum*), Bigwood mangrove (*Glionetia sericea*) and the Coco-de-mer (*Lodoicea maldivica*).

Vulnerable species include a bat *Mops pusillus*; eleven bird species: Seychelles Tchitrec (*Terpsiphone corvina*) (350-506 ind, 2020) on La Digue Island, Denis Island (introduced in 2008, 84 birds in 2019) and Curieuse Island (26 birds reintroduced in 2018), Seychelles Kestrel (*Falco araea*) (ca. 430 pairs), Seychelles Salangane (*Aerodramus elaphrus*) (only 3 known breeding caves), Seychelles White-eye (*Zosterops modestus*) (ca. 500-600 individuals on 4 islands) plus Seychelles Black Parrot (*Coracopsis barklyi*), 500-900 ind. on a single island; Reuleux et al. 2013); four reptiles: the Aldabra Giant Tortoise (*Geochelone aldabrensis*) (ca. 100,000 individuals on Aldabra plus numerous small translocated populations, all threatened by climate change), Wright's Skink (*Trachylepis wrightii*), Leatherback Turtle (*Dermochelys coriacea*), and *Cryptoblepharus aldabrae.*

The 114 vulnerable invertebrates include snail species such as *Stylodonta unidentata*, *Pachnodus praslinus*, and *Silhouettia silhouettae*. However, the lack of data (abundance, trends) severely limits the ability to make Red List assessments of data for invertebrates, and it is likely that the list of threatened invertebrates would be much longer if more surveys and taxonomic work could be conducted.

The 31 vulnerable vascular plants include three endemic palms, as well as rare endemic species such as Bois banane (*Gastonia crassa*), Bois cateau (*Brexia madagascariensis*), Bois dur blanc (*Canthium carinatum*), Bois couleuvre (*Psychotria pervillei*), Bois dur bleu (*Tarenna sechellensis*), Bois cafoul trois feuilles (*Allophyllus sechellensis*), and Vacoa de rivière (*Pandanus balfouri*), etc.

The Seychelles Reedwing (*Acrocephalus sechellensis*) (over 3000 individuals on 5 islands), once Critically Endangered with only 29 surviving birds on Cousin Island, has been progressively downgraded and is now considered Near Threatened (NT). Similarly, the

Seychelles Fody, with a population of over 2300 individuals on 5 islands, has also been downgraded from VU and is now NT[28] .

Finally, a minimum total of 131 marine species are considered globally threatened in Seychelles, according to the IUCN Red List 2022 database. This includes 97 vulnerable species, 26 endangered species and 8 critically endangered species. The majority of these threatened species are corals (60 sp., all VU, except 2 EN), 48 fishes, including 17 sharks (3 EN, 4 CR and 10 VU), nine sea urchins (5 VU and 4 EN), four marine mammals, including three whales (2 VU and 1 EN) and one Sirenian (VU), and three sea turtles (1 CR, 1 EN and 1 VU). However, these statistics need to be updated. Indeed, additional research is needed to compile a complete list of the threatened marine biodiversity of the Seychelles, as there is currently no authoritative compendium. Existing search engine formats do not allow for this type of geographically focused search and research documents/reports are held in various agencies, often overseas. The 31 vulnerable vascular plants include three endemic palms, as well as rare endemic species such as Bois banane (*Gastonia crassa*), Bois cateau (*Brexia madagascariensis*), Bois dur blanc (*Canthium carinatum*), Bois couleuvre (*Psychotria pervillei*), Bois dur bleu (*Tarenna sechellensis*), Bois cafoul trois feuilles (*Allophyllus sechellensis*), and Vacoa de rivière (*Pandanus balfouri*), etc.

5.2 Site outcomes

KBAs are sites that support populations of at least one globally threatened, restricted, biome-limited, or large aggregation species. The following table shows the distribution of KBAs within the Hotspot.

Table 27 Distribution of Key Biodiversity Areas (KBAs) of the MADIO Hotspot by country

	Madagascar	Comoros	Maurice	Seychelles	**TOTAL**
Updated number of KBAs	235	20	17	57	329
Land area (ha)	6 872 323	36 500	37 853,4	192 838,2	7 139 514,6
Marine area (ha)	2 285 924	149 452,9	43 793,7	11 779,8	2 490 950,4
Total area (ha)	9 158 307	185 952,9	81 647,1	204 617,9	9 630 524,9

5.2.1 Madagascar

Key Biodiversity Areas in Madagascar

In 2014, the criteria for identifying the 212 KBAs varied from institution to institution and from project to project or initiative to initiative. The lack of harmony between the different approaches sometimes makes it difficult to assess the objectivity, transparency and rigor in their identification. For example, at the IUCN level, a KBA standard was developed and published in 2016 to consolidate the criteria and methodology for identifying key areas for

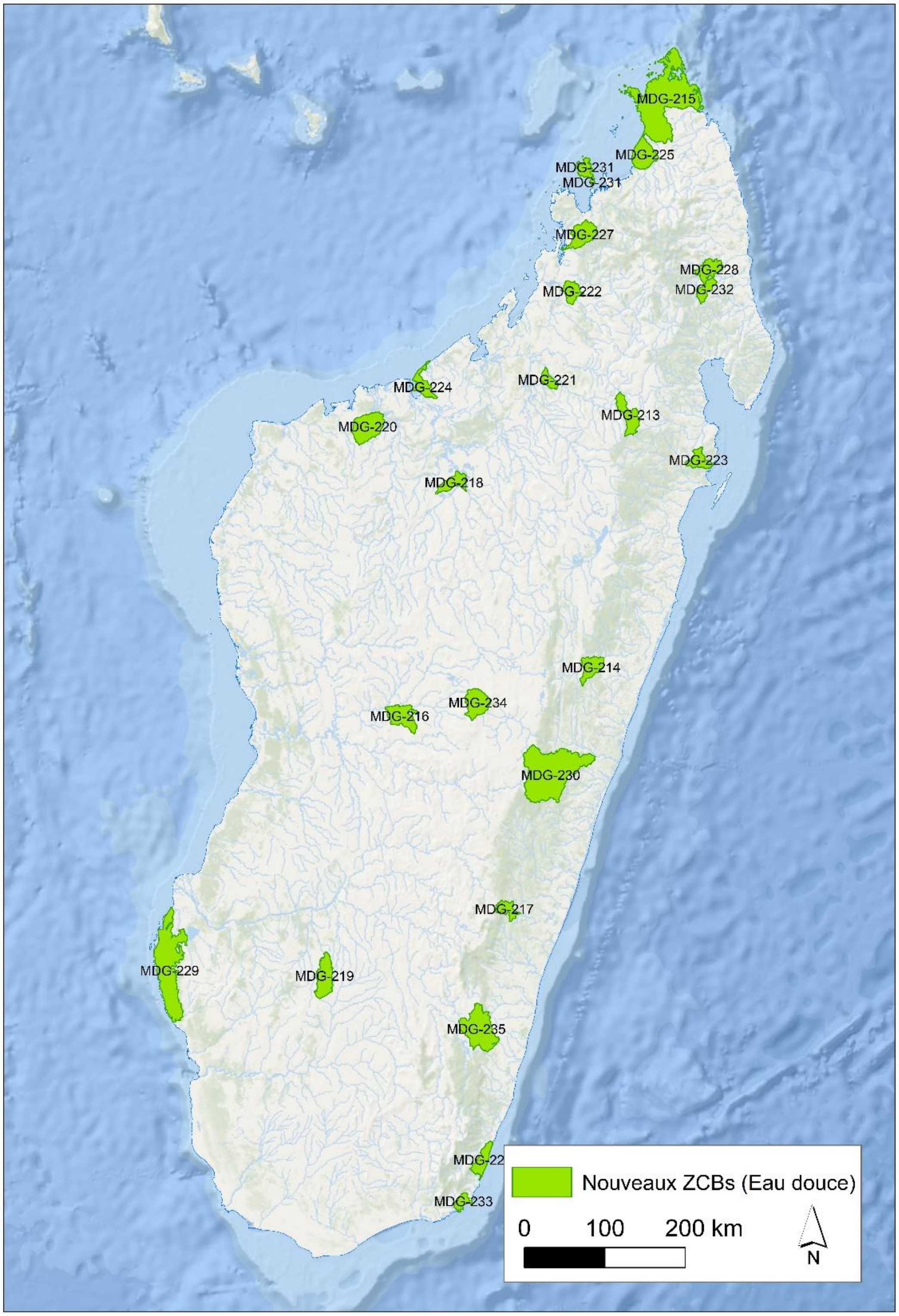
28 Note: An additional number of species were considered for identifying KBAs and these species are named "species, of conservation concern" by Senterre et al. (2013). Of a total of 1045 species of concern classified in various rarity categories, most are endemic to Seychelles (73%). Species considered "rare" (618 species) represent 59% of all recorded species of concern and 18% of the total estimated number of native species among the groups included in the KBA study. Of these rare species, 488 (80%) are endemic and 60 (10%) are highly threatened (IUCN categories EX, CR, EN).

KBA as sites that contribute significantly to global biodiversity persistence. In Madagascar, all protected areas are KBAs.

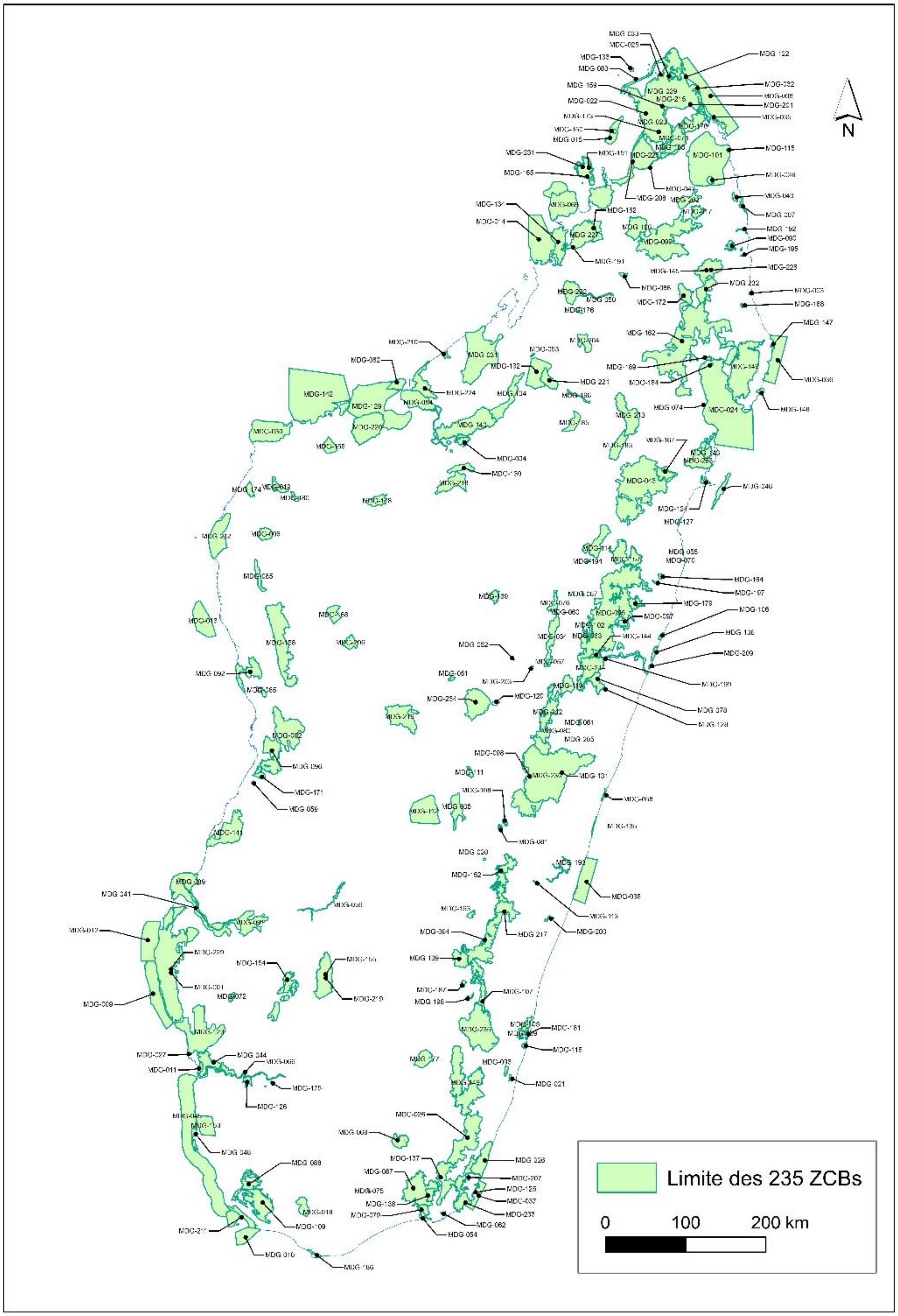
In 2018, the first application of this standard in Madagascar was conducted on freshwater ecosystems under the leadership of the IUCN Freshwater Department with local and international expert partners. The exercise resulted in the identification of 23 new freshwater KBAs important for river, lake and wetland systems. Most of these are in the northwestern freshwater ecoregion and the eastern highlands of Madagascar that include livelihoods, according to the Madagascar Atlas Resilience (CI, 2014).

The number of KBAs in this analysis is 235 (212 original and 23 additional).

The 212 KBAs identified in the 2014 analysis reported without any changes and the 23 new ones are shown in the following two maps and the following table lists these **235** KBAs.



Map 1 The new KBAs (Wetlands)



Map 2 The 235 KBAs of Madagascar updated in 2022

Table 28 List of 235 Key Biodiversity Areas in Madagascar (2022)

KBA/KBA ID#	KBA (French name)	KBA (English name)
MDG-1	Mikea Protected Area	Mikea Protected Area
MDG-2	Ambalimbe Menabe	Ambalibe Menabe
MDG-3	Ambanitazana (Antsiranana)	Ambanitazana (Antsiranana)
MDG-4	Ambato-Boeny	Ambato-Boeny
MDG-5	Ambatofinandrahana	Ambatofinandrahana
MDG-6	Ambereny	Ambereny
MDG-7	Ambondrobe (Vohemar)	Ambondrobe (Vohemar)
MDG-8	MPA of Ambodivahibe Bay	Ambodivahibe Bay MPA
MDG-9	North Salary MPA	North Salary MPA
MDG-10	MPA of Nosy Ve Androka	Nosy Ve Androka MPA
MDG-11	Tsinjoriake-Andatabo MPA	Tsinjoriake-Andatabo MPA
MDG-12	Velondriake MPA	Velondriake MPA
MDG-13	Barren Islands MPA	Barren Islands MPA
MDG-14	AMP Iranja-Ankazoberavina-Russian Bay	Iranja-Ankazoberavina-Russian Bay MPA
MDG-15	AMP Mitsio-Tsarabanjina	Mitsio-Tsarabanjina MPA
MDG-16	Ampombofofo	Ampombofofo
MDG-17	Andravory (Andrafainkona)	Andravory (Andrafainkona)
MDG-18	Anena (Beloha)	Anena (Beloha)
MDG-19	Angodoka-Ambakoa (Besalampy)	Angodoka-Ambakoa (Besalampy)
MDG-20	Ankafina (Ambohimasoa)	Ankafina (Ambohimasoa)
MDG-21	Ankarabolava-Agnakatriky	Ankarabolava-Agnakatriky
MDG-22	Antanifotsy North (Diana)	Antanifotsy North (Diana)
MDG-23	Antanifotsy South (Diana)	Antanifotsy South (Diana)
MDG-24	Antongil Bay	Antongil Bay
MDG-25	Diego Bay	Diego Bay
MDG-26	Beampingaratsy	Beampingaratsy
MDG-27	Belalanda	Belalanda
MDG-28	Bobakindro (Salafaina)	Bobakindro (Salafaina)
MDG-29	Cap d'Ambre	Cap d'Ambre
MDG-30	Cape Saint Andrew	Cape Saint Andrew
MDG-31	Mahajamba Bay Complex - Anjavavy	Mahajamba Bay - Anjavavy Complex
MDG-32	Rigny Bay Complex	Rigny Bay Complex
MDG-33	Three Bays Complex	Three Bays Complex
MDG-34	Anjozorobe-Angavo-Tsinjoarivo Corridor	Anjozorobe-Angavo-Tsinjoarivo Corridor
MDG-35	East coast of Antsiranana	Coastal area East of Antsiranana
MDG-36	Coast from Antalaha to Mahavelona	Coastal area between Antalaha-Mahavelona
MDG-37	Lokaro, Cape Antsirabe, Bay of Gallions, Cape Malaimpioka, Coastal Cape of the Sainte Marie coast	Lokaro, Cape Antsirabe, Bay of Gallions, Cape Malaimpioka, Cape Sainte Marie coastline
MDG-38	Mananjary Coast	Mananjary coast
MDG-39	Efatsy (Farafangana)	Efatsy (Farafangana)
MDG-40	Fanambana (Vohemar)	Fanambana (Vohemar)
MDG-41	Mangoky River	Mangoky River
MDG-42	Classified Forest of Onive	Onive Classified Forest
MDG-43	Classified forest of Bidia-Bezavona	Bidia-Bezavona Classified Forest
MDG-44	Saint-Augustin Forest	Saint Augustine Forest

KBA/KBA ID#	KBA (French name)	KBA (English name)
MDG-45	Great reef of Toliary	Toliary Great Reef
MDG-46	Sainte-Marie Island (Ambohidena)	Sainte-Marie Island (Ambohidena)
MDG-47	Ilevika (Matsaborilava)	Ilevika (Matsaborilava)
MDG-48	Itampolo West - Mahafaly	West Itampolo - Mahafaly
MDG-49	Lake and River of Andranomalaza	Lake and river Andranomalaza
MDG-50	Lake Andrapongy and Anjingo River	Lake Andrapongy and Anjingo River
MDG-51	Lake Itasy	Lake Itasy
MDG-52	Lake Tsarasaotra	Lake Tsarasaotra
MDG-53	Lake Tseny	Lake Tseny
MDG-54	Anony and Erombo Lakes	Lakes Anony and Erombo
MDG-55	Mahatsara (Mahambo Foulpointe)	Mahatsara (Mahambo Foulpointe)
MDG-56	Makay	Makay
MDG-57	Mandraka	Mandraka
MDG-58	Nankinana (Ambodibonara-Masomeloka)	Nankinana (Ambodibonara-Masomeloka)
MDG-59	Allée des Baobabs	Avenue of the Baobabs NPA
MDG-60	Ambakoana/Analabe	Ambakoana/Analabe NPA
MDG-61	Ambatofotsy (Anosibe An’Ala)	Ambatofotsy (Anosibe An’Ala)
MDG-62	Ambatotsirongorongo	Ambatotsirongorongo
MDG-63	Ambohidray	Ambohidray
MDG-64	Ambohipiraka	Ambohipiraka
MDG-65	Ambondrobe (Belo on Tsiribihana)	Ambondrombe (Belo on Tsiribihana)
MDG-66	Amoron’i Onilahy and Onilahy River	Amoron’i Onilahy and Onilahy River
MDG-67	Ampananganandehibe-Beasina (Andilanatoby)	Ampananganandehibe-Beasina (Andilanatoby)
MDG-68	Ampasindava - East	Ampasindava - Rigny Bay (East)
	Rigny Bay	
MDG-69	Anadabolava-Betsimalaho (Anosy)	Anadabolava-Betsimalaho (Anosy)
MDG-70	Analalava Foulpointe	Analalava Foulpointe
MDG-71	Analalava-Analabe-Betanantanana (Ambatosoratra)	Analalava-Analabe-Betanantanana (Ambatosoratra)
MDG-72	Analavelona	Analavelona
MDG-73	Andrafiamena	Andrafiamena
MDG-74	Andreba	Andreba
MDG-75	Angavo Androy	Angavo Androy
MDG-76	Anjozorobe	Anjozorobe
MDG-77	Ankafobe	Ankafobe
MDG-78	Ankeniheny-Lakato future SAPM	Ankeniheny-Lakato future SAPM
MDG-79	Ankodida future SAPM	Ankodida future SAPM
MDG-80	Ankorabe (Antadonkomby)	Ankorabe (Antadonkomby)
MDG-81	Antoetra	Antoetra
MDG-82	Antrema	Antrema
MDG-83	Archipelago Cap Anorontany	Cape Anorontany Archipelago
MDG-84	Bombetoka/Belemboka Bay and Marovoay Wetlands (Betsiboka-Tsiribihina Rivers)	Bombetoka/Belemboka Bay and Marovoay wetlands (Betsiboka-Tsiribihina rivers)
MDG-85	Beanka	Beanka
MDG-86	Bemanevika (Ankaizina Wetland)	Bemanevika (Ankaizina wetlands)
MDG-87	Complex Ifotaky future SAPM	Ifotaky Complex future SAPM
MDG-88	Mahafaly Plateau Forest Complex	Mahafaly Plateau Forest Complex
MDG-89	Lake Ihotry Complex - Mangoky Delta	Lake Ihotry - Mangoky Delta Complex
MDG-90	Makirovana-	Makirovana-Ambatobiribiry

KBA/KBA ID#	KBA (French name)	KBA (English name)
	Ambatobiribiry Complex	Complex
MDG-91	Mangoky-Ankazoabo Complex	Mangoky-Ankazoabo Complex NPA
MDG-92	Tsimembo-Manambolomat-Bemamba Complex	Tsimembo-Manambolomaty-Bemamba Complex
MDG-93	Vohipaho Complex	Vohipaho Complex
MDG-94	Ambositra-Vondrozo Corridor	Ambositra-Vondrozo Corridor
MDG-95	SAPM Ankeniheny-Zahamena Corridor	Ankeniheny Zahamena Corridor SAPM
MDG-96	Menabe Antimena/ Kirindy-Ambadira Corridor/ Haut de Tsiribihana and Tsiribihana	Menabe-Antimena/Kirindy-Ambadira Corridor/Upper Tsiribihana and Tsiribihana
MDG-97	Analamay-Mantadia Forest Corridor	Analamay-Mantadia Forest Corridor
MDG-98	Fandriana-Marolambo Forest Corridor	Fandriana-Marolambo Forest Corridor
MDG-99	Tsaratanana-Marojejy future SAPM	Tsaratanana-Marojejy Future SAPM
MDG-100	Crater of Nosy Be	Nosy Be Crater (Lake Mount Passot)
MDG-101	SAPM Daraina-Loky-Manambato	Daraina-Loky Manambato SAPM
MDG-102	Fierenana	Fierenana NPA
MDG-103	Classified Forest of Andavakoera	Andavakoera Classified Forest
MDG-104	Classified Forest of Bongolava (Marosely)	Bongolava Classified Forest (Marosely)
MDG-105	Classified Forest of Manombo	Manombo Classified Forest
MDG-106	Classified Forest of Vohibola	Vohibola Classified Forest
MDG-107	Classified forest of Vondrozo and surrounding areas	Vondrozo Classified Forest and surrounding areas
MDG-108	Classified Forest of Zafimaniry	Zafimaniry Classified Forest
MDG-109	Menarandra Forest	Menarandra Forest

KBA/KBA ID#	KBA (French name)	KBA (English name)
MDG-110	Forest of Sahafina (Anivorano Brickaville)	Sahafina Forest (Anivorano-Brickaville)
MDG-111	Ibity future SAPM	Ibity future SAPM
MDG-112	Itremo Vakinankaratra future SAPM	Itremo Vakinankaratra future SAPM
MDG-113	Kianjavato	Kianjavato
MDG-114	Lake Alaotra	Lake Alaotra
MDG-115	Lake Sahaka-Analabe	Lake Sahaka-Analabe
MDG-116	Mahabo Mananivo	Mahabo Mananivo
MDG-117	Mahialambo	Mahialambo
MDG-118	Mandena	Mandena
MDG-119	Mangabe-Ranomena-Sasarotra	Mangabe-Ranomena-Sasarotra
MDG-120	Massif of Manjakatompo-Ankaratra	Manjakatompo-Ankaratra Massif
MDG-121	Mountain of the French	Mountain of the French
MDG-122	Oronjia	Oronjia
MDG-123	PK32-Ranobe	PK32-Ranobe
MDG-124	Pointe à Larrée	Pointe à Larrée
MDG-125	Sainte-Luce - Ambato Atsinanana	Sainte-Luce - Ambato Atsinanana
MDG-126	Seven Lakes	Seven Lakes
MDG-127	Tampolo	Tampolo
MDG-128	Vohibe-Ambalabe (Vatomandry)	Vohibe-Ambalabe (Vatomandry)
MDG-129	Wetland of Mahavavy-Kinkony future SAPM	Mahavavy-Kinkony future SAPM wetlands
MDG-130	Wetlands of Maevatanana Ambato Boeny	Maevatanana-Ambato-Boeny Wetlands
MDG-131	Wetland of Nosivolo	Nosivolo wetland
MDG-132	Port-Bergé wetland	Port-Bergé wetlands
MDG-133	Nosy Foty	Nosy Foty

KBA/KBA ID#	KBA (French name)	KBA (English name)
MDG-134	Wetland Sahamalaza Bay	Sahamalaza Bay Wetlands
MDG-135	Nosy Varika	Nosy Varika
MDG-136	North Pangalane	North Pangalane
MDG-137	Andohahela National Park - Plot I	Andohahela National Park - Section I
MDG-138	Andohahela National Park - Plot II	Andohahela National Park - Section II
MDG-139	Andringitra National Park	Andringitra National Park
MDG-140	Integral Natural Reserve of Ankarafantsika, National Park and Forest Station of Ampijoroa	Ankarafantsika Strict Nature Reserve, National Park, and Ampijoroa Forestry Station
MDG-141	Kirindy Mite National Park and surroundings	Kirindy Mite National Park and surrounding areas
MDG-142	Baly Bay National Park	Baly Bay National Park
MDG-143	National Park of Mananara-Nord	Mananara-North National Park
MDG-144	National Park of Mantadia and Special Reserve of Analamazaotra	Mantadia National Park and Analamazaotra Special Reserve
MDG-145	Marojejy National Park	Marojejy National Park
MDG-146	Masoala National Park	Masoala National Park
MDG-147	Masoala National Park - Plot II	Masoala National Park - Section II
MDG-148	Masoala National Park - Plot III	Masoala National Park - Section III
MDG-149	South Midongy National Park	Midongy South National Park
MDG-150	National Park of Nosy Mitsio	Nosy Mitsio National Park
MDG-151	National Park of Nosy Be and Satellite Islands (Nosy Tanihely)	Nosy Be and Satellites Islands (Nosy Tanihely)
MDG-152	Ranomafana National Park and extension	Ranomafana National Park and extension

KBA/KBA ID#	KBA (French name)	KBA (English name)
MDG-153	National Park of Tsimanampetsotsa	Tsimanampetsotse National Park
MDG-154	Zombitse-Vohibasia National Park	Zombitse-Vohibasia National Park
MDG-155	National Park of Isalo	Isalo National Park
MDG-156	National Park of Tsingy of Namoroka	Tsingy of Namoroka National Park
MDG-157	National Park and Integral Natural Reserve of Zahamena	Zahamena National Park and Strict Reserve
MDG-158	National Park and Integral Natural Reserve of Tsingy de Bemaraha	Tsingy de Bemaraha National Park and Strict Nature Reserve
MDG-159	National Park and Special Reserve of the Amber Mountain	Montagne d'Ambre National Park and Special Reserve
MDG-160	Amber Forest	Ambre Forest
MDG-161	Humdie zone of Torotorofotsy	Torotorofotsy Wetlands
MDG-162	Makira	Makira
MDG-163	Anja Community Reserve	Anja Community Reserve
MDG-164	Integral Nature Reserve of Betampona	Betampona Strict Nature Reserve
MDG-165	Integral Natural Reserve of Lokobe	Lokobe Strict Nature Reserve
MDG-166	Tsaratanàna Integrated Nature Reserve and adjacent areas	Tsaratanana Strict Nature Reserve and adjacent areas
MDG-167	Special Reserve of Ambatovaky	Ambatovaky Special Reserve
MDG-168	Special Reserve of Ambohijanahary	Ambohijanahary Special Reserve
MDG-169	Special Reserve of Ambohitantely	Ambohitantely Special Reserve
MDG-170	Special Reserve of Analamera	Analamera Special Reserve
MDG-171	Special Reserve of Andranomena	Andranomena Special Reserve

KBA/KBA ID#	KBA (French name)	KBA (English name)
MDG-172	Anjanaharibe-sud - Marojejy future SAPM	South Anjanaharibe -Marojejy future SAPM
MDG-173	Special Reserve of Ankarana	Ankarana Special Reserve
MDG-174	Special Reserve of Bemarivo	Bemarivo Special Reserve
MDG-175	Special Reserve of Beza Mahafaly	Beza Mahafaly Special Reserve
MDG-176	Bora Special Reserve	Bora Special Reserve
MDG-177	Special Reserve of Kalambatritra	Kalambatritra Special Reserve
MDG-178	Special Reserve of Kasijy	Kasijy Special Reserve
MDG-179	Special Reserve of Mangerivola	Mangerivola Special Reserve
MDG-180	Maningoza Special Reserve	Maningoza Special Reserve
MDG-181	Special Reserve of Manombo	Manombo Special Reserve
MDG-182	Special Reserve of Manongarivo and extension	Manongarivo Special Reserve and extension
MDG-183	Special Reserve of Marotandrano	Marotandrano Special Reserve
MDG-184	Special Reserve of Nosy Mangabe	Nosy Mangabe Special Reserve
MDG-185	Special Reserve of Tampoketsa-Analamaintso	Tampoketsa-Analamaintso Special Reserve
MDG-186	Cape St. Mary Special Reserve	Cape Sainte Marie Special Reserve
MDG-187	Special Reserve of the Peak of Ivohibe	Ivohibe Special Reserve
MDG-188	Ankavia-Ankavanana River (Antalaha)	Ankavia-Ankavanana River (Antalaha)
MDG-189	Antainambalana-Andranofotsy River (Antalaha)	Antainambalana-Andranofotsy River (Antalaha)
MDG-190	River of Bemarivo	Bemarivo River
MDG-191	River of Maevarano	Maevarano River
MDG-192	Mahanara River	Mahanara River

KBA/KBA ID#	KBA (French name)	KBA (English name)
MDG-193	River of Mananjary	Mananjary River
MDG-194	Mangarahara-Amboaboa River	Mangarahara-Amboaboa River
MDG-195	River of Sambava	Sambava River
MDG-196	River of Sofia	Sofia River
MDG-197	Ivoloina River	Ivoloina River
MDG-198	South River of Mananara	Mananara South River
MDG-199	Mangoro and Rianala Rivers	Mangoro-Rianila rivers
MDG-200	Namorona-Faraony rivers	Namorona-Faraony rivers
MDG-201	Sahafary (Andranomena Antsiranana)	Sahafary (Andranomena Antsiranana)
MDG-202	Sorata	Sorata
MDG-203	Angavokely Forestry Station	Angavokely Forest Station
MDG-204	Forest Station of Anjiamangirana	Anjiamangirana Forest Station
MDG-205	Tarzanville (Moramanga)	Tarzanville (Moramanga)
MDG-206	Tsinjoarivo	Tsinjoarivo
MDG-207	Natural Forest of Tsitongambarika NAP	Tsitongambarika Natural Forest
MDG-208	Wetland of Ambavanankarana	Ambavanankarana wetland
MDG-209	Wetland of Ambila-Lemaintso	Ambila-Lemaintso wetland
MDG-210	Wetland of Ankobohobo	Ankobohobo wetland
MDG-211	Wetlands of the southwest coast and Nosy Manitse Island future SAPM	Southwestern Coastal Wetlands and Nosy Manitse Future SAPM Marine
MDG-212	Wetlands of Tambohorano	Tambohorano Wetlands
MDG 213	Amboaboa watershed	Amboaboa Catchment
MDG 214	Andasibe	Andasibe

KBA/KBA ID#	KBA (French name)	KBA (English name)
MDG 215	Antsiranana	Antsiranana
MDG 216	River of Mahajilo	Mahajilo River
MDG 217	Source of Faraony	Faraony Headwaters
MDG 218	Ikopa Lakes	Ikopa Lakes
MDG 219	National Park of Isalo	Isalo National Park
MDG 220	Kinkony Lakes	Kinkony Lake
MDG 221	Lake Tseny Basin	Lake Tseny Basin
MDG 222	Bass of Ankofia	Lower Ankofia
MDG 223	Bass of Anove	Lower Anove
MDG 224	Coastal zone of Mahajanga	Mahajanga Coastal Zone
MDG 225	Mahavavy Delta	Mahavavy Delta
MDG 226	Manambato-sud	Manambato South
MDG 227	Manongarivo watershed	Manongarivo Catchment
MDG 228	Marojejyy National Park	Marojejy National Park
MDG 229	Mikea National Park	Mikea National Park
MDG 230	Ramsar site of Nosivolo	Nosivolo Ramsar Site
MDG 231	Group of Islands of Nosy-Be	Nosy Be Island Group
MDG 232	Upper river of Lokoho-sud	Southern Upper Lokoho River
MDG 233	Tolagnaro	Tolagnaro
MDG 234	Upper Kitsamby River	Upper Kitsamby River
MDG 235	Upper Mananara River	Upper Mananara river

AZE (Alliance for Zero Extinction) sites for Madagascar

Initiated in 2005 by conservation organizations, the Alliance for Zero Extinction (AZE) is a global initiative that aims to identify and protect sites that are the last remaining refuges of one or more Endangered (EN) or Critically Endangered (CR) species" (https://zeroextinction.org/)

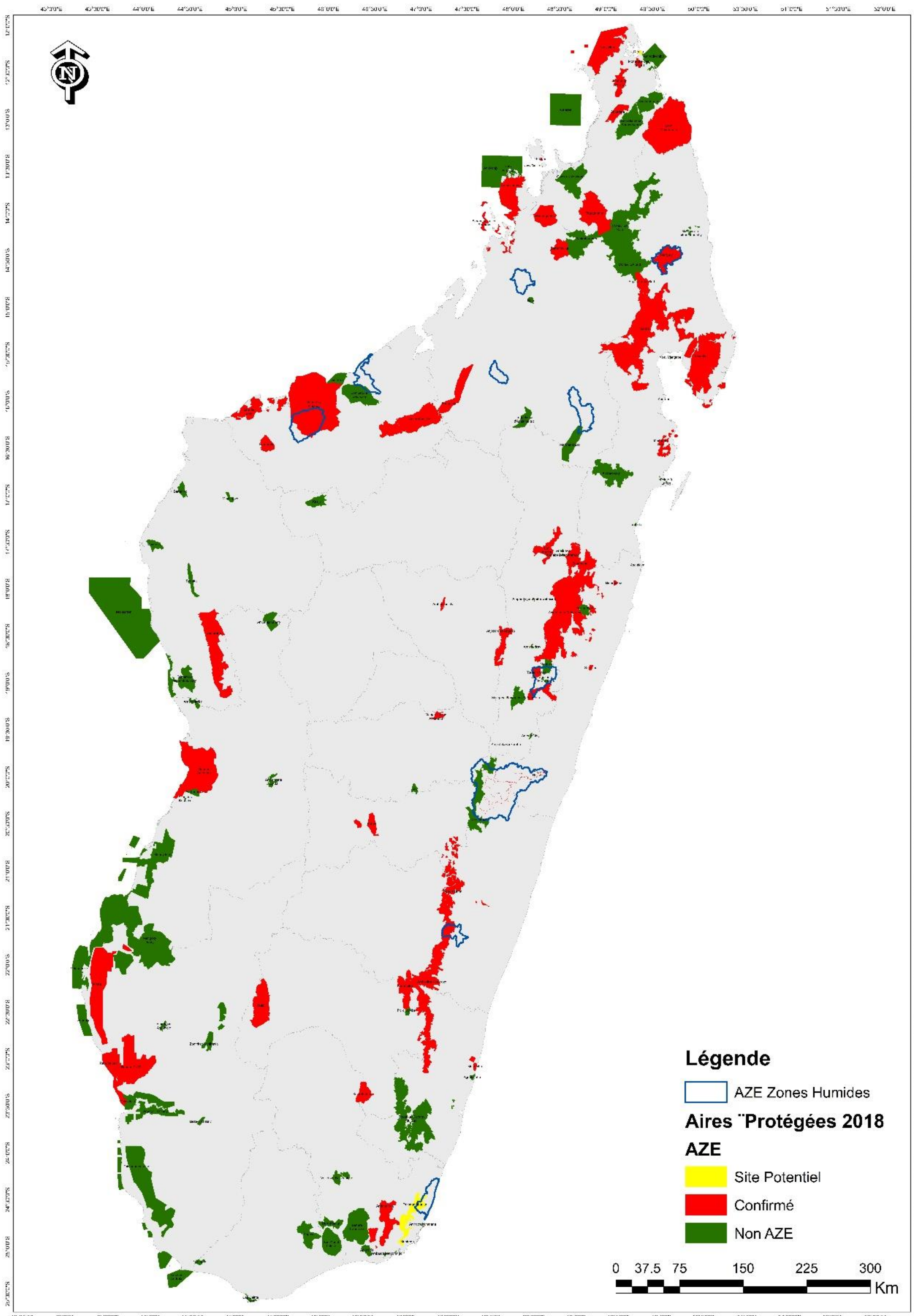
Madagascar currently has 55 confirmed AZE sites and 13 candidate sites (where AZE status was proposed during the project consultations, usually in relation to taxa not comprehensively assessed). Of these already confirmed AZE sites, two sites have partial protection (only part included in protected areas) and seven do not even have a manager. These sites are threatened by logging, mining, petroleum, and national development projects.

The following table shows the number of sites with conservation actions:

Table 29 Conservation in AZE sites in Madagascar

Sites	Number of sites	With conservation actions	Without conservation action
Confirmed	55	48	7
Candidates	13	6	7
Total	68	54	14

Of the candidate sites, six already have protection status and conservation actions are underway. In 2018, conservation actions were initiated and developed on the demonstration sites, Tsitongambarika Forest. In addition, during this update of the Madagascar Ecosystem Profile, AZE sites are analyzed separately from other KBAs. Based on available data, 57 AZE-KBAs are analyzed; 10 of these are identified as freshwater KBAs in 2018.



Map 3 AZE sites in Madagascar

Important Marine Mammal Areas (IMMA) in Madagascar

Madagascar has 4 IMMA sites: the North West and the Center East of the Mozambique Channel for 9 species, the Center East of the coasts (Bay of Antongil, Sainte Marie) for *Megaptera novaeangliae*, the waters of the plateaus of the South of Madagascar for *Megaptera novaeangliae*, and the South West area for 6 species, as well as two candidate sites: the Madagascar Ridge (for 04 species) and the center of the Mozambique Channel for 05 species.

Important Plant Areas in Madagascar

Madagascar currently has 80 Important Plant Areas (IPAs), whose identification criteria differ slightly from those used by *PlantLife* to identify KBAs for plants: center of endemism, irreplaceable area, AZE site, area of concentration of species with restricted distribution (Raharimampionona *et al.* 2005).

As a result of the Durban Initiative initiated in 2003, which allowed for the inclusion of these KBAs for plants in the Madagascar Protected Area System, more than half (45 out of 80) have been established as protected areas and are currently under the governance of 16 managers, including Missouri Botanical Garden, which promotes and/or manages 13 sites - new SAPM Protected Areas. A total area of 139,283 ha encompasses these 13 new PAs that MBG either promotes or manages throughout Madagascar.

The identification of this category is to ensure maximum representativeness of the flora of Madagascar in terms of habitats and species.

Freshwater KBA in Madagascar

In 2018, regional experts identified and validated 23 important rivers, lakes, and wetlands as freshwater KBAs, 10 of which are also AZE sites. 92 species were confirmed as trigger species for KBAs. Freshwater KBAs support 80 globally threatened (Critically Endangered [CR], Endangered [EN], or Vulnerable [VU]) species, 62 geographically restricted species, and 10 species showing population aggregations during one or more key life stages.

The area of freshwater KBAs is 23,920 km², representing 4% of the total area of Madagascar. The area of existing protected areas adopted for freshwater species is 9,159 km² (38% of the total area of confirmed freshwater KBAs) (IUCN, 2018).

5.2.2 Comoros

Key biodiversity areas in Comoros

In 2014 the only official protected area in the Union of Comoros was the former Moheli Marine Park with an area of 404 km², the largest marine area in the Indian Ocean region, while ecological studies conducted in 2011 on priority areas for the conservation of terrestrial biodiversity, present a delineation and zoning of 3 terrestrial protected areas covering 19.73% of the national territory.

During the participatory process implemented in 2014 by CEPF, a total of **20 KBAs** were defined for the Republic of Comoros.

As of 2019, six protected areas have been formally established corresponding to 9 KBAs defined by CEPF in 2014.

Table 30 List of Key Biodiversity Areas in Comoros (2022)

KBA/ KBA ID#	KBA (French name)	KBA (In English)
COM-1	Moya Forest	Moya Forest
COM-2	Lake Dziani-Boudouni	Dziani-Boudouni Lake
COM-3	Lake Hantsongoma	Hantsongoma Lake
COM-4	Massif de la Grille	La Grille Mountains
COM-5	Karthala Massif	Karthala Mountains
COM-6	Mount Mlédjélé (Heights of Mwali)	Mount Mlédjélé (Mwali highlands)
COM-7	Mount Ntringui (Ndzuani Heights)	Mount Ntringui (Ndzuani highlands)
COM-8	Marine Park of Moheli	Moheli National Park
COM-9	Coral reefs of Anjouan	Anjouan coral reefs
COM-10	Coral reefs of Grande Comore	Great Comorecoral reefs
COM-11	Coral reefs of Moheli - outside the Marine Park	Mohéli coral reefs - outside of Marine Park
COM-12	Bimbini area and Ilot de la Selle	Bimbini area and la Selle Islet
COM-13	Chiroroni area	Chiroroni area
COM-14	Domoni area	Domoni area
COM-15	Male Zone	Male area
COM-16	Moya area	Moya area
COM-17	Mutsamudu area	Mutsamudu area
COM-18	Zone of Ndroudé and Ilot aux Tortues	Ndroudé area and Ilot aux Tortues
COM-19	Pomoni area	Pomoni area
COM-20	Coelacanth Zone	Coelacanth area

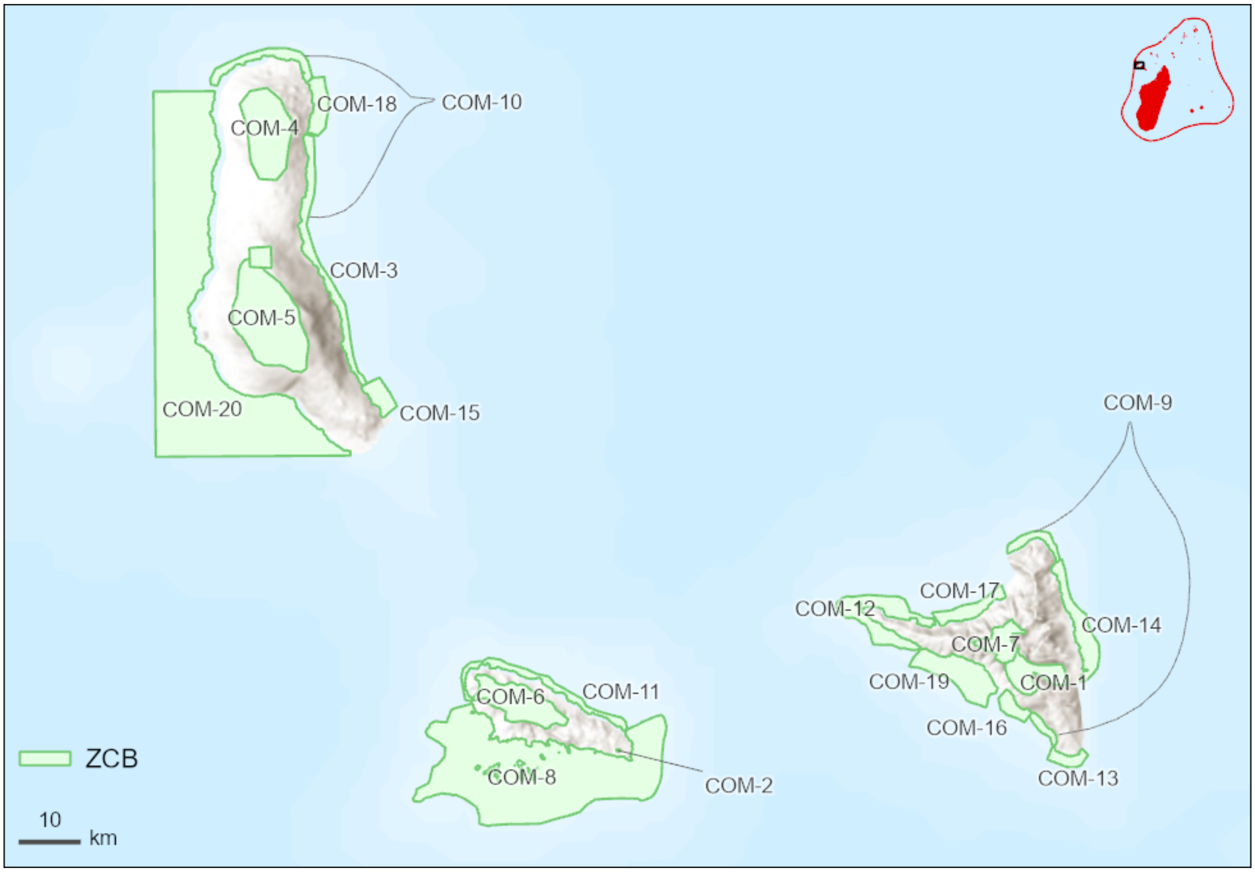


Figure 3 KBAs in the Comoros

AZE sites for Comoros

There are two AZE sites in Comoros. Moheli Island has a unique forest bird fauna, including two species endemic to the island: the critically endangered Mohelian Screech-Owl (*Otus moheliensis*) and the Mohelian Warbler (*Nesillas mariae*). Six other restricted species and one shorebird nest here, including the Comoro Pigeon (*Columba pollenii*). Twelve subspecies endemic to the island and seven subspecies endemic to the Comoros are also present, as well as the threatened but not endemic Maillard's Harrier (*Circus maillardi*). One endemic seabird subspecies, *Puffinus lherminieri temptator*, appears to nest only in the forest of Moheli. Most of the threatened and restricted species are associated with the intact forest, although all have been recorded elsewhere. This forest is classified as an Important Bird Area (IBA) and an AZE site, due to the presence of endangered and critically endangered restricted species.

Mont Ntringui National Park on the island of Anjouan, with an area of 11,700 ha, represents 28% of the total area of the island. It has also been identified as an AZE site due to the presence of endangered or critically endangered species of limited distribution, as a Ramsar site in 2006 and as an IBA.

5.2.3 Mauritius

For Mauritius, the identification of KBAs was based on IBAs, as well as a study to determine the most important areas to complement the current protected area network, conducted during the preparation of the UNEP/GEF project "*Expanding and Strengthening the*

Management Effectiveness of the Terrestrial Protected Area Network in Mauritius" (Desmet 2009). This study was based on the quality of plant inventories by Page and D'Argent (1997), who had also assessed the quality of the native forest. This information was added to previous biodiversity data (especially the presence or absence of native angiosperm taxa) and the knowledge of local experts and stakeholders to create a final biodiversity importance map (Desmet 2009). The list of threatened endemic species by site, produced as part of this profile, complements that compiled by Desmet (2009).

Table 31 List of Key Biodiversity Areas in Mauritius

KBA ID#	KBA (French name)	KBA (English name)	ILE
MUS-1	Banks of Cargados Carajos	Cargados Carajos Shoals	Saint Brandon
MUS-2	Bamboo Mountain Range	Bamboo Mountain Range	Maurice
MUS-3	Chamarel - Le Morne	Chamarel - Le Morne	Maurice
MUS-4	Tamarin Falls / Mount Simonet / Cabinet Nature Reserve	Tamarind Falls / Mount Simonet / Cabinet Nature Reserve	Maurice
MUS-5	Relict forests of the Central Plateau	Relict Forests of the Central Plateau	Maurice
MUS-6	Islands of Rodrigues	Rodrigues' Islets	Rodrigues
MUS-7	Islands of the North of Mauritius	Mauritius Northern Islets	Maurice
MUS-8	Islands of the South-East of Mauritius	Mauritius South-Eastern Islets	Maurice
MUS-9	Le Pouce - Anse Courtois - Pieter Both - Montagne Longue	Le Pouce - Anse Courtois - Pieter Both - Longue Mountain	Maurice
MUS-10	Mondrain - Magenta - Trois Mamelles - Mont du Rempart	Mondrain - Magenta - Trois Mamelles - Mont du Rempart	Maurice
MUS-11	Mountain Corps de Garde	Guardhouse Mountain	Maurice
MUS-12	Black River Gorges National Park and adjacent areas	Black River Gorges National Park and surrounding areas	Maurice
MUS-13	Coral Plain	Coral Plain	Rodrigues
MUS-14	Plaine des Roches - Bras d'Eau	Plaine des Roches - Bras d'Eau	Maurice
MUS-15	Good God Bridge	Good God Bridge	Maurice
MUS-16	South side of Grande Montagne	South Slopes of Grande Montagne	Rodrigues
MUS-17	Yemen-Takamaka	Yemen-Takamaka	Maurice

The maps below show these KBAs identified for the Republic of Mauritius.

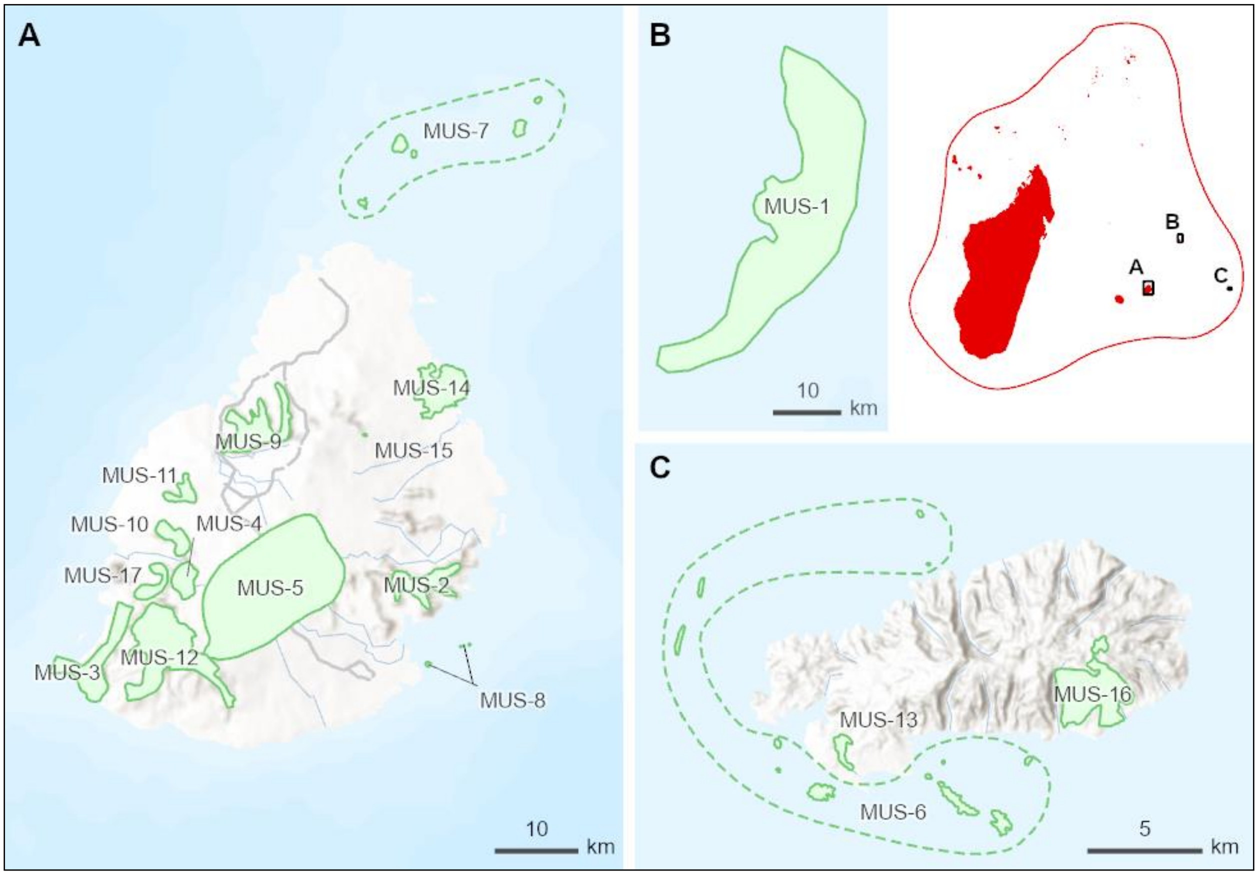


Figure 4 KBAs in Mauritius

5.2.4 Seychelles

In 2014, in order to harmonize the presentation of results with other countries, all individual KBAs included in national parks (9 for Morne Seychellois NP, 11 for Silhouette NP, 3 for the Montagne Planneau NP extension project) and a few small islands and sites (4 on Curieuse, 3 on Felicité, 2 neighboring sites on Praslin) were merged into single (and thus larger) KBA units. Approximately 10 sites on Mahé of relatively limited interest identified by Carlström (1996), which had been affected by development or other forms of habitat degradation, and/or for which insufficient data were available, were left out. According to the methodology used, only terrestrial sites with documented KBA criteria (presence of globally threatened species or sites meeting IBA criteria) were retained. Two small sites in Praslin without globally threatened species but verifying other international criteria proposed as important sites for ecological processes (IFC, 2012) were temporarily left out until more information is available on how these criteria can be considered by the IUCN. Other sites, including protected areas of current limited biological interest (e.g., 5 small unmanaged bird sanctuaries and a small national park) were incorporated into larger adjacent marine/coastal areas of high biodiversity value. These marine/coastal areas, almost always bordering terrestrial sites, consist primarily of existing Marine National Parks on granitic islands, as well as areas of high biological interest identified as potential marine parks on outlying islands. Existing special reserves and IBAs with terrestrial and marine areas were divided into their terrestrial and marine parts for consistency, to simplify the comparative assessment of conservation value, level of threats, etc. among all these sites, and to define priorities for action, which was done separately for terrestrial and marine sites.

The figure below (Bertzky et al. 2013) visualizes the correspondence between IBA (IBA, BCZ) and AZE (Alliance for Zero Extinction) sites. The same reasoning can be applied to spatial inventories where important areas for other taxa (plants, fish, cetaceans, turtles, etc.) have been defined.

Figure 5 Correspondence between IBA, KBA and AZE sites in Seychelles

As a result, a total of 43 terrestrial KBA sites, plus an additional 33 marine sites of high biodiversity value, were identified. English and French site names were reviewed and harmonized for all sites. However, to reduce the final number of KBAs, the marine and terrestrial portions of these sites were merged, and a list of 57 KBAs was finalized and considered eligible for CEPF funding, which continues to be the case.[29]

29 Notes: Only 3 Ramsar sites have been declared under the Ramsar Convention by the Seychelles (Aldabra, the coastal wetlands of Port Launay and part of the Morne Seychellois National Park (Mare aux Cochons). Furthermore, there does not appear to have been an Alliance for Zero Extinction inventory in the Seychelles, although some documents mention two sites in the granitic islands (La Digue plateau and Morne Seychellois National Park on Mahé). If such an inventory had been conducted, other key sites for threatened plant and animal species such as Silhouette and Frégate Islands should also have been identified.

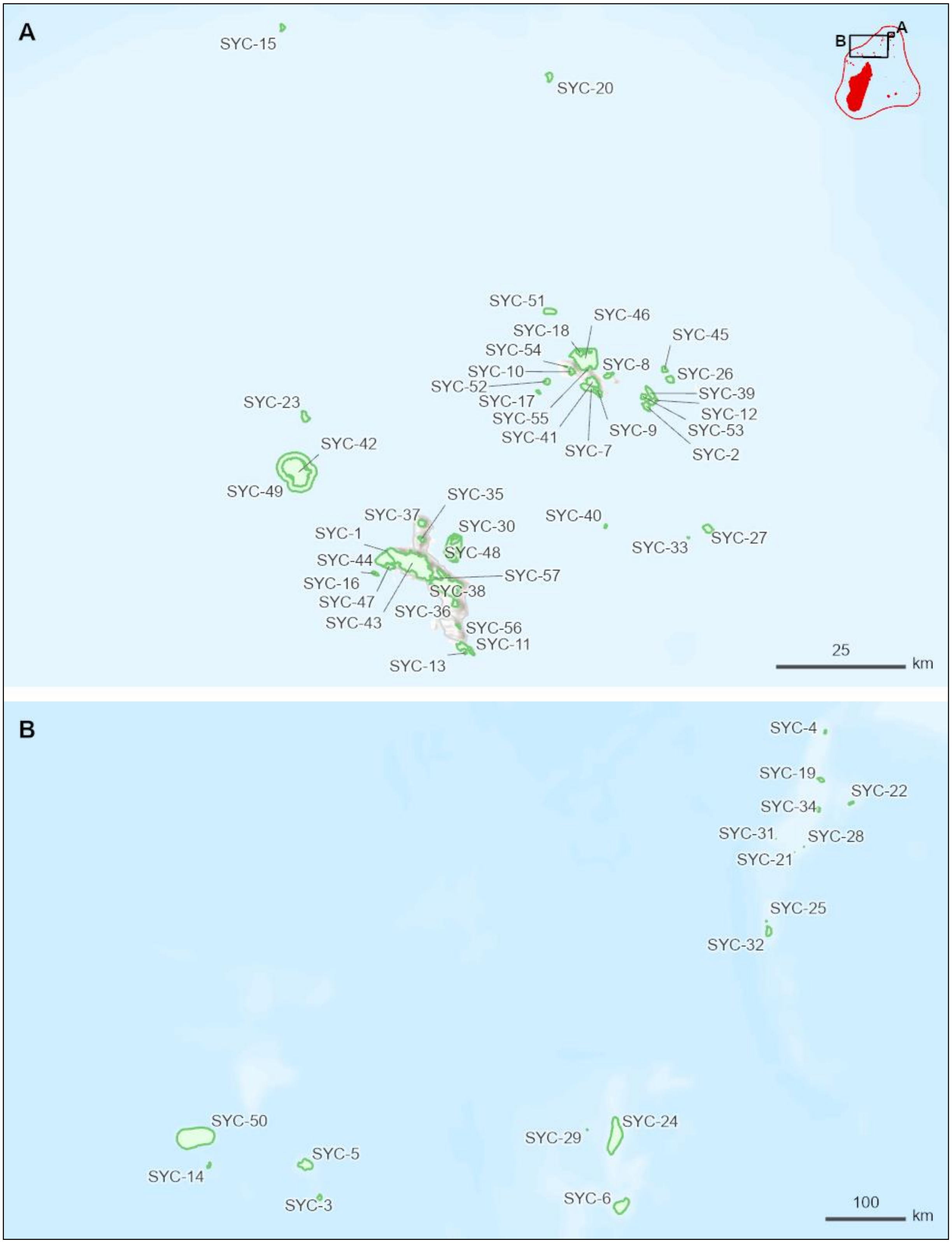


Figure 6 KBAs in the Seychelles (CEPF, 2014)

The area of current terrestrial KBA sites with high biodiversity value considered eligible for CEPF funding covers 27093.5 ha, which represents 59.5% of the total area of Seychelles. This total is lower than that given in the Senterre *et al.* (2013) KBA inventory, as some areas were excluded from selection in this study. The coastal and marine areas considered by CEPF as KBA sites correspond to previously existing MPAs. The percentage of KBAs (and total land) protected was already much higher for the outer islands compared to the inner islands, again as noted by Senterre *et al.* (2013). This is thanks to the Aldabra Special Reserve, which accounts for most of the outer islands' area and about one-third of the total area of the Seychelles. Now that four new protected areas with land (totaling 573 ha) have been declared, this proportion is even higher and reaches 77.3% of the outer islands' land area. As a result, the protected land area in Seychelles reaches 47.8% of the total.

Table 32 List of Key Biodiversity Areas in Seychelles

KBA ID#	KBA (French name)	KBA (English name)
SYC-1	Anse Major / Anse Jasmin (marine part of MSNP)	Anse Major / Anse Jasmin (marine area of MSNP)
SYC-2	Anse Source d'Argent-Anse Marron	Anse Source d'Argent-Anse Marron
SYC-3	Astove	Astove
SYC-4	African benches	African Banks
SYC-5	Cosmolédo	Cosmoledo
SYC-6	Farquhar - South island and islets	Farquhar - South Island and islets
SYC-7	Fond Azore (southern slopes) to Anse Bois de Rose	Fond Azore southern slopes to Anse Bois de Rose
SYC-8	Fond Diable and Pointe Joséphine	Fond Diable and Pointe Josephine
SYC-9	Fond Ferdinand	Fond Ferdinand
SYC-10	Friendship Forest	Friendship Forest
SYC-11	Coral Mountain-Southern Hills Dry Forests	Coral Mountain-Southern Hills dry forests
SYC-12	Grand Anse-Petite Anse-Fond Piment	Grand Anse-Petite Anse-Fond Piment
SYC-13	Grand Police (wetlands)	Grand Police wetlands
SYC-14	Assumption Island	Assumption Island
SYC-15	Bird Island (Ile aux Vaches)	Bird Island (Ile aux Vaches)
SYC-16	Conception Island	Island Design
SYC-17	Cousin Island	Cousin Island
SYC-18	Curious Island	Curious Island
SYC-19	Arros Island and Saint-Joseph Atoll	D'Arros Island and Saint Joseph Atoll
SYC-20	Denis Island	St. Denis Island
SYC-21	Desnoeufs Island	Desnoeufs Island
SYC-22	Desroches Island - surrounding reefs	Desroches Island - surrounding reefs
SYC-23	North Island	North Island
SYC-24	Providence Island and Banks	Providence Island and Bank
SYC-25	Alphonse Island and Lagoon	Alphonse Island and Lagoon
SYC-26	Félicité Island	Félicité Island
SYC-27	Frégate Island	Frégate Island
SYC-28	Marie-Louise Island	Marie-Louise Island
SYC-29	St. Anne's Island	Sainte-Anne Island
SYC-30	St. Peter's Island	Saint-Pierre Island
SYC-31	Star and Sulky Islands	Etoile and Boudeuse Islands
SYC-32	Saint-François and Bijoutier Islands	Saint-François and Bijoutier Islands
SYC-33	Frégate Island	Frégate Island
SYC-34	Pepper lagoon and surrounding reefs	Poivre Lagoon and surrounding reefs
SYC-35	Mount Signal	Mount Signal
SYC-36	Burnt Mountain-Piton de l'Eboulis	Burnt Mountain-Piton de l'Eboulis

SYC-37	Glacis Mountain - When she comes	Glacis Mountain - When she comes
SYC-38	Planneau Mountain (Grand Bois-Varigault-Cascade)	Planneau Mountain (Grand Bois-Varigault-Cascade)
SYC-39	Eagle’s Nest (ridges and eastern slopes)	Eagle’s Nest (ridge and eastern slopes)
SYC-40	Reef Island National Park	Recif Island National Park
SYC-41	Praslin National Park	Praslin National Park
SYC-42	Silhouette National Park	Silhouette National Park
SYC-43	Morne Seychellois National Park	Morne Seychellois National Park
SYC-44	National Marine Park of Cap Ternay / Ternay Bay	Cape Ternay / Ternay Bay Marine National Park
SYC-45	Cocos Island National Marine Park	Cocos Island Marine National Park
SYC-46	National Marine Park of the Curieuse Island	Curieuse Island Marine National Park
SYC-47	Port Launay National Marine Park and coastal wetlands	Port Launay Marine National Park and coastal wetlands
SYC-48	Sainte-Anne National Marine Park (PNMSA)	Sainte-Anne Marine National Park (SAMNP)
SYC-49	Silhouette National Marine Park	Silhouette Marine National Park
SYC-50	Aldabra Special Reserve	Aldabra Special Reserve
SYC-51	Special Reserve of the Arid Island	Aride Island Special Reserve
SYC-52	Special Reserve of Ile Cousin	Cousin Island Special Reserve
SYC-53	La Veuve Special Reserve	La Veuve Special Reserve
SYC-54	Kerlan River	Kerlan River
SYC-55	Rocks of Anse Petite Cour	Anse Petite Cour Boulders
SYC-56	Endor Valley	Endor Valley
SYC-57	La Misère-Dauban area : La Misère	La Misère-Dauban area: La Misère

5.3 Landscape Objective (Conservation Corridors)

CEPF considers Conservation Corridors to be larger geographic units than KBAs, through which conservation investment is directed at the landscape level. These planning units include groups of KBAs. While KBAs are intended to be protected or managed with biodiversity protection as a primary goal, isolated KBAs, even those with large areas, will remain threatened by limited ecological processes or environmental changes such as those brought about by climate change. A longer-term vision of conservation can be achieved through the management and protection of biodiversity conservation corridors. Conservation corridors represent both a response to species loss, habitat loss and fragmentation, and a proactive response to the need to integrate biodiversity protection into productive areas, particularly agriculture. The scale of the corridors is also relevant to take into account the services provided by ecosystems, beyond biodiversity conservation, for human well-being.

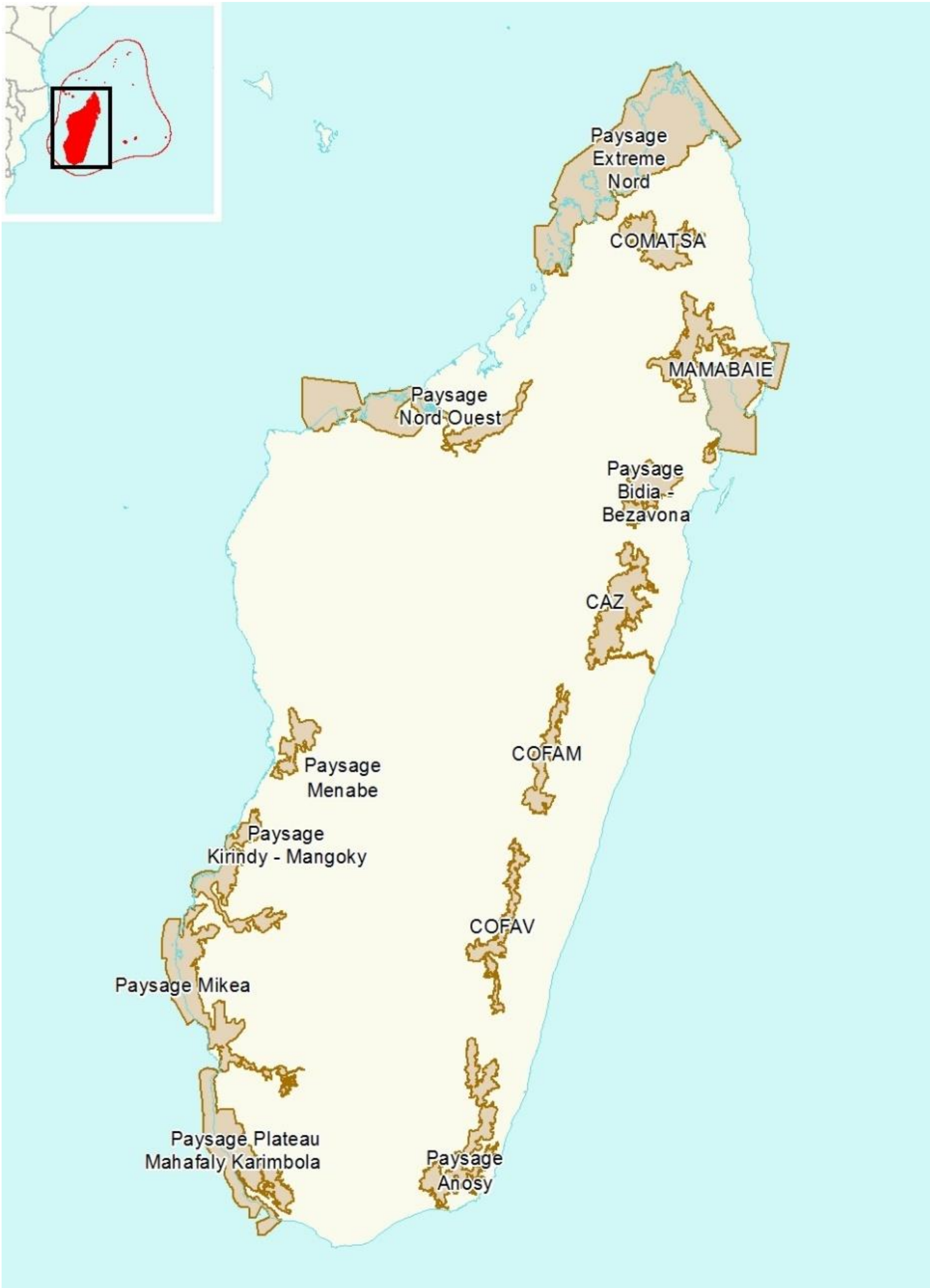
In the small islands of the Indian Ocean, the notion of a biodiversity corridor did not seem justified - mainly due to the size of the islands and the KBAs. However, the issue of ecological continuity remained at the heart of the concerns and groups of terrestrial sites were thus identified, where a global approach would better achieve conservation objectives. Thus, in Mauritius as in the Seychelles, the terrestrial KBAs identified most often encompass several small protected areas, along with the unprotected areas that surround them. The principle of preserving biological continuity has therefore been maintained, even if the areas concerned do not justify the creation of specific "corridors".

5.3.1 Madagascar

In Madagascar's Eastern Ecoregion, large forest blocks still exist, linking protected areas along the eastern slopes of the central cordillera. Seven important corridors have been identified that are necessary to ensure ecological continuity. These corridors are of great importance in terms of biodiversity, as they include most of the country's remaining rainforests. They also play an important role in terms of ecosystem services, including carbon storage and water supply.

In other ecoregions, natural ecosystems are much more fragmented, and ecological continuity would often be difficult, if not impossible, to restore. Nevertheless, some regions have a number of important sites, sometimes small but of very high biological value, that share certain biological traits, and often share the same species. Even if the natural ecosystems are not contiguous, genetic exchanges between fragmented sites are still possible for some species. These exchanges could even be reinforced in the long term by human intervention. Biodiversity conservation in these regions would benefit from a broader vision, rather than a "site-by-site" approach. River systems in these regions also play an important role as natural connectors between sites, and require coordinated management to maintain water quality for freshwater species, as well as for coastal and marine areas near river mouths. This is particularly the case for the important river systems of the Mahajanga River (North West Landscape), the Mangoky (Kirindy - Mangoky Landscape) or the Onilahy (Mikea Landscape). For this part of the country, where sites are more fragmented, the term "landscape" was chosen, following a term commonly used in the Malagasy conservation community, to differentiate these corridors from the contiguous forest blocks of the Eastern Ecoregion.

The following figure shows the most important conservation and landscape corridors identified.



Map 4 Conservation Corridors in Madagascar

Thirteen corridors are identified:

Table 33 List of corridors outcomes in Madagascar

N°	CORRIDORS	Area (Ha)
1	Northwestern landscape	925 493
2	Extreme North Landscape	2 194 046
3	Anôsy landscape	508 016
4	Landscape Plateau Mahafaly Karimbola	725 510
5	Kirindy Mangoky landscape	404 942
6	COMATSA Landscape Corridor	317 287
7	Menabe landscape	201 312
8	Mikea landscape	744 376
9	MaMaBAIE Landscape Corridor	1 800 000
10	Bidia-Bezavona Corridor	280 097
11	Ankeniheny Zahamena Corridor or CAZ	370 211
12	Fandriana - Marolambo or COFAM corridor	194 127
13	Ambositra Vondrozo Forest Corridor or COVAV	314 186
	TOTAL	**8 979 603**

5.3.2 Comoros

The notion of ecological corridors seems to be absent from Comoros' environmental policies and strategies, whether national or sectoral. This is the case for biodiversity strategies and action plans, national communications on climate change and the agricultural strategy. The small size of the archipelago could justify the lack of interest of policy makers, biodiversity conservationists and territorial planners in maintaining ecological continuities, but the absence of academic studies and scientific reports further reinforces this lack of interest. However, ecological continuity at the level of each island can be considered at the following three levels: (1) the establishment of a national network of protected areas and its extension strategy, (2) the existence of a permanent or semi-permanent hydraulic network in the islands of Anjouan and Moheli, and (3) biodiversity in urban areas. For the purposes of the ecosystem profile, no corridor outcomes are defined in Comoros.

5.3.3 Mauritius

In Mauritius, it was proposed to link the remaining areas of good quality native forests, degraded/secondary forests and some plantations[30] as part of a project to link various forests through mainly existing vegetation corridors. Such an exercise was not conducted for Rodrigues, which has experienced a greater degree of forest clearing than Mauritius. Two other "ridge to reef" projects are also being implemented: one by the National Parks and Conservation Service[31] in Mauritius and a second in the Bel Ombre Reserve. In Rodrigues, although the concept of Ridge to Reef is well understood by the Regional Assembly of Rodrigues, NGOs, civil society, for example for the Grande Montagne - Mourouk watershed, such a project is not yet implemented. However, for the purposes of the ecosystem profile, no corridor outcomes are defined in Mauritius.

30 Mauritius government project entitled "Protected Areas Network Expansion Strategy", supported by UNDP
31 Forests our lifeline | EEAS Website (europa.eu)

5.3.4 Seychelles

Few actions have been done so far on this aspect, including since the last Profile in 2014. In particular, no specific study on conservation corridors has been done so far in Seychelles. Therefore, for the purposes of the Ecosystem Profile, no corridor outcomes are defined in Seychelles.

As a continuation of the KBA inventory, a study should be conducted to define conservation corridors, particularly on large islands where most human development has occurred, to maintain connectivity and interactions between populations of flora and fauna of conservation concern, as well as between ecosystems of special interest within landscapes. This will help reduce the adverse effects of isolation on (small) patches of natural habitat and associated plant and animal species. It will also help ensure continuity of ecosystem functions (water catchment, soil retention, forest carbon sinks, recreation, etc.) at the landscape scale. This includes the need to work on seascapes and marine corridors (or at least geographic units that could be used from a management perspective), the same work having been done on whale sharks and marine mammals by the MCSS. At this time, the map showing the geographic distribution of existing KBA sites with higher biodiversity value identified by CEPF in 2014 provides an idea of where corridors connecting these terrestrial and coastal sites could be identified.

6 ECOSYSTEM SERVICES AND KBA+

6.1 Importance of ecosystem services

Ecosystem services are the contributions of ecosystems to benefits used for economic and other human activities (European Environment Agency, 2013). The Common International Classification of Ecosystem Services (CICES, IAEA 2013), and updated by Haines-Young R. and Potschin (2018), includes three categories of ecosystem services:

Table 34 The different ecosystem services

Station	Division	Ecosystem service
Procurement	Nutrition	Fish
		Wild animal meat
		Edible plant
		Wild fruit picking
		Picking of spices (ex: cinnamon)
		Medicinal plant
		Water for domestic use
		Water for irrigation
	Materials	Building materials (wood, thatch)
		Materials for handicrafts (wood, sedge)
		Forage for livestock
		Water for mining
	Energy	Firewood
		Charcoal
		Water for hydroelectricity
Regulation & Maintenance	Arbitration regarding toxic waste and other nuisances	Water quality for domestic use
		Water quality for irrigation
		Water quality for hydroelectricity
	Concerning the flows	Flood control (marshes)
		Water flow regulation for hydroelectricity
		Drought regulation
		Reduction of soil erosion
		Protection against cyclones (mangrove, reef, beach)
	Maintenance of physical, chemical and biological conditions	Carbon storage and sequestration
		Protection against cyclones at local and global level (mangroves, forests)
		Genetic material
Cultural	Physical and intellectual interactions with ecosystems and land/seascapes	Ecotourism
		Existence value (biodiversity)
	Spiritual, symbolic and other interactions with ecosystems and landscapes/seascapes	Cultural and spiritual identity

6.2 Objectives, methodology and limitations

The methodologies for the definition of hotspot ecosystem services, and detailed by country, are described in the WP1 reports, annexed to this document.

For the current profiling, through literature reviews and stakeholder consultations, the identified ecosystem services (ES) are ranked according to the importance of their contribution to climate change resilience, allowing for the establishment of priority ecosystem service lists. Thus, the importance of ecosystem-based climate change adaptation was particularly taken into account.

The definition of ecosystem services is thus the product of a literature review and a public consultation using the "expert opinion" approach. Managers and experts of KBAs directly involved in ecosystem service issues were first consulted.

However, for the Indian Ocean islands in particular, assessments of ecosystem services are relatively underdeveloped. Although the importance of ecosystem services is affirmed in various strategic development documents, they have not been sufficiently assessed to provide quantitative data to evaluate the scientific, ecological and financial contributions to local populations. This situation should be taken into account when reading the ecosystem services results below.

6.3 Results

6.3.1 Madagascar

For a better assessment of the importance of KBAs to the provision of ecosystem services and their importance to ecosystem-based adaptation (EbA), a combined and then weighted relative aggregation after taking into account the contributions of the stakeholders' assessment was implemented.

Then, each ecosystem service was classified after deleting the few services that were not important for EbA (carbon stock and their associated parameters, population and resource distance), and aggregating ES of the same nature (example: "agriculture", merging all the speculations like rice, cassava, etc.).

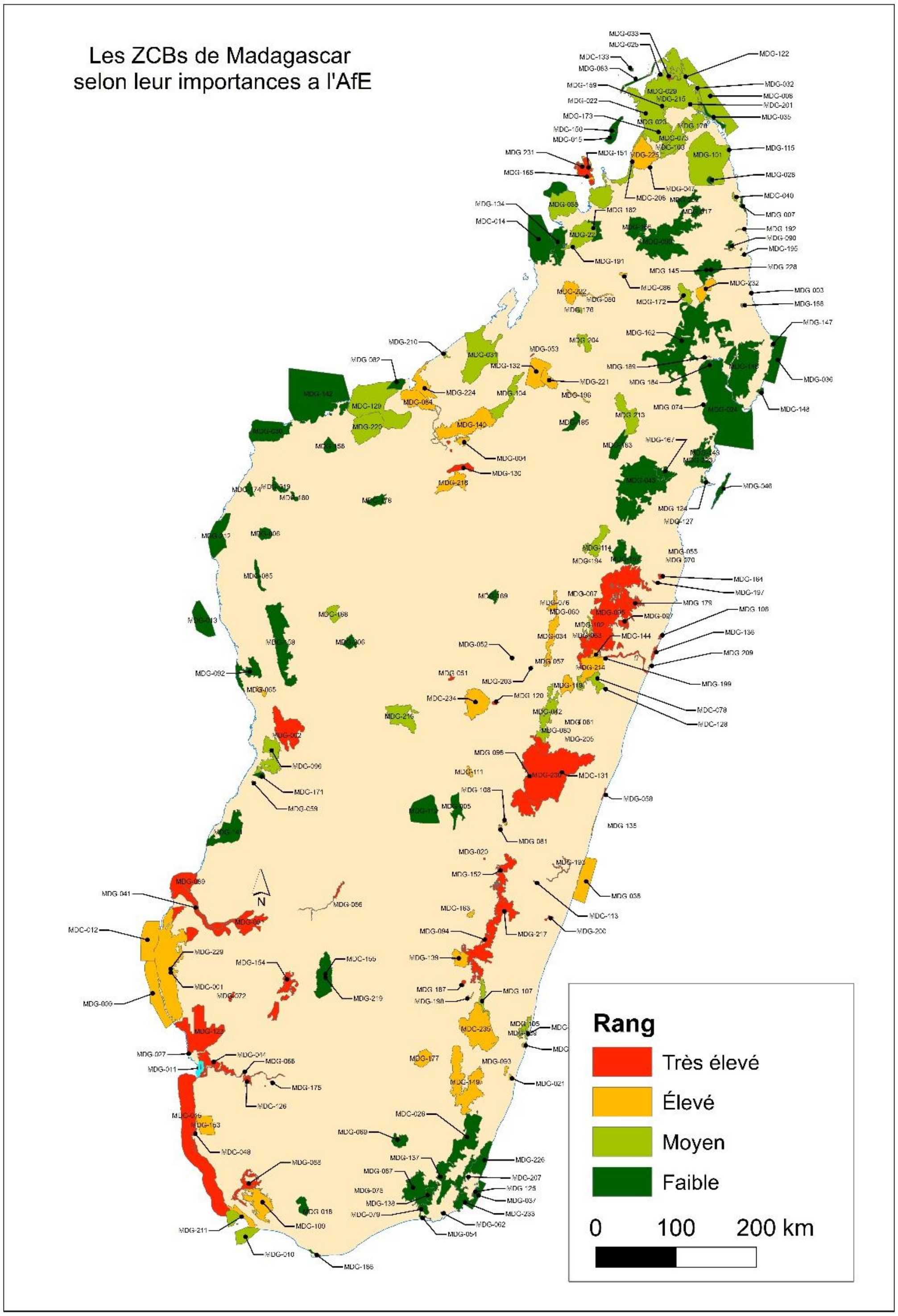
Details of the analysis process are contained in the WP1 report accompanying this profile.

Table 35 Ranking of KBAs in Madagascar using multi-criteria analysis (top 50 sites only)

Code	KBA	Multi-criteria score
MDG-199	Mangoro and Rianala Rivers	4.75
MDG-110	Forest of Sahafina (Anivorano Brickaville)	4.18
MDG-097	Analamay-Mantadia Forest Corridor	3.43
MDG-131	Wetland of Nosivolo	3.29
MDG-066	Amoron'i Onilahy and Onilahy River	3.17
MDG-041	Mangoky River	3.12
MDG-098	Fandriana-Marolambo Forest Corridor	3.11
MDG-094	Ambositra-Vondrozo Corridor	3.11
MDG-051	Lake Itasy	3.09
MDG-055	Mahatsara (Mahambo Foulpointe)	3.05
MDG-197	Ivoloina River	3.00
MDG-179	Special Reserve of Mangerivola	2.88
MDG-164	Integral Nature Reserve of Betampona	2.80
MDG-095	SAPM Ankeniheny-Zahamena Corridor	2.79

MDG-123	PK32-Ranobe	2.78
MDG-136	North Pangalane	2.63
MDG-230	Ramsar site of Nosivolo	2.61
MDG-027	Belalanda	2.58
MDG-130	Wetlands of Maevatanana Ambato Boeny	2.55
MDG-020	Ankafina (Ambohimasoa)	2.54
MDG-154	Zombitse-Vohibasia National Park	2.52
MDG-011	Tsinjoriake-Andatabo MPA	2.48
MDG-128	Vohibe-Ambalabe (Vatomandry)	2.43
MDG-089	Lake Ihotry Complex - Mangoky Delta	2.42
MDG-072	Analavelona	2.41
MDG-152	Ranomafana National Park and extension	2.37
MDG-217	Source of Faraony	2.26
MDG-056	Makay	2.21
MDG-070	Analalava Foulpointe	2.20
MDG-193	River of Mananjary	2.18
MDG-106	Classified Forest of Vohibola	2.17
MDG-091	Mangoky-Ankazoabo Complex	2.14
MDG-203	Angavokely Forestry Station	2.13
MDG-045	Great reef of Toliary	2.06
MDG-200	Namorona-Faraony rivers	2.02
MDG-209	Wetland of Ambila-Lemaintso	2.01
MDG-088	Mahafaly Plateau Forest Complex	2.01
MDG-033	Three Bays Complex	1.97
MDG-175	Special Reserve of Beza Mahafaly	1.97
MDG-187	Special Reserve of the Peak of Ivohibe	1.97
MDG-053	Lake Tseny	1.97
MDG-044	Saint-Augustin Forest	1.96
MDG-120	Massif of Manjakatompo-Ankaratra	1.95
MDG-126	Seven Lakes	1.91
MDG-113	Kianjavato	1.90
MDG-002	Ambalimbe Menabe	1.89
MDG-058	Nankinana (Ambodibonara-Masomeloka)	1.84
MDG-052	Lake Tsarasaotra	1.82
MDG-048	Itampolo West - Mahafaly	1.79
MDG-231	Group of Islands of Nosy-Be	1.76

The relative importance of the KBAs for Madagascar is shown in the following map:



Map 5 Multi-criteria score and importance of KBAs based on ES important to EbA
Low (0-1), Medium (1-2), High (2-3), Very high (3+)

6.3.2 Comoros

Assessments of ecosystem services, particularly in the Comoros Archipelago, are relatively underdeveloped. Nevertheless, the analysis conducted as part of the ecosystem profile update allows for the ranking of KBAs according to their relative importance in providing ES important to local populations, as shown in the table below. A table showing the detailed scoring and weighting by ES for all KBAs in Comoros can be found in the Appendix.

Table 36 Ranking of KBAs in Comoros according to multi-criteria analysis

Code	KBA	Multi-criteria score
COM-7	Mount Ntringui (Ndzuani Heights)	0,54
COM-5	Karthala Massif	0,45
COM-20	Coelacanth Zone	0,43
COM-1	Moya Forest	0,27
COM-14	Domoni area	0,25
COM-4	Massif de la Grille	0,22
COM-8	Ex-Marine Park of Moheli	0,21
COM-12	Bimbini area and Ilot de la Selle	0,19
COM-19	Pomoni area	0,18
COM-16	Moya area	0,17
COM-10	Coral reefs of Grande Comore	0,16
COM-17	Mutsamudu area	0,15
COM-3	Lake Hantsongoma	0,14
COM-9	Coral reefs of Anjouan	0,14
COM-13	Chiroroni area	0,13
COM-15	Male Zone	0,12
COM-6	Mount Mlédjélé (Heights of Mwali)	0,11
COM-18	Zone of Ndroudé and Ilot aux Tortues	0,10
COM-11	Coral reefs of Moheli - outside the Marine Park	0,09
COM-2	Lake Dziani-Boudouni	0,05

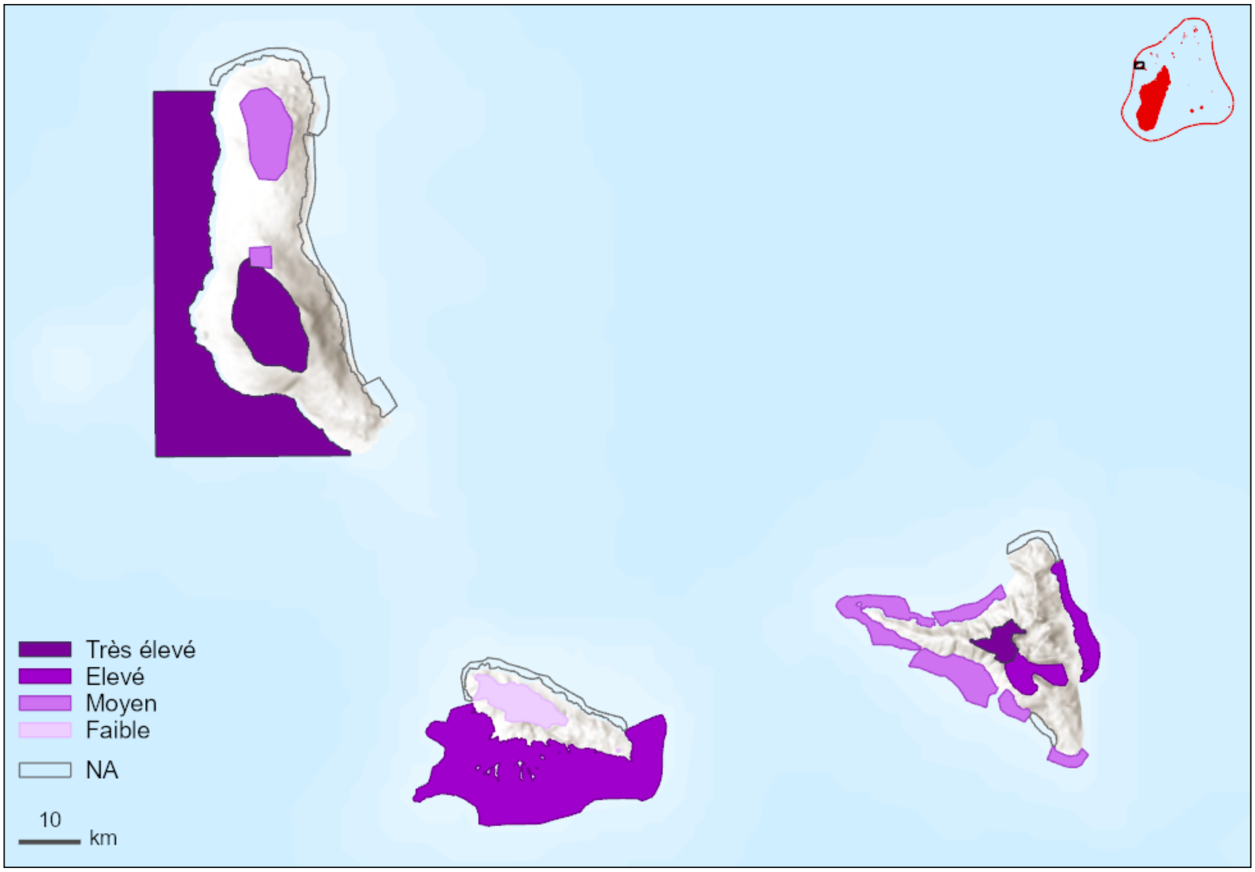


Figure 7 Relative importance of Comoros' KBAs for the provision of ecosystem services

6.3.3 Mauritius

As for the other islands, the results are also the product of a literature review and public consultation using the "expert opinion" approach, including KBA managers and experts directly involved in ecosystem service issues.

A table showing the detailed scoring and weighting by ES for all KBAs in Mauritius is provided in the Appendix, and the results are summarized in the table below .

Table 37 Ranking of KBAs in Mauritius using multi-criteria analysis

Code KBA	KBA	Multi-criteria score
MUS-2	Bamboo Mountain Range	0,655
MUS-5	Relict Forests of the Central Plateau	0,550
MUS-14	Plaine des Roches - Bras d'Eau	0,537
MUS-12	Black River Gorges National Park and surrounding areas	0,520
MUS-3	Chamarel - Le Morne	0,503
MUS-8	Mauritius South-Eastern Islets	0,395
MUS-16	South Slopes of Grande Montagne	0,364
MUS-17	Yemen-Takamaka	0,353
MUS-11	Guardhouse Mountain	0,343
MUS-6	Rodrigues' Islets	0,308
MUS-4	Tamarind Falls / Mount Simonet / Cabinet Nature Reserve	0,290

Code KBA	KBA	Multi-criteria score
MUS-9	Le Pouce - Anse Courtois - Pieter Both - Longue Mountain	0,280
MUS-7	Mauritius Northern Islets	0,260
MUS-10	Mondrain - Magenta - Trois Mamelles - Mont du Rempart	0,225
MUS-13	Coral Plain	0,220
MUS-1	Cargados Carajos Shoals	0,200
MUS-15	Good God Bridge	0,167

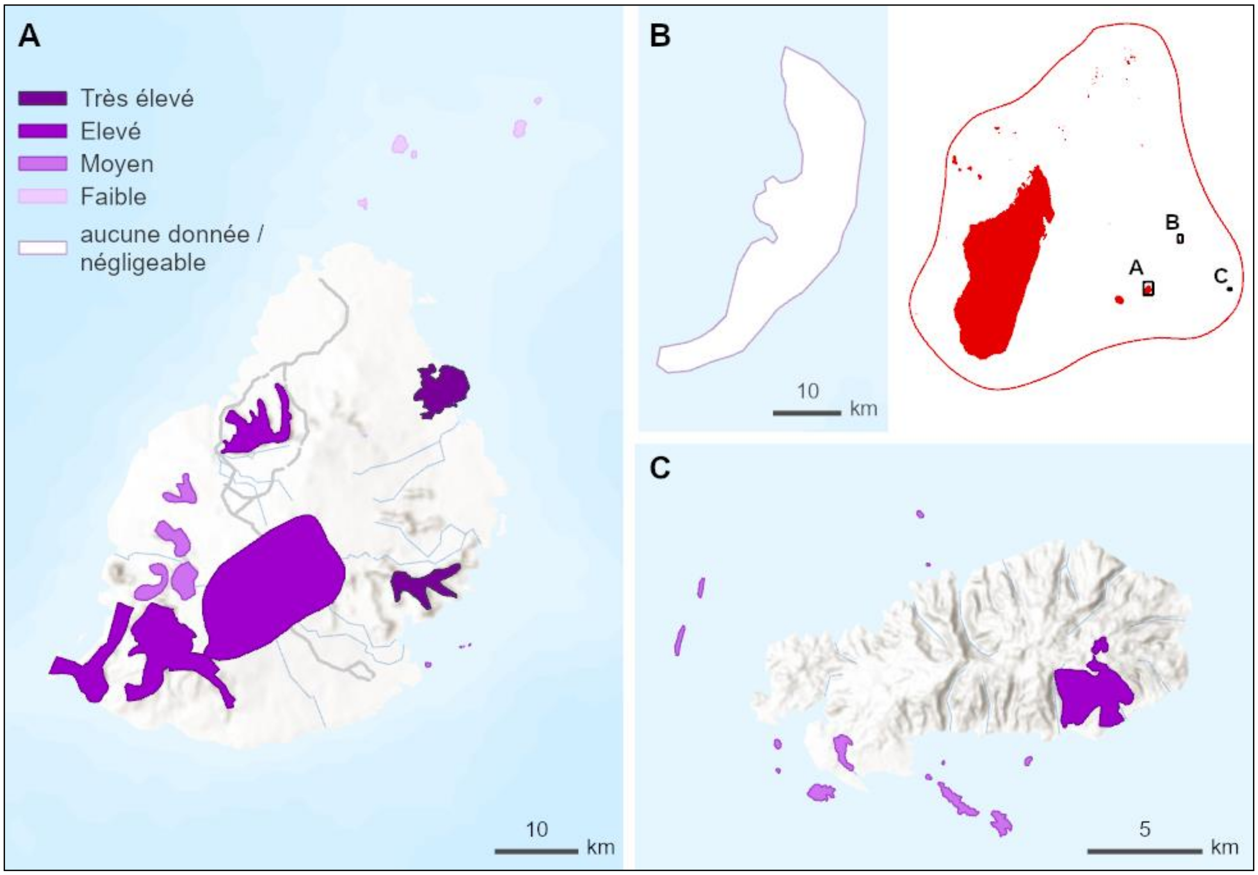


Figure 8 Relative importance of KBAs in Mauritius for the provision of ecosystem services

6.3.4 Seychelles

Table 38 Ranking of KBAs in Seychelles according to multi-criteria analysis

Code KBA	Group of islands	Land/ Marin	NAMES OF KBAS	Multi-criteria score
SYC-43	Inner	T	Morne Seychellois National Park	0,719
SYC-38	Inner	T	Planneau Mountain (Grand Bois-Varigault-Cascade)	0,633
SYC-41	Inner	T	Praslin National Park	0,586
SYC-42	Inner	T	Silhouette National Park	0,563
SYC-36	Inner	T	Burnt Mountain-Piton de l'Eboulis	0,500

Code KBA	Group of islands	Land/ Marin	NAMES OF KBAS	Multi-criteria score
SYC-50	Aldabra	M/T	Aldabra Special Reserve	0,469
SYC-47	Inner	M	Port Launay Marine National Park and coastal wetlands	0,469
SYC-15	North edge	T	Bird Island (Ile aux Vaches)	0,469
SYC-5	Cosmoledo	M/T	Cosmoledo	0,453
SYC-51	Inner	M/T	Aride Island Special Reserve	0,445
SYC-52	Inner	M/T	Cousin Island Special Reserve	0,445
SYC-48	Inner	M	Sainte-Anne Marine National Park (SAMNP)	0,438
SYC-20	North edge	T	St. Denis Island	0,430
SYC-46	Inner	M	Curieuse Island Marine National Park	0,406
SYC-32	Amirantes	M/T	Saint-François and Bijoutier Islands	0,406
SYC-3	Cosmoledo	M/T	Astove	0,398
SYC-18	Inner	T	Curious Island	0,391
SYC-19	Amirantes	M/T	D'Arros Island and Saint Joseph Atoll	0,383
SYC-6	Farquhar	M/T	Farquhar - South Island and islets	0,375
SYC-9	Inner	T	Fond Ferdinand	0,352
SYC-49	Inner	M	Silhouette Marine National Park	0,344
SYC-22	Amirantes	M	Desroches Island - surrounding reefs	0,344
SYC-25	Amirantes	M/T	Alphonse Island and Lagoon	0,344
SYC-39	Inner	T	Eagle's Nest (ridge and eastern slopes)	0,336
SYC-23	Inner	T	North Island	0,336
SYC-56	Inner	T	Endor Valley	0,328
SYC-26	Inner	T	Félicité Island	0,320
SYC-17	Inner	T	Cousin Island	0,320
SYC-27	Inner	T	Frégate Island	0,313
SYC-2	Inner	T	Anse Source d'Argent-Anse Marron	0,313
SYC-44	Inner	M	Cape Ternay / Ternay Bay Marine National Park	0,305
SYC-7	Inner	T	Fond Azore southern slopes to Anse Bois de Rose	0,305
SYC-34	Amirantes	M	Poivre Lagoon and surrounding reefs	0,297
SYC-45	Inner	M	Cocos Island Marine National Park	0,289
SYC-21	Amirantes	T	Desnoeufs Island	0,289
SYC-12	Inner	T	Grand Anse-Petite Anse-Fond Piment	0,281
SYC-53	Inner	T	La Veuve Special Reserve	0,273
SYC-28	Amirantes	T	Marie-Louise Island	0,258
SYC-10	Inner	T	Friendship Forest	0,250
SYC-37	Inner	T	Glacis Mountain - When she comes	0,242
SYC-4	Amirantes	M	African Banks	0,242
SYC-24	Farquhar	M/T	Providence Island and Bank	0,234
SYC-29	Inner	T	Sainte-Anne Island	0,234

Code KBA	Group of islands	Land/ Marin	NAMES OF KBAS	Multi-criteria score
SYC-11	Inner	T	Coral Mountain-Southern Hills dry forests	0,227
SYC-13	Inner	T	Grand Police wetlands	0,219
SYC-1	Inner	M	Anse Major / Anse Jasmin (marine area of MSNP)	0,219
SYC-14	Aldabra	M/T	Assumption Island	0,219
SYC-31	Amirantes	T	Etoile and Boudeuse Islands	0,211
SYC-57	Inner	T	La Misère-Dauban area: La Misère	0,195
SYC-8	Inner	T	Fond Diable and Pointe Josephine	0,188
SYC-40	Inner	T	Recif Island National Park	0,148
SYC-35	Inner	T	Mount Signal	0,148
SYC-33	Inner	T	Frégate Island	0,125
SYC-16	Inner	T	Island Design	0,125
SYC-54	Inner	T	Kerlan River	0,109
SYC-55	Inner	T	Anse Petite Cour Boulders	0,078
SYC-30	Farquhar	T	Saint-Pierre Island	0,055

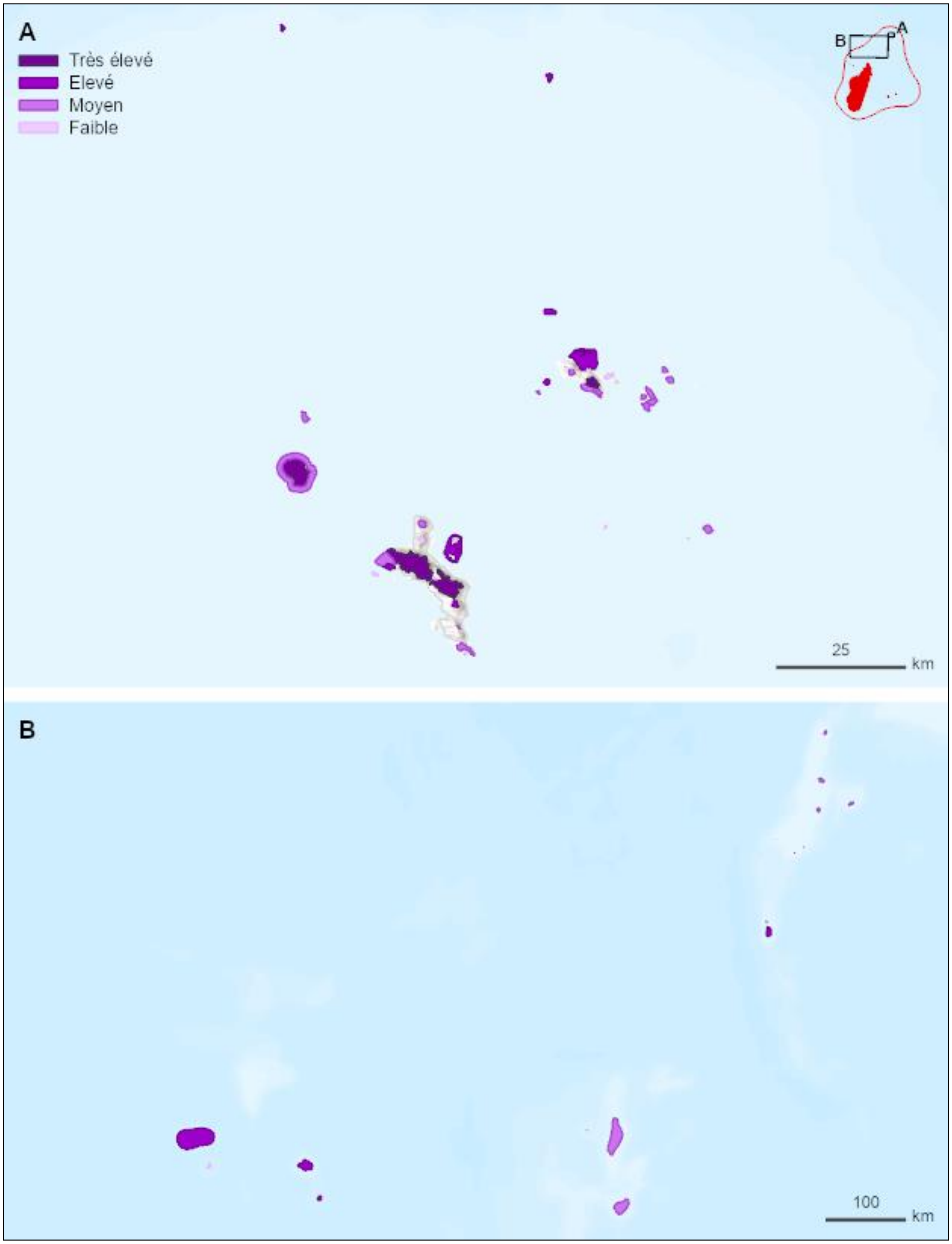


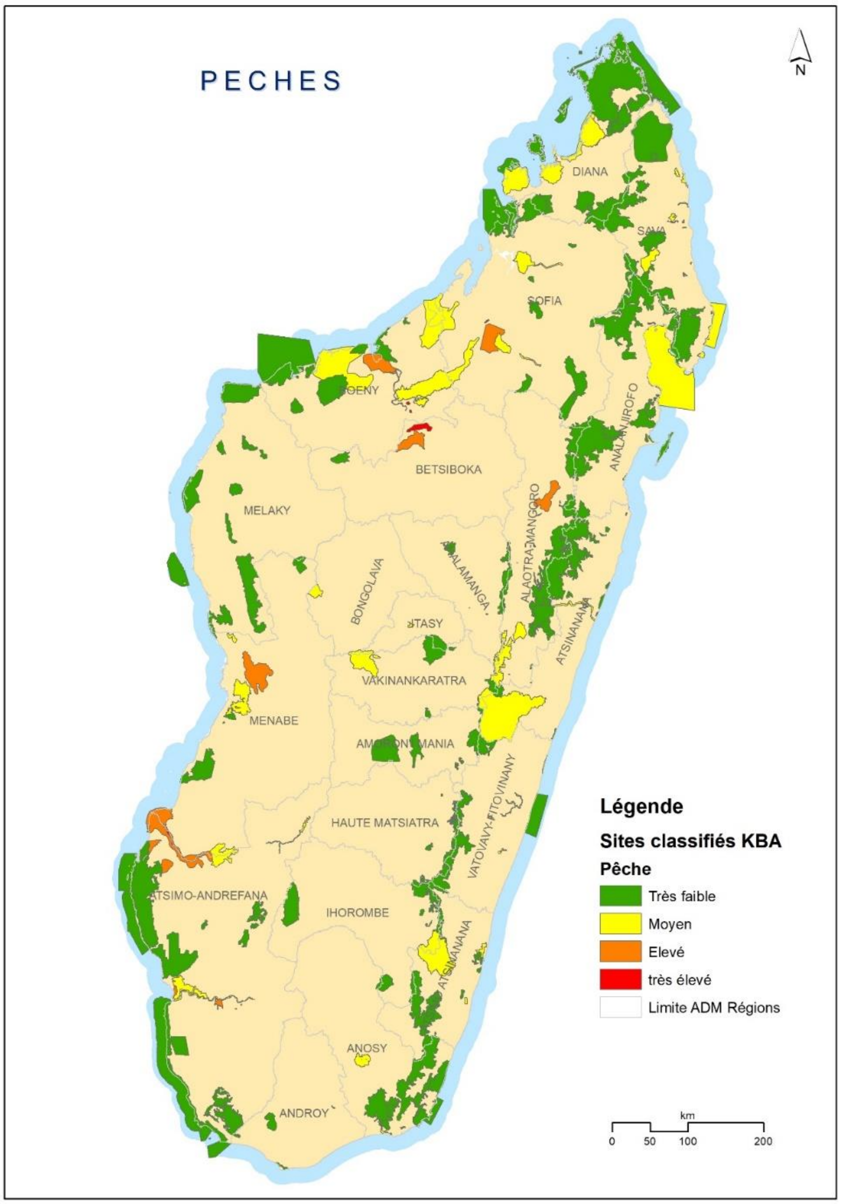
Figure 9 Relative importance of Seychelles' KBAs for the provision of ecosystem services

6.4 Procurement Services

6.4.1 Madagascar

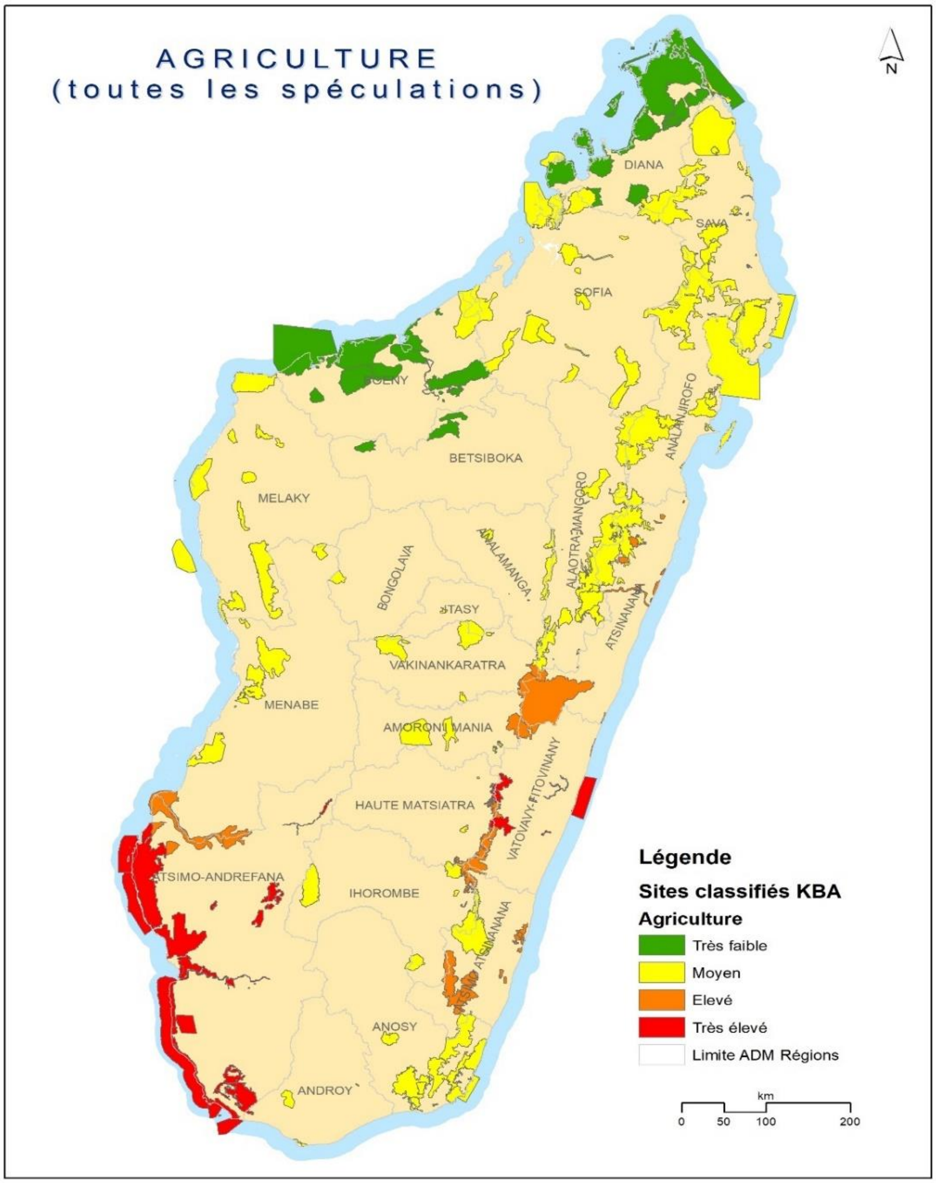
Fishing

Fishing constitutes a significant portion of people's income, up to 70% of total income (Gough *et al.* 2020) for those living near the coast. In addition, fish can constitute up to 80% of protein intake (Mihari, 2022). Fishing is thus identified as one of the most important ecosystem services for the rural population. Therefore, the government as well as many conservation NGOs are promoting responsible fishing as a response and adaptation to the effects of climate change.



Map 6 Fish catches from freshwater and coastal ecosystems (Sources: Fedele *et al.* 2021)

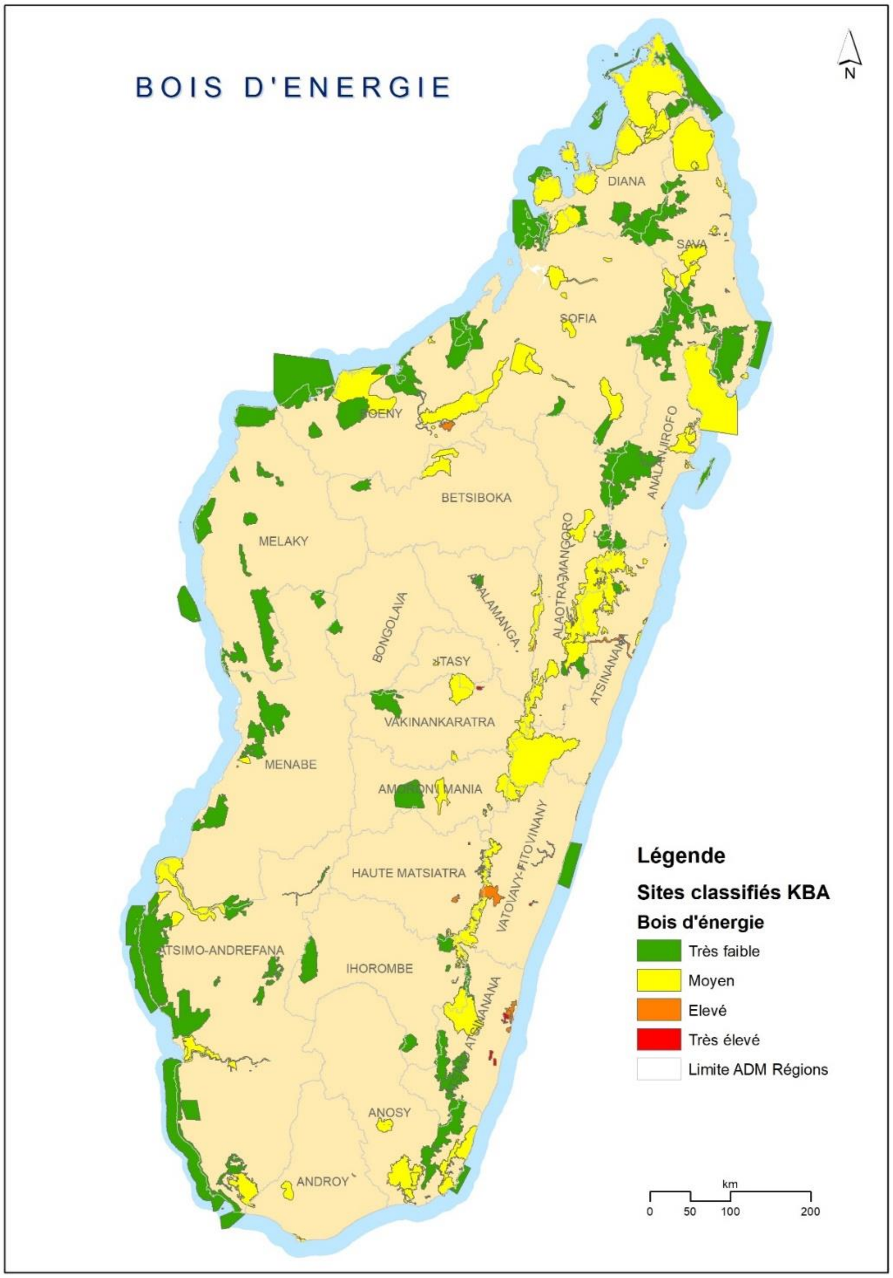
Agriculture
More than 80% of Madagascar's population lives from agriculture (World Bank, 2021). This makes agriculture very important ecosystem services for Madagascar. In addition, Madagascar has been identified as one of the most vulnerable countries to climate change. The map below shows the size of the cultivated area in and around the KBAs. Interestingly, those with the most cultivated area are those in southwestern Madagascar where the climate is dry to arid. Then, the eastern part of Madagascar has a higher cultivated area compared to the KBAs in western Madagascar where cultivated area is low.



Map 7 Fish catches from freshwater and coastal ecosystems (Sources: Fedele et al. 2021)

Fuelwood and non-timber forest products
The national need for fuelwood is estimated at about 18 million cubic meters per year (Ministry of Energy and Hydrocarbons, 2018), which is almost twice the country's

production capacity (9 million cubic meters). This makes fuelwood a very important service provided by the ecosystem, and very important for climate change adaptation. Fuelwood collection is important especially in the eastern part of Madagascar. Most of these KBAs are on the edge of natural forest or between blocks of natural forest.



Map 8 Importance of Madagascar's KBAs for wood energy supply

6.4.2 Comoros

Commercial fishing

The coastal or reef KBAs of the Comoros are fishing areas inhabited by a population of fishermen living mainly from this resource. The 2020 fishery statistics bulletin identifies the landing ports and assesses the amount of catch per port. This has allowed an assessment of the amount of commercial fish caught in these KBAs, in order to establish a geographical distribution of the amount of fish caught per KBA.

Moreover, fishing families are the most vulnerable groups to the depletion of sources. And it is the women who sell the fish at the market. In bad weather, the whole chain, from the fisherman, to the transporter and the retailer, to the consumer, is strongly affected because the fishermen cannot go to sea. Indeed, fish is the main source of protein for Comorian families.

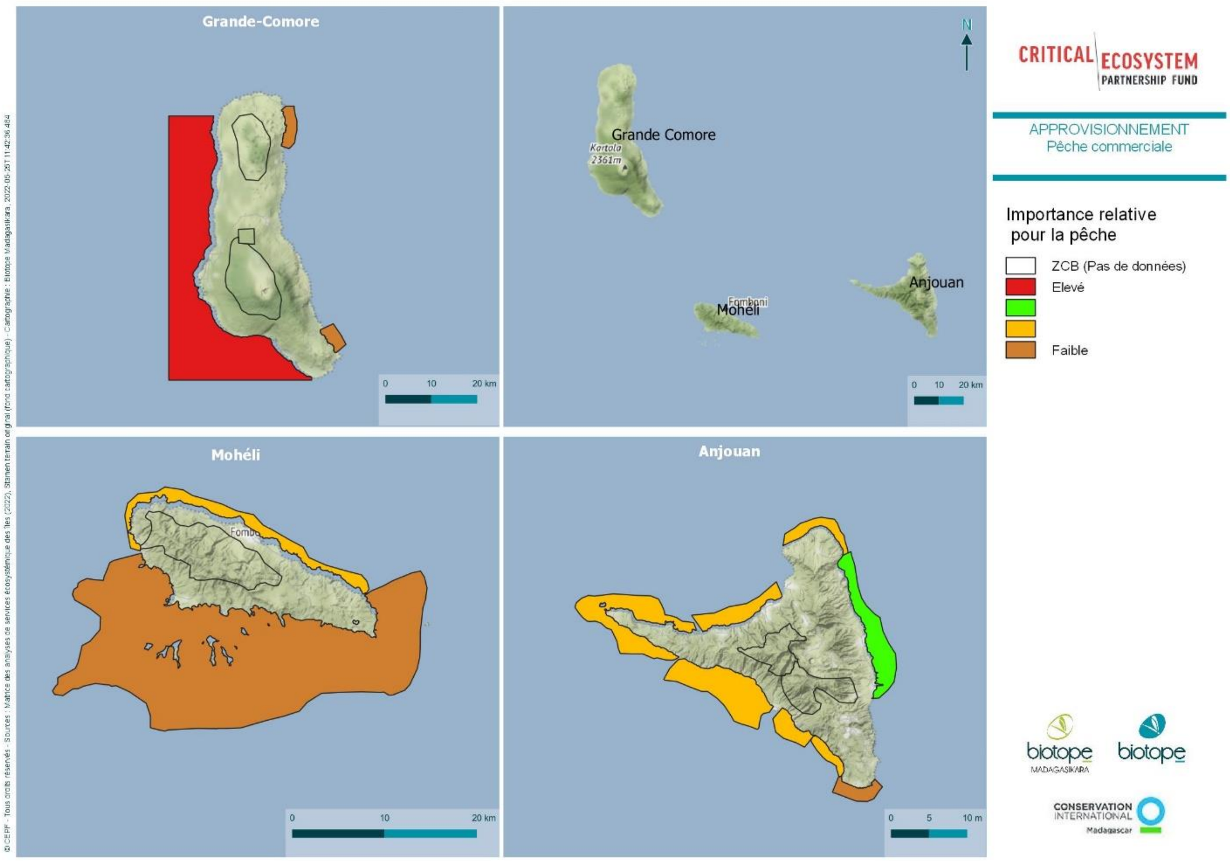


Figure 10 Relative importance of the Comoros KBAs for the commercial fishery

Wood energy

Wood is the main source of energy for Comorian families and the aromatic flower distillation industry. It is made up of trees cut down to make charcoal to be sold in urban centers or of dry wood collected during the clearing of agricultural land. Both of these products are transported to markets in towns and villages. This is a very profitable service, which the families have invested in promoting production to marketing.

Although wood harvesting appears to be limited in low and medium elevations, the high demand for this energy resource is increasing. The number of loggers is gradually increasing in secondary forests undergoing reconstitution. The species most in demand for its abundance, quality and proximity is an invasive exotic species, *Psdyium cattelianum*. However, some native species of ecological interest are being felled for the same purpose.

Families using wood and charcoal respectively for the forestry KBAs were counted in order to assess the proportion of the population using this service.

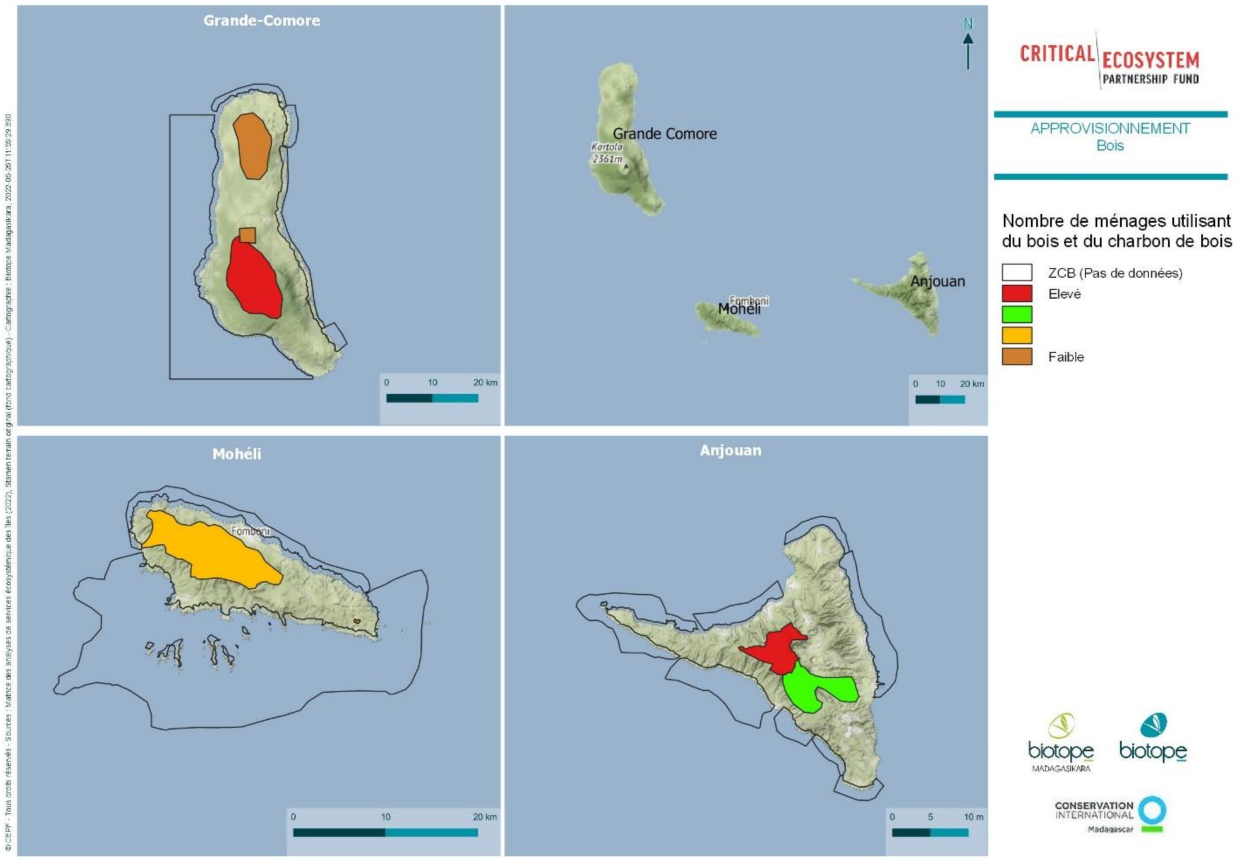


Figure 11 Relative importance of the Comoros KBAs for wood energy supply

6.4.3 Mauritius

Supply : Commercial fishery

The fishing sector represents an important economic sector in Mauritius; it generates employment, is a source of foreign income and ensures food security. In addition, the fisheries sector employs some 22,000 people, working directly or indirectly, the majority of whom operate in the fish processing sector.

In 2019, local fish production was about 31,663 tons and the total export of fish and fishery products generated revenues of about Rs. 13 billion, contributing to about 19% of national exports. In addition, the fisheries sector makes a vital contribution to the lives of coastal communities by supporting the livelihoods of coastal communities, tourism and ensuring the supply of fresh fish to the local market. Currently, the fisheries sector is the mainstay of the blue economy.

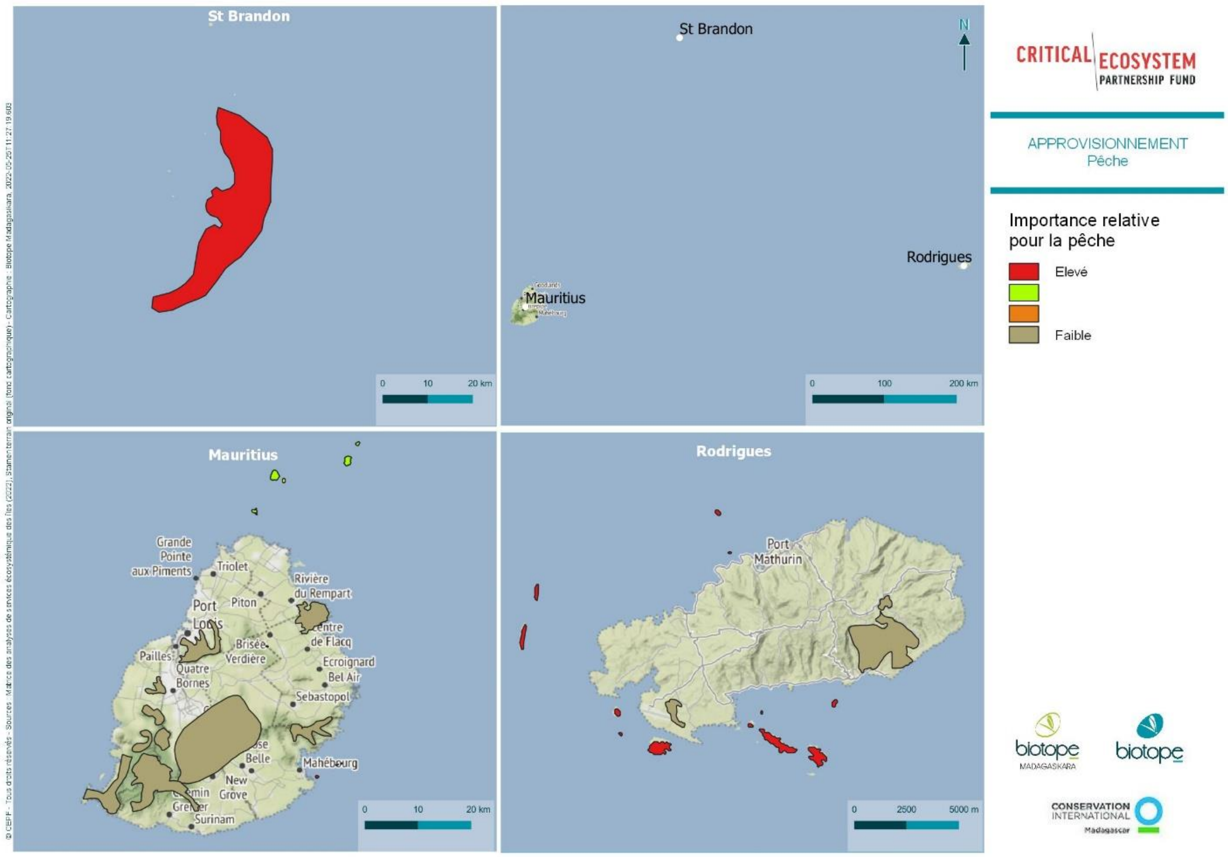


Figure 12 Relative Importance of KBAs to the Commercial Fishery in Mauritius

6.4.4 Seychelles

Commercial fishing/ Food

In the Seychelles, all marine KBAs provide food for humans, at least indirectly in the case of protected KBAs. For terrestrial KBAs, the food supply is only anecdotal (e.g., jackfruit).

The ongoing climate and environmental crisis will certainly affect the fishing industry through the cost of fuel. Therefore, in terms of resilience to climate change, the distance of fishing areas to ports and fish markets is also a factor to consider. Another factor to consider is the repeated bleaching of coral reefs and the possible effect this could have on fish populations in some areas.

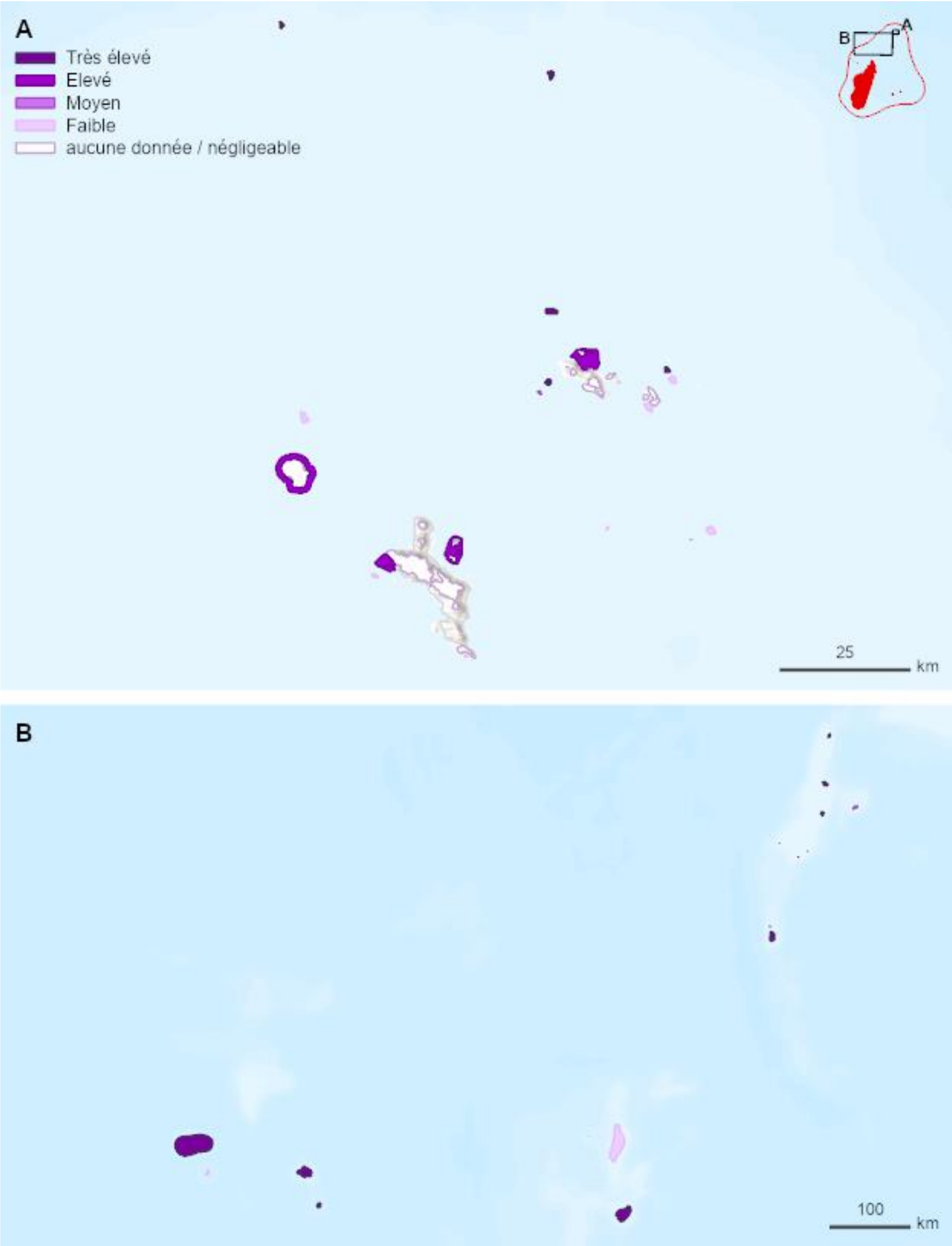


Figure 13 Relative importance of KBAs to the commercial fishery

Forestry products

Several KBAs provide timber, such as Morne Seychellois National Park, the Montagne Brûlée area, and Praslin National Park. Data on the volume of stocks, or on timber removals are not available, let alone in terms of spatial data. Other forest products include Coco-de-mer nuts (*Lodoicea maldivica*) and palm leaves (representing different services), but data are limited or only locally relevant for a given KBA. Currently, this ecosystem service remains limited due to the high cost of local extraction, relative to the cost of imported wood products. Nevertheless, local communities occasionally enter forested KBAs (e.g., Morne Seychellois National Park) to collect timber or perches for their own use, although this is not normally allowed, but this activity is very marginal.

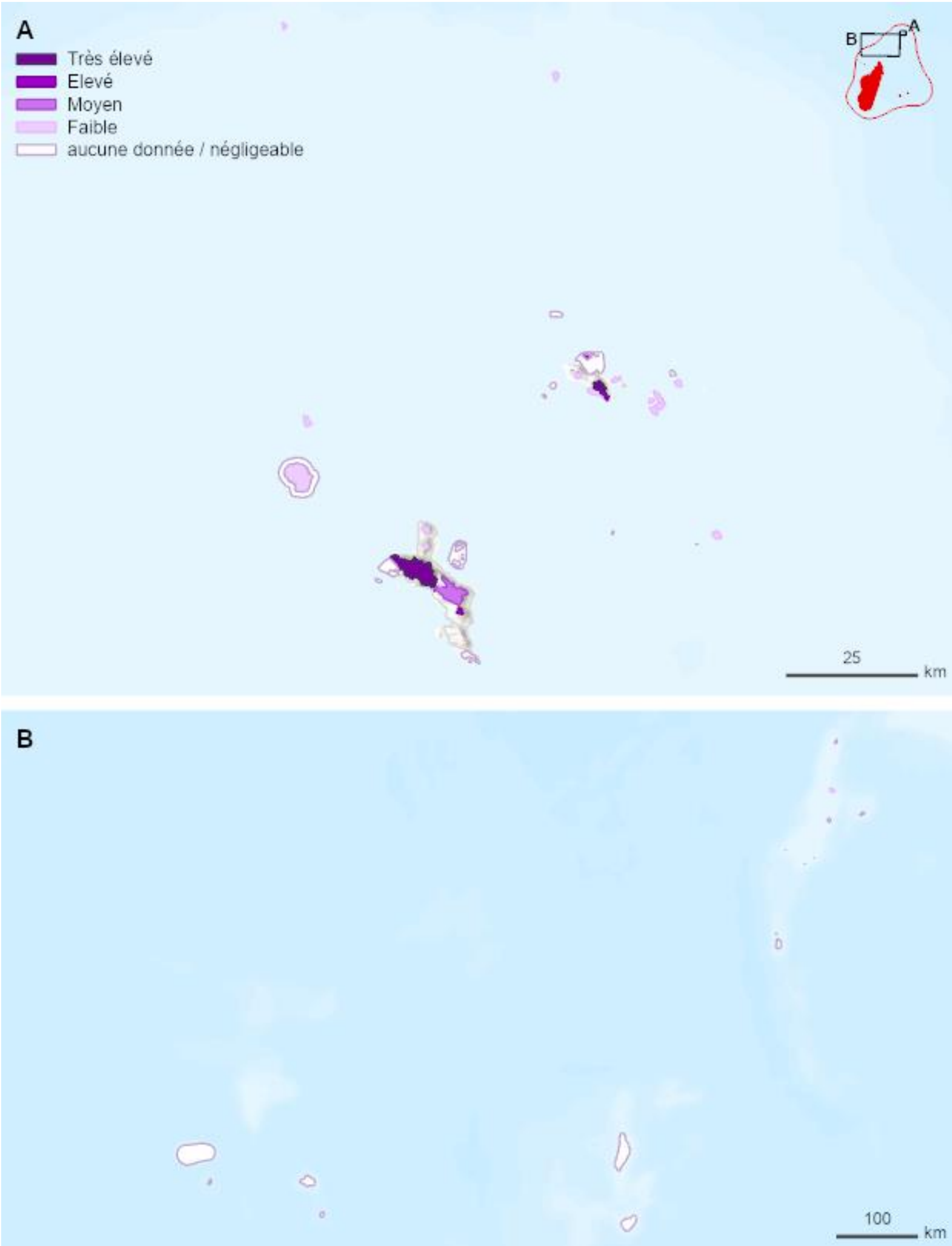


Figure 14 Relative importance of KBAs for wood supply

Drugs

The most popular medicinal plants targeted by local communities for collection in (semi-)natural ecosystems include *Psychotria pervillei*, *Craterispermum* spp., *Diospyros seychellarum*, *Aphloia theiformis* subsp. *sechellensis*, *Brexia microcarpa*, *Ochrosia oppositifolia* and *Pittosporum senacia* subsp. *Wrightii*.

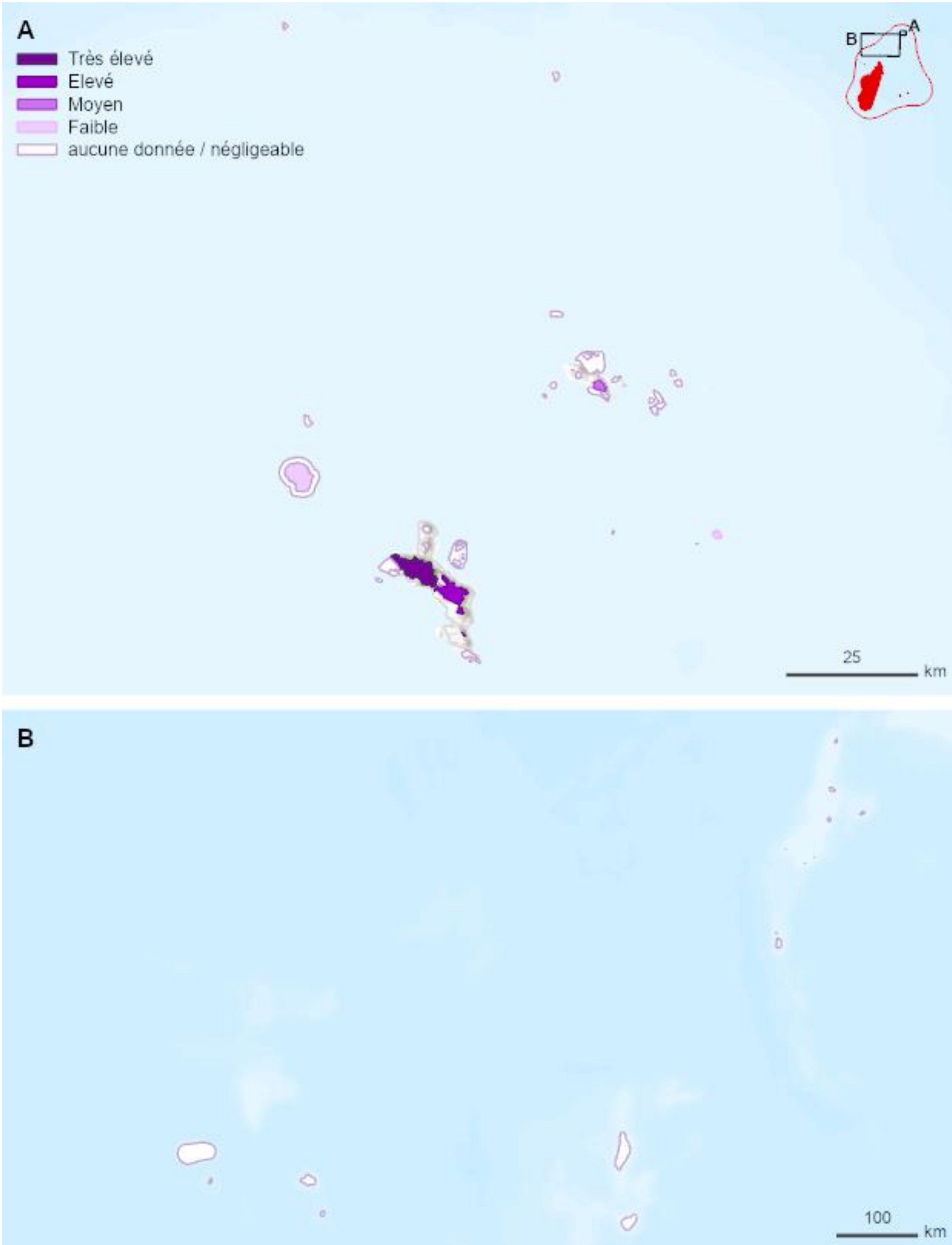


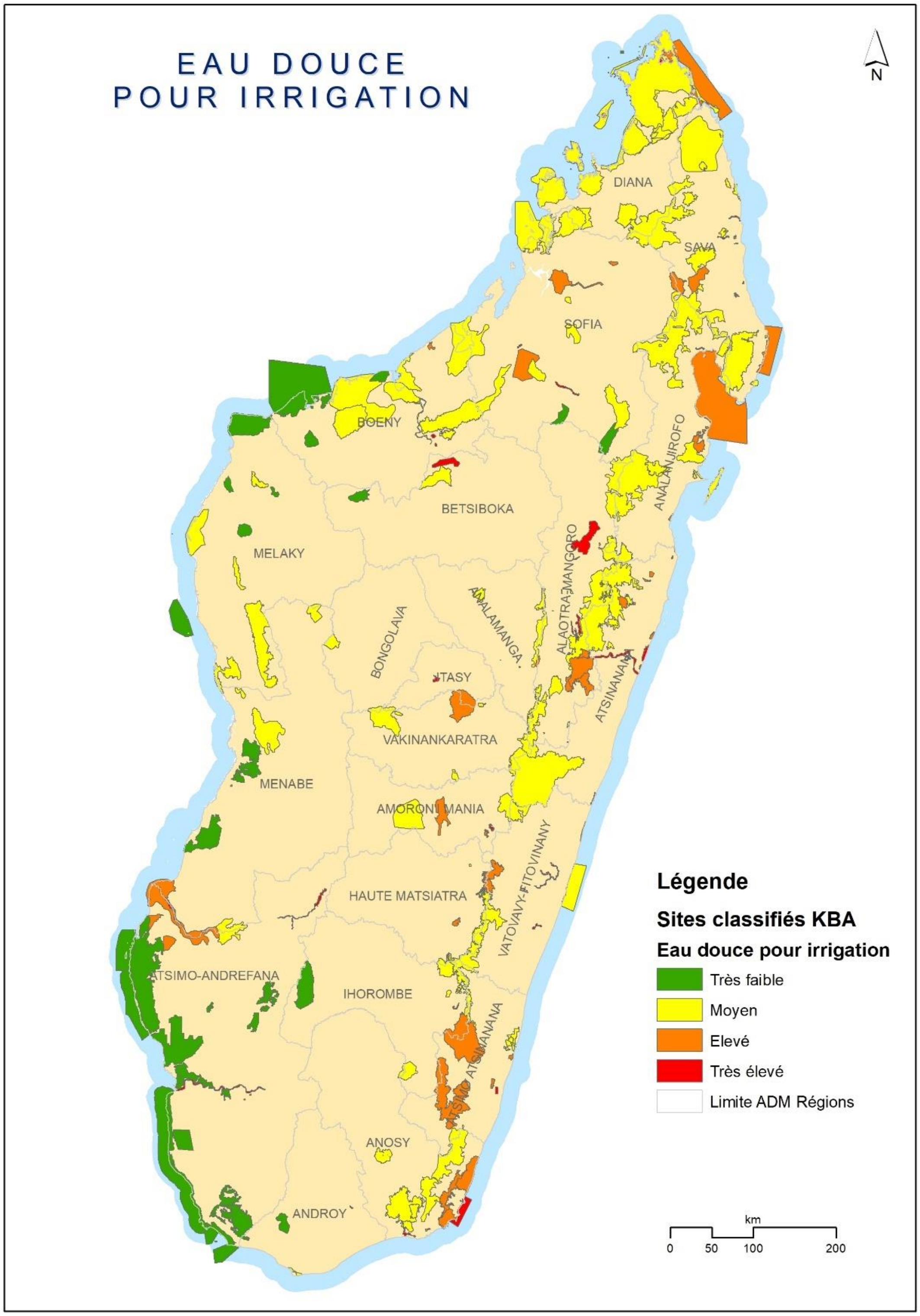
Figure 15 Relative Importance of KBAs in Seychelles for Medicinal Products

6.5 Supply Services: Fresh Water

6.5.1 Madagascar

Water for irrigation

Freshwater ecosystems are among the most diverse environments in the world (Dayton, 2019). It includes surface water, rivers, lakes, streams, and groundwater. The ecosystem services identified for Madagascar are freshwater for irrigation (agriculture), freshwater for drinking, and water for energy production (electricity).



Map 9 Freshwater availability for irrigation (Source: Neugarten *et al.* 2016).

6.5.2 Comoros

Water for domestic consumption

The oldest islands of the Comoros archipelago, Mayotte, Moheli and Anjouan, have an important hydraulic network comprising permanent or semi-permanent rivers. On the other hand, Grande-Comores, the youngest island, has no rivers. Rainwater infiltrates under a very impermeable rocky soil to form groundwater at the coast.

Thanks to the forest ecosystems sheltering rivers with an average rainfall of 800 mm but which can reach 6000 mm per year, the permanent or semi-permanent rivers make it possible to provide for the daily water needs of the population of these three islands. Catchment basins for decantation and storage are built upstream to allow the distribution to the houses by a system of canalization.

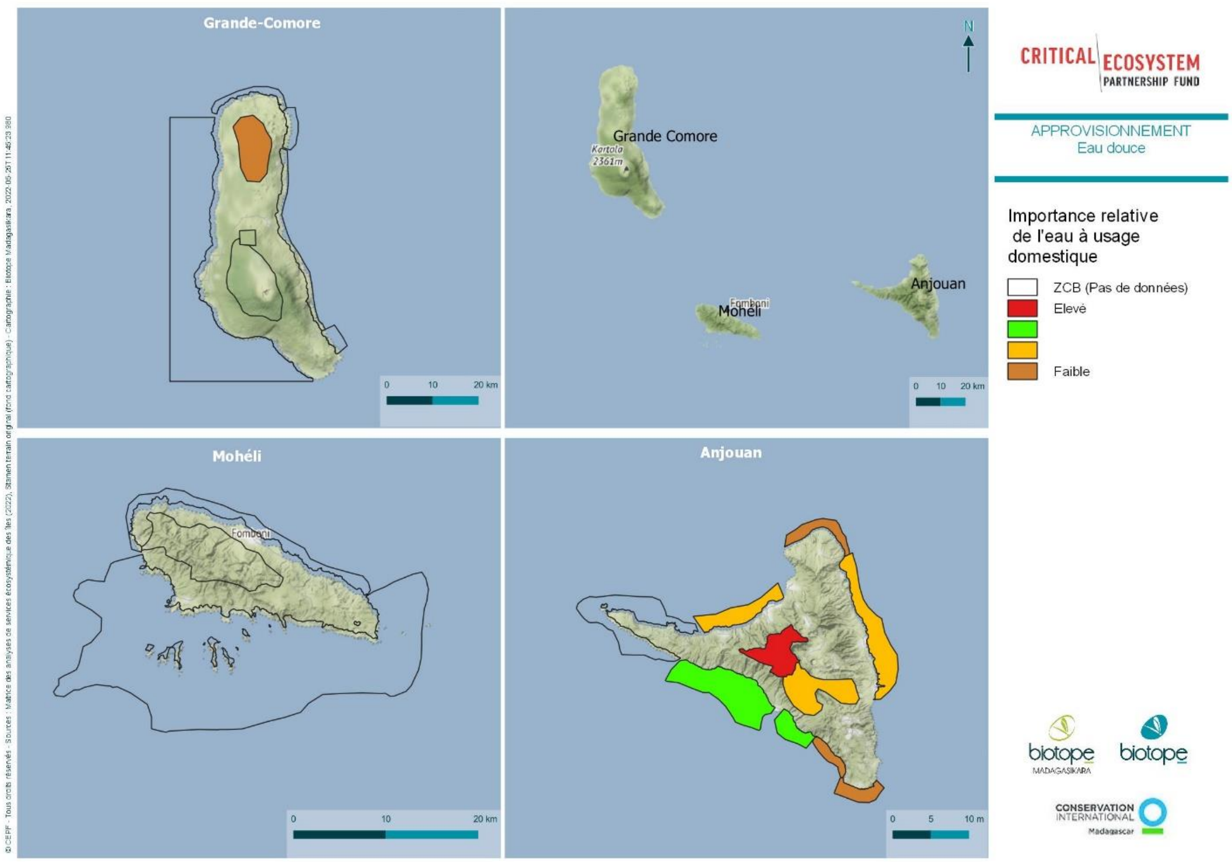


Figure 16 Relative importance of the Comoros KBAs for domestic water use

Water for irrigation

The importance of the river network in Moheli and Anjouan has allowed the development of irrigated crops in these two islands.

On the island of Moheli, the Moheli National Park supports farmers to improve agricultural production in a sustainable way.

The island of Grande Comore does not have a permanent waterway like Moheli and Anjouan. Farmers there practice a type of rain-fed agriculture. They are therefore trying to adapt to the current climatic challenges.

Each of the three islands in the archipelago that are the subject of this study has a wetland associated with a lake ecosystem. These lakes, smaller in terms of water volume, are fully protected and drainage of water for irrigation is prohibited.

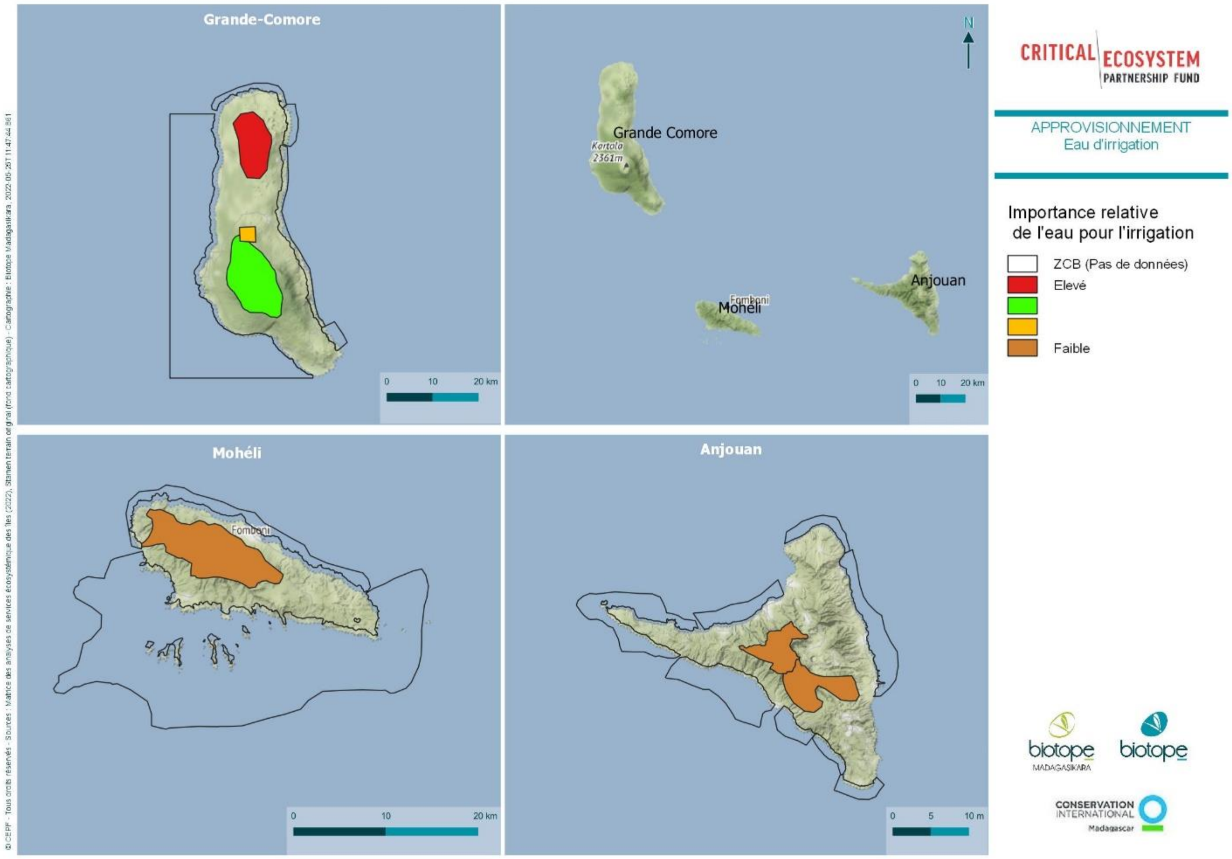


Figure 17 Relative importance of Comoros KBAs for irrigation water

Water for hydroelectricity

Hydroelectricity is very little represented on the two islands concerned, Anjouan and Moheli, where there are permanent water sources: two hydroelectric dams on Anjouan Island and one on Moheli Island.

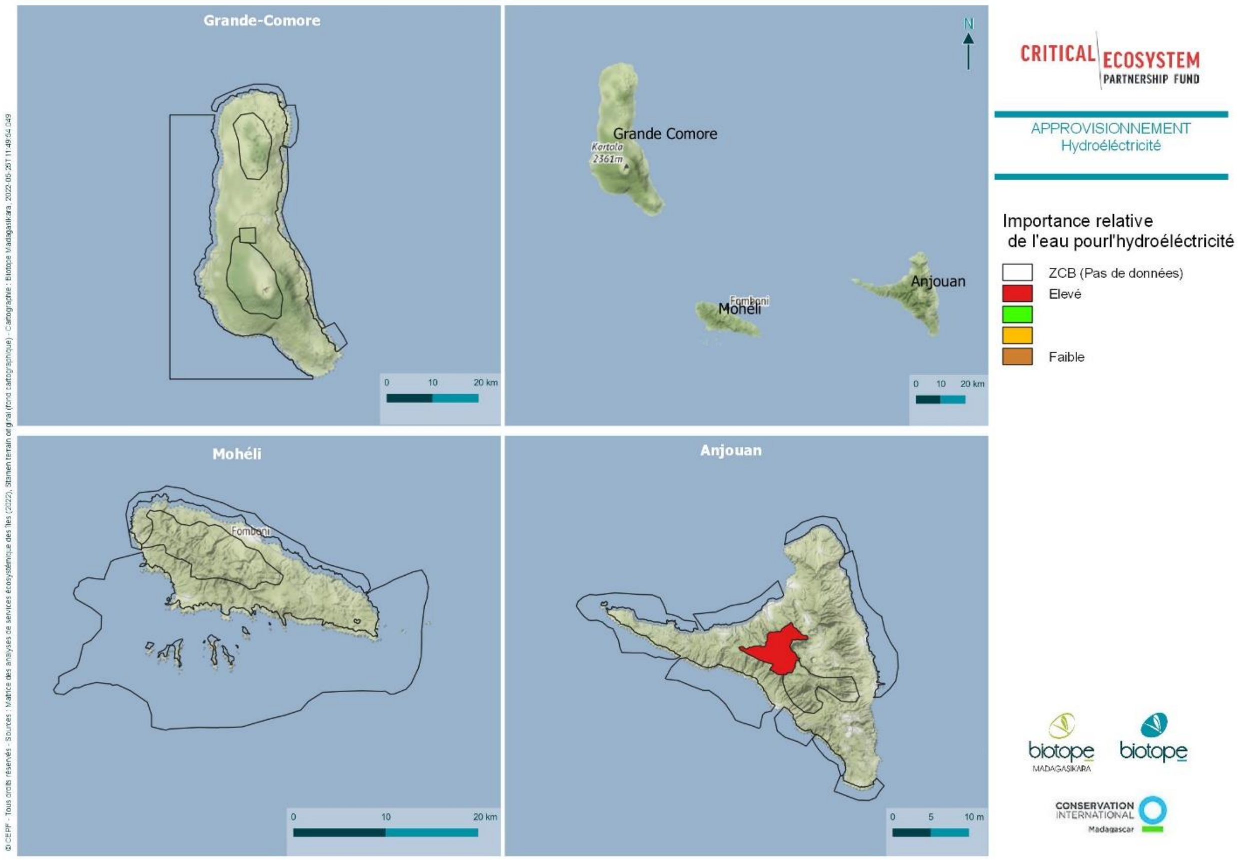


Figure 18 Relative importance of Comoros' KBAs for hydropower

6.5.3 Mauritius

Fresh water supply for consumption

Protected areas, while often focused on terrestrial protection and less frequently designed to protect freshwater resources, can be extremely important for the conservation of freshwater biodiversity and for the security of water needed for human survival and development.

In Mauritius, the main source of domestic water supply is groundwater (50%) which is extracted by 163 boreholes. The remaining 50% comes from surface sources such as impoundments and river intakes.

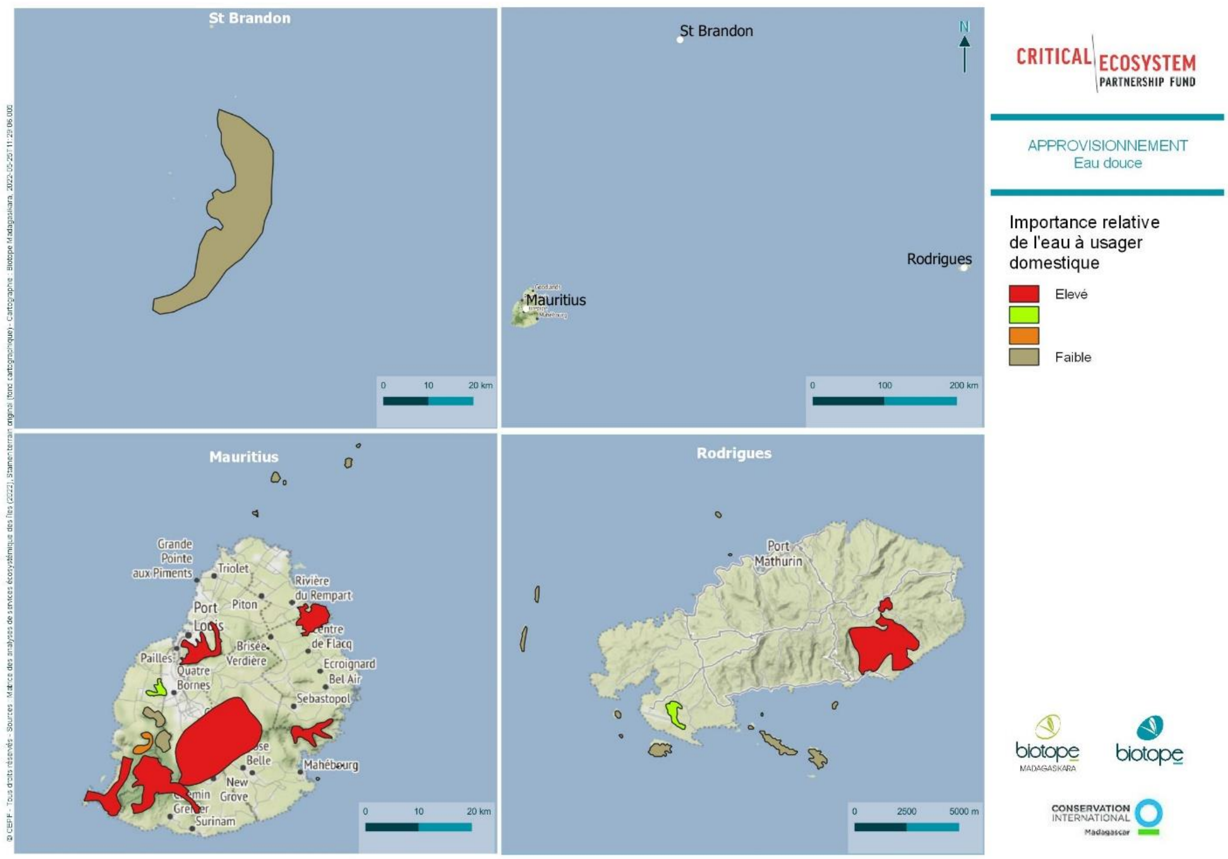


Figure 19 Relative importance of KBAs in Mauritius for domestic water use

Fresh water supply for irrigation

The large Mauritian sugar estates draw their water from rivers (there is no tax on this water), as much of their land is along these rivers. On the other hand, the government, through the Irrigation Authority, has planned irrigation programs for the benefit of small farmers. The water requirements in this sector vary from 30 to 100 Mm^3 . Initially, the water needed was obtained from natural springs, streams or rivers near the plantations, and few sugarcane farmers had holding tanks to store their irrigation water. The La Ferme and La Nicolière impoundments were built specifically to provide irrigation water for the sugar industry. Extensive feeder systems (e.g., La Nicolière feeder and La Ferme distribution canals) were also constructed to feed the reservoirs and distribute the water over large areas. Irrigation projects are sometimes decided without complete technical data. As the population increases, the available water per capita inevitably decreases. In previous years, water used for irrigation was three times the annual consumption of potable water (domestic, tourist and industrial).

The total area for irrigation in Mauritius has increased from 15,000 hectares in 1970 to 19,000 hectares in 2019, growing at an average annual rate of 0.52%.

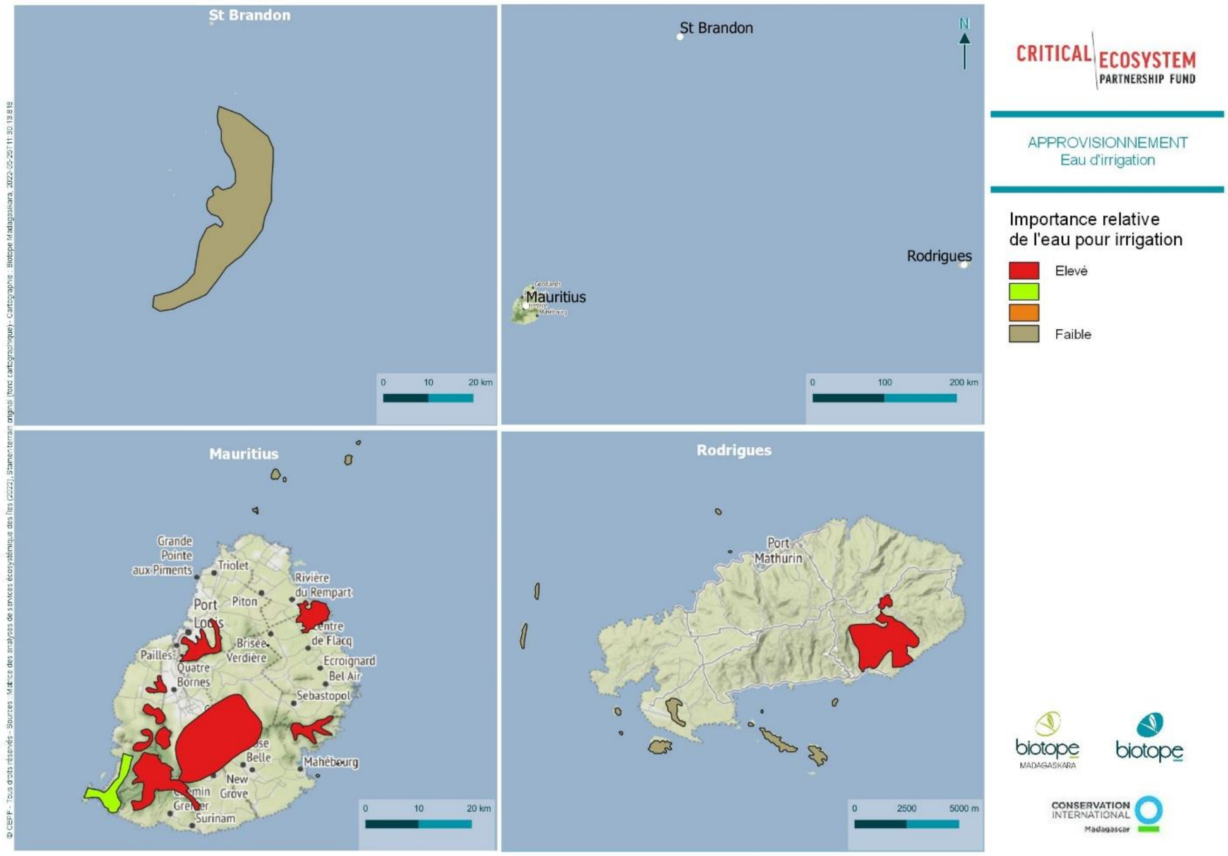


Figure 20 Relative importance of KBAs in Mauritius for irrigation

Fresh water supply for hydroelectricity

Mauritius' hydropower generation accounted for 3.0% of total electricity generated in 2019. Fluctuations in hydropower generation tend to follow annual rainfall levels. Electricity generated by all hydroelectric plants was 98.6 GWh in 2019. In the rainy season, annual production can reach 125 GWh, while in the dry season it can drop to 57 GWh. On average, therefore, some 90 GWh per year is considered a normal rainfall year.

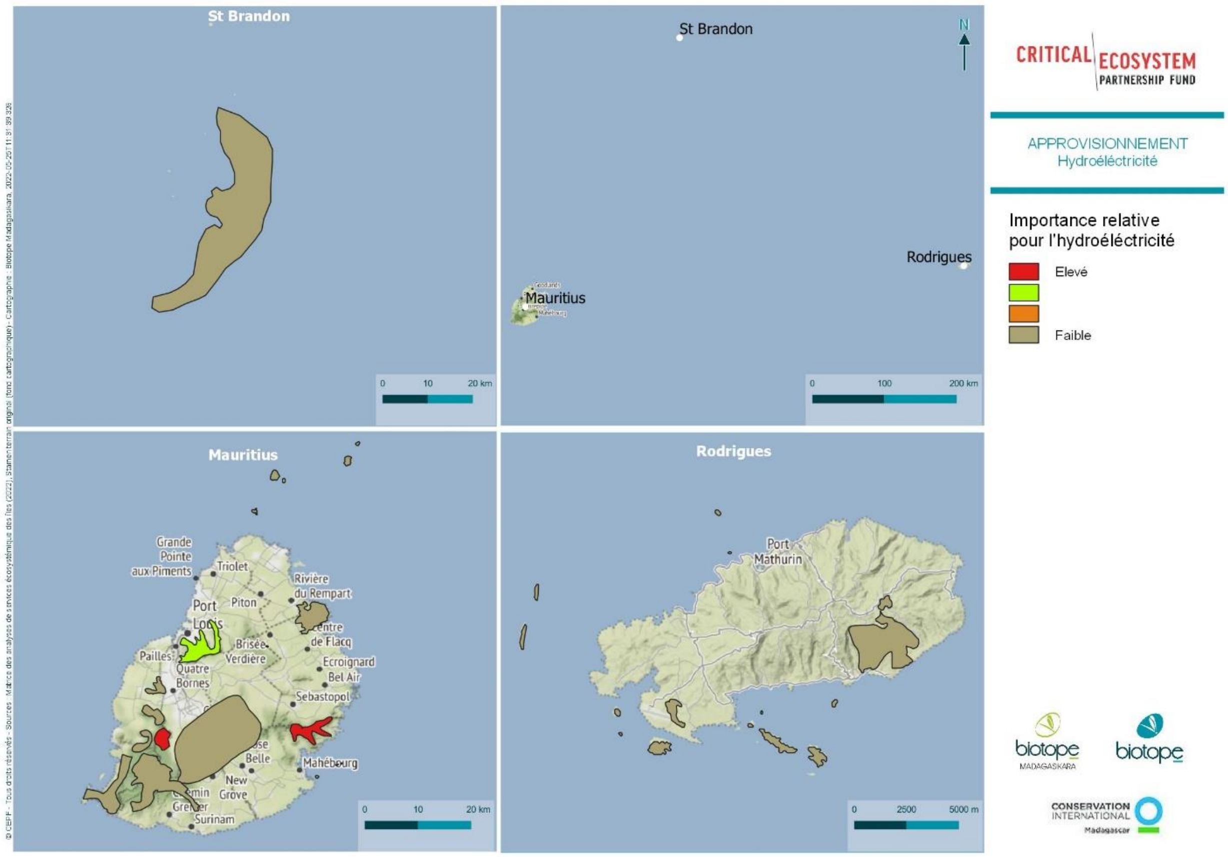


Figure 21 Relative importance of KBAs in Mauritius for hydropower

6.5.4 Seychelles

Water supply

Considering that the vast majority of the population is located on the three main islands of Mahé, Praslin, and La Digue, only the KBAs on these islands are potentially relevant to the provision of water resources in the context of climate resilience for the population of Seychelles. Although water appears to be abundant on these islands, it is entirely dependent on the quality of the tiny watersheds there, as opposed to mainland areas with large watersheds. Therefore, and also given the increasing water consumption, it is clear that the population of Seychelles, as well as its tourism industry, will be increasingly vulnerable to water scarcity, especially if deforestation (due to urban development) or forest fires affect the watersheds. Another concern for La Digue, where groundwater is the main source of supply (Futter and Dollar 2017), is the high vulnerability of the limited freshwater table on this small island (about 1,000 ha), subject to irreversible salinization risk if overexploited, as well as pollution risks due to the lack or very limited graywater collection and treatment system on the plateau where most of the habitat is concentrated.

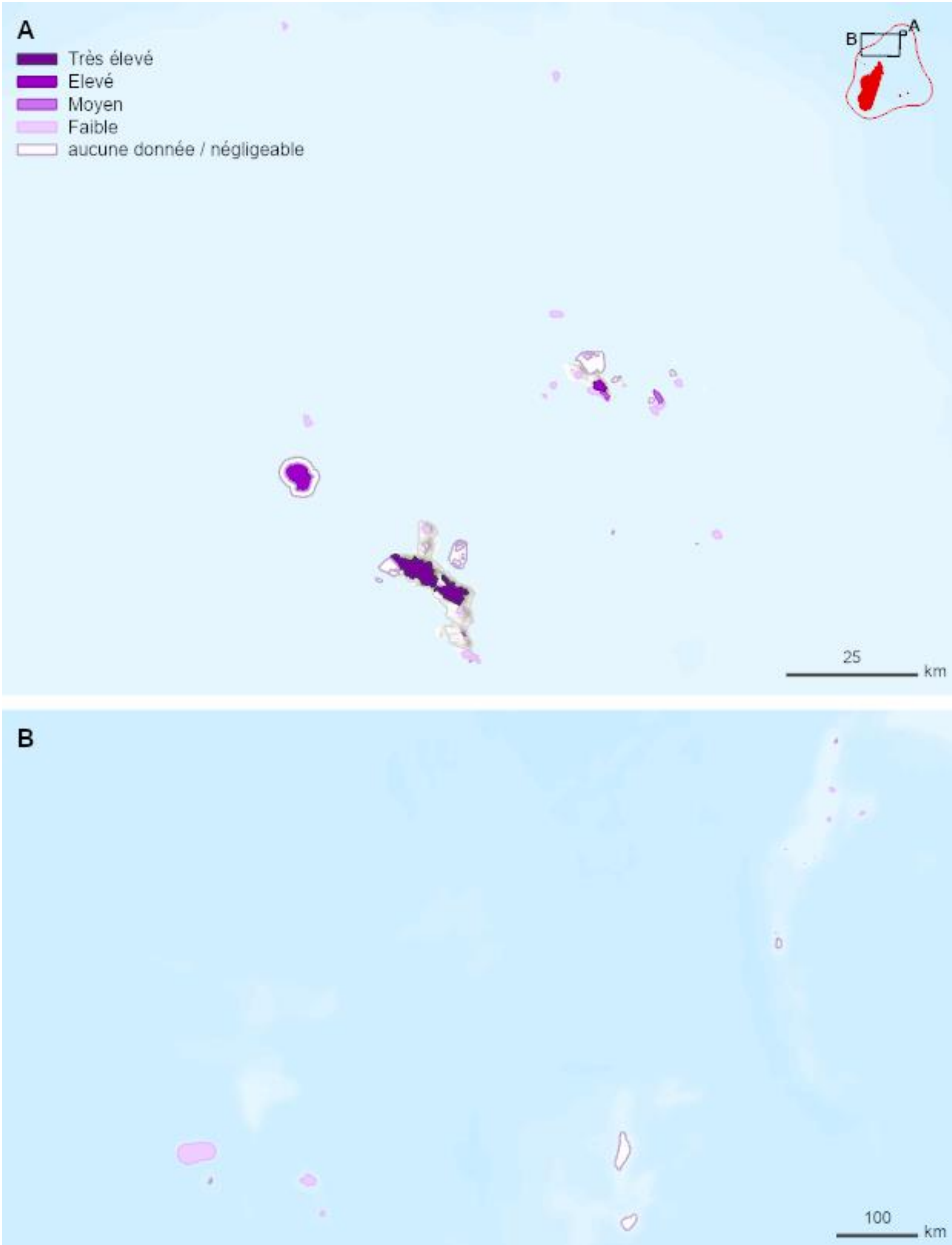


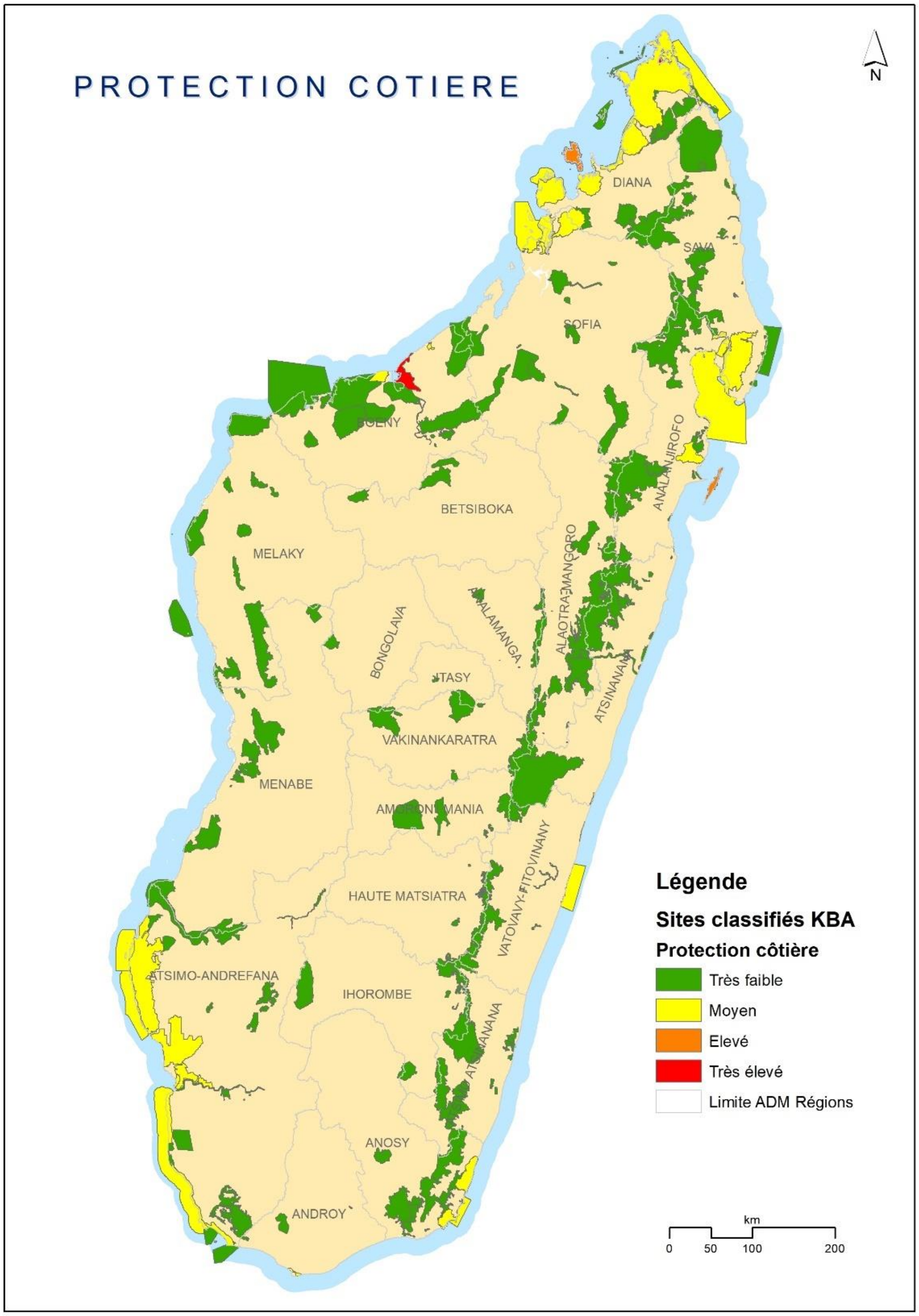
Figure 22 Relative importance of KBAs in Seychelles for domestic water supply

6.6 Control Services

6.6.1 Madagascar

Coastal protection

Reefs and mangroves are the ecosystems that protect Madagascar from extreme weather events and climate change. Mangroves are mainly found in western Madagascar and cover a total area of 250,000 hectares (Shapiro *et al.* 2018). Mangrove forest is somewhat fragile and has steadily decreased in area since 2000 (Shapiro *et al.* 2018). Mangroves within 2km of the coastline are affected by the protection of said coastline. The KBAs with high coastal protection value are the Three Bays complex, the Mahajanga coastal zone, the Nosy Be island group, Nosy Varika, Nosy Be and the Satellite Islands (Nosy Tanihely), Sainte Marie Island (Ambohidena, east coast) and Taolagnaro (southeast). The KBAs of the eastern coast have for the most part a greater reef protection value; this is not the case for Ambodivahibe Bay (North), which exceptionally has mangroves.



Map 10 Importance of CCAs for coastal protection in Madagascar

6.6.2 Comoros

Protection against flooding

During storms, mangroves play a key role in protecting local populations and nearby infrastructure from large waves, storm surges and tsunamis.

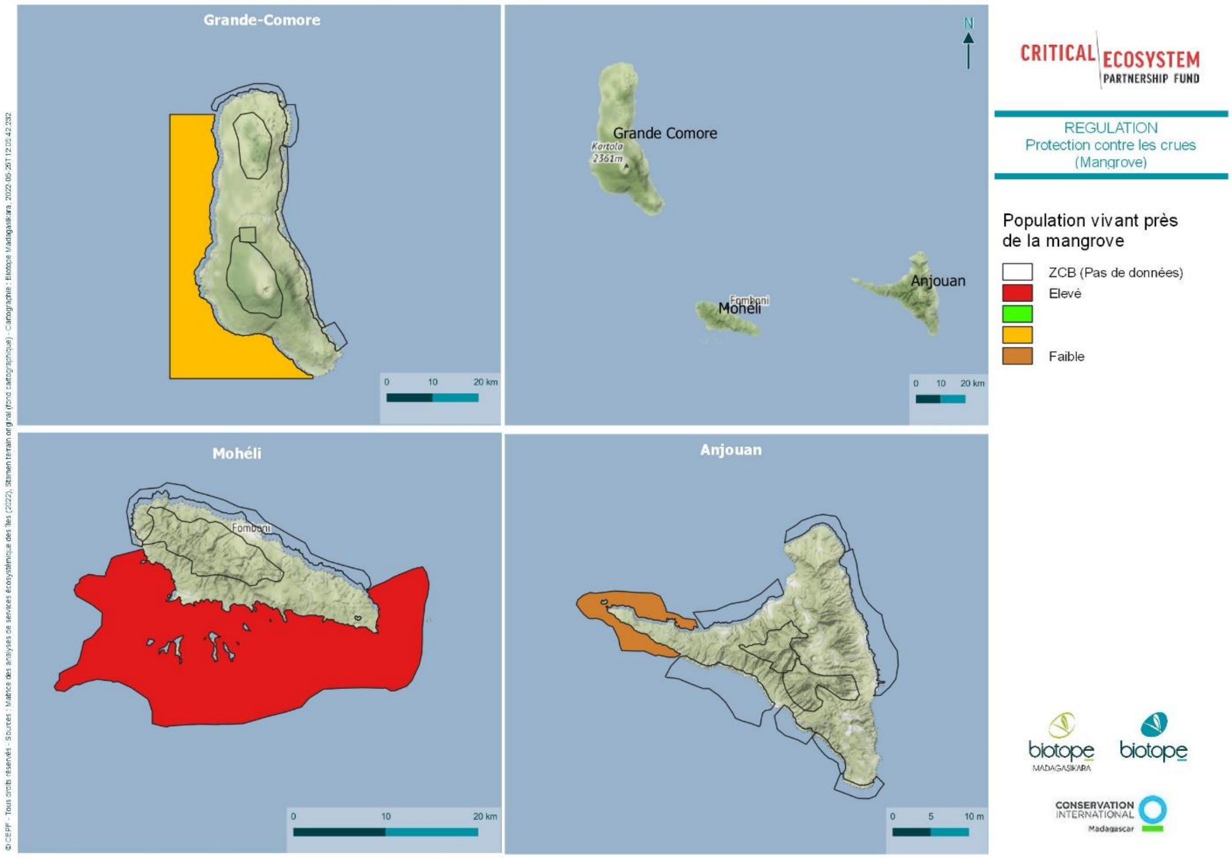


Figure 23 Relative importance of mangroves in the Comoros for protection against flooding

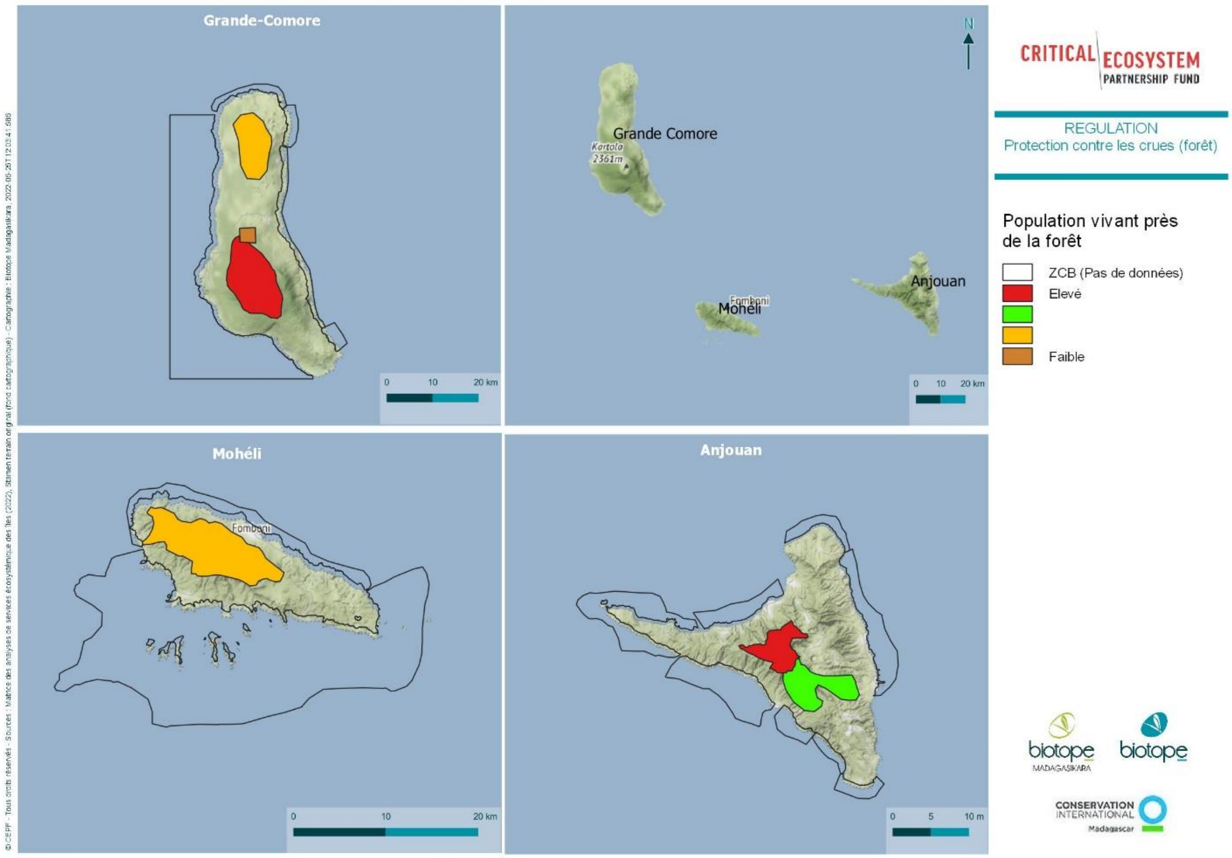


Figure 24 Relative importance of forests in Comoros for flood protection

6.6.3 Mauritius

Protection against cyclones

Tropical cyclones are by far the most significant hazard, causing about 80 percent of average annual losses per year (World Bank 2017). The cyclone season in the Republic runs from November to April, although severe storms can occur in any month. The frequency of extreme weather events, heavy rainfall and storms of tropical cyclone strength or greater, has increased significantly over the past two decades.

Tropical cyclones affect almost all aspects of ecosystem services provided by mangroves, such as infrastructure protection, wildlife habitat provision, and carbon sequestration.

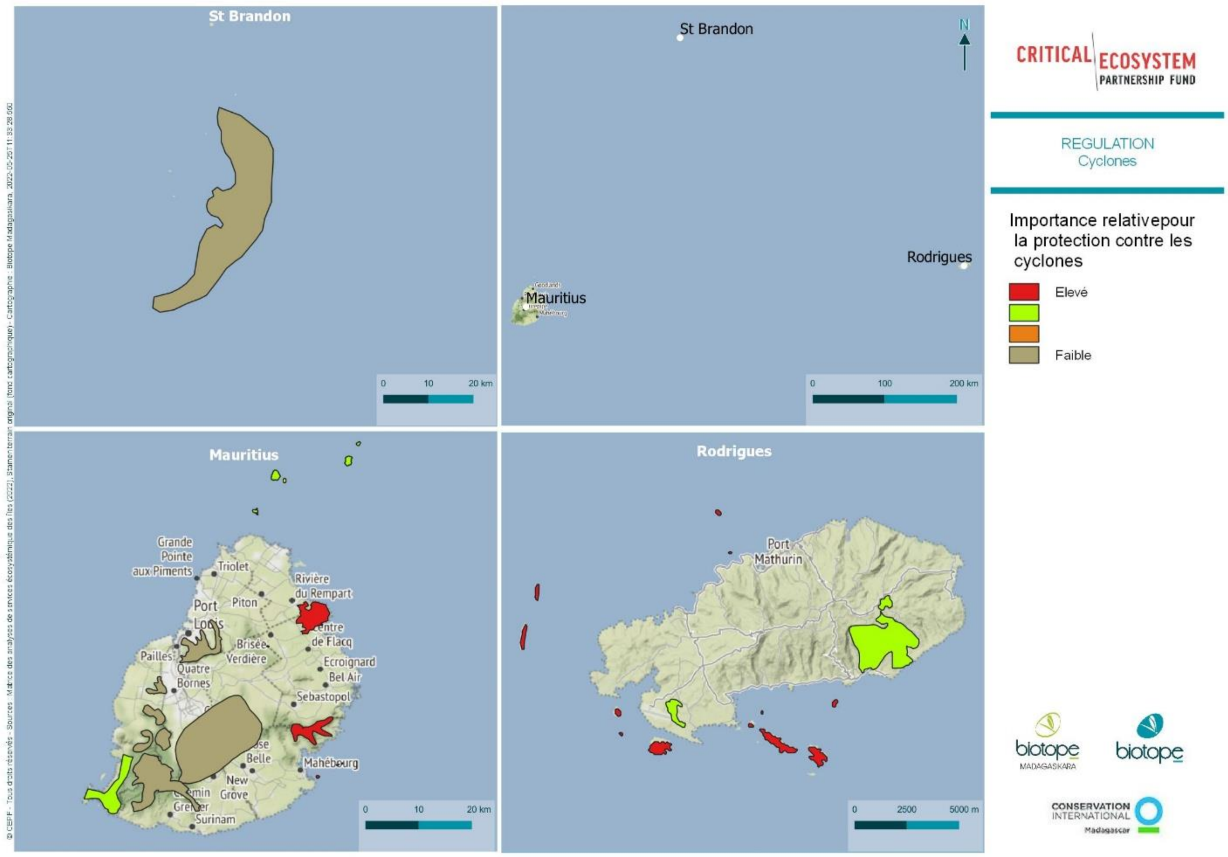


Figure 25 Relative importance of KBAs in Mauritius for cyclone protection

Protection against flooding

According to the National Council for Disaster Risk Reduction and Management, in the Republic of Mauritius, floods that are caused by heavy/torrential rains account for more than 70 percent of catastrophic events each year. Of the many flash floods the country has experienced, the one that occurred in Port Louis on March 30, 2013, caused one of the highest numbers of deaths. Furthermore, according to the Strategic Framework and Action Plan for Disaster Risk Reduction (DRR Report 2013), it has been estimated that damage to buildings and infrastructure from floods over the next 50 years will cost Mauritius approximately US$2 billion (Anon 2019).

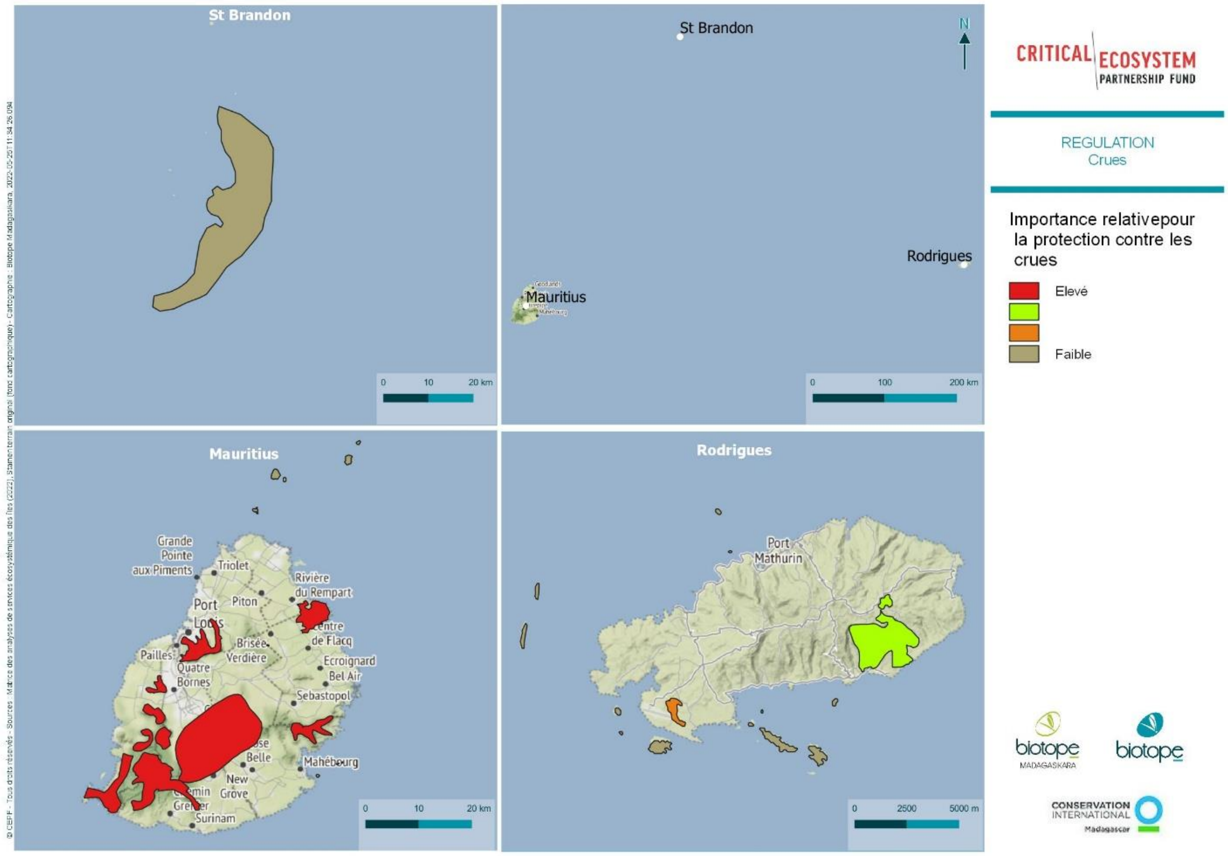


Figure 26 Relative importance of KBAs in Mauritius for flood protection

6.6.4 Seychelles

Regulation of liquid flows - Protection against flooding

Flooding has occasionally occurred in the Seychelles in the coastal plateau areas of the islands of Mahé, La Digue, and (less frequently) Praslin, due to the degree of urbanization (increased runoff and decreased infiltration), land reclamation, and deforestation of the watersheds.

In addition, it is important to note that rising sea levels will increase the risk of coastal flooding and salt water infiltration into the soil of the islands.

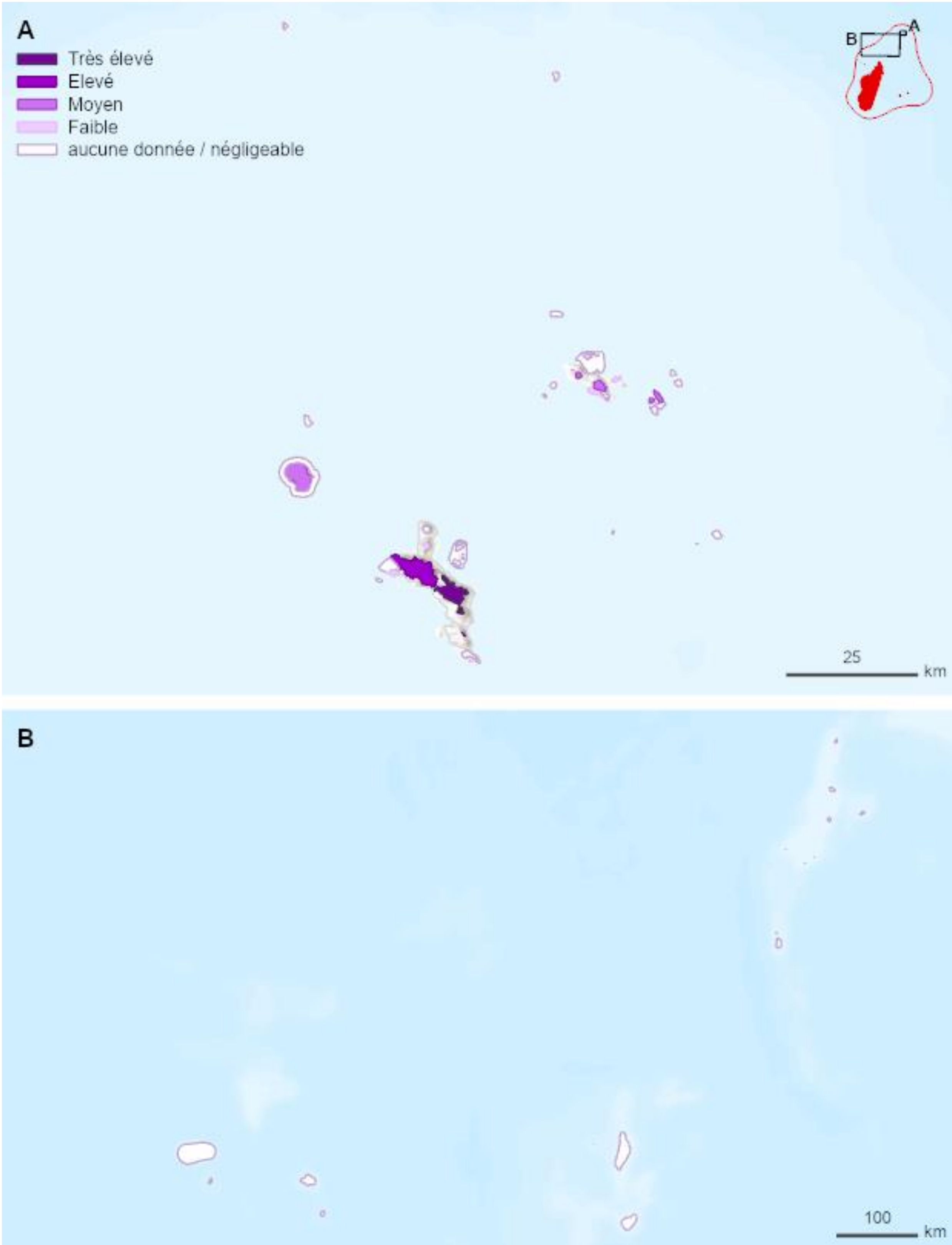


Figure 27 Relative importance of KBAs in Seychelles for flood protection

Regulation of liquid flows - Protection against cyclones

Protection from potential increases in cyclones is largely provided by marine and intertidal ecosystems, such as mangroves and the coastal shelf, combined with the degree of exposure to swell and shoreline protection.

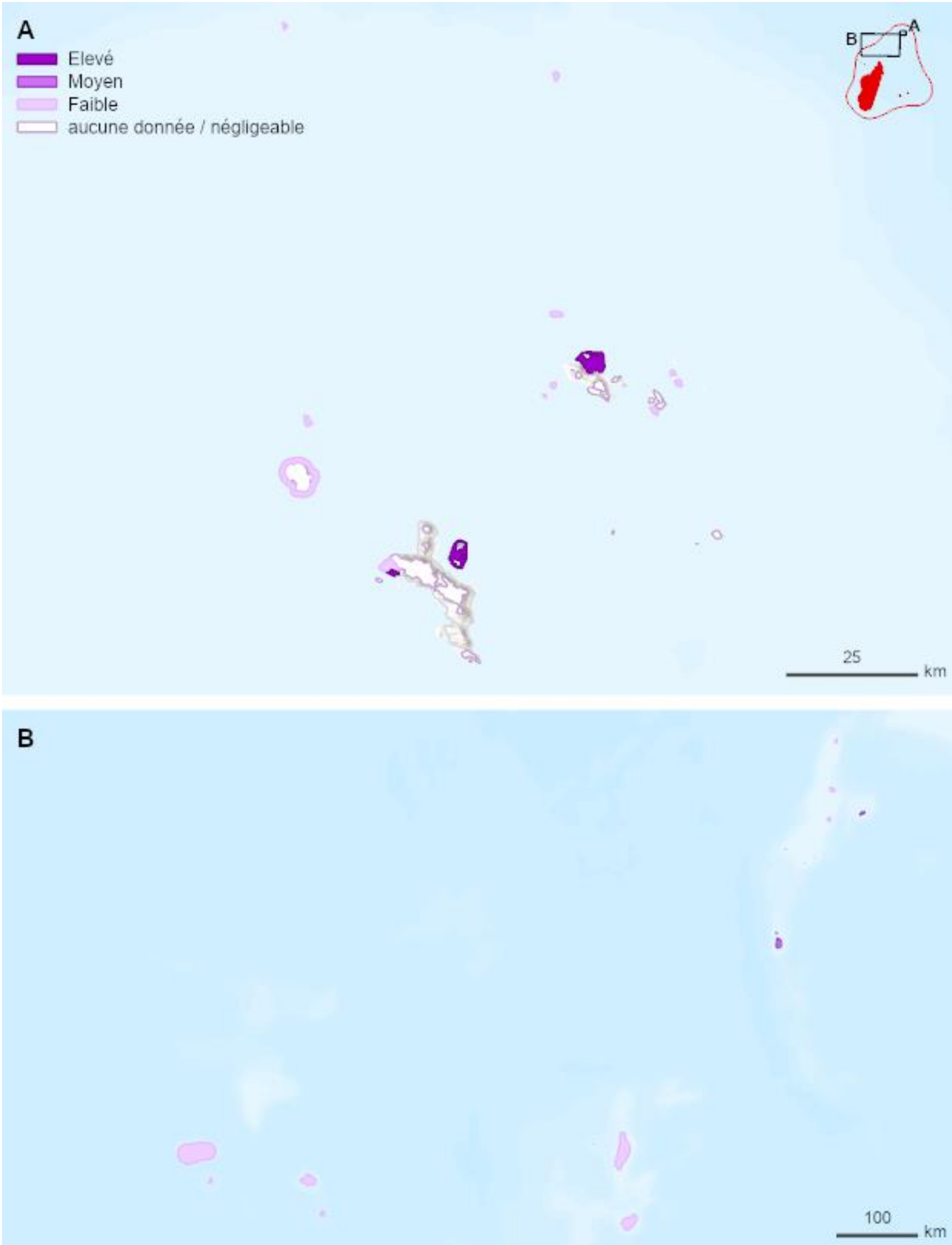


Figure 28 Relative importance of KBAs in the Seychelles for coastal protection against cyclones

Regulation: Maintenance of habitats, species and genes
Some KBAs contribute significantly to nature conservation because of their exceptional biological value. They provide, for example, suitable habitats for some rare and endangered species, especially unique plants and animals that may be endemic forms found only in Seychelles, including KBAs such as Morne Seychellois National Park, Praslin National Park and Silhouette National Park. KBAs may represent a reservoir of species with healthy, genetically diverse populations capable of repopulating areas where they are over-exploited or have disappeared. Some species that may not have immediate economic value may become a resource in the future (e.g., plants that could provide medicines, or flavors to produce perfumes, ornamental species, etc.). KBAs also contribute to key biological life cycle processes. These include large KBAs such as Aldabra Atoll or Cosmoledo Atoll, but also tiny islands such as Aride, Cousin, or Bird that support internationally important concentrations of wildlife (seabirds, sea turtles) and contribute significantly to the functioning of the overall ocean ecosystem.

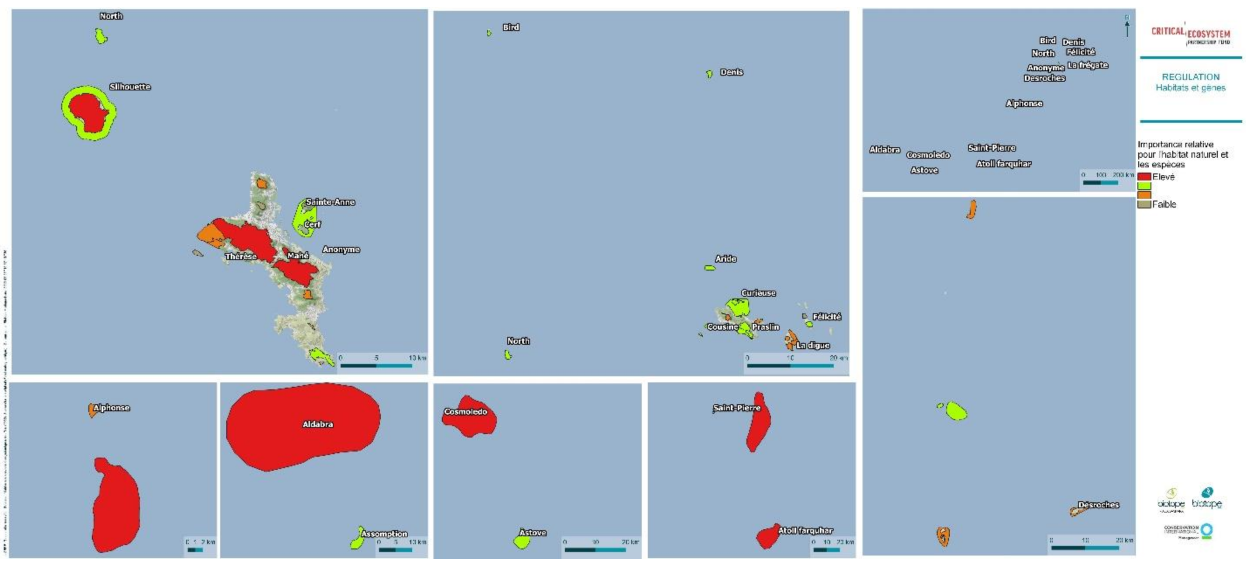


Figure 29 Relative importance of KBAs in Seychelles for the sustainability of natural processes

Local climate regulation - Forest cover
The most relevant aspect for local communities in Seychelles in terms of climate change, including their vulnerability and adaptability, is not as much related to global climate as it is to local climate. Indeed, for tropical environments, and in particular small islands like Seychelles, local climate is largely influenced by local forest cover, which is a key factor in water cycling and temperature regulation (Bunyard 2014; Catling and Stroud 2012; McAlpine *et al.* 2018; Oglesby *et al.* 2010; Shaw 2003; Sheil 2018; Sheil and Murdiyarso 2009).

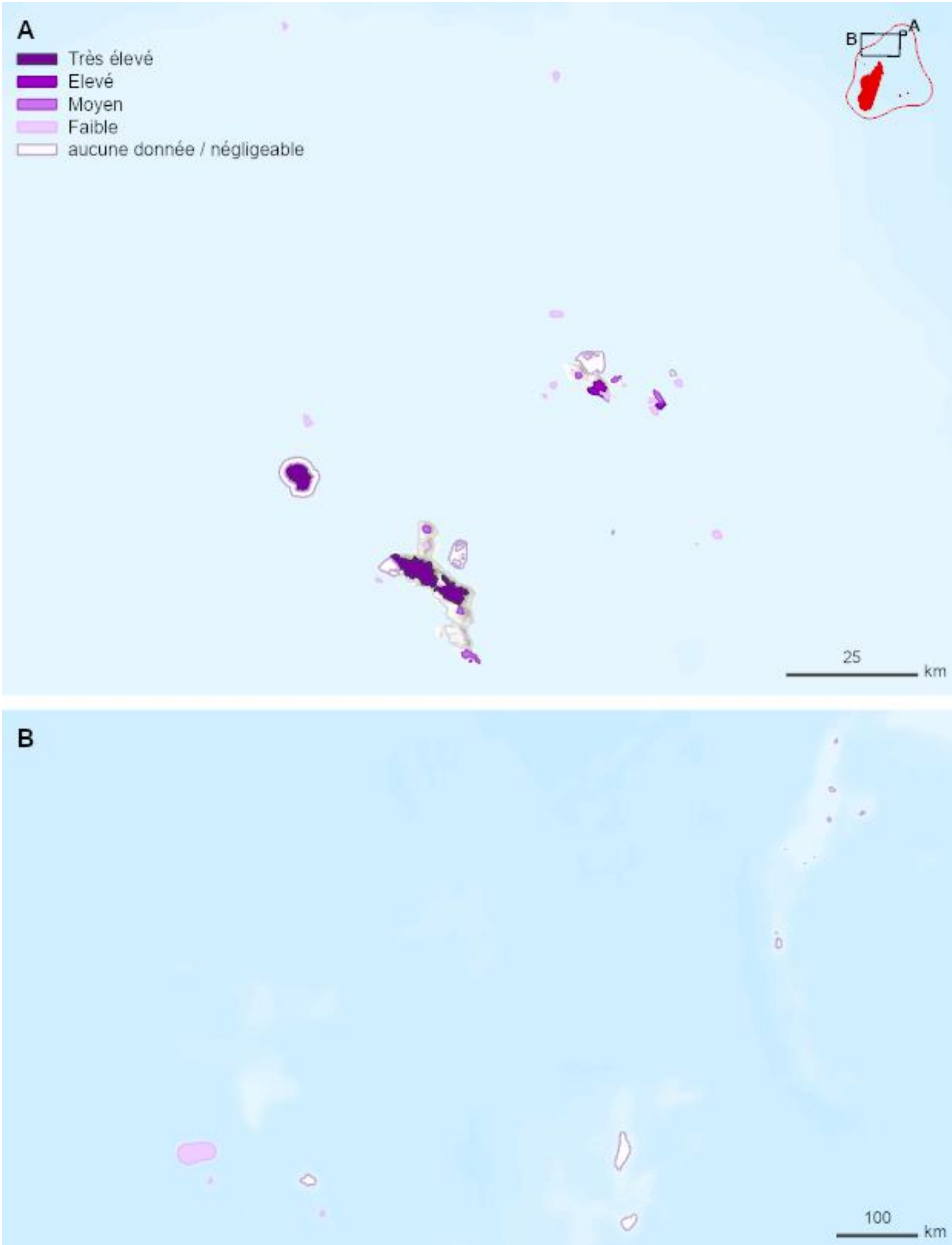


Figure 30 Relative importance of KBAs in Seychelles for local climate

6.7 Cultural values and ecotourism

6.7.1 Madagascar

Ecotourism: number of visitors to national parks in 2012 (limited data)
Ecotourism data are only available for 32 protected KBAs managed by Madagascar National Park. The KBAs that received the most visitors in 2012 were Isalo National Park, Mantadia National Park and Analamazaotra Special Reserve (Andasibe), Ranomafana National Park, Nosy Be and Satellite Islands (Nosy Tanihely), and Ankarana Special Reserve. It should be noted that these data are limited only to certain sites and relate to a single year. However, much of ecotourism in Madagascar is centered on the national park system. Thus even though this data set is incomplete, the national parks have relatively high values for this sector.

The KBAs that receive the greatest number of visitors are still the National Park of Isalo, the National Park of Mantadia and the Special Reserve of Analamazaotra (Andasibe), the National Park of Ranomafana, Nosy Be and the satellite islands (Nosy Tanihely), and the Special Reserve of Ankarana.

Coastal and reef ecotourism
This ES is about visiting coastal ecosystems such as mangroves and reefs for recreational activities, including sport fishing. With a coastline of nearly 5,000 km, Madagascar is one of the most popular destinations in the world (http://bossiadventures.com/). This SE is measured by US dollars spent. The KBAs concerned are those in the northwest of Madagascar, around Nosy Be, Nosy Hara, Mitsio Archipelago and the coast between Ampasindava, Vohilava and Nosy Be. In southwestern Madagascar, significant values are observed north of Tulear, especially in the PK32 Ranobe and Baie de Salary BCZs, and in the northeast at Ambodivahibe.

6.7.2 Comoros

Tourism
The Union of the Comoros is a country with an ecotourism vocation, although the infrastructure for the promotion of ecotourism is either underdeveloped or non-existent. The recent creation of National Parks is still very promising for the development of this sector.

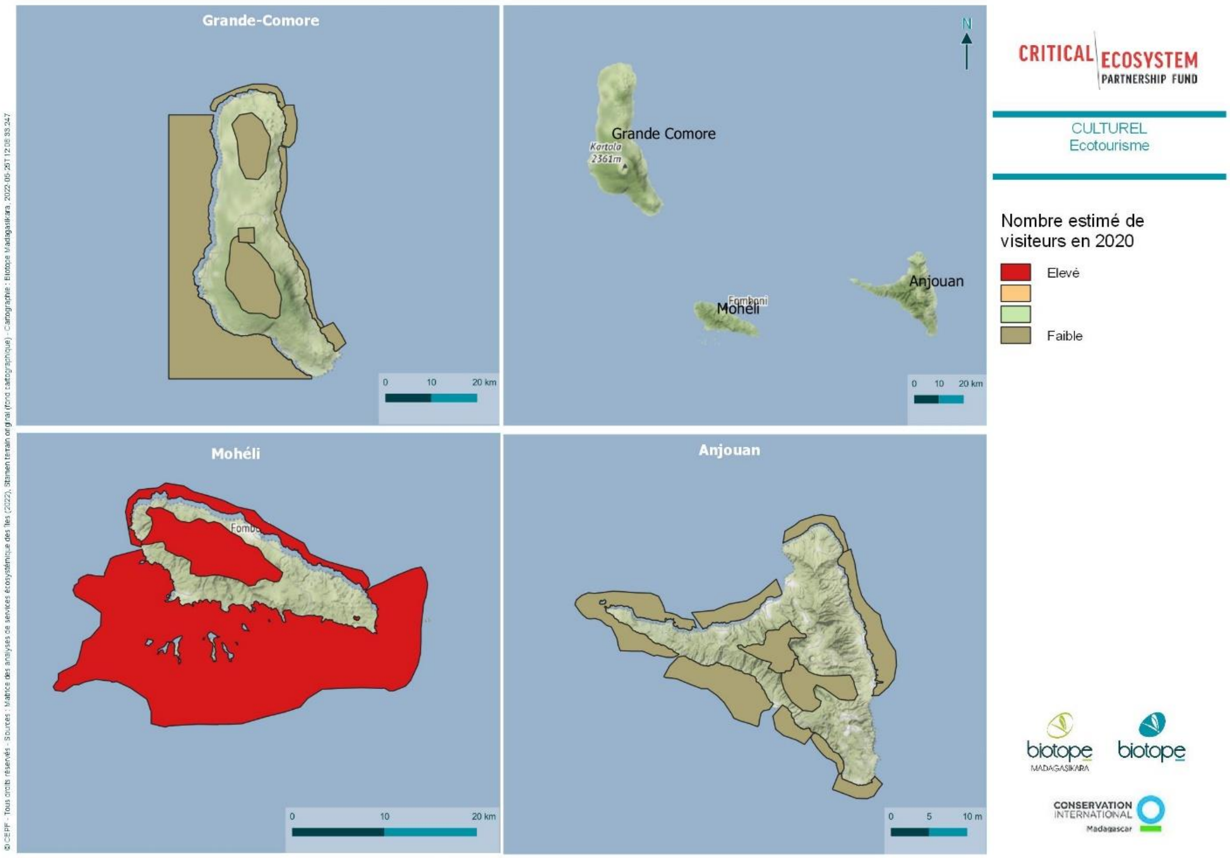


Figure 31 Relative importance of the KBAs in Comoros for ecotourism

Cultural sites and monuments

The Comoros CBZs are home to natural sites of monumental and cultural interest such as lake ecosystems, mangroves which are places of spiritual pilgrimage. The forest massifs of Grande-Comores cover vestiges of colonial residences of historical and cultural interest such as the Convalescence, the old industrial village of the Boboni era, the industrial and administrative site of the Nioumbadjou era for the Karthala and the House of Humblot at the Grille massif.

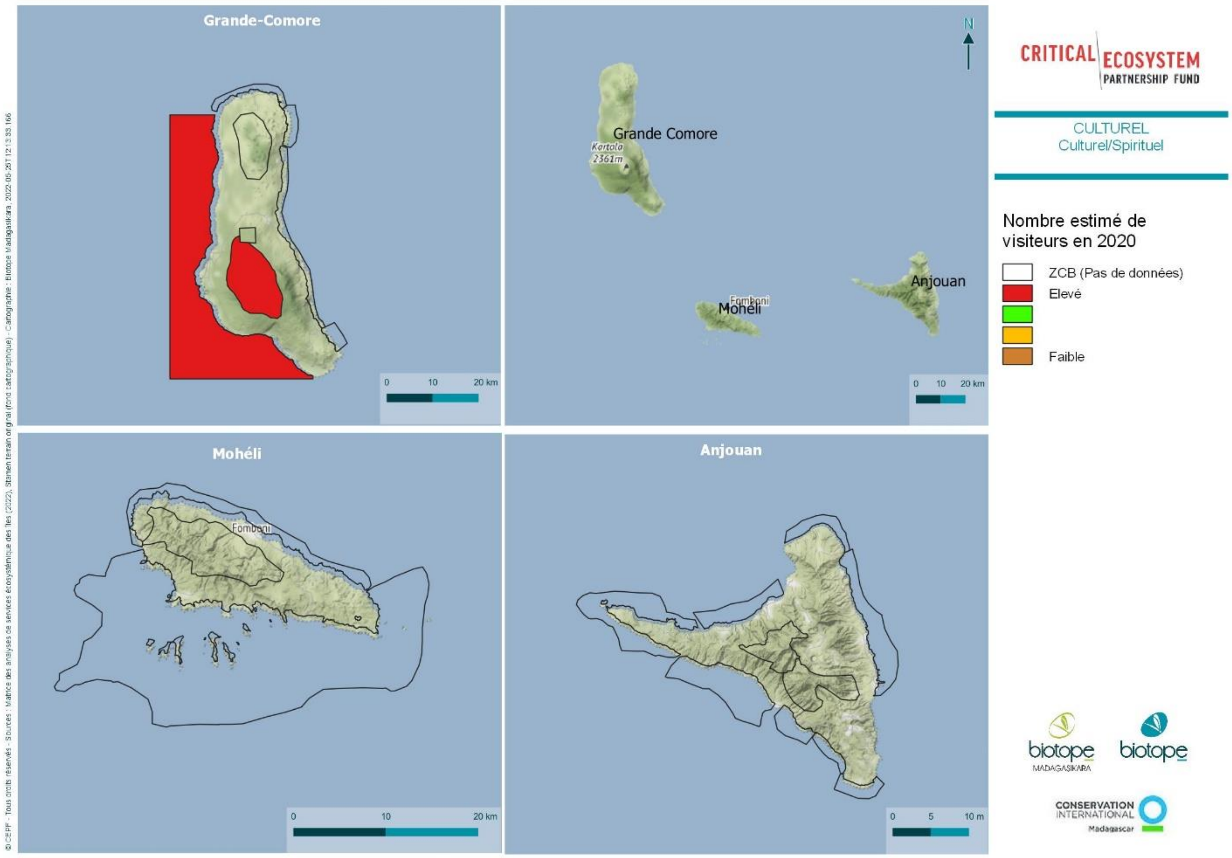


Figure 32 Relative importance of Comoros' KBAs for cultural values

6.7.3 Mauritius

Cultural Services - Ecotourism Value

All of the selected KBAs are fully or partially open to visitors. They have beautiful landscapes, unique fauna and flora, and offer immense and often untapped ecotourism potential. Tourism is a major sector of the economy of Mauritius and Rodrigues (Seetanah *et al.* 2015), and is even considered the main economic sector. The KBAs have functional ecotourism projects, but there is also room for more authentic ecotourism projects.

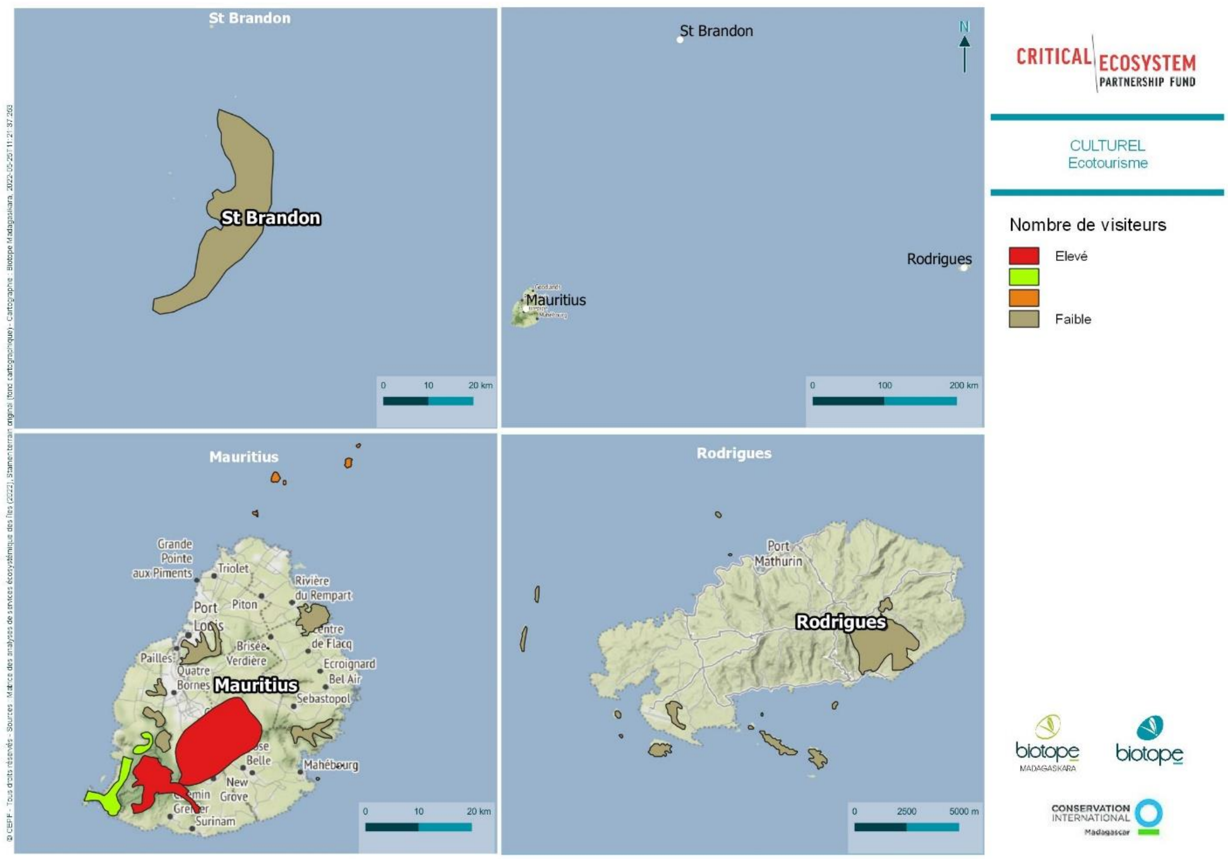


Figure 33 Maps showing the value of tourism in Mauritius

6.7.4 Seychelles

Cultural Services - Recreational and Ecotourism Value

Nature-based tourism is the most important source of income for Seychelles, where a large proportion of employment opportunities are linked to hotels and the tourism industry. In addition, less intensive and more sustainable forms of tourism aimed at discovering the natural assets of Seychelles (hiking trails, endemic animals and plants, medicinal plants, historical and cultural assets, etc.) with nature guides and in closer contact with local communities are developing, aiming to share with visitors their cultural and natural assets. Beneficiaries include nature guides and local communities living from ecotourism (guest houses, small farmers, handicrafts).

Figure 34 Relative Importance of KBAs in Seychelles for Recreation and Tourism Value

Cultural Services - Cultural, spiritual and educational value

The natural environment is closely linked to the cultural values of local communities. It therefore provides an important ecosystem service by connecting people to their culture and history. Some sites, such as the Aldabra World Heritage Site, but also other remote atolls such as Cosmoledo or Farquhar, or natural sanctuaries such as the Aride or Cousin Islands, have great importance in Seychelles culture and spirituality. In addition, the functional ecosystems provide environmental education opportunities for children and scholars.

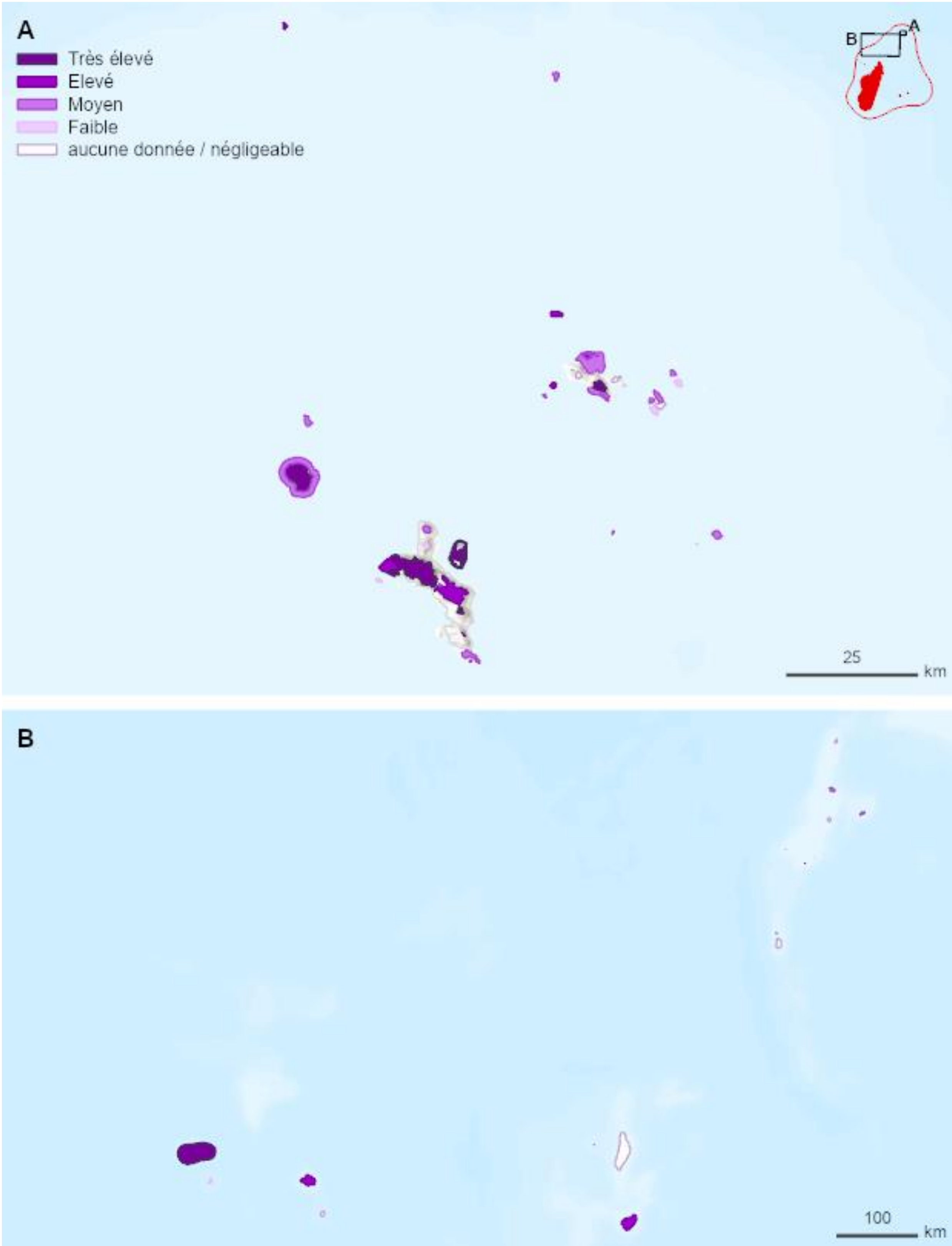


Figure 35 Relative Importance of KBAs in Seychelles for their Cultural, Spiritual and Educational Value

7 THREAT ASSESSMENT

This chapter provides an overview of the main threats to biodiversity in the Hotspot and is closely linked to the chapter dealing with the socio-economic aspect. The chapter was developed on the basis of information gathered from the literature, interviews with experts, and assessments conducted during the national consultations.

The pressures and threats that affect biodiversity and ecosystems can be anthropogenic or natural. Anthropogenic activities include agriculture, landfills, filling, illegal collection, fires, and urbanization, and natural events include cyclones, storms, floods, and drought. All ecosystems and species are affected, including wetlands and their flora (Bamford *et al.* 2017; Maharombaka *et al.* 2017), and freshwater habitats and species. Natural phenomena concern cyclones and drought, the intensity and occurrences of which are exacerbated by climate change, while invasion by exotic species are also major threats, especially to freshwater habitats and species (Berisel & Lévêque 2010; Maharombaka *et al.* 2017).

A summary table summarizes the different threats for each country, showing threats to terrestrial and marine ecosystems, as well as wetlands.

The degrees or level of importance of each threat are determined, as well as, when possible, the sources or origins.

7.1 Madagascar

Madagascar faces significant environmental challenges-deforestation, degradation of natural areas, land and coastal erosion, accelerated depletion of natural resources, disappearance of endemic species, and climate change-that threaten the ecological functions and ecosystem services that ensure the country's well-being and socio-economic development. In addition, there are threats from mining activities encroaching on forests and protected areas, illegal logging of precious wood, invasive species, pollution and the use of wood as a primary energy source for the population.

Generally speaking, all the different ecosystems in Madagascar must be considered as threatened. The origins are diverse and are mainly linked to human activities (need for wood for energy supply, construction and infrastructure, overgrazing, transportation), although other causes can be cited: climatic hazards, proliferation of invasive species, etc.

7.1.1 Threats to Terrestrial Ecosystems :

7.1.1.1 Deforestation, forest degradation and fragmentation

The main cause of deforestation is the traditional agricultural technique, *tavy*. In this traditional practice, fields are prepared by burning, used for crops, and then fallowed for ten years. When long cycles are respected, this practice can be effective and productive for subsistence agriculture. However, population pressure has led farmers to shorten the cycles and use *tavy* on steep, high slopes-with low yields and high soil degradation and erosion, leaving large abandoned areas that are quickly colonized by weeds and secondary pioneer or invasive species.

Grazing pressure is also a major driver of deforestation and forest degradation, particularly in the western and southern regions of Madagascar. Grasslands are expanding at the expense of natural habitats due to population growth and economic and cultural principles favoring increased herding. In addition, the burning of grasslands before the rainy season to promote regrowth often results in uncontrolled fires that destroy forests and natural habitats. It is possible that the renewal and clearing of grasslands by fire has eliminated some of the native biodiversity.

In 1953, Madagascar's natural forests covered 16.0 M ha in 1953, or about 27% of the national territory. The Big Island lost 44% of its natural forests between 1953 and 2014, including 37% between 1973 and 2014. Nevertheless, for all four forest types, with the exception of the thorny forest, Madagascar observed a gradual decrease in the deforestation rate after 1990: from 205,000 ha/year (1. 6%/year) over the period 1973-1990 to 42,000 ha/year (0.4%/year) over the period 2000-2005(Then from 2005 onwards, the deforestation rate gradually increased and more than doubled over the period 2010-2014(99,000 ha/year, 1.1%/year) compared to 2000-2005 (Vieilledent G. *et al*., 2018). On the other side, a trend of accelerating deforestation for the next 10 years is observed, according to the Ministry in charge of the environment and forests (MEEF, 2017) : In the document "Report of analyses of the drivers of deforestation and forest degradation in Madagascar", a significant increase in deforestation is expected in 2028, especially for the dry forests of the West and the humid forests of the Northeast. And for the Atsimo Andrefana Region, a projected loss of 70,000 ha between 2018-2028 is estimated, while the projection is 100,000 ha in the Boeny Region.

Finally, the pressure for firewood is an important factor in the degradation of forest ecosystems: firewood represents 92% of the energy sources used by the Malagasy population.

7.1.1.2 Mining

Rising world market prices and economic stimulus policies have led to an increase in mining operations, both large and small, which can have a significant impact on ecological systems, including forests. Mining in the north (Ankarana), which began in 1996, has resulted in a 10% loss of forest (the Ankarana Special Forest Reserve covers 18,000 hectares). Small-scale mining can irreparably damage forest areas and increase fragmentation. Although the percentage of total national forest loss due to mining is relatively small, the impacts may be more permanent, given the associated earthworks (ETOA, 2008).

Mining exploration is increasing and will become a major threat in Madagascar. Barren Island is an example: although it is an important area for birds and a future protected area (Durban Vision), destructive phosphate exploration has begun there. Future threats to birds in the marine and coastal environment include oil and gas exploration, as many large areas of Madagascar's west coast are potential areas for oil exploration,

7.1.1.3 Soil erosion, sedimentation and pollution

One of the biggest environmental problems in Madagascar is soil erosion. Deforestation in the highlands of Madagascar, coupled with the alteration of natural geological and soil conditions, results in widespread soil erosion, which can reach 400 t/ha per year in some areas. For Madagascar, whose economy is based on agricultural production, the loss of this soil is particularly costly.

7.1.1.4 Deterioration of coral reefs in some regions of Madagascar.

Domestic, agricultural, and industrial pollution also cause various types of harm to marine ecosystems, particularly in areas of urban concentration and near port areas. The proliferation of small-scale, unregulated mining operations along rivers also exposes downstream marine and coastal ecosystems to intense disturbance. Pollution, including accidental oil spills, is also not negligible in some coastal parts of Madagascar (East, South and South-East).

7.1.2 Overexploitation of wildlife.

Illegal exploitation of natural resources continues to be a scourge for Madagascar and, if left unchecked, will reduce the impact of Madagascar's biodiversity conservation efforts. Illegal and unregulated exploitation of wildlife, forest products, precious minerals, and fisheries has grown and is under increasing public attack.

Illegal trade in wildlife and other natural resources (notably rosewood) poses a serious threat to their survival: In 2009, an estimated 52,000 tons were extracted from 100,000 trees of rosewood (*Dalbergia spp.*) and ebony (*Diospyros spp.*), with more than 60,000 trees in protected areas, representing a degradation of at least 4,000 ha of parkland and 10,000 ha of unclassified intact forest

Species trafficking also poses a significant risk to reptiles (tortoises, chameleons), as well as orchids and succulents, among others. Without protection, the Madagascar radiated tortoise (*Astrochelys radiata*) sold as a pet could disappear within two decades (Platt, 2010), while the large-headed tortoise (*Erymnochelys madagascariensis*), the island's only endemic freshwater tortoise, is illegally exported to Asian markets as a traditional medicine.

For seabirds (in particular, terns), the main direct threats are egg collection and hunting.

Madagascar's native species have been victims of the illegal wildlife trade. Indeed, although it has been illegal to kill or keep lemurs as pets since 1964, today lemurs are hunted in areas where they are not protected by local taboos. Carnivores are also widely hunted as sources of protein. Reptiles and amphibians are collected for the international pet trade: Chameleons, geckos, snakes and turtles are targeted. On the other hand, the waters around Madagascar are used for large-scale fisheries. Foreign fishing boats approach the artisanal fishing areas, much to the displeasure of the locals. Sharks, sea cucumbers, and lobsters are fished at rates that threaten the sustainability of the resource availability.

7.1.3 Invasion of invasive species on all ecosystems

In 2018, the managers and promoters of 98 Protected Areas described the main threats to the biodiversity of their sites and identified invasive species: 37 species for flora and 09 for fauna.

Table 39 Invasive plant species *(Goodman, S. M., Raherilalao, M. J. & Wohlhauser, S. (eds.). 2018).*

Acacia dealbata,	*Cecropia peltata,*	*Melaleuca quinquenervia,*	*Ravenala madagascariensis*[32]
Vachellia farnesiana	*Cinnamomum sp*	*Mucuna paniculata*	*Ricinus communis*
Acacia mangium	*Cissus quadrangularis*	*Nastus sp*	*Rubus alceifolius*
Acrostichum sp	*Clidemia hirta*	*Opuntia stricta*	*Salvinia molesta*
Aframomum angustifolium	*Cynanchum mahafalense*	*Pinus sp*	*Solanum mauritianum*

[32] Although endemic, this species is invasive

Agave angustifolia	*Grevillea banksii*	*Pinus patula*	*Tristemma mauritianum*
Agave sisalana	*Mesosphaerum suaveolens*	*Pithecellobium dulce*	
Auccoumea klaineana	*Lantana camara*	*Pontederia crassipes*	
Bambusa sp	*Leucaena leucocephala*	*Psiadia altissima*	
Brugmansia candida	*Litsea glutinosa*	*Psidium cattleyanum*	

Table 40 Invasive Wildlife Species

Acridotheres tristis	*Canis lupus*	*Rattus rattus*
Batrachochytrium dendrobatidis	*Channa striata*	*Technomyrmex albipes*
Tilapia rendalli	*Ophicephalus striatus*	*Corvus splendens*
Duttaphrynus	*Viverricula indica*	

However, at the national level and derived from the same source, from direct observations in the field and recorded in the database, invasive species - fauna and flora combined - 934 taxa/species are identified: it includes species reported as invasive, introduced and weed plants (weeds). 74 species (52 plants and 22 animals) are known to be invasive based on field observations.

The proliferation of the Asian toad *Bufo melanostictus* which endangers the ecosystem of the East of the country the number is estimated at 20 million, five times more than in 2016 and the species is classified as invasive and dangerous species.

7.1.4 Loss of Aquatic Habitat

Major changes in land use, especially the increase in agriculture, the detour of rivers by dams, dykes and pipelines, as well as the drainage of upper and lower marshes for rice cultivation, are diminishing water quality and quantity, impacting the survival of freshwater biodiversity.

The loss of freshwater habitats in Madagascar continues apace despite efforts. For example, after the designation of the Torotorofotsy wetland complex as a protected area in 2015, 38% of the intact marshes slated for conservation had been illegally converted to rice fields (Lova, 2016) within one year. The continued expansion of cultivable areas (non-annual and perennial crops) is one of the greatest threats to ecosystems, followed by shifting and small-scale agriculture (Lova 2016). Many wetlands are being transformed into areas for crops or aquaculture, at the expense of the ecosystem as well as the particular biodiversity found there. When the banks of rivers, lakes, marshes are stripped of their forest cover, soils clogged with various nutrients quickly accumulate and silt up these places as well.

Table 41 Threats to Madagascar's ecosystems, their intensity and consequences

ECOSYSTEMS		Threats	Causes and origins of threats	Intensity: (low (L), medium (M) and high (H)	Consequences
TERRESTRIAL ECOSYSTEMS	Coastal forests (currently very fragmented)	Source of firewood	Population growth and density	**H**	Disruption of the ecosystem, allowing invasive species to establish themselves
		Timber harvesting	Lack of good governance	**M**	
		Slash and burn	Uses and customs	**L**	
				M	
		Hunting, harvesting and extraction	Lack of good governance	**F**	
		Mining	Undervaluation of biodiversity goods and services	**M**	
		Intense cyclone and sea level rise	Insufficient adaptation measures	**M**	
	Dense lowland forests of the East (0-800 m altitude)	Progression of slash and burn cash crops	Unsustainable production and consumption patterns	**F**	Decrease in watershed protection
		Mining	Undervaluation of biodiversity goods and services	**F**	Decrease in soil erosion prevention
		Timber exploitation, including precious woods	Lack of good governance	**M**	Decrease in the sequestration capacity of CO_2
		Hunting, harvesting and extraction	Lack of appropriate laws	**M**	Disruption of ecosystem functioning

ECOSYSTEMS		Threats	Causes and origins of threats	Intensity: (low (L), medium (M) and high (H)	Consequences
		Deforestation and clearing by selective cutting	Lack of good governance	**F**	Habitat Fragmentation
	Dense humid forests of medium altitude (800-1200 m)	Clearing by agriculture	Unsustainable production methods	**H**	Degradation of the habitat of 08 species of lemurs already threatened
		Illegal cuts	Lack of good governance	**M**	Forest Degradation
		Hunting, harvesting and extraction	Lack of appropriate laws	**L**	Disruption of ecosystem functioning
	Dense humid forests of the East and Central Highlands (1200-2000 m)	Vegetation fires in dry season	Unsustainable production and consumption patterns	**H**	Disruption of ecosystem functioning
		Wood cuts	Poverty and demography	**L**	Increased spread of invasive species
		Pasture Renewal Fires	Unsustainable production and consumption patterns	**H**	Forest and soil degradation
	Western moist forests (within the western dry biome)	Forest fires for agriculture and grazing	Uses and customs	**H**	Forest and soil degradation
		Illegal cuts	Lack of good governance	**M**	Forest Degradation
	Western sub-humid forests (riparian forest)	Forest fires for agriculture and grazing	Unsustainable production and consumption patterns	**H**	Forest and soil degradation

ECOSYSTEMS		Threats	Causes and origins of threats	Intensity: (low (L), medium (M) and high (H)	Consequences
		Selective cuts	Lack of good governance	**M**	Decrease in the sequestration capacity of CO_2
		Collection of horticultural plants	Unsustainable production and consumption patterns	**L**	Disruption of the ecosystem, allowing invasive species to establish themselves
		Poaching	Lack of good governance	**M**	Disruption of ecosystem functioning
		Mining	Undervaluation of biodiversity goods and services	**M**	Decrease in soil erosion prevention
	Riparian forests (50-1700 m) - specific natural habitats	Clearing of land for cultivation on slash-and-burn	Uses and customs	**H**	Dilution of ecological connectivity (biological corridor)
		Selective wood cutting	Unsustainable production and consumption patterns	**H**	Decreased water quality protection (this habitat acts as a natural filter)
		Cutting of firewood and charcoal	Unsustainable production and consumption patterns	**H**	Decrease in the sequestration capacity of CO_2
		Artisanal mining	Lack of good governance	**M**	Risk of habitat and species loss
	Tapia forests (500-800 m) in the western and central parts	Manufacture of charcoal	Unsustainable production and consumption patterns	**H**	Problem of tree regeneration

ECOSYSTEMS		Threats	Causes and origins of threats	Intensity: (low (L), medium (M) and high (H)	Consequences
		Collection of firewood	Unsustainable production and consumption patterns	**M**	Decrease in the sequestration capacity of CO_2
		Timber collection	Lack of good governance	**L**	Decrease in the sequestration capacity of CO_2
		Grazing	Uses and customs	**M**	Habitat degradation
		Change in light regime (more frequent)	Unsustainable production and consumption patterns	**H**	Habitat degradation
	Western dry forests (1/5 surface of Madagascar)	Slash-and-burn agriculture (*Hatsake*: corn cultivation)	Unsustainable production and consumption patterns	**H**	Decrease in cultivable areas
		Collection of plant species	Lack of appropriate laws	**M**	Migration to the North
		Hunting	Lack of appropriate laws	**M**	Disappearance of endemic and threatened biodiversity
		Manufacture of charcoal	Unsustainable production and consumption patterns	**H**	Loss of forests
	Southern and southwestern dry thickets and forests (Coastal and subcoastal areas of the south and southwest)	Slash and burn agricultural practice	Unsustainable production and consumption patterns	**H**	Regression of socio-economic benefits

ECOSYSTEMS		Threats	Causes and origins of threats	Intensity: (low (L), medium (M) and high (H)	Consequences
	Coastal bushes of the South-West (Coastal strip from Soalara to Cape Sainte Marie)	Conversion to crop fields	Unsustainable production and consumption patterns	**H**	Reduction of ecosystem services
	Secondary grassy formations or Roranga (eastern part 0-2700 m)	Cash crop	Unsustainable production and consumption patterns	**M**	Regression of socio-economic benefits
		Grazing and agriculture	Unsustainable production and consumption patterns	**H**	Habitat Fragmentation
		Mining	Undervaluation of biodiversity goods and services	**L**	Loss of biodiversity and fragmentation
		Collection of useful and medicinal plants	Unsustainable production and consumption patterns	**M**	Reduction of ecosystem services
	Savannahs of the West and the Central Highlands (conditioned by frequent fire)	Very repetitive bushfires	Lack of good governance	**H**	Aridity of the soil
		Soil erosion by runoff accentuated by steep topography	Upstream deforestation	**H**	Sedimentation
	Dry deciduous forests of the karst system (west coast)	Illegal mining	Lack of good governance	**L**	Loss and fragmentation
		Illegal collection of endemic flora and fauna and CITES	Lack of good governance	**L**	Integrity of the karst substratum

ECOSYSTEMS		Threats	Causes and origins of threats	Intensity: (low (L), medium (M) and high (H)	Consequences
		Cutting of forestry wood	Lack of good governance	**M**	Decrease in the sequestration capacity of CO_2
		Oil exploration	Undervaluation of biodiversity goods and services	**M**	Loss of habitats and biodiversity
		Mining activities	Undervaluation of biodiversity goods and services	**M**	Loss of biodiversity
		Bushfires	Uses and customs	**H**	Habitat degradation
		Career	Poverty	**L**	Environmental degradation
		Invasive species	Insufficient safeguards	**L**	Disappearance of endangered species
		Urbanization	Demographics	**L**	Decrease in the sequestration capacity of CO_2
		Tourism	Undervaluation of biodiversity goods and services	**L**	Disruption of ecosystems
		Climate change	Environmental degradation	**M**	Regression of socio-economic benefits
	Agricultural ecosystem	Genetic erosion of agrobiodiversity	Poverty	**H**	Decrease in production rate
			Lack of scientific knowledge	**H**	Food insecurity
			Underutilization of local knowledge	**H**	
CONTINENTAL AQUATIC ECOSYSTEM	Lakes and ponds (150 cm deep)	Climate change	Environmental degradation	**H**	Changes in physico-chemical properties: degradation of surface water quality

ECOSYSTEMS		Threats	Causes and origins of threats	Intensity: (low (L), medium (M) and high (H)	Consequences
		Overexploitation of fishery resources	Lack of good governance	**H**	Decrease in surface area
		Rampant demographics	Lack of awareness	**M**	Sustainability of Lake Biological Resources
		Proliferation of invasive aquatic plants	Insufficient safeguards	**H**	Drying up of springs due to deforestation and watershed degradation
		Selective conversion of lake, marsh and pond areas into rice fields	Demographics	**L**	Imbalance of the ecological function
		Sedimentation due to deforestation and bush fires	Upstream degradation	**M**	Shrinkage and depth reduction
			Shoreline Degradation		Riverbed exit
	Freshwater marshes (continental and coastal) with a hydrological regulation and water purification role	Heavy sedimentation due to deforestation, clearing of vegetation, silting and bush fires	Intense deforestation	**H**	Shrinkage in area
		Climatic variation and high concentration of precipitation	Environmental degradation	**H**	Regression of socio-economic benefits
	Groundwater (porous or fissured aquifers in karstic environment)	Pollution	Insufficient appropriate legislation	**H**	Loss of almost all architectural species on the reef slope
		Erosion, silting and siltation	Deforestation	**H**	Increased turbidity of continental waters
		Mining	Lack of good governance	**L**	Reduction of ecosystem services

ECOSYSTEMS		Threats	Causes and origins of threats	Intensity: (low (L), medium (M) and high (H)	Consequences
		Divagation of livestock		**L**	
MARINE & COASTAL ECOSYSTEMS	Coral reefs in the North-East (cyclone passage zone par excellence), from Cap d'ambre to Masoala	Strong wave	Natural disasters	**H**	Mechanical degradation of corals
		Increase in temperature	Climate change	**H**	Coral bleaching
		Water desalination	Flooding and continuous rainfall	**H**	Degradation of mangroves
	Coral reefs of the East (Cape Masoala-Bay of Toamasina) - fringing reefs	Intensive fishing	Lack of good governance	**M**	Coral bleaching
		Sedimentation	Intense deforestation	**M**	Advanced state of degradation
		Extraction of corals	Lack of good governance	**M**	Irreversibility of bleaching for reefs under stress
		Various pollutions	Insufficient appropriate legislation	**F**	Loss of marine biodiversity, degradation of human health
		Natural disasters (hurricane zone)	Climate change	**H**	Habitat change
		Increase in temperature	Climate change	**H**	Migration of certain species
	Coral reefs of the South coast	Marine pollution by oil spill	Lack of good governance	**H**	Impact on the production of neritic lobsters
		Intensive industrial fishing	Lack of good governance	**H**	Decrease in inventory
		Illegal collection of marine resources (black corals)	Lack of good governance	**H**	Disruption of marine ecological function
		Coastal erosion by sea level rise	Climate change	**H**	Disturbance of marine habitats

ECOSYSTEMS		Threats	Causes and origins of threats	Intensity: (low (L), medium (M) and high (H)	Consequences
	Coral reefs of the southwest and west coasts	Intensive fishing (Great reef of Toliara)	Lack of good governance	**H**	Coral bleaching
		Large sedimentation volume	Intense deforestation upstream	**H**	Increased turbidity in coastal waters
		Various pollutions	Insufficient appropriate legislation	**M**	Loss of almost all architectural species on the reef slope
		Climate change (temperature increase)		**M**	Replacement of architectural species by algae
					Decrease in fish biomass
	Coral reefs of the northwestern (from Androka to the north of Antsiranana) and western coasts	Terrigenous sedimentation	Massive soil erosion due to recurrent deforestation	**H**	Degradation of fringing reefs
		Intensive fisheries in populated areas	Demographics	**M**	Coral bleaching
		Climate change		**M**	
	Marine herbaria (angiosperm populations distributed in tropical coastal waters) of the Northeast coast	Coastal development	Insufficient appropriate legislation	**M**	Damage to seagrass beds
		Population growth		**M**	
		Sea level rise and temperature increase	Climate change	**H**	Phenomenon of species migration
		Increased frequency and intensity of storms	Climate change	**H**	Habitat disturbance

ECOSYSTEMS		Threats	Causes and origins of threats	Intensity: (low (L), medium (M) and high (H)	Consequences
	Northwest coast seagrass beds (large bays and coastal areas, deeper seabed)	Sedimentation	Deforestation on the ground	**M**	Increased runoff due to deforestation and mangrove cutting
		Intensive fisheries in coastal areas	Lack of good governance	**H**	Increase in turbidity
		Algae bloom	Climate change	**M**	Disruption of ecological function
	Northwest coast seagrass beds (large bays and coastal areas, deeper seabed)	Coastal development (infrastructure and pollution)	Insufficient appropriate legislation	**H**	Continued decline of biotic components
		Climate Change		**M**	Loss of grass biomass diversity
					Reduction in the amount of large herbivorous fish
					Decrease in the coverage of the meadows
	Marine herbs (large bays and coastal areas, deeper seabed) of the southwestern coasts (Bombetoka and Mahajanga bays): low coverage	Increased sediment loads	Intense deforestation upstream	**H**	Degradation of the physical environment
	East coast seagrass beds; low coverage, dugong habitats	Sedimentation	Deforestation	**H**	Decrease in seagrass cover in coastal waters
		Development of destructive fishing practices (seine fishing on beaches)	Lack of good governance	**H**	Decrease in inventory
		Trawling	Lack of good governance	**L**	Disturbance of marine habitats

ECOSYSTEMS		Threats	Causes and origins of threats	Intensity: (low (L), medium (M) and high (H)	Consequences
		Trampling	Lack of good governance	**M**	Reef destruction
		Coastal development (infrastructure and pollution)	Unsustainable production methods	**M**	Disturbance of marine habitats
	Mangroves of the northwestern coast (98% of the mangroves of Madagascar)	Collection of wood (timber, construction, heating and charcoal)	Lack of good governance	**H**	Breakdown of the function of stabilization of the coastal space and the function of protection of coral reefs
		Aquaculture	Unsustainable production methods	**H**	
		Conversion to rice farming	Unsustainable production methods	**M**	
		Conversion to building land	Unsustainable production methods	**L**	
		Prolonged flooding	Climate change	**L**	
		Strong winds and cyclones	Climate change	**M**	
		Excessive sedimentation leading to strong continental erosion	Deforestation	**H**	
	West coast mangroves (estuaries, delta, bay bottom, mouth and coastline)	Continental alluvium (terrigenous input)	Upstream degradation	**H**	Degradation phenomenon
			Population Migration		Progression from land to sea space

7.2 Comoros

7.2.1 Threats to terrestrial ecosystems in Comoros

In the three islands, the accelerated degradation of ecosystems and natural resources is largely attributable to the increased vulnerability of the populations as a result of demographic, land, economic, social and environmental pressures. In 1986, the forest area was estimated at 12,375 ha. Between 1973 and 1983, forests decreased by 36% on Grande Comore, 73% on Anjouan and 53% on Moheli in favor of food crops. Thus, during this period, Anjouan lost 5950 ha of forest compared to 5000 ha in Grande Comore and 1800 ha in Moheli.

Natural forests, heather steppe and savannahs are threatened by (i) uncontrolled and unsustainable logging for timber and service wood, (ii) abusive slag extraction, (iii) uncontrolled land clearing for the expansion of cultivated land in the absence of land use planning (iv) uncontrolled bushfires and fires for pasture or slash-and-burn cultivation, (v) increasing insecurity of tenure over cultivable land, (vi) high population growth, (vii) poor tenure of agricultural land, (viii) inadequate forestry legislation and incomplete and unenforced environmental legislation, and (ix) the introduction and development of exotic species such as Mstongoma (Chinese guava or red guava) or *Psidium cattleyanum*.

Deforestation contributes to the disappearance of many species, some of which may not have been known by science or inventoried.

The clearing of land for food crops does not spare sensitive areas or those with steep slopes, which very often leads to intense erosion and landslides. Both phenomena contribute to land degradation and considerable loss of habitats and biodiversity. For historical and technical reasons, the multipurpose (low slope) lands that were suitable for food crops are largely occupied by cash crops, mainly clove and ylang ylang. This poor use of space, aggravated by unsuitable cultivation techniques, has finally resulted in the degradation of cultivable land on the low slopes, forcing farmers to be constantly on the lookout for new land, particularly in the forest area. Agroecosystems are threatened by soil erosion and depletion, the replacement of these systems by field crops and monocultures and the introduction of exotic species and varieties.

Bush fires are still common and originate most often in crop plots and grazing lands, resulting in the destruction of habitats and heritage animal and plant species. Repeated wildfires are more destructive and give little chance for biodiversity to recover. On small populations with limited space, even small fires can have serious consequences - and fires have been considered a major threat factor for small islands - such as the Comoros. In addition to direct damage, fires often pave the way for the establishment of invasive alien species. This can be seen as a way to create a more open and inclusive society, and a way to create a more sustainable society.

In Grande Comore, where the soil is porous, surface water resources are almost non-existent. Immediately after the rainfall stops, the canalized water runs off and infiltrates rapidly to make way for dry beds. Anjouan is currently facing a serious problem of loss of surface water resources. While 49 perennial streams were recorded in 1950, by 1970 there were only about 30, and according to statistics, only four permanent streams remain today.

This situation is directly related to the problems of land clearing and soil erosion caused by increasing demographic pressure. Although there are no measurements of the flow and sustainability of rivers and streams to assess the changes that have occurred in recent years, the vast majority of rivers and streams dry up in the dry season (from July to November).

Many natural species, mainly in Grande Comore, are specific to lava flows which are slowly colonized by a pioneer flora. These lava flows in the process of colonization are real open-air laboratories to better determine the dynamics of plant settlement. The extraction of basaltic slag for crushing, accentuated by urbanization, constitutes a threat to these young ecosystems.

In the Comoros, the land situation is characterized by an unclear legal status. Rather than run the risk of the borrower trying to appropriate the land, landowners prefer to leave their land unused rather than share it out. This refusal to lend the land leads a large segment of the population, without land, to occupy the State's forest estates, which constitute the country's last land reserves. This occupation also leads to the disappearance of habitats and species of flora and fauna that are still little known.

Demographic pressures are a major constraint for any biodiversity conservation policy. The proportion of unskilled, unemployed and landless adults is growing steadily. This category of the population is likely to increase considerably with the poor performance of the education system. These unemployed young people, future heads of households, without the possibility of learning a trade, present a serious threat to the protection of the last forest relics and therefore to the conservation of fauna and flora, despite the current provisions for the creation of national forest parks.

7.2.2 Threats to marine and coastal ecosystems in Comoros

Coastal and marine areas are threatened by erosion and the removal of materials for construction, pollution by household waste due to the increase in the volume of non-degradable and non-recyclable waste (plastic packaging and containers) and the discharge of wastewater in urban areas. Coral islands, banks and reefs are threatened by habitat destruction due to unsustainable traditional exploitation methods (e.g., fishing on corals), high fishing pressure on the coastal reef zone, global warming and excessive sedimentation due to erosion from deforestation. Seagrass beds, which are the staple food of globally threatened sea turtles and dugongs, are threatened by oxygen depletion in the water caused by reef destruction and temperature increases. Threats to the nearshore environment include pollution from household waste, sewage, unsustainable traditional fishing methods, dynamite fishing (an isolated and infrequent occurrence), and Tephrosia (located in one area of Anjouan Island).

The biodiversity of coastal environments is also strongly threatened by anthropic actions.

These threats include:

- ✓ the extraction of natural coastal materials for construction (sand; pebbles) having led to the disappearance of certain beaches, in particular those which concern the laying of marine turtles;
- ✓ pollution linked to coastal urbanization (household waste deposits on the coast, urban waste and hydrocarbons, waste water)
- ✓ Erosion of the coastal zone, accentuated by heavy rains and leading to the important discharge of terrigenous deposits on the beaches, and sea waves (sudden and unexpected rise of the sea observed recently);
- ✓ the exploitation of mangrove stands for construction and charcoal making;
- ✓ The rise of sea water and coastal erosion destroying in a consequent way the infrastructures that the State struggles to rebuild them
- ✓ anarchic urbanization, without any respect of urbanization plan in all the territories.

A more remarkable case would be the disappearance of beaches due to abusive sand extraction, which accelerates coastal erosion. In 1987, the Direction Générale des Travaux Publics reported the disappearance of 11 beaches out of 25 in Grande-Comores and 7 beaches out of 18 in Anjouan in 10 years, mainly due to major construction works (airport, hospital, school and mosque). Unfortunately, in the absence of systematic monitoring of these ecosystems, the current rates of degradation are not known.

7.2.3 Threats from Invasive Alien Species (IAS)

The Sad Kingfisher (*Acridotheres tristis*), a bird of the starling family imported to the region from Asia, is well established in Comoros. Although to date no study has been carried out on the impacts of the introduction of this species to Comoros, unlike some neighboring countries, it is clear that it constitutes a threat to native forest birds.

The *Agama agama* lizard, which would have been observed for the first time in Comoros in 1994 in the capital is reproducing very quickly.

At the rate of its spread, specialists fear its introduction into the natural habitat of the Comoro Iguana or Burale, an extremely restricted habitat located in a cliff in the north of the island.

Invasive alien plant species also represent a very significant threat to ecosystems. For the Comoros, an FAO study in 2004 indicated a list of 16 invasive woody species, while stressing that *in the Comoros archipelago reliable information is limited. (...) With the exception of Mayotte, awareness of the potential danger to biodiversity and crops posed by plant invasions remains low*. (Vos, 2004).

Between April 2017 and July 2018, a regional project of the southern Indian Ocean islands (Comoros, Seychelles and Mauritius/Rodrigues) called INVA'ZILES on the fight against invasive alien species has brought out the national hierarchical list of IAS, on the 1013 taxa distributed in 130 families, it emerged from our analysis:

- 11 IAS present in natural environments: *Accacia auriculiformis*, *Clidemia hirta*, *Erigeron karvinkianus*, *Merremia peltata*, *Psidium cattleyanum*
- 148 potentially invasive species
- 273 new species for Comoros inventoried in the field
- 168 species from the bibliographic list not observed in the field
- 29 cryptogenic species

At the level of invisibility of the spontaneous exotic vascular flora in the Comoros, the analysis and processing of the data was according to the scale of Christophe Lavergne with the approach ''the sayings of the experts''.

Table 42 Category and level of invisibility of invasive vascular plant species in Comoros

Level of invisibility	Category	Number of species	Percentage (%)
5	Very invasive in natural environment with impact	6	< 1
4	Invasive in the wild and impact unknown	6	< 1
3+	Invasive in anthropized and natural environments	29	4
3	Invasive in an anthropized environment (secondarized)	73	10
2P	Beginning of invasion and potentially invasive	7	1
2	Naturalized and potentially invasive	50	7
1	Non-invasive	158	21
0	No data	53	7

Preliminary results show that for more than 100 EEEs, data analysis showed that six are highly invasive in the natural environment with impact, and four are invasive in the wild with unknown impact.

Table 43 Classification of threats, Comoros

Degree of threat	Threat	Source/origin of threats	Ecosystem/habitat affected	Affected species
FORTE	Pollution by waste and household refuse	- Lack of waste management - Insufficient waste management	- Mangrove area in the whole islands of Grande Comore, Anjouan and Moheli - Coral reef area in the islands of Grande-Comores, Anjouan and Moheli - Coastal zone	Crabs; birds; mangrove plants, coral reefs, reef fish
	Agricultural Expansion	- Demographic growth - Pauperization of rural populations	-Lowland dry forest of 0-800 m (the two slopes of Karthala; the Grille massif, the Dibwani plateau) -High altitude zone between 1200 and 1800 m (both sides of Karthala) -Dry forest of low altitude of 0-800 m (Itsamia and lake Boudouni) -Lowland forest of 0-800 m (Mount Ntringui) -Dense forest of high altitude from 1200 to 1600 m (Mount Ntringui)	Terrestrial fauna and flora Sensitive species
	Urbanization	- Demographic growth High demand for real estate (building land	- Lowland forest from 0-800 m (both sides of Karthala; the grid massif, the Dibwani plateau) -Dry forest of low altitude of 0-800 m (Mount Ntringui) - Coastal zone of the 3 islands	Terrestrial fauna and flora
	Cutting of firewood	Demographic growth Growing need for biomass energy Development of the flower distillery industry	-Lowland forest from 0-800 m (both sides of Karthala; the grid massif, the Dibwani plateau) -Dry forest of low altitude of 0-800 m (Mount Ntringui) Medium altitude fields	Terrestrial fauna and flora
	Timber cutting	- Demographic growth - High demand for wood for the construction of wooden and solid houses	-Lowland forest from 0-800 m (both sides of Karthala; the grid massif, the Dibwani plateau) -Lowland forest of 0-800 m (Mount Ntringui) - Forest of medium altitude Mount Mledjele Mohéli	Terrestrial fauna and flora
	Slash-and-burn agriculture and fires	- Demographic growth - High demand for arable land	-Lowland dry forest of 0-800 m (both sides of Karthala; the grid massif, the Dibwani plateau) - High altitude zone between 1200 and 1800 m (the two sides of Karthala; the massif of the grid) -Lowland forest from 0 to 800 m (Mount Ntringui) -Dense forest of high altitude from 1200 to 1600 m (Mount Ntringui)	Terrestrial fauna and flora
	Timber cutting	Demographic growth	-High altitude zone between 1200 and 1800 m (the two sides of Karthala; the massif of the grid)	Terrestrial fauna and flora

Degree of threat	Threat	Source/origin of threats	Ecosystem/habitat affected	Affected species
			-Dense forest of high altitude from 1200 to 1600 m (Mount Ntringui)	
	Invasive plant	- Deforestation and land clearing - Lack of a national control strategy	- Coastal zone and cultivation zone between 0 and 800 m of altitude in all 3 islands - High altitude area between 1200 and 1800 m of forest massif of 3 islands	Terrestrial fauna and flora
	Coal production	- Growing population - Increasing need for biomass energy	-High altitude zone between 1200 and 1800 m (the two sides of Karthala; the massif of the grid) -Dense forest of high altitude from 1200 to 1600 m (Mount Ntringui)	Terrestrial fauna and flora
	Extraction of natural coastal materials for construction (sand, pebbles)	Urban development	- Beach (Grande Comore) - Beach (Moheli)	Green turtles, hawksbill turtles, sensitive flora and fauna of coastal areas
	Silting	Deforestation Cleared land sows cultivation	Mangroves (Moheli)	Crabs; birds; mangrove woods
	Grazing	Demographic growth	Dry forest of low altitude of 0-800 m (Itsamia and lake Boudouni)	Terrestrial fauna and flora
	Reduction of river flows	Deforestation	Lake Dzialandze at the top of Mount Ntringui	Aquatic fauna and flora
	Sedimentation	Deforestation	Lake Dzialandze at the top of Mount Ntringui	Aquatic fauna and flora
AVERAGE	Cutting of mangrove wood	Need for firewood	Mangrove (Grande Comore)	Crabs; birds; mangrove woods
	Non-respect of the geometrical pitch	Urban and hotel development	Mangrove (Grande Comore)	Crabs; birds; mangrove woods
	Erosion	Terrigenous inputs from watersheds	- Herbarium of phanerogam (Grande Comore) -Herbarium of phanerogam (Moheli) - Beach (PNM Zone) - Reef area in the set of 3 islands	-Fauna and Flora of the sea grass ; Sea turtles ; Algae -Fauna and Flora of the sea grass ; Turtles ; Algae ; Dugong - Green turtles, hawksbill turtles
	Trampling of coral reefs	- Lack of means to go offshore for fishermen - No awareness	-Coral reef (Grande Comore) -Coral reef (Anjouan)	Acropora; clownfish, parrotfish; holothurians; crustaceans
	Grazing	Demographic growth	-Lowland dry forest of 0-800 m (both sides of Karthala; the grid massif, the Dibwani plateau) -High altitude zone between 1200 and 1800 m (both sides of Karthala)	Terrestrial fauna and flora

Degree of threat	Threat	Source/origin of threats	Ecosystem/habitat affected	Affected species
			- Dry forest of low altitude of 0-800 m (Mount Ntringui) -Dense forest of high altitude of 1200-1600 m (Mount Ntringui)	
	Chemical pollution	Products and chemical inputs for market gardeners	-Lowland dry forest of 0-800 m (both sides of Karthala; the grid massif, the Dibwani plateau) - Lake Dzialandze at the top of Mount Ntringui - Dry forest of low altitude of 0-800 m (Mount Ntringui)	Terrestrial fauna and flora Aquatic fauna and flora
	Urbanization	Demographic growth	Lowland dry forest (0-800 m) (Itsamia and Lake Boudouni)	Terrestrial fauna and flora
	Cutting of firewood	Demographic growth	Lowland dry forest (0-800 m) (Itsamia and Lake Boudouni)	Terrestrial fauna and flora
	Timber cutting	Demographic growth	Lowland dry forest (0-800 m) (Itsamia and Lake Boudouni)	Terrestrial fauna and flora
	Destructive fishing	Harpoon and dynamite fishing	Coral reef of Anjouan Coral reef in Grande Comore	Acropora; clown fish, parrot fish, holothurians
	Sedimentation	Deforestation	Coral reef of Grande-Comores, Anjouan and Moheli	Acropora; clown fish, parrot fish, holothurians
	Habitat destruction	Conversion to agricultural land	Ilot (Bimbini peninsula) in Anjouan	Seabirds
LOW	Cutting of mangrove wood	- Construction of houses - Manufacture of dugouts	-Mangrove (Grande Comore) -Mangrove (Moheli)	Crabs; birds; mangrove woods
	Destructive fishing	-Harpoon, beach seine and mosquito net fishing -Harpoon and dynamite fishing	-Herbarium of phanerogam (Grande Comore) -Coral reef (Grande Comore) -Coral reef (in the PNM, Moheli)	Fauna and Flora of the herbarium; Turtles, Algae
	Turtle poaching	- Direct consumption - Commercialization of the turtle meat	-Beach (Grande Comore) -Beach (in the PNM, Mohéli)	Green turtles, hawksbill turtles Turtle egg
	Extraction of corals	Ornamentation	Coral reef (Grande Comore)	Acropora; clown fish, parrot fish, holothurians
	Coral bleaching	Climate change	-Coral reef (Grande Comore) -Coral reef (in the PNM, Moheli)	Acropora; clown fish, parrot fish, holothurians
	Sedimentation	Deforestation	-Coral reef (Grande Comore) -Coral reef (in the PNM, Moheli)	Acropora; clown fish, parrot fish, holothurians
	Coral destruction	Invasion of Acanthaster	-Coral reef (Grande Comore) -Coral reef (in the PNM, Moheli)	Acropora; clown fish, parrot fish, holothurians
	Seabird Predation	- Predation by mongooses (introduced mammals) - Egg collection	Ndroudé island (Grande Comore)	Seabirds

Degree of threat	Threat	Source/origin of threats	Ecosystem/habitat affected	Affected species
	Coelacanth bycatch	Fishing with maze	Underwater caves (Grande Comore)	Coelacanth
	Location of quarries	Urbanization	-Lowland dry forest 0-800 m (both sides of Karthala) -Dry forest of low altitude from 0 to 800 m (Mount Ntringui)	Terrestrial fauna and flora
	Hunting	Need for bush meat	-High altitude zone between 1200 and 1800 m (both sides of Karthala) - Dense forest of high altitude of 1200-1600 m (Mount Ntringui)	Terrestrial fauna
	Trampling of coral reefs	Lack of means to go offshore for fishermen	-Coral reef (in the PMM, Moheli)	Acropora; clownfish, parrotfish; holothurians; crustaceans
	Fish disturbance	Maritime transport	Sub- and mid-littoral environment (Anjouan)	Whales; dolphins, rays; sharks
	Marine pollution	- Oil spill - Lack of waste and garbage management	- Coral reef (Grande Comore) - Coral reef (Moheli) - Coral reef (Anjouan)	Acropora; clownfish, parrotfish; holothurians; crustaceans
	Lava flow	Volcanic eruption	High altitude zone between 1200 and 1800 m (both sides of Karthala)	Terrestrial fauna and flora
	Thick lahar runoff	Natural phenomenon (volcanic eruption)	High altitude zone between 1200 and 1800 m (the two sides of Karthala; the massif of the grid)	Terrestrial fauna and flora

7.3 Mauritius

In Mauritius, economic growth, as well as changing patterns of production, consumption and service delivery are putting pressure on the environment as never before. Some of the sectors in important areas such as health services, education, energy, food, sanitation and transport seeking to satisfy the demands of the Mauritian and Rodriguan population are perceived to be in direct or indirect competition with environmental and biodiversity conservation. While these sectors contribute to a vibrant economy, if not properly integrated with the preservation of native biodiversity and its ecosystems, they will add undue pressure on the islands' fragile environment. For example, demand for land and water in Mauritius is expected to increase (MOE 2011), while the island has one of the highest proportions of built-up areas in the world and on a daily basis, a large proportion of the population endures long water cuts and in some places there are temporary acute water shortages especially during periods of rainfall deficit. The drive to build, to replace greenery, including forest with concrete, has accelerated since the last ecosystem profile (2014). Water scarcity is also a critical issue in Rodrigues.

In addition, the recent COVID-19 pandemic has caused some uncertainty in funding for restoration efforts and species monitoring, as well as logistical delays and difficulties in staff recruitment and movement, and decreased visitation and education activities, etc. (MWF 2021). These effects may have had impacts on biodiversity, but on the other hand, the decrease in economic activities and the disruption they may have brought may have had beneficial effects on plants and animals. Although it is difficult to assess the outcomes of the COVID-19 pandemic, it is safe to assume that the overall impacts on terrestrial biodiversity conservation have been negative. If the closure of beaches has caused people to trek into the forests, this, if unchecked, may have impacts on biodiversity. On the other hand, marine conservation may have benefited from reduced pressure on the coastline.

The main threats to biodiversity of the different ecosystem types discussed and ranked during the workshop with stakeholders for the previous ecosystem profile (CEPF 2014) remain valid. Overall, there is low government commitment to conservation, resulting in low allocation of funds and lack of trained personnel for proper monitoring and enforcement. Policy makers and civil society have a low appreciation and understanding of the need for environmental protection and conservation of indigenous biodiversity. Not surprisingly, there are still too few active NGOs. CSR funds are only available to registered NGOs, excluding stakeholders who could contribute, such as research institutes or universities.

Protected area research activities contribute to conservation due to the presence of researchers in the field (Laurance 2013; Florens 2013b; Tatayah 2011). However, funding for research is very limited, as are the institutions involved. In addition, few people are qualified to conduct good quality research and there are few opportunities to train young people in conservation activities or research. Biological repositories are somewhat neglected, with the exception of plant collections.

In addition, there is a need to update the status of species already on the red list, and to add new assessments and increase the scope of biological groups that are listed. While a number of plants, birds, bats and reptiles for Mauritius and Rodrigues have been assessed or reviewed, there are an overwhelming number of taxa that have not yet been assessed. However, for many groups, particularly for marine biodiversity, there is still a need to create a species list and determine the distribution of species, and some groups have been little or not studied at all. This lack of reference is a very important gap, as it is a block to objectively define protected areas and conservation actions. The same is true for certain groups of insects. Finally, categorization and mapping of ecosystems is also needed for terrestrial and marine ecosystems.

Other similar or different threats that were raised during the consultations include:

- Invasive alien species
- Human activities
- Climate change
- Lack of funds
- Urbanization
- Infrastructure development
- The lack of manpower
- Lack of capacity
- Unconsciousness
- Political interference
- Pressures on available land
- Overcrowding
- Pollution.

Table 44 Threats to biodiversity in Mauritius and their importance, according to the public consultation. Threat significance: Timeframe (S=short term; M=medium term; L=long term); Threat scope (S=Small, M=Medium, H=Large); Threat intensity (L=Low; M=Medium; H=High); updated 2022

Threats	Cause		Importance of threats			Implications/Comments
	Direct causes	Indirect causes	Deadline	Rank / Range	Intensity	
Forest Biodiversity						
Invasive alien species	Land use change Economic development (increased business, tourism) Lack of awareness of the local population (horticultural introductions; pets)	Inadequate management (especially for plants) Weak border and inter-island control capacity Weak policy implementation Climate change	C/L	L	H	Biodiversity decline, loss of endemic species, decline in provision of ecosystem services, and loss of future restoration potential. Limited control. Ambiguous legislation (control over mountain reserves). Some existing strategies not yet implemented (lack of funding).
Land use change	Economic development Population growth	Lack of management capacity Lack of execution capacity Weak policy implementation	C/M/L	P/M	H	Unsustainable development. Precautionary principle not applied Abandonment of agricultural land/change of built-up areas
Fire	Human activities	Climate change	C/M	P/M	H	Loss of forest cover, facilitation of IAS spread, increased erosion with increased sedimentation (inland and marine waters) and decline in provision of ecosystem services
Climate change	Increased number of storms and drought events		L	L	?	Ability to adapt Increased impacts of IAS

Pests and diseases	Increase in epidemics related to IAS	Climate change	L	M/L	H	Loss of economic resources, detour of limited resources to deal with an epidemic
Habitat fragmentation	Increased fragmentation		M/L	M/L	H	*"Extinction debt",* IAS invasion, biodiversity decline, loss of endemic species, decline in provision of ecosystem services, and loss of future restoration potential
Inland Biodiversity						
Reclamation or filling of marshes Pipe	Economic development Increase in built-up areas (of construction) Agriculture	Lack of management capacity Weak policy implementation	M/L	P/M	M	Loss of biodiversity and ecosystem services, increased sedimentation, decreased value as ecological corridors Decrease in groundwater levels
Sedimentation	Land use change Deforestation	Lack of management capacity Weak policy implementation	M/L	P	L	Decline in water quality and associated loss of biodiversity and ecosystem services.
Pollution Eutrophication	Economic development Unconsciousness Lack of wastewater treatment POPs accumulation	Lack of management capacity Weak policy implementation Lack of application Lack of biosafety protocol	M/L	M/L	M/H	Decline in water quality and associated loss of biodiversity and ecosystem services, reduced value as ecological corridors
Loss of forest cover Increase in IAS	Unconsciousness Economic activities	Lack of management capacity Weak policy implementation	L	M	M/H	Loss of biodiversity and ecosystem services, reduced value as ecological corridors

Climate change	More droughts, increased flooding, increased salinity		L	L	?	
Threats	**Cause**		**Importance of threats**			**Implications/Comments**
	Direct causes	**Indirect causes**	**TF**	**Rank**	**Direct causes**	**Indirect causes**
Marine and coastal biodiversity						
Overexploitation	Economic pressures Overfishing Poor fishing practices	Insufficient management, control and monitoring capacity	C/M/L	P/M/L	M	Unsustainable exploitation of resources, loss of income with impact on livelihoods, increased cost of living Potential phase shift in some habitats Lack of data on the impact of recreational fishing New for the development quota system for long-term sustainability
Unsustainable tourism	Increased demand from tourism	Economic pressure	C/M/L	P/M	H	Localized problem but can have a strong impact on biodiversity
Illegal fishing			C/M/L	L	H	Use of illegal fishing gear
By the fishing with the blow	DCP		M/L	L	M/H	Illegal fishing of protected species (turtles, etc.)
Erosion and sedimentation Freshwater discharge	Increased discharge of fresh water into the sea		C/M/L	L	H	

Land-based pollution	Sedimentation		M	M	L/M	Some habitats that are heavily impacted and disappearing (e.g. seagrass beds)
Marine debris: offshore drift, non-degradable solids	Industrial and domestic waste from land and boats, abandoned fishing gear	Poor waste management in the region Unconsciousness High use of plastic bags	C/M/L	L	M/H	Secondary deaths (dolphins, turtles, etc.)
EEE	Ballast water		C/M/L	L	M/H	No basic data New study undertaken and data should be available soon
Coral bleaching, sea temperature rise, sea level rise, extreme events	Climate change		L	L	H	Major factor but not fully understood Continued restoration of reefs
Oil spills	Increase in recreational marine traffic	Weak control of vessel movements Insufficient response capacity	C	P/M	M/H	Impact on marine and coastal ecosystems

7.4 Seychelles

The table below, taken from the 4th CBD report, was adapted and updated at the first CEPF national workshop (November 2013).

Table 45 Threat to Biodiversity, 4th National Report - CBD

Type of ecosystem	Threats	Direct and indirect drivers of threats	Implications
Forest	Invasive Alien Species (IAS)	Change in land use Increased trade and tourism Lack of public awareness of horticultural introduction Lack of capacity and techniques to respond to existing IAS problems in areas of endemic biodiversity (e.g., mountain forest 200-500m altitude) Lack of capacity in border controls and inter-island movements	Degradation of biodiversity, decline of ecosystem services, and loss of future development potential
	Fire	Human activities Climate change	Loss of forest cover, accelerated spread of IAS, increased erosion and sedimentation, decline in ecosystem services
	Diseases	Increase in IAS-related diseases Climate change	Loss of economic resources, redirection of limited resources to cope with the onset of the disease
Inland water	Drainage/Canalization	Economic development Lack of planning, management and capacity building	Loss of biodiversity and ecosystem services, increased sedimentation in the marine environment
	Sedimentation	Land use change, deforestation Lack of management capacity	Decline in water quality and relative losses in biodiversity and ecosystem services
	Pollution	Economic development Lack of awareness Lack of management capacity	Decline in water quality and relative losses in biodiversity and ecosystem services
	Invasive alien species	Lack of awareness	Loss of biodiversity and ecosystem services
Ocean and coastline	Overexploitation	Economy Insufficient management measures and capacity Inappropriate incentives	Unsustainable exploitation of resources, large loss of future income and impact on livelihoods. Increase and possible future phases of modification of certain

			habitats, increase in the frequency of diseases
	Pollution	Economic development Oil exploration and exploitation	-
	Change in sea temperature	Climate change	Changes in currents and nutrient inputs, changes in the occurrence and distribution of pelagic resources, changes in weather patterns, increase in the number of coral bleaching events
	Sea level change	Climate change	Loss of biodiversity, coastal erosion, potential impact on economic activities and human settlements on coastal plains
	Acidification of the sea	Climate change	Modification of coral calcification rate, impact on shell formation, coral recruitment and planktonic phase of some species

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All of the threats listed were initially ranked by the national workshop participants according to their importance in the Seychelles islands. This table was re-circulated in March 2022 to all stakeholders and their feedback was incorporated to update it.

Table 46 Threats to biodiversity in Seychelles identified by consulted stakeholders, March 2022

Threats to biodiversity							
Type of ecosystem	**Threats**	**Cause**		**Importance**			**Implications / comments**
		Direct causes	**Indirect causes**	**Time frame: short/medium/long** **C/M/L**	**Rank: low/medium/high** **B/M/E**	**Intensity** **F (low)** **M (average)** **H (high)**	
Forest Biodiversity	Invasive alien species	Land use change Economic development - increased trade and tourism. Lack of public awareness of horticultural initiations	Lack of management capacity for border control and inter-island control, Climate change.	L	E	H	Biodiversity decline, loss of endemic species, decline in the provision of environmental services and loss of future development potential New ecosystem" concept to consider
	Land use change	Economic development	Lack of management capacity, policy implementation, etc.	C/M	B/M	M	Disappearance due to residential development, infrastructure, etc. Precautionary principle. Farmland Abandonment (MNSP)

Threats to biodiversity							
Type of ecosystem	**Threats**	**Cause**		**Importance**			**Implications / comments**
		Direct causes	**Indirect causes**	**Time frame: short/medium/long** **C/M/L**	**Rank: low/medium /high** **B/M/E**	**Intensity** **F (low)** **M (average)** **H (high)**	
	Fire	Human activities	Climate change	C/M	M	M	Loss of forest cover, facilitation of IAS spread, increased erosion, increased sedimentation (see Inland Waters), decline in provision of environmental services.
	Climate change	Frequent droughts, storms, impacts of IAS		L	E	?	
	Pests / Vectors / Diseases	Increase in diseases related to IAS pests. Climate change?	Climate change?	M/L	M/W	H	Loss of economic resources, detour of already limited resources to deal with an epidemic.
	Habitat fragmentation	Increased fragmentation		M/L	M ?	?	Lack of information on consequences (related to residential development, roads)
Inland Biodiversity	Drainage/Canalization	Economic development, residential development, agriculture	Lack of management capacity, policy implementation, etc.	M/L	E/M	M	Loss of biodiversity and environmental services (little support for their protection), increased

Threats to biodiversity							
Type of ecosystem	**Threats**	**Cause**		**Importance**			**Implications / comments**
		Direct causes	**Indirect causes**	**Time frame: short/medium/long** **C/M/L**	**Rank: low/medium /high** **B/M/E**	**Intensity** **F (low)** **M (average)** **H (high)**	
							sedimentation in the marine environment
	Sedimentation	Land use change, deforestation	Lack of management capacity	M/L	M	M	Degradation of water quality and associated loss of biodiversity and environmental services.
	Pollution, eutrophication	Economic development Lack of awareness, lack of wastewater treatment, lack of enforcement, accumulated POPs	Lack of management capacity	M/L	M/W	M/H	Degradation of water quality and associated loss of biodiversity and environmental services.
	EEE	Lack of awareness, lack of biosafety protocol (contamination of marshes)		L	M	M/H	Loss of biodiversity and environmental services.
	Climate change	Long drought, large floods, increase in salinity		L	E	?	
Marine and coastal biodiversity	Overexploitation	Economy, overfishing Fishing overcapacity: sea cucumbers, lobsters, sharks; poaching	Lack of management capacity, inappropriate/perverse incentives.	M/L	M/L	M/H ?	Unsustainable resource exploitation, significant loss of future income and impact on

Threats to biodiversity							
Type of ecosystem	**Threats**	**Cause**		**Importance**			**Implications / comments**
		Direct causes	**Indirect causes**	**Time frame: short/medium/long** **C/M/L**	**Rank: low/medium /high** **B/M/E**	**Intensity** **F (low)** **M (average)** **H (high)**	
							livelihoods, cost of living, etc. Potential phase change in some habitats.
	By catch (sharks, turtles...)	Handcrafted fashions and accessories		M/L	E	?	A major problem in the semi-industrial longline fishery, shark finning and the use of trace metals must be banned.
	Pollution	Economic development, urbanization, inadequate industrial and domestic sanitation,	Lack of management capacity	M	M	F/M	Impact on some localized coastal habitats and production (also a much broader threat from shipping and oil exploration)
	Offshore debris / non-degradable solids (marine debris)	Industrial and domestic waste from land and boats, abandoned fishing gear	Poor waste management and lack of education, use of plastic bags in stores	C/M/L	E	M/H	Lack of information Example from India: takeaway bags made of banana leaves
	EEE ?	Ballast water. Encouraging the development of mariculture can significantly increase this risk.		M/L	?	?	Lack of information The IUCN assessment identified three species, but very limited general assessment work

Threats to biodiversity							
Type of ecosystem	**Threats**	**Cause**		**Importance**			**Implications / comments**
		Direct causes	**Indirect causes**	**Time frame: short/medium/long** **C/M/L**	**Rank: low/medium /high** **B/M/E**	**Intensity** **F (low)** **M (average)** **H (high)**	
							has been done. Actual occurrence of marine IAS unknown. Continued degradation and stress levels of reef habitats suggest that there is potential for the establishment of IAS
	Climate change (sea temperature rise, sea level change, coral bleaching, localized salinity change, loss of critical habitats: seagrass beds, etc.)	Human activities		M/L	E	H	Economic loss in the artisanal fishery and tourism industry, increased cost of living, potential for ecosystem phase change and increased coastal erosion. Changes in the occurrence and distribution of pelagic resources, changes in weather conditions, increased frequency of coral bleaching events, etc. Loss of biodiversity, coastal erosion, potentially disastrous socio-

Threats to biodiversity							
Type of ecosystem	**Threats**	**Cause**		**Importance**			**Implications / comments**
		Direct causes	**Indirect causes**	**Time frame: short/medium/long** **C/M/L**	**Rank: low/medium /high** **B/M/E**	**Intensity** **F (low)** **M (average)** **H (high)**	
							economic impact, as economic activity and human habitation are concentrated on the coastal plains.
	Claim			L	M	H	This has had a very marked impact on some species, also on the east coast of Mahé, with the center of the vast majority of the reclamation being key egg-laying/spawning/breeding habitat for various species
	Sedimentation	Urban development		C/M/L	B	F/M	Degradation of coral reefs, economic loss in the artisanal fishing and tourism industry

In addition, the threats affecting each of the 57 KBAs were also reviewed, disseminated and updated with input from local experts and stakeholders.

Table 47 Threats to KBA in Seychelles

Biome	KBA ID#	KBA (French name)	ILE	AZE	IBA	RAMSAR	Protection	(co)-Manager(s)	VU	IN	CR	TOTAL	Rank	Threat level	Main threats
MC	SYC-1	Anse Major / Anse Jasmin (marine part of MSNP)	Mahé				no		0	1	1	2	29	Medium	Global warming, poaching/overharvesting, pollution, sea level rise (climate change)
TER	SYC-2	Anse Source d'Argent-Anse Marron	La Digue	X	X		no	The Union Pty Ltd	1	1	1	3	24	Medium	IAS, land use change/urbanization, fragmentation, fire, climate change
MC	SYC-3	Astove	Astove		X		no	IDC/ICS	0	0	0	0	34	Medium	IAS, land use change/construction development, fire, sea level rise, marine debris
TER	SYC-4	African benches	African benches		X		AP	ICS/IDC	0	0	0	0	34	Medium	Global warming, poaching/overharvesting, pollution, sea level rise (climate change), marine debris
TER	SYC-5	Cosmolédo	Cosmoledo		X		PROPOSED	IDC/ICS	0	0	0	0	34	Fort	IAS, poaching, fire, marine debris, sea level rise, climate change
TER	SYC-6	Farquhar - South island and islets	Farquhar		X		PROPOSED	IDC/ICS	0	0	0	0	34	Medium	IAS, poaching, fire, marine debris, sea level rise
TER	SYC-7	Fond Azore (southern slopes) to Anse Bois de Rose	Praslin		X		PROPOSED		14	4	2	20	6	Medium	IAS, fire, land use change/urbanization, fragmentation, climate change
TER	SYC-8	Fond Diable and Pointe Joséphine	Praslin				no		3	1	0	4	20	Medium	IAS, fire, land use change/urbanization, fragmentation, climate change
TER	SYC-9	Fond Ferdinand	Praslin				PROPOSED		12	6	1	19	7	Medium	IAS, fire, fragmentation, climate change
TER	SYC-10	Friendship Forest	Praslin				no		4	0	0	4	21	Medium	IAS, fire, land use change/urbanization, fragmentation, climate change
TER	SYC-11	Coral Mountain-Southern Hills Dry Forests	Mahé				PROPOSED		12	1	1	14	8	Medium	IAS, fire, land use change/urbanization, fragmentation, climate change
TER	SYC-12	Grand Anse-Petite Anse-Fond Piment	La Digue	X			no		3	0	1	4	22	Low	IAS, fire, land use change/urbanization, fragmentation, climate change

TER	SYC-13	Grand Police (wetlands)	Mahé				no	Private companies	4	1	0	5	16	Medium	IAS, land use change/urbanization, pollution/eutrophication, climate change
MC	SYC-14	Assumption Island	Assumption				PROPOSED	IDC/ICS	0	0	0	0	34	Medium	IAS, land use change/building development, fire, climate change, marine debris
TER	SYC-15	Bird Island (Ile aux Vaches)	Cow Island		X		no	Private companies	0	0	0	0	34	Medium	Overexploitation, climate change, IAS, rising water levels, poaching
TER	SYC-16	Conception Island	Design		X		no		1	1	0	2	30	Fort	IAS, fire, climate change
TER	SYC-17	Cousin Island	Cousin		X		no	Private companies	2	1	0	3	25	Medium	IAS, fire, climate change, sea level rise
TER	SYC-18	Curious Island	Curious				no	NAPS	9	2	1	12	9	Medium	IAS, fire, climate change, sea level rise, poaching
TER	SYC-19	Arros Island and Saint-Joseph Atoll	D'Arros/St Joseph		X		PROPOSED	Save our Seas	0	0	0	0	34	Medium	IAS, fire, climate change, sea level rise, poaching
TER	SYC-20	Denis Island	Ile denis		X		no	Private companies	1	1	1	3	26	Medium	IAS, fire, climate change, sea level rise
TER	SYC-21	Desnoeufs Island	Desnoeufs		X		PROPOSED	IDC/ICS	0	0	0	0	34	Medium	Climate change, sea level rise, poaching, overexploitation of resources
MC	SYC-22	Desroches Island - surrounding reefs	Desroches				PROPOSED	IDC/ICS	0	0	0	0	34	Medium	IAS, land use change/building development, fire, overexploitation (sea cucumber), sea level rise, climate change
TER	SYC-23	North Island	North Island		X		no	Wilderness Safaris	0	1	0	1	32	Low	IAS, land use change/building development, fire, climate change
TER	SYC-24	Providence Island and Banks	Providence		X		no	IDC/ICS	0	0	0	0	34	Medium	Global warming, poaching/overharvesting, sea level rise, marine debris
MC	SYC-25	Alphonse Island and Lagoon	Alphonse		X		no	ICS/IDC/ Hotel	0	0	0	0	34	Medium	Global warming, poaching/overharvesting, sea level rise, marine debris

TER	SYC-26	Félicité Island	Felicity				no	Private companies	9	0	1	10	10	Medium	IAS, land use change/urbanization, fragmentation, fire, climate change
TER	SYC-27	Frégate Island	Frigate		X		no	Private companies	1	3	1	5	17	Low	IAS; Land use change/urbanization; Fragmentation; Fires; Climate change
TER	SYC-28	Marie-Louise Island	Marie-Louise		X		no	IDC/ICS	0	0	0	0	34	Medium	IAS, climate change, sea level rise, poaching
TER	SYC-29	St. Anne's Island	Saint Anne				no	Private companies	3	0	0	3	27	Medium	IAS, land use change/building development, pollution, fire, climate change
MC*	SYC-30	St. Peter's Island	Saint Peter				no	IDC/ICS	0	0	0	0	34	Medium	IAS, poaching, climate change, sea level rise, marine debris
TER	SYC-31	Star and Sulky Islands	Star & Sulky		X		AP	ICS/IDC	0	0	0	0	34	Medium	IAS, poaching, climate change, sea level rise, marine debris
TER	SYC-32	Saint-François and Bijoutier Islands	Saint François & Bijoutier		X		PROPOSED	ICS/Hotel	0	0	0	0	34	Medium	IAS, poaching, climate change, sea level rise, marine debris
MC	SYC-33	Frégate Island	Frégate Island		X		AP	Fregate Island	0	0	0	0	34	Medium	Poaching, IAS, sea level rise
MC	SYC-34	Pepper lagoon and surrounding reefs	Pepper				PROPOSED	IDC/ICS	0	0	0	0	34	Medium	Global warming, poaching/overharvesting, sea level rise, marine debris
TER	SYC-35	Mount Signal	Mahé				no		2	0	0	2	31	Medium	IAS, land use change/urbanization, fragmentation, fire, climate change
TER	SYC-36	Burnt Mountain-Piton de l'Eboulis	Mahé				PROPOSED		21	9	3	33	4	Medium	IAS, fragmentation, climate change
TER	SYC-37	Glacis Mountain - When she comes	Mahé		X		no		10	0	0	10	11	Medium	IAS, land use change/urbanization, fragmentation, fire, climate change
TER	SYC-38	Planneau Mountain (Grand Bois-Varigault-Cascade)	Mahé	X	X		PROPOSED		31	16	10	57	3	Medium	IAS, land use change/urbanization, fragmentation, fire, climate change
TER	SYC-39	Eagle's Nest (ridges and eastern slopes)	La Digue	X	X		no		6	0	0	6	14	Low	IAS, land use change/urbanization, fragmentation, fire, climate change

TER	SYC-40	Reef Island National Park	Reef Island		X		AP	SNPA / MEE	0	0	0	0	34	Medium	IAS, poaching, climate change, sea level rise, marine debris
TER	SYC-41	Praslin National Park	Praslin		X		AP	SNPA / SIF	16	7	3	26	5	Medium	IAS, fire, land use change/urbanization, fragmentation, climate change
TER	SYC-42	Silhouette National Park	Silhouette		X		AP	IDC/ICS/ SNPA	40	20	21	81	1	Low	IAS, land use change/urbanization, fragmentation, fire, climate change
TER	SYC-43	Morne Seychellois National Park	Mahé	X	X		AP	NAPS	29	21	13	63	2	Medium	IAS, land use change/urbanization, fragmentation, fire, climate change
MC	SYC-44	National Marine Park of Cap Ternay / Ternay Bay	Mahé				APMC	NAPS	0	0	0	0	34	Medium	Global warming, poaching, sedimentation, pollution, sea level rise (climate change)
MC	SYC-45	Cocos Island National Marine Park	Felicity				APMC	NAPS	0	0	0	0	34	Medium	Global warming, poaching, sea level rise (climate change)
MC	SYC-46	National Marine Park of the Curieuse Island	Curious				APMC	NAPS	0	0	0	0	34	Medium	Global warming, sedimentation, sea level rise (climate change)
MC	SYC-47	Port Launay National Marine Park and coastal wetlands	Mahé				APMC	NAPS	0	0	0	0	34	Medium	Global warming, poaching, sedimentation, pollution, sea level rise (climate change)
MC	SYC-48	Sainte-Anne National Marine Park (PNMSA)	Saint Anne				APMC	NAPS	0	0	0	0	34	Medium	Global warming, poaching, sedimentation, pollution, sea level rise (climate change)
MC	SYC-49	Silhouette National Marine Park	Silhouette				APMC	NAPS	0	0	0	0	34	Medium	Global warming, poaching, sea level rise (climate change), marine debris
TER	SYC-50	Aldabra Special Reserve	Aldabra	X	X	X	AP	FIS	2	2	0	4	23	Medium	Global warming, sea level rise (climate change), marine debris
MC	SYC-51	Special Reserve of the Arid Island	Arid		X		APMC	ICS	2	2	2	6	15	Medium	Poaching, IAS, global warming, sea level rise
MC	SYC-52	Special Reserve of Ile Cousin	Cousin		X		APMC	Nature Seychelles	2	1	0	3	28	Medium	Global warming, sea level rise, sedimentation, IAS
TER	SYC-53	La Veuve Special Reserve	La Digue	X	X		AP	NAPS	0	0	1	1	33	Medium	IAS, fragmentation, pollution/eutrophication
TER	SYC-54	Kerlan River	Praslin				no		7	0	0	7	13	Low	IAS, land use change/urbanization, water withdrawal

TER	SYC-55	Rocks of Anse Petite Cour	Praslin				no		4	1	0	5	18	Low	IAS, fire, land use change/urbanization, fragmentation, climate change
TER	SYC-56	Endor Valley	Mahé				no		5	0	0	5	19	Medium	IAS, fire, land use change/urbanization, fragmentation, climate change
TER	SYC-57	La Misère-Dauban area : La Misère	Mahé	X	X		no		6	1	1	8	12	Medium	IAS, fire, land use change/urbanization, fragmentation, climate change

7.4.1 Threats to forest biodiversity in Seychelles

IAS are the most significant threat to forest biodiversity in Seychelles, as their impact is compounded by other factors such as land use change, increased international and inter-island trade and transport in Seychelles, the development of the tourism and hiking industry, and climate change. The impacts of all these factors affect forests on a large scale and over the long term, and can lead to dramatic consequences in terms of habitat loss, even with the extinction of endemic species, and the alteration of ecosystem functions. Among IAS, diseases and vectors represent a formidable threat that can have dramatic consequences both ecologically and economically (as well as for public health, for example with the increased abundance of the Tiger mosquito, responsible for Dengue and Chikungunya). Increased droughts and severe storms that may be linked to climate change are also likely to have widespread negative impacts on forests and their biodiversity, although native plants appear to be more resistant to these stresses than exotic plants. Fire has a very high destructive potential, but normally has more localized consequences, as does the clearing of forests for infrastructure or residential development.

7.4.2 Threats to inland water biodiversity in Seychelles

IAS are probably the most widespread and acute threat to inland freshwater wetlands here as well, resulting in net losses of biodiversity and environmental services; the invasive water lettuce *Pistia stratiotes* and, to a lesser extent, the water hyacinth *Eichhornia crassipes* that have covered much of these wetlands in the Seychelles, being a good example of such ecological catastrophes. Pollution from lack of or under-capacity sewage treatment plants is also a considerable threat to most of the coastal wetlands in Seychelles, which are almost always close to residential areas (Baie Police, in southern Mahé, is one of the few exceptions). Drainage and infilling continue to be a major threat to coastal wetlands, as nearby construction developments too often encroach on their bangs. Freshwater animals such as mud turtles have seen their habitat on Mahé greatly reduced in recent decades, and their numbers have declined accordingly.

7.4.3 Threat to marine and coastal biodiversity in Seychelles

Overfishing and climate change are currently the two greatest threats to marine and coastal biodiversity, the former making ecosystems less resilient to the latter; there are also other stressors such as pollution, sedimentation, reclamation, etc.

Overfishing has confounding, and probably aggravating, contemporary and historical aspects in coastal waters and particularly the 12,000 square miles of the Mahé Plateau. Major components of the megafauna have disappeared (seals, crocodiles) or been significantly reduced in numbers/biomass (turtles, sharks, + large resident groupers?). The functional extirpation of these species from the ecosystem can be expected to induce significant and long-term impacts on the stability and productivity of marine shelf and bank ecosystems. This situation has been exacerbated over the past 40 years by the sustained overfishing of demersal stocks on the Mahé Shelf, with marked historical declines in populations of various grouper species and continued overfishing of key economic stocks such as the emperor red snapper locally called 'Bourgeois'.

Seychelles' ocean waters have also been affected by historical whaling and the contemporary expansion (from the 1980s onwards) of industrial and semi-industrial fleets, both regionally and nationally, raising concerns about the long-term sustainability of tuna and associated fisheries (by-catch such as sharks and turtles).

The general and cross-sectional impacts of current and projected climate change are poorly understood, but the major coral bleaching event of 1998 provided a glimpse of the serious potential consequences for the future. Coral reefs on the Mahé Plateau, apart from some localities, did not show strong recovery from this event and recovery was further hampered by subsequent less severe bleaching events. Recent studies indicate that the effect of coral reef decline will soon become apparent in the catch and composition of the fishery.

Pollution is a secondary threat factor due to Seychelles' small population and limited industrial and agricultural base, but is increasing year by year. Pollution impacts coupled with sedimentation and reclamation activities have had significant effects on the coastal habitats of the main populated islands. Indeed, the main area of pollution loading and reclamation is along the east coast of Mahé, and the collapse of some fish species in local fishing nets (*Epinephelus ongus* and *Leptoscarus vaigiensis*) has been attributed to the reclamation of key habitats. The east coast of Mahe is also the main nursery area for multiple shark species and the consequences of the ecosystem changes presented above are still unknown.

8 SOCIO-ECONOMIC PROFILE

The Hotspot countries are a heterogeneous group geographically, demographically and socioeconomically.

8.1 Demographics and population

Table 48 Demographics of the islands

	Population	Area (km²)
Seychelles (2021)	99 202	455
Comoros (2017)	742 287	2 170
Mauritius (2021)	1 260 000	1 865
Rodrigues		109
Madagascar (2018)	28 177 762	587 041

The main population indices show a gap between Madagascar and the Comoros on the one hand, and the Seychelles and Mauritius on the other. Madagascar's population growth is particularly strong: with an annual growth rate of about 3%, it is estimated that Madagascar's population will be well over 33 million by 2030. This growth rate is relatively higher than that of other sub-Saharan countries (average 2.4%) and the islands of the Indian Ocean (with the exception of the Republic of Comoros (1.97%)) and in the current context leads to increased pressure on natural resources and biodiversity.

In Comoros, the average density is very high (407 inhabitants/km²) and varies significantly from one island to another and within the islands. This density is particularly high in Anjouan where it reaches 772 inhabitants/km², thus posing important socio-economic and environmental problems. The country is experiencing strong demographic pressure, which is causing high and increasing urbanization. The share of the urban population is constantly growing. From 28% in 2003, it reached 31% in 2017.

As for Mauritius, the average population density is about 630 persons/km², among the highest in the world, although population growth is low (0.4% in 2012), with a crude birth rate of 10.3 in 2021 (compared to 10.6 in 2020). Concerning Rodrigues, the population density is 404 persons/km².

In Seychelles, the average population density is 212 persons/km², with 58.4% of people living in the urban area.

8.2 Ethnicity, languages and religion

The Malagasy population is made up of 18 ethnic groups, spread throughout the country, each of which has its own local or group language, while the country's first official language is "Malagasy", a single language spoken by the entire population and taught throughout the island. The second official language is French, while English has been progressively practiced for some years. There are no official statistics concerning religion. Nearly half of the Malagasy population declares itself Christian, nearly the other half practices the ancestral religion and about 10% of Malagasy people say they are Muslims.

The population of the Union of the Comoros is largely of Bantu ethnicity. Comorian is the first official language, followed by French and Arabic. Islam is the state religion, with 97% of the population practicing Sunni Islam.

The population of Mauritius and Rodrigues is composed of different ethnic groups, the majority of which are of Indian origin in Mauritius, and Catholic ('Creole') in Rodrigues. Another part is of Chinese and European origin, while mestizos occupy an important place. Mauritian Creole is inspired by French and spoken by a large majority of the population, as well as French, although English is the official language of the country. In Rodrigues, the lexicon of Rodriguan Creole has just been formalized in 2022. Hinduism is the majority in Mauritius (49% of the population), followed by Islam (17%) officially, but the 'Creole' population is also important. The last ethnic census of Mauritius was conducted in 1972, although there have been major ethnic, social and cultural changes since then.

In Seychelles, the population is a mixture of African, Malagasy, European and Asian cultures resulting from the colonial slavery era that prevailed when the first settlers came with slaves from Mauritius and Reunion, and the arrival of Indian and Chinese workers and families during the 19th and 20th centuries. It is predominantly Christian (over 90% of the population: mainly Roman Catholic and also Anglican), with other religions such as Hinduism, Islam, Bahai, etc. There are three official languages in Seychelles: English (the administrative language), Creole (the dominant spoken language) and French.

8.3 Trends

Madagascar's HDI value of 0.528 (2019) places the country in the low human development category, ranking 164th out of 189 countries and territories. Between 2000 and 2019, Madagascar's HDI value increased from 0.462 to 0.528, an increase of 14.3 percent. According to INSTAT, the growth rate was -7.1% in 2020, while the poverty rate for the same year is 71.5% (National Survey on the Monitoring of the Millennium Development Goals), after a real GDP growth of 4.4% in 2019 (ADB). The country thus entered a recession in 2020 due to Pandemic Covid-19, when real GDP declined by 4%.

For the Comoros, where the HDI is 0.554 (2019). The country is characterized by extreme poverty affecting a quarter of the population, an overall poverty rate affecting 42.4% of the population (World Bank, 2018), and persistent inequality despite a decline with a Gini coefficient dropping from 0.55 to 0.45 between 2004 and 2014 (United Nations System, 2020). Poverty and inequality are, in large part, explained by the prevailing economic context in Comoros, but also by the absence of a reliable social protection system. The State's limited financial resources prevent it from implementing a redistribution policy to benefit the most vulnerable social classes, which accentuates inequalities, particularly those related to gender. The Union of the Comoros is a Small Island Developing State (SIDS) and was part of the Least Developed Countries club until the end of 2019. Following the World Bank's assessment, the country joined the Lower Middle Income Countries club.

As for the Republic of Mauritius, social and economic indicators are comparable to those of OECD (Organization for Economic Cooperation and Development) countries. The HDI of 0.804 in 2019 ranks it 66th among the 189 countries and territories assessed. Inequality exists within the Republic of Mauritius, although the incidence of absolute poverty is relatively low, despite pockets still prevailing in some suburban and coastal areas of Mauritius and Rodrigues Island. Rodrigues' level of development has improved, as indicated by the increase in its relative development index (RDI) from 0.3473 in 2000 to 0.5570 in 2011, but also indicating that Rodrigues is the second poorest region in Mauritius. Pockets of poverty are in some ways correlated with where most descendants of slaves live, such as traditional coastal fishing communities. These communities are particularly vulnerable because government investment is more focused on higher education in an attempt to promote economic growth. Yet children from poor families, such as those found on the coast of Mauritius and Rodrigues, are less likely to benefit from this policy.

Social and economic indicators in Seychelles are also comparable to OECD countries, and poverty is marginal. This is due to the government's emphasis on education, health, housing, and other social development programs. The country's social indicators have remained strong and its HDI equal to 0.796. Seychelles is the country with one of the highest indices in Africa and is well on its way to achieving the Sustainable Development Goals (4 are already achieved). Nevertheless, poverty and deprivation exist in Seychelles, but are difficult to measure or have not been measured sufficiently in the past. According to World Bank data, the poverty rate is about 2.5 percent, but a 2020 study by the Seychelles National Statistical Office found that 12 percent of the population was multi-dimensionally poor and suffered from deprivations related to standard of living, education, health and employment.

In general, in addition to climate change, the current global health and geopolitical context (Covid 19, monkeypox virus, Russia-Ukraine war) is not without impact on the economy of each country, becoming more and more tense. The Indian Ocean Islands are not spared.

8.4 Main economic sectors

8.4.1 Madagascar : Main economic sectors

Since 2013 until before the Covid 19 pandemic, GDP growth in Madagascar has steadily increased and entered a stabilization phase in 2018 (World Bank). The tertiary sector has been the main growth driver since 2015, particularly services, estimated at 5.4% in 2018. Within this sector, trade has been dynamic with a 4.1% increase in 2017 that is expected to continue in 2018 to reach 4.5%.

In Madagascar, nearly 80% of the population is engaged in agricultural activities. However, this sector does not contribute significantly to economic development. Between 2014 and 2017, the agricultural sector even contracted by an average of 0.8% per year, indicating that the economic growth of recent years has not had a positive impact on the living conditions of the rural population. One reason for this is low agricultural productivity, due to insufficient use of modern technology, lack of connectivity between markets to facilitate the transport of goods, and sometimes unfavorable weather conditions. Apart from agricultural work, rural households have few alternative activities that can generate sufficient income to mitigate the impact of crop failure and weather shocks.

Nonetheless, as a cash crop producing country, Madagascar can rely on export revenues from vanilla, cloves and other spices. For example, the significant increase in vanilla prices boosted export revenues in 2017, allowing the Central Bank to accumulate more foreign exchange reserves than expected. Nevertheless, on the other hand, as the current situation shows, the price of vanilla can experience significant fluctuations at the global level, which can have significant impacts at the national level. Madagascar is also known for its mineral wealth. Two major mining companies are established in the country, respectively in the East for the exploitation of nickel-cobalt and in the South-East, for the exploitation of ilmenite.

On the other hand, fishing has also been a foreign exchange earner for years in Madagascar and the country plans to expand its EEZ (exclusive economic zone) in the context of development through the blue economy. In 2018, the fisheries sector accounted for nearly 7% of the national GDP and represented 6.6% of exports (FAO).

Finally, tourism, particularly ecotourism, is the 3rd largest foreign exchange earner, contributing to 10% of GDP (before Covid-19). Visits to protected areas (national parks) and scuba diving take precedence over beach tourism, demonstrating the particular interest of foreign tourists in nature in Madagascar.

8.4.2 Comoros: Main economic sectors

The Comorian economy is dominated by the agriculture and trade sectors. It is characterized by very limited production capacity, which accounts for 61% of the primary sector and 34% of the tertiary sector, respectively. The primary sector is focused on the production of three crops of high commercial value - vanilla, cloves and ylang-ylang - which provide the bulk of the country's export earnings (around 95%). Food production, mainly bananas, copra and tubers, as well as fishing for local consumption, remain underdeveloped. The tertiary sector alone accounts for an average of 53.79% (INSEED SCN 93, 2019 series) of GDP, followed by the primary sector (32.22% of GDP).

Agriculture provides employment for a large part of the Comorian population. Agriculture is poorly mechanized and marked by low yields, due in part to the use of rudimentary production technology. Its productivity is very low and farmers live in a situation of economic insecurity.

As for industry, it is in an embryonic state. As a result, national production is struggling to meet the demand of Comorian households, which is increasingly boosted by remittances from Comorian migrants. The Comoros is becoming increasingly dependent on imports, to the detriment of its trade balance, which has been growing steadily from one decade to the next, particularly in relation to countries such as Tanzania and the United Arab Emirates.

The Comorian economy faces several problems related to the size of demand, supply, transaction and transport costs, and the weakness of economies of scale in defining profitable production choices. The access of enterprises to productive resources is very limited, as financial institutions do not offer services that enable them to acquire the operating goods they require.

However, there are opportunities that can contribute to the sustainable development of the country. These include: (i) tourism, as the country has an extremely rich and varied tourist heritage, consisting of an important environmental wealth and a particularly attractive tropical environment which remain under-exploited; (ii) the blue economy: the country can take advantage of the potential of the oceans, seas and coasts to eliminate overfishing and other harmful fishing practices, by opting for approaches that promote growth, conservation and sustainable fishing and ending illegal fishing, but promoting the sustainable management of aquatic resources and marine biodiversity, and (iii) the use of renewable energies including geothermal, hydro, wind and solar as opportunities to provide energy in sufficient quantity and quality and at affordable cost.

8.4.3 Mauritius: Main Economic Sectors

The sustained increase in national income has been driven by the textile industry, construction and manufacturing, tourism, and financial services. Today, the services sector accounts for 67.7% of Mauritius' GDP. Further diversification of the economy is linked to the expansion of the service sectors (information and communication technology (ICT) and business process outsourcing (BPO)). Other economic sectors that are expanding are the seafood, real estate, and energy industries. Mauritius is also investing to become a health tourism destination and a regional center for higher education (MOE 2011). The economy is driven by local and foreign investment. Foreign direct investment was estimated at US$41 million in 2005; US$589 million in 2011 and up to US$245 million in 2020. Mauritius is considered an investor-friendly country and enjoys a number of competitive advantages (social, cultural, political and environmental) over other African countries. However, some economists argue that recent programs to restructure the economy may not soothe "its exposure to the vagaries of international trade, but continue a historical pattern of development that addresses struggling economic performance by refining and then replacing one small set of industries with another" (Kothari & Wilkinson 2013). However, it is clear that living standards and education have improved dramatically in recent decades (Shobee 2009).

Sugar industry :

In 2018, the sugarcane industry accounted for about 0.65% of GDP. Although representing a small percentage of GDP, the agricultural sector employs 3.5% of the population. With the end of the ACP-EU protocol that guaranteed sugar export quotas in 2000, the price of sugar fell by 36% in 4 years. Mauritius has shifted the focus of the sugarcane industry to electricity generation, as well as the production of specialty sugars for export. The area devoted to sugarcane has been reduced and covers an area of 54,182 hectares of land in 2017.

Textile and clothing

Although it contributes only 3.4% of GDP in 2019, the textile and apparel industry remains a key sector in Mauritius, generating over 22.4 billion rupees ($630 million) in export earnings.

Tourism

The tourism industry in Mauritius began in the early 1950s, but it began to grow steadily as an important economic option after independence in the early 1970s (Prayag 2011). In order to diversify the economy and reduce dependence on sugar exports, the government encouraged the establishment of hotels with tax incentives. These incentives led to an increase in tourist arrivals and the incentives provided by the government led to a rapid increase in the number of hotels and hotel capacity, a trend that has continued to the present. The statistics in this section are based on official government figures, unless otherwise noted.

The number of tourist arrivals has steadily increased over the years, from 965,000 tourist arrivals in 2012 to 1,383,488 in 2019. The Mauritian tourism industry focuses on selective, high-end, quality tourism. This choice is set on the national tourism policy, as the tourism industry is considered a pillar of the economy and seen as a key factor in the overall development of the country. The country's total gross revenue from tourism has steadily increased over the past decade. About half of this spending is on accommodation, while entertainment and shopping account for about 20%. As a result, most tourist spending is captured by large hotels, with little revenue distributed to other smaller related businesses. While tourism may bring short-term economic benefits to the poorer part of society, it is unlikely to make a sustainable longer-term contribution to poverty reduction (Sharpley & Naidoo, 2010).

8.4.4 Seychelles: Main Economic Sectors

The private sector is the largest contributor to GDP and employment: in 2018, the sector accounted for about 60 percent of GDP and about 65 percent of the formal labor force. As mentioned earlier, the two main driving sectors of the Seychelles economy are tourism and fishing. Industrial fishing is the country's largest source of foreign exchange after tourism (and the largest during the Covid-19 period, which reduced the number of visitors). Foreign direct investment inflows have increased in recent years following the construction of several high-end hotels and a residential project on Perseverance Island, but are expected to slow down.

Fishing (before Covid-19) provided about 6,000 jobs, or 17% of formal employment, and contributed 8-20% of GDP. Fisheries products account for 92% of national exports. Tuna fishing, an increasingly important activity in the economy (Shareef & McAleer, 2008), is the main fishing activity in the country and the port of Victoria is the largest port in the Indian Ocean for tuna landings. Tuna fishing in the Seychelles began in 1982 and has since largely outgrown artisanal fishing (Payet, 2006). Prior to Covid-19, tourism contributed 19% of direct employment, or over 25% of GDP, and the majority of revenue was in foreign currency. In addition, some tourist facilities play an important direct role in nature conservation programs, particularly on private islands, by co-funding programs to eradicate invasive species (particularly rats) and restore habitats, as well as to conserve or reintroduce native wildlife.

The other economic sectors are[33] : transport, storage, communication and information (16.3%), government services (12.7%), financial activities, insurance and real estate (8.7%), construction, electricity, gas, water supply and sewerage (5.6%), other wholesale and retail trade (5.6%), other manufacturing (2.5%), and agriculture, which accounts for only 1.3% of GDP (the forestry sector is almost non-existent). Downstream oil is an important economic sector*, with the* potential for oil and gas in Seychelles. Exploration has taken place over the past decade and has provided interesting prospects.

According to the Seychelles National Development Strategy 2019-2023 (NDS), the ocean economy is one of the main engines of growth and development, driven by tourism and fisheries. This plan provides a model for sustained growth through strategic positioning of the government as a facilitator. The NDS is based on six pillars: i) good governance, transparency and accountability; ii) people-centered development; iii) social cohesion; iv) innovative economy; v) economic transformation; and vi) environmental sustainability and resilience. It also takes into account international commitments such as Agenda 2030, the SDGs, the Paris Declaration on Aid Effectiveness, and Agenda 2063, and aims to help the country address several challenges: upgrading infrastructure for sustainable socio-economic development, transforming the education system to integrate science and technology, increasing productivity and innovation, removing barriers to structural economic transformation, and resilience to climate change.

33 Seychelles National Statistical Office, 2019

9 POLITICAL CONTEXT

This chapter provides an overview of the political situation in the countries and indications and analysis on the general strategies of the key development sectors that affect and/or are related to the conservation of biodiversity and the fight against climate change, taking into account national policies and legislation and international and regional conventions.

9.1 Historical context

Following several waves of settlement (initially Austronesian, then Bantu, with Arab contributions from the end of the first millennium), political power in Madagascar was organized around numerous small kingdoms. At the end of the 18^{e} century, King Andrianampoinimerina strengthened the Imerina kingdom, whose capital is the current Antananarivo, by dominating the neighboring kingdoms. His son Radama I ensured thereafter the domination of the Imerina kingdom on the quasi-totality of the island, creating in fact the first Malagasy State. He and his descendants were recognized by the European powers as the sovereigns of Madagascar. From 1896, Madagascar was colonized by France. It obtained its independence in 1960.

The Comoros, initially populated by Bantus from the African coast, saw the establishment of the first sultanates, set up by Arab-Persian Chanazians around 15^{e} century, following the arrival of the fleet of Mohammed ben Hassa. The political power is then divided into many small sultanates, in perpetual evolution following the games of alliance, wars and marriages. In the 16^{e} century, Malagasy raids were frequent, mainly to recover slaves, for whose trade the Comoros was an important hub, trading for Arabs and Europeans. A Malagasy sultanate was established in 1830 on Moheli and then on Mayotte, and some of the sultans asked for protection from the French king Louis XIII. Mayotte became a French protectorate in 1841, then Anjouan in 1866. Grande Comore, unified by a sultan with the help of the French, became a protectorate in 1886, foreshadowing the creation of the French colony of "Mayotte and Dependencies" in 1892. In 1973, a referendum on self-determination was organized, during which the Comoros voted for independence, except for Mayotte. The Republic of the Comoros was declared unilaterally in 1975. Mayotte remains *de facto* a French overseas territory, a situation not recognized by the Comorian state.

The other islands of the Indian Ocean were not populated (or at least permanently) before the arrival of European sailors (Portuguese, Dutch, British and French) in the 16^{e} century. Mauritius and the Seychelles (as well as Reunion Island) came under the British crown and the French domination according to the wars and agreements. Mauritius and the Seychelles became independent from the United Kingdom in 1968 and 1976, while Reunion Island became a French Department in its own right; this island is part of the European space as an ultraperipheral region of the European Union. The scattered islands, not inhabited, were for a time attached to the French colony of Madagascar; they are now French overseas territories, managed by the administration of the French Southern and Antarctic Lands (TAAF), a situation contested by Madagascar.

Table 49 Historical landmarks of the islands of the Indian Ocean

Country	Main historical landmarks
Madagascar	1895: French Protectorate 1960: Independence
Maurice	1598 - 1710 : Dutch occupation

	1715-1810 : French colony 1810-1968 : British colony 1968: Independence
Comoros	1866: The Sultan of Anjouan requests the French protectorate 1912 - 1946: French colony and attachment to Madagascar 1947: Administrative autonomy from Madagascar 1958- 1975 : French Overseas Territory 1975 : Independence (except Mayotte)
Seychelles	1756: French takeover 1770 : First French settlements 1814: France cedes the Seychelles to Great Britain 1903 : British colony 1976: Independence

9.2 Governance structures, level of decentralization, political conflicts and security issues

Independent since 1960, Madagascar is a semi-presidential republic with a bicameral legislative system consisting of a National Assembly composed of directly elected representatives and senators partially elected by local legislators and partially appointed by the Head of State, in a multi-party context. The territorial organization is made up of 6 provinces, 23 Regions, 119 Districts, 1579 Communes and 17,485 Fokontany (the smallest administrative territorial delimitation). Theoretically, the Regions and Communes benefit from a certain autonomy within the framework of a decentralization policy. The Fokontany (or fokonolona, referring to the population living in the Fokontany) represent the scale of the village community or of gathered neighborhoods. In 1972, 1991, 2001-2002 and 2009, Madagascar experienced socio-political crises lasting several months, each time blocking all administrative, production and cooperation machinery with foreign partners, thus penalizing economic development and impacting the very identity of the population, whose vision, sense of values and outlook were negatively influenced by the disastrous consequences of the economic blockade experienced by the country. After a long period of transition, Madagascar has experienced a certain stability since 2013. The current regime is the result of elections held in December 2018, based on the new constitution (2010) on which the current 4th Republic is based.

The Union of the Comoros gained its national independence in a difficult context. The country entered early into a cycle of political crises and conflicts marked by political and institutional instability and punctuated by a multitude of coups and attempted coups d'état. In 2001, a new constitution was adopted following the reconciliation agreement known as the Fomboni agreement signed in February 2001, establishing the Union of the Comoros. This constitution granted the islands a large measure of internal autonomy and also established the principle of a rotating presidency among the islands of the country. However, the lack of a clear definition of the competencies of the various institutions established led to new conflicts of competence over the prerogatives of the autonomous entities and the Union.

However, the Fomboni Agreement allowed the country to enter an era of relative institutional and political stability, marked in particular by three democratic changes of head of state. The country took advantage of this lull to focus on economic and social development issues and has regularly adopted national reference strategies in this area since 2001. It should be noted, however, that since 2018, following the constitutional reforms contested by the opposition, which believes that they call into question the foundations of the Fomboni Agreement, the country seems to have returned to major political conflicts of the past. A national inter-Comorian dialogue process has been underway for several months. It aims at national reconciliation and the construction of a lasting peace through a global political consensus shared by the different political actors and civil society with the aim of overcoming the multiform crises in order to build together a prosperous country.

The Republic of Mauritius is based on a democratic parliamentary system, in which the President and Vice-President are elected by the National Assembly. The Prime Minister is the head of government. The legal system is based on the British system while retaining some influences from French codes, such as the Napoleonic Code for the Civil Code, in force since 1808. Following the adoption of a Statute of Autonomy in 2002, Rodrigues has a Regional Assembly of 18 members, which appoints a Chief Commissioner to act as head of the local government. The scattered islands of Mauritius (including Agaléga and Saint Brandon) are under the responsibility of the Ministry of Local Government and Scattered Islands.

Seychelles is a Republic whose President, elected by universal suffrage for 5 years, is the head of state and government. The Parliament is composed of 34 members. A multiparty system was reinstated in 1991. The inner islands, the most densely populated, are divided into 25 districts (including 22 on Mahé, the capital island), while the outer islands are not part of any district.

9.3 Overview of public policies on conservation and climate change

9.3.1 Madagascar

9.3.1.1 Environmental policies and legislation in general, in Madagascar

. International Commitment

Madagascar is a full party to the three major Rio conventions (CBD, UNFCCC, UNCCD) and has ratified most of the international texts resulting from these conventions, relating to the protection of biological diversity, the fight against climate change and the fight against desertification and land degradation.

. National Policy and Institutional Framework

Madagascar is a pioneer in Africa, having developed its National Environmental Action Plan (PNAE) in the early 1990s, which was divided into three program phases, implemented until the mid-2000s, and which continues to inspire actions in favor of environmental protection in Madagascar, while continuing to improve. The development of this PNAE was notably motivated by the richness of Madagascar's biodiversity and the importance of its protected areas.

Madagascar's protected areas are grouped within the Madagascar Protected Area System, which in 2021 includes 124 terrestrial and marine protected areas, governed according to the IUCN categorization and covering about 12% of the national territory, as well as one protected area under temporary protection, and eight protected areas in the process of being created (Direction des Aires Protégées, des Ressources Naturelles et des Ecosystèmes- DAPRNE/MEDD, 2021).

Legally, Madagascar has a Protected Areas Management Code (COAP) updated in 2015.

In addition, in the implementation of the Convention on Biological Diversity, Madagascar has its national strategy and national action plans for biodiversity management (2015-2025) and its 6th national report on biological diversity (2019). Madagascar also has specific strategies and conservation plans for certain species such as amphibians (amphibian conservation program in 2008, strategy and conservation plans for the species *Mantella aurantiaca* for the period 2008-2015), or primates (lemur conservation strategy for the period 2013-2016).

From an institutional point of view, based on the principles and provisions of the Charter of the Environment (revised in 2015) and the International Conventions relating to the protection of the environment ratified by Madagascar, the Ministry of the Environment and Sustainable Development (MEDD) is responsible for the design, coordination, implementation and monitoring-evaluation of the State's environmental policy and sustainable development.
Two organizations attached to the MEDD are particularly important for protected areas and climate change adaptation: Madagascar National Parks (MNP), whose mission is to establish, conserve and manage in a sustainable manner the national network of Parks and Reserves, representative of Madagascar's biological diversity and natural heritage, and the National Office for the Environment (ONE), whose mission is to prevent environmental risks in public and private investments, and to fight against pollution, while also being a regulatory body, ensuring the implementation of the MECIE decree (Mise en Compatibilité des Investissements avec l'Environnement.

9.3.1.2 Policies and legislation on the fight against climate change and institutional framework in Madagascar

It is notably during the third phase of the NEAP that actions and initiatives on the fight against climate change emerged and that Madagascar began to participate in the Conferences of the Parties (CoP).

Madagascar has ratified the United Nations Framework Convention on Climate Change (UNFCCC) through Law n° 98-02029 of December 2, 1998 and its implementing Decree n° 98-16830 of December 18, 1998. From this adhesion stem the measures (texts, policies, reference documents) adopted by the country in terms of climate change:

. Devices with international scope :

- Law n° 2003-009 of September 03, 2003 authorizing the ratification of the Kyoto Protocol of the United Nations Framework Convention on Climate Change
- Decree No. 2003-009 of September 3, 2003 ratifying the said Protocol
- Law 2014-022 of December 10, 2014 authorizing the ratification of the Doha Amendment to the Kyoto Protocol
- Decree No. 2015-701 of April 20, 2015 ratifying the Doha Amendment
- Law No. 2016-019 of June 30, 2016, authorizing the ratification of the Paris Agreement of the United Nations Framework Convention on Climate Change.

. Nationwide Arrangements :

- The revised National Policy for the Fight against Climate Change (2022), declined in National Action Plan for the Fight against Climate Change
- The National Determined Contribution (2016), in the updating phase (2022)
- The National Adaptation Plan (2021), which 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)
- The Third National Communication (2020)
- Decree 2018-500 on the National REDD+ Strategy in Madagascar
- Decree No. 2017-757 on the national commitment to land degradation neutrality. In this commitment, Madagascar prioritizes among its actions the mobilization of financial incentives to promote research on sustainable land management in relation to biodiversity and climate change,
- The consideration of climate change as part of the risks related to the environment in Law No. 2015-003 of February 20, 2015, on the updated Malagasy Environment Charter
- The integration of risk and disaster management in climate change adaptation, in Law No. 2015-031 of February 22, 2016 on the National Risk and Disaster Management Policy (PNGRC),
- Recognition of climate change issues on development sustainability in Decree No. 2015-1308 of September 22, 2015 setting the National Policy of the Environment for Sustainable Development (PNEDD)
- The National Appropriate Mitigation Actions List ("NAMA List"), established in 2010.

At the institutional level, under the supervision of the General Secretariat of the Ministry of the Environment and Sustainable Development, the National Office for the Fight against Climate Change and REDD (BNCCREDD) is in charge of the local coordination of strategic initiatives and policies for the fight against climate change. The BNCCREDD is the Designated National Authority (DNA) of the FVC. It is responsible for coordinating all initiatives and actions related to climate change and REDD+. Its actions aim to promote a climate change resilient economy, reduce emissions from deforestation and forest degradation, as well as other greenhouse gases that cause climate change, in order to achieve sustainable low-carbon development.

Due to the cross-cutting nature of climate change, the National Committee on Climate Change (CNCC) was created in November 2014, according to Decree No. 2014-158828. The CNCC was created, in order to strengthen the coordination of the implementation of the PNLCC. It is a multisectoral structure for consultation, information sharing and exchanges in this area. The National Committee on Climate Change is chaired by the Secretary General of the Ministry of the Environment and Sustainable Development, and the BN-CCREDD+ provides the permanent secretariat. Within the framework of the implementation of the NAP, the CNCC plays a major role in the technical aspects of the elaboration of the document and in the validation process by the Secretariat of the United Nations Framework Convention on Climate Change. Last but not least, the Comité Interministériel de l'Environnement (CIME), placed under the authority of the Prime Minister, is the body that guarantees the integration of environmental actions in the different sectoral policies for a sustainable development. Within this framework, the CIME assists the Head of Government in the choice of the main orientations of the environmental policy, as well as in the choice of operational strategies for the implementation of this policy. Given that the coordination of the fight against climate change is under the responsibility of the ministry in charge of the environment, the CIME, which is a high-level body, can therefore be mobilized to effectively ensure the integration of adaptation to climate change into the major political and strategic orientations for sustainable development.

CIME also aims to support all ministries and Decentralized Territorial Collectivities (DTCs) in their initiatives to integrate the environmental dimension and climate change into their development efforts, and to ensure interministerial and cross-cutting coordination around these issues.

9.3.1.3 Involvement of local communities in the sustainable use of natural resources , Management Transfers

Public participation in environmental management is defined in the Malagasy Constitution. Already, in the first version of the Charter of the Environment adopted in 1990, specifies the forms of public involvement in the management of the environment. It is manifested in two variants: (i) the transfer of competences such as the transfer of natural resources management, the management of protected areas and (ii) the contribution to decision making through environmental management instruments such as the environmental impact assessment.

The first legal instrument instituting local management of renewable resources is Law 025-1996, known as the GELOSE Law (Gestion Locale Sécurisée) concerning forest, continental and marine fisheries resources (Bertrand *et al.* , 2009), which institutes the principle of Transfer of Management of Renewable Natural Resources (TGRN). This law resulted in Decree No. 2000-27 of January 13, 2000 on local communities in charge of the local management of renewable natural resources and Decree 2001-122 on Contractualized Forest Management (CFM). In addition, the national reforestation strategy (MEF, 2004) provides for the involvement of actors other than the State in its implementation: Reforestation can be initiated by grassroots communities, peasant association, families/individuals, local associations and NGOs as well as communes in order to increase forest cover, protect watersheds related to agricultural perimeters or for energy needs. The transfer of management of pastoral resources is governed by Decree 2005-001.

For marine resources, only pelagic fish, octopus and crabs are transferable resources, not shrimp and lobsters (considered strategic resources). Local communities with the private sector and NGOs are more generally involved in the establishment and management of marine resources through Locally Managed Marine Protected Areas (Le Manach *et al.* , 2013), while the Policy for the Sustainable Development of Coastal and Marine Areas (Decree No. 2010 -137) promotes the sustainable development of coastal and marine areas through the implementation of integrated management.

9.3.1.4 Promotion of the green and blue economy in Madagascar

In its plan of emergence established in 2019, the Government of Madagascar now gives an important place to the development of the green economy and the blue economy. This initiative demonstrates the will to make biodiversity a real pillar of sustainable development, by putting in tune the conservation and economic development of biodiversity. Since 2021, a full ministry is dedicated to fisheries and the blue economy, whose responsibilities are complementary to those of the ministry in charge of the environment and sustainable development.

9.3.2 Comoros

Since 1994, the Union of the Comoros has had a National Environmental Policy, an Environmental Action Plan and strategies to implement this policy. These policies and strategies also include the Agricultural Strategy, which aims, among other things, to improve the agri-food balance in order to ensure food security, and the National Tourism Strategy. A revision of the National Environment Policy to bring it in line with the Emerging Comoros Plan 2030 and the commitments of the post-2015 conventions, namely the SDGs, the Sendai framework and the Paris Climate Agreement, is currently being considered.

The national environmental policy focuses on the protection, conservation and restoration of natural heritage. It is oriented preferentially on ecosystems and sensitive habitats sheltering threatened and endemic species of national, sub-regional and/or global importance. It also concerns the protection and restoration of ecosystems, particularly in the terrestrial domain for relict forests and in the marine domain for coral reefs and mangroves. To help preserve the fauna and flora, actions are planned to help set up protected areas, national parks and botanical gardens.

9.3.2.1 Institutional framework: State institutions and bodies

The strategy for the implementation of the national environmental policy in Comoros is based on the establishment of a genuine partnership between the state, NGOs, the private sector and local authorities and on the strengthening of institutions.

The Comorian institutional framework for the environment includes state institutions and bodies. It is supported by the Ministry of Environment and Forests through the National Directorate of Environment and Forests (DNEF), the National Institute of Applied Research in Fisheries and Environment (INRAPE). Numerous ministries are also involved in natural resource management and climate change issues, including the Ministries of Public Finance, Budget, Economy and Planning, Transport and Tourism, as well as the Ministries of Land Management, Urban Planning, Housing, Public Health and Population, National Education, and Justice.

The Governors and Delegations of the autonomous islands resulting from the new constitution of the Comoros are in charge of the implementation of the actions and the application of the regulations protecting the natural environment and of its control, as well as the Mayors and the municipalities, at their respective levels.

9.3.2.2 Legislative framework: Constitution and legal texts

The development of a national environmental policy has given concrete expression to the Comorian government’s commitment to address the problems of environmental degradation. In particular, it has reinforced the government’s objectives of integrating the environmental dimension into the social and economic policy and development of Comoros.

The framework law on the environment was adopted on 6 October 1994 by the Federal Assembly and promulgated by the President of the Republic (decree no.[0] 94/100/PR). This framework law lays down the general principles that should inspire and guide the regulation of activities that may affect the environment. It also provides for a procedure for assessing the impact of activities likely to affect the environment. Under this law, the protection regime is stricter for endemic, rare or endangered animal and plant species and for animal and plant species whose maintenance is important for the natural balance or whose existence could be compromised by uncontrolled exploitation. The framework law devotes a great deal of space to the creation of parks and nature reserves on the national territory.

Finally, the framework law also provides that the state determines the policy for the management of forests, whether public or private, and had to determine the general regime for the protection and exploitation of forests. Particular emphasis is placed on the promulgation of laws on the modalities of forest and land management.

The Comoros also subscribes to the many major international and regional texts.

A review process is underway to revise the framework law.

9.3.3 Mauritius

9.3.3.1 Institutional context

One of the main problems in the Republic of Mauritius is the dispersed roles and responsibilities of the different agencies dealing with environmental issues and biodiversity conservation (NBSAP 2006, MOE 2011, NBSAP 2017). Environmental and biodiversity conservation legislation is also broken down into different pieces of legislation. Few officers are able to have a comprehensive view of the legislation and how to better enforce the regulations. Another aspect related to environmental governance concerns public awareness campaigns, which are also conducted by different ministries and departments, often with duplication. Land and marine NGOs have also developed education programs.

The Forests and Reserves Act (1983), updated in 2003, contains conservation provisions while the Environmental Protection Act (1991) provides the general framework for environmental protection in Mauritius. The Native Terrestrial Biodiversity and National Parks Act (NTBNPA) (2015) replaced the Wildlife and National Parks Act (1993) with the aim of strengthening conservation practices and management of native terrestrial biodiversity and to comply with international conventions acceded to by the country.

The ministry responsible for climate change is the Ministry of Environment, Solid Waste Management and Climate Change. This ministry is directly involved in environmental protection through the administration of environmental impact assessments (EIA), pollution reduction activities, public awareness and environmental education, and the rehabilitation and preservation of natural heritage sites.

The Ministry of Agro-Industry and Food Security (MAIFS) is involved in terrestrial biodiversity. MAIFS is the national focal point for the CBD.

As for the Ministry of Blue Economy, Marine Resources, Fisheries and Navigation, its mission is to "strengthen governance and exploit marine resources in the exclusive economic zone.

Although the Ministry of Fisheries is the main regulator of marine life, as is the case for terrestrial biodiversity, there are other ministries, authorities and organizations also involved in coastal and marine issues (MOE 2011), such as the Ministry of Tourism; or the Ministry of Local Government and Disaster Risk Management. Legislation has been passed in the National Assembly in 2022, including the Beach Authority (Amendment) Act 2022 and the National Environment Cleaning Authority Act 2022, which will be important from an environmental perspective.

The island of Rodrigues in particular is governed by the Rodrigues Regional Assembly (RRA), established under the Rodrigues Regional Assembly Act (2001). An Executive Council is responsible for carrying out the functions of the Regional Assembly and comprises the Chief Commissioner, the Deputy Chief Commissioner and up to five other members. Each is assigned responsibility for different departments. Unlike in Mauritius, the responsibilities for biodiversity conservation are mainly under the same commissioner for agriculture, environment, fisheries, food production, marine parks, plant and animal quarantine. With the exception of environmental impact assessments (EIAs), all decisions related to these divisions can be made independently of Mauritius.

Regarding formal terrestrial and marine protected areas, these are managed by different stakeholders. The formal PAs in Mauritius and Rodrigues are all on state land, with their boundaries demarcated and officially proclaimed in the Government Gazette and Acts, while informal private reserves also exist on both islands. Nevertheless, most PAs in Mauritius and Rodrigues are owned by the government. On the other hand, Agalega and Saint Brandon do not have PAs, although there was a proposal to create a marine protected area in the past (1998).

9.3.3.2 International commitments

Mauritius is a signatory to most of the international treaties related to conservation and climate change:

- United Nations (UN) Convention on the Law of the Sea (UNCLOS, 1982)
- CBD (Convention on Biological Diversity, Rio de Janeiro, 1992). The Republic of Mauritius was the first to sign and ratify it in September 1992
- CITES (Convention on International Trade in Endangered Species, 1973)
- UNFCC (1992) and Kyoto Protocol (1997)
- CPB (Cartagena Protocol on Biosafety to the Convention on Biological Diversity, 2000)
- UNFF (United Nations Forum on Forests)
- UNCCD (UN Convention to Combat Desertification in those Countries Experiencing Serious Drought and/or Desertification particularly in Africa (UNCCD), Paris 1994)
- African Convention on Conservation of Nature and Natural Resources, Algiers, 1968
- Convention in Fishing and Conservation of Living Resources of the High Seas (1958)
- Convention on the Wetlands of International Importance Especially as Waterfowl Habitat, Ramsar, Iran 1971
- Convention for the Protection of the World Cultural and Natural Heritage (1972)
- Vienna Convention for the Protection of the Ozone Layer, 1985
- Montreal Protocol on Substances that Deplete the Ozone Layer 1987 and the amendments.
- Bonn Guidelines on Access to Genetic Resources and Fair and Equitable Sharing of the Benefits Arising out of their Utilisation, 2002
- United Nations Framework Convention on Climate Change (UNFCCC), Rio de Janeiro, 1992
- Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade (PIC), Rotterdam, 1998
- Convention on Persistent Organic Pollutants (POPS), Stockholm, 2001
- Convention on Migratory Species, 1994
- Convention on the Conservation of Migratory Species of Wild Animals (CMS) or the Bonn Convention, 1983
- International Convention for the Regulation of Whaling, 1946
- African Eurasian Water Bird Agreement, 1999.

9.3.4 Seychelles

The Ministry of Agriculture, Climate Change and Environment (MACCE) has the role of environmental management and protection. Through various mechanisms and tools, it is responsible for taking measures to promote the protection, preservation and improvement of the environment, combat pollution and improve waste management, increase environmental education and awareness, and strengthen resilience to climate change. In addition, it promotes positive environmental behavior among the general population through national education and public awareness campaigns.

9.3.4.1 Institutional framework

There are several parastatal agencies concerned with biodiversity management and climate change adaptation issues:

- Seychelles Parks and Gardens Authority: management of most of the protected areas and the two botanical gardens, resulting from the merger of the Seychelles National Parks Authority (SNPA) and the National Botanical Gardens Foundations (NBGF), formerly manager of the Mont Fleuri Botanical Gardens and the Barbarons Biodiversity Pole (programs for the propagation of native & endemic plants and the recovery of endangered plants).

- Landscape and Waste Management Agency (LWMA), formerly responsible for the cleanup and beautification of Seychelles

- National Meteorological Services (NMS)

- Public Utilities Corporation (PUC): provision of electricity, water and sanitation services

- Seychelles Islands Foundation (SIF): two UNESCO World Heritage Sites in Seychelles and Fond Ferdinand Park on Praslin Island.

- Seychelles Fisheries Authority (SFA): fisheries management and research in the field of fisheries and aquaculture.

- Islands Development Company (IDC): management of the outer islands and Silhouette Island.

NGOs also play an important role in environmental governance in Seychelles, especially since some of them own, manage or co-manage nature reserves or islands with high biodiversity value, and/or are very active at the national level by conducting conservation programs, educational programs targeting school children, general public and as partners of many government institutions.

The main legislations under which nature conservation and protected areas are regulated in Seychelles are

- The National Parks and Nature Conservation Act (1969): repealed in 2022 and replaced by the Reserves and Nature Conservation Act. It establishes a national advisory committee, provides for a large number of clarifications regarding access and restrictions to different protected areas, the designation of authorized officers and their powers, and introduces six new categories of protection, in line with the protected areas policy
- The Protected Areas Act (1967)
- The Environmental Protection Act (1994): repealed in 2016 (and a new one was passed). It designates a department in charge of the environment that will be responsible for issuing norms to ensure the protection of biodiversity, whether terrestrial, freshwater or marine. Some regulations (Environmental Protection (Impact Assessment) Regulations) provide for a mandatory environmental impact assessment for any activity or project that has a significant impact on biodiversity
- The Environmental Impact Assessment (EIA) Act (1996)
- The Wild Animals and Birds Protection Act (and associated regulations) (1966), updated in 2021, will enable the Seychelles authorities to better protect its wildlife, particularly marine species
- The Forest Reserves Act (1955): The power to create forest reserves is vested in a ministry and determines the laws to be applied within these reserves. Trees may not be cut down without prior authorization from the head of the forestry section

- The Fisheries Act (1987): repealed in 2014 (and a new one adopted) incorporates the idea of sustainable development and management of fisheries in Seychelles' waters, includes measures related to aquaculture as well as measures to protect fisheries resources. This law takes into account the application of the conventions to which Seychelles is a signatory, and also integrates the fact that the State is a member of the Indian Ocean Tuna Commission
- The Land Use Planning Act (1972): consolidated in 2012, stipulates and controls land use planning. The law provides for the production of a land use plan based on knowledge of the land.

The only official national policy specific to protected areas is the Seychelles Conservation Policy (1971) derived from the Seychelles Tourism Policy (1969) and the National Parks and Nature Conservation Ordinance (1969). The different types of protected areas under this revised policy were redefined and harmonized with the IUCN protected area categories in 2014.

9.3.4.2 National and International Commitment and Framing for Climate Change

National level:

- The Seychelles National Climate Change Strategy (NCCS) 2009 (updated version in progress)
- The Seychelles Sustainable Development Strategy (SSDS) 2012-2020
- Seychelles Energy Policy 2010-2030
- The Coastal Management Plan (CMP) 2019-2024
- The 2018-2022 Wetlands Policy and Action Plan
- The 2017 Water Policy
- The National Biodiversity Strategy and Action Plan (NBSAP) for 2015-2020
- The Blue Economy Strategic Framework and Roadmap for 2018-2030
- Nationally Determined Contributions [NDC] (2021 most recent
- Vision 2033 and the National Development Strategy [NDS] of 2019-2023

International level:

- The United Nations Framework Convention on Climate Change (UNFCCC), 1992
- The Kyoto Protocol (KP), 1995
- The Paris Agreement (PA), 2015
- The Montreal Protocol on Substances that Deplete the Ozone Layer (a protocol to the Vienna Convention for the Protection of the Ozone Layer adopted in 1985)
- The 2030 Agenda for Sustainable Development, 2015.

Furthermore, the integration of biodiversity considerations into these policies is also an important point to analyze. The need to conserve critical species and ecosystems is indicated in policies, especially the most recent ones, and particularly if these ecosystems are critical to climate resilience, such as coral reefs or coastal vegetation (Seychelles National Climate Change Policy 2020, The Coastal Management Plan of 2019 -2024).

Nevertheless, according to the Seychelles Climate Change Policy Report 2020, there is still work to be done to develop more actions and policies related to climate change mitigation and adaptation. Furthermore, these various national reports highlight some potential needs for climate change adaptation and mitigation measures in the future (Seychelles National Climate Change Policy 2020):

- integration of climate change considerations in society, including in the private sector and at all levels of government;

- Improved (long-term) research and monitoring of climate change stressors and their impacts in the Seychelles (granite and coral islands);

- Capacity building and understanding of the issue, as well as engagement at all levels of society (government, youth, civil society, private sector) to be able to respond to and implement adaptation and mitigation measures;

- the transition to an ambitious and sustainable low-carbon economy;

- the ambitious transition to a climate change resilient society.

9.3.4.2.3 International framework for biodiversity conservation

Like Madagascar and Mauritius, the Republic of Seychelles is a signatory to several major global treaties in terms of biodiversity conservation:

- United Nations Convention on the Law of the Sea (UNCLOS), 1982 *The Convention defines the different types of maritime zones (territorial sea, EEZ, continental shelf, high seas etc) and associated rights*
- Convention on Biological Diversity (CBD), Rio de Janeiro, 1992, ratified in 1992 : *CBD has as its objectives the conservation of biodiversity, the sustainable use of resources, and the fair and equitable sharing of the benefits derived from genetic resources.* Aichi Targets
- CITES (Convention on International Trade in Endangered Species); *CITES regulates the transport and international trade of endangered species of wild fauna and flora*
- United Nations Framework Convention on Climate Change UNFCCC (1992) : *UNFCCC seeks to limit the impact of human activities on climate change*
- Kyoto Protocol (1997), ratified in 2002: *Binding and quantified targets for limiting and reducing greenhouse gases*
- Cartagena Protocol on Biosafety (CPB) to the Convention on Biological Diversity (2000), ratified in 2004; *Aims to provide legally enforceable means to prevent actual or potential "biotechnological risks" induced by biotechnology or its products*
- United Nations Forum on Forests (UNFF); *working towards a global consensus on the management, conservation and sustainable development of all types of forests*
- UN Convention to Combat Desertification in those Countries Experiencing Serious Drought and/or Desertification particularly in Africa (UNCCD)
- United Nations Convention to Combat Desertification to combat land degradation and desertification UNCCD Paris 1994), ratified in 1997: *The UNCCD combats land degradation and desertification*
- World Heritage Convention (WHC) of UNESCO: UNESCO *defines natural areas of outstanding universal value in order to ensure that these areas are strongly protected.*
- Convention on Migratory Species (CMS) (Bonn Convention): *CMS ensures the conservation of terrestrial, aquatic and aerial migratory species throughout their range*
- The International Coral Reef Initiative (ICRI) : *ICRI works to preserve coral reefs and related ecosystems round the world*
- RAMSAR convention (Convention on the Wetlands of International Importance Especially as Waterfowl Habitat, Ramsar, Iran 1971), (Seychelles has three Ramsar sites).

9.4 International conventions and regional agreements

9.4.1 International and regional environmental conventions in force in the Hotspot

The table below lists the main international and regional conventions on the environment in which the Hotspot countries participate. The rate of ratification of international conventions is particularly high. However, active participation is sometimes limited by the human resources allocated by the administrations, especially for the Small Island States. Effective implementation may also be limited by the financial means available to the administrations, particularly for Madagascar and the Comoros.

Table 50 Participation of Hotspot countries in the main international and regional conventions related to biodiversity

	Madagascar	Maurice	Seychelles	Comoros
Convention on Biological Diversity (CBD)	X	X	X	X
International Convention on Trade in Endangered Species (CITES)	X	X	X	X
United Nations Framework Convention on Climate Change (UNFCCC)	X	X	X	X
United Nations Convention to Combat Desertification	X	X	X	X
Convention on Conservation Migratory Species	X	X	X	
Convention on Wetlands of International Importance, RAMSAR	X	X	X	X
UNESCO Convention concerning the Protection of the World Cultural and Natural Heritage	X	X	X	X
Cartagena Protocol on Biosafety	X	X	X	X
International Treaty on Plant Genetic Resources for Food and Agriculture	X	X	X	
International Whaling Commission				
United Nations Convention on the Law of the Sea (UNCLOS)	X	X	X	X
United Nations Forum on Forests (active members)	X			X
United Nations Programme of Action on the Sustainable Development of Small Island Developing States (Barbados Programme of Action)		X	X	X
International Coral Reef Initiative	X		X	
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

	Madagascar	Maurice	Seychelles	Comoros
International Convention on the Conservation of European Wildlife and Natural Habitats				
African Convention on the Conservation of Nature and Natural Resources, known as the Algiers Convention	X	X		
African Conference of Ministers of the Environment	X	X	X	X
Libreville Declaration on Health and Environment	X			
Memorandum of Understanding on the Conservation and Management of Marine Turtles and their Habitats in the Indian Ocean and South East Asia	X	X	X	X

Sources: Convention websites and country NBSAPs

9.4.2 Regional cooperation organizations

Because of their colonial history, subsequent waves of settlement, and more recent political history, the various Hotspot states are members of various regional and international cooperation organizations, which influence their economic and environmental choices.

Table 51 Regional or international cooperation organizations to which the Hotspot States belong

	Seychelles	Maurice	Comoros	Madagascar
Indian Ocean Rim Association	2011	1995	2012	1996
Common Market for Eastern and Southern Africa (COMESA)	2001	1981	1981	1981
Southern African Development Community (SADC)	1997	1995		2005(2)
Indian Ocean Commission	1984	1984	1986	1984
Commonwealth of Nations	1976	1968		
International Organization of the Francophonie	1976	1970	1977	1970 (2)

Sources: organizations' websites, accessed in 2013. CEPF compilation.

Notes: (1) Observer state (2) Madagascar is suspended from these organizations during the current transition period

The Indian Ocean Rim Association brings together states around the Indian Ocean, from Australia, Indonesia and India to coastal African states. Its areas of intervention are organized around six main themes: maritime safety, fisheries management, trade and investment, tourism, scientific cooperation and disaster management.

The Common Market *for* Eastern and Southern Africa (COMESA) is an international organization with a regional focus in East Africa that aims to create a customs union among its 20 member countries. The Southern African Development *Community* (SADC) has a program on natural resource management, including fisheries, forestry, wildlife management and transboundary protected areas.

The Indian Ocean Commission (IOC), an intergovernmental organization created in 1982, brings together all the Hotspot States. Its main mission is to strengthen the bonds of friendship and solidarity between the Indo-Oceanic populations, and to build regional projects for sustainable development, aimed at protecting them, improving their living conditions and preserving the natural resources on which they heavily depend (IOC, 2013).

9.5 Other policies and regulations related to conservation funding

This section also considers taxes, protected area revenue streams, resource licenses, payments for ecosystem services, carbon credits and environmental trust funds.

In Madagascar, given the weakness of public resources, the conservation and management of protected areas, as well as actions to combat climate change, cannot be financed mainly by the State. Moreover, the State does not have a mechanism for mobilizing specific fiscal resources for the financing of the environment and the fight against climate change (unlike some sectors that benefit from tax/royalty projects: gaming, fuel, roads, beverages, tobacco, mining or oil activities, etc.).

Nevertheless, some funding sources are developed, including:

- Revenues from protected areas: according to the Code of Protected Areas (2015), the manager of a Protected Area is authorized to collect fees, including entry fees (via ecotourism), research rights, intellectual property rights, filming rights whose collection, use and distribution modalities are set by regulation ;

- Innovative financing mechanisms such as REDD+:

  . As an example and as a pioneering project, in February 2021, the payment agreement for the "Atiala Atsinanana" (Eastern Forests) emission reduction program is signed between the Government of Madagascar and the World Bank's Forest Carbon Partnership Facility (FCPF), for an amount of $50 million over a period of 5 years.

  . On the other hand, according to the country's REDD+ strategy, decentralized authorities, private operators, NGOs, local grassroots communities, any civil society organization or other stakeholders can develop projects that can contribute to Madagascar's emission reduction objective and become carbon beneficiaries.

- Payment for Ecosystem or Environmental Services (PES). In Madagascar, PES schemes began between 2000 and 2010 (Bidaud *et al.* , 2013). Here are some examples that can be cited, for a concept that would benefit from being better developed and whose first initiatives should be scaled up:

. Rural hydro-electrification (NGO GRET/ European Union, 2013-2016) by the Andasy watershed in the rural commune of Tolongoina : The PES consisted of accompanying land user households upstream in adopting and respecting certain practices (no tilling on steep slopes or near streams, anti-erosion farming methods, stopping fires and new clearings) and in return for their efforts, these land users, considered as environmental service providers, were to receive compensation in the form of support in agroforestry, anti-erosion techniques and micro-projects on their own initiative (small-scale livestock farming, plant material...).

. Implementation of a “Water” PES initiated at the end of 2009 in Andapa (North-East) by the World Mountain Farmers Association (WMPA) in collaboration with the World Wild Fund (WWF), aiming to reduce land clearing in a 42 ha area located upstream of the Sahamazava watershed, where the main springs feeding the watercourses are located and which, downstream, are used by the drinking water supply network of the urban commune of Andapa. This contract was signed for a renewable period of four years and established the principle of direct compensation to households providing environmental services, to be distributed according to the area of annual crops abandoned.

. Private beverage company (Star Brewery) and collaboration with local communities: preservation of water resources through the protection of watersheds. In exchange, the populations benefit from agricultural infrastructure (development of water supply canals, rehabilitation of dams) and social infrastructure (health center and schools).

Other prospects are under study or in the development phase, in other areas such as fisheries and energy.

- Private-Partnership, like what exists between the managers of some protected areas of mining companies such as Rio Tinto/Qit Madagascar Minerals - QMM and the Ambatovy Mining Company (Offset). The companies’ activities do not encroach on the protected areas, but as part of its participation in sustainable development, they contribute to conservation and development activities.

- Trust fund through the Foundation for Protected Areas and Biodiversity of Madagascar (FAPBM) which is a funding agency recognized as being of public utility, created in 2005 at the initiative of the Malagasy State, Conservation International (CI) and World Wildlife Fund (WWF). According to its statutes, the FAPBM is a mechanism for the sustainability of funding for protected areas of the system of protected areas of Madagascar (SAPM) through the management of different types of funds.

9.6 Review of Opportunities for Integration of EbA into Public Policy

Since its ratification of the UNFCCC, Madagascar has developed different strategies that have evolved according to international advances and national situations (political, socio-economic). With a certain continuity, the strategic documents that have succeeded one another have built on the achievements of the previous ones, while integrating the necessary updates in relation to international and national circumstances, in particular the orientations of the public development policy. Today, national adaptation planning is linked to the strategic vision of the government through the Ministry of Environment and Sustainable Development, which refers to Commitment (or “Velirano”) 10, on the “Sustainable Management of Natural Resources” of the national project Initiative Emergence Madagascar (IEM 2019, from which the Plan Emergence derives). This vision is itself articulated on six strategic axes, including actions related to climate change and energy transition.

In addition, for Madagascar, on the one hand, the fundamental references (Constitution, Plan Emergence, General Policy of the Government - PGE) which recognize the capital importance of the country's biodiversity and its place in sustainable development, and its link with the problems of climate change, and on the other hand, the general context of the country (geography, environment, socio-economic situation), demonstrate that adaptation to climate change is not an option but an imperative. The biodiversity of the country offers - and this, for any sector of activity - a natural capital to exploit in a reasoned way. Therefore, it turns out that AE is an opportunity, not a constraint for a vision of sustainable development.

Madagascar has a national policy to fight climate change that has just been updated, as well as its National Adaptation Plan (2021). The basic tools are therefore available for each sector to develop its own adaptation policies and strategies, taking into account the context mentioned above.

10 CIVIL SOCIETY CONTEXT

The purpose of this chapter is to provide an overview of the status of civil society and its capacity throughout the Hotspot. The focus is on associative structures, but information is also provided on research organizations and the private sector, which are considered by CEPF as part of civil society. Because of the difference in size-and information-between Madagascar and other countries and territories, the first section focuses specifically on Madagascar. The second section sheds light on the situation on the other islands of the Hotspot, which deals very briefly with the French departments in which CEPF does not have a funding mandate. A third section examines regional collaboration within the Hotspot. The last section proposes a synthesis and regional conclusions.

10.1 Civil Society and Conservation in Madagascar

The National Platform of Civil Society Organizations in Madagascar (PFNOSCM) has 3,000 associations throughout the country, many of which are partially or totally involved in environmental issues.

According to the audit initiated in 2011 by CIVICUS, the main weaknesses of the legal framework are the obsolescence and inadequacy of texts governing civil society organizations. The audit also noted the low level of knowledge or even ignorance, on the part of CSOs themselves, of the regulatory texts and fundamental values of civil society. As a result, there is frequently (i) a lack of respect for the non-political nature of associations, and (ii) a lack of respect for obligations related to legal forms, with associations acting as cooperatives or economic interest groups, for example (CIVICUS *et al.* 2011b).

According to surveys conducted in 2011, it appears that civil society enjoys a good reputation in Madagascar: 84.4% of the population trust them. In terms of self-assessment of their impact, only 28.7% of CSOs find that civil society in general has had a tangible impact on local/national policies in the country, while 39.7% of CSOs have advocated for the adoption of a policy (CIVICUS *et al.* , 2011c).

Although to date it is difficult to put an exact figure on the number of national NGOs working in the environment in Madagascar, it is known that they are quite numerous at the level of the 23 regions and at the central level. Being relay structures between the state and the population, they constitute important stakeholders and should have a crucial role to play in this sense.

Despite the confidence of the population, almost half of CSOs find the social impact of CSO interventions in general to be mixed (53.8%). The areas where these impacts are perceived to be notable are social development, education and health. The audit also highlighted the weakness of collaboration between the state, CSOs, and other actors, as well as the weakness of citizen mobilization and civic engagement at the country level (CIVICUS *et al.* 2011c).

The majority of national civil society organizations (associations and NGOs at all levels - local, regional, and national) face a funding challenge. CSOs rely heavily on international funding partners to carry out their missions (CIVICUS *et al.* 2011d) and this is still the case today. The financial situation of many organizations was worsened by the political situation between 2009 and 2013, and the suspension of several cooperation programs.

International NGOs working on the protection of biodiversity and the fight against climate change

International NGOs in Madagascar operate at different levels through the presence of national, regional and local branches and the development of partnerships with national civil society organizations or other small international NGOs/associations.

Table 52 Main international organizations active in conservation and contributing to the fight against climate change in Madagascar

Conservation International	CI	Collection and analysis of data on biodiversity and environmental services. Support for the creation and management of Protected Areas. Training of conservation experts. Capacity building of partner organizations (associations and local communities to national and international organizations). Support for the definition and implementation of the country's environmental policy
Blue Ventures	BV	Focus on marine biodiversity. Scientific and monitoring expeditions with the support of international volunteers. Support to local projects of fisheries resources management, marine protected areas with local management.
BirdLife International	BL	No in-country presence, but support to national partner organization Asity. Identification of Important Bird Areas (IBAs).
Durrell Wildlife Conservation Trust	Durrell	Support for community management of sites, strengthening of local organizations. Focus on critically endangered species (birds, turtles)
International Union for Conservation of Nature	IUCN	No presence in the country (regional office in Nairobi). Support to the definition of prioritization tools (Red Lists, KBA). Participation and information on regional issues (invasive species, payment for environmental services)
Missouri Botanical Garden	MBG	Focus on plant conservation. Identification of Important Plant Areas. Collection, analysis and dissemination of botanical data. Support to site management and capacity building.
National Museum of Natural History	MNHN	Scientific expeditions (Atimo Vatae, 2010, radeau des cimes, 2001), collection and analysis of data on biodiversity (fauna and flora, marine environments). Training in partnership with the Universities of Antananarivo, Toliara, Mahajanga. Site management: Antrema bio-cultural pilot project.
The Peregrine Fund	TPF	Focus on raptors. Support to community conservation, species safeguard programs. Training and research.
Royal Botanical Garden - Kew	RBG	Support to the implementation of the Durban Vision and the Global Strategy for Plant Conservation. The work covers: taxonomic and systematic research in botany, conservation of species and habitats with a focus on plant species.
Wildlife Conservation Society	WCS	Support for the conservation of the unique flora and fauna of Madagascar. Training of protected area managers, education of local communities on the protection of forests and marine ecosystems.

World Wildlife Fund	WWF	Preservation of biodiversity on priority landscapes and seascapes by supporting Madagascar's protected area system and rational management of natural resources,

These organizations also intervene in the areas of professionalization of conservation professions (individuals or national structures) and capacity building with different training and capacity building initiatives (WIO-COMPAS supported by WCS and WWF, Conservation Educators and Professionals Network Program (CEN), supported by *the American Museum of Natural History* Durrell, CI and WCS.

In general, the major international NGOs work and collaborate with national and local organizations and communities. These organizations are managers and/or partners in conservation or sustainable natural resource management programs and projects, and they are all involved in protected area projects.

NGOs and national associations

The NGOs/national associations fulfill crucial functions in the sector. They are involved in the creation and management of protected areas, inventories, monitoring and ecological assessments, research, alternative activities to deforestation, awareness raising and training, natural resource development, capacity building, transfer of natural resource management, as well as social mobilization and structuring. These national organizations usually act as implementing agencies for the various projects of technical and financial partners (government, international NGOs, bilateral or multilateral donors or foundations). The proximity of the national NGOs to the local population has allowed the weaving of links between these two actors and a better knowledge of environmental and social problems leading to innovative approaches or projects.

Table 53 Main Malagasy national associations and NGOs working in the environmental field

SIGLE	SIGNIFICANCE	DESCRIPTION
ACCE	Arongampanihy Communication Culture Environment	Conservation of Madagascar's fruit bats and other wild endemic species through research, education and communication
AED Action	Association of Students in Didactics in Action	Multidisciplinary but focused on the environment and sustainable development through research, IEC (Information Education Communication)
IAMF	Association of Forest Engineers of Madagascar	Sustainability, protection and enhancement of the forest heritage and its attributes
AIM	Intercooperation Association of Madagascar	Development association whose priority is to give the rural population control over their economic and social development in order to amplify their role as partners in the development of the country
AJE	Association of Environmental Journalists	Intensification of communication, lobbying and sensitization of the population of Madagascar on actions related to the environment

SIGLE	SIGNIFICANCE	DESCRIPTION
ANAE	National Association for Environmental Action	Promotion of natural resource management by the population as well as land use and development techniques
Ankoay	Association for the protection of nature	Improving the standard of living of members, to contribute to rural development and promote environmental protection
WMPA	Association of Mountain People of the World or Tambohitravo Malagasy	Improving the living conditions of mountain populations by recognizing their rights in the local governance of their territories, promoting equitable access to social goods and demanding respect and development of the identities, cultures and specificities of the mountain
APPA	Association of Fishermen and Fry Producers of Andapa	Protection of the environment, especially the continental waters and enrichment of endemic fish
ARSIE	Environmental Information System Network Association	A platform for the production of metadata, establishment of the information sharing policy and capacity building on database management
ASITY (member of Birdlife International)	Association	Promotion of action for the better knowledge of the biodiversity of Madagascar, its conservation, in its natural ecosystem and its scientific, social, economic, cultural and ecological valorization within the Malagasy and international society
AVG	Voahary Gasy Association	Platform for advocacy, information sharing, capacity building and social innovation, and for good governance of natural resources
BCM	Biodiversity Conservation Madagascar	Biodiversity conservation in specific sites in Madagascar
CEL	Libanona Ecological Center	Specific training center on environment and biodiversity conservation
CETAMADA		Association for the protection of marine mammals in the Indian Ocean, studies and promotion of ecotourism
DELC	Development and Environmental Law Center or Mizana Maitso	Establishment of a viable legal framework for the balance between the conservation of natural resources and sustainable economic and human development for development actors as well as populations, NGOs and associations
Fanamby Association		Biodiversity conservation and sustainable human development based on a regional approach to environmental problems in regions identified as national priorities

SIGLE	SIGNIFICANCE	DESCRIPTION
FAPBM	Foundation for Protected Areas and Biodiversity of Madagascar	Private foundation of public utility to claim sustainable funding for conservation in Madagascar
Tany Meva Foundation		Mobilization and management of financial resources to promote sustainable environmental management and contribute to global environmental challenges through the active engagement of local communities
Foniala		Protection of the environment and better management of renewable natural resources in a process of sustainable development
GERP	Group of Study and Research on the Primates of Madagascar	Research on lemurs and their surrounding habitats in the country's economic development strategy
GSPM	Group of Plant Specialists of Madagascar	Representative of IUCN Plants in Madagascar for the revision of plant conservation statutes and the promotion of their preservation
IMPACT	NGO	Protecting and conserving Madagascar's biodiversity while improving the lives of its inhabitants, aiming to implement permanent change through collaboration with local people,
INDRI	Initiative for Development, Ecological Restoration and Innovation: *think-and-do-tank*	Mobilization of Malagasy actors (authorities, civil society, NGOs, private sector, donors) to develop approaches that bring about visible and sustainable changes in urban, land and coastal landscapes in order to produce a positive psychological effect and overcome structural obstacles to development.
Koloharena	Farmers' associations	Efficient agricultural practice with improved breeding techniques consistent with the environment.
LRA	Applied Research Laboratory	Multidisciplinary association that works for research related to Forestry - Development - Environment
MATE	Man and the Environment	Sustainable development and preservation of biodiversity through the involvement of disadvantaged local populations
Ma-Voa	Madagasikara Voakajy	With a conservation vocation, it provides services and support related to the conservation of endemic vertebrates in line with the national environmental policy

SIGLE	SIGNIFICANCE	DESCRIPTION
MBP	Madagascar Biodiversity Partnership	Protection of local forests and lemurs in particular, while sustainably increasing the standard of living of the thousands of people who depend on natural resources
MIHARI	MItantana HArena and-Ranomasina avy eny Ifotony,	Supporting the networking of LMMA communities for Locally-Managed Marine Areas (LMMAs), aiming at the long-term management of marine areas through capacity building, improvement of their welfare, advocacy and effective sharing of their experience
MICET	Madagascar Institute for the Conservation of Tropical Ecosystems	Intervenes in the environmental program in Ranomafana and also in its sites based in the regions of Vatovavy and Fitovinany, Haute Matsiatra, Amoron'i Mania and Atsimo Atsinanana
Mitsinjo		Nature-based tourism, conservation and research in Andasibe,
Otitsara	Orimbaton'ny Tontolo Iainana TSARArindra	Protection of the environment and sustainable development integrating the better education that each citizen in general and each woman in particular receives
THINK		NGO for the strengthening of the public and community health system including environmental protection
Reniala		Group of botanists for the protection of the environment, especially plants
SAF FJKM	Sampan'Asa momban'ny Fampandrosoana FJKM	Church-affiliated organization that works in the field of social and economic development of the country, including the environment
SAGE-Fampandrosoana Maharitra	Service d'Appui à la Gestion de l'Environnement - Fampandrosoana Maharitra	Emphasis on the promotion of sustainable development through good governance and rational management of natural resources
Tandavanala		Promotion of sustainable development and maintenance of the ecological function of Madagascar's forest ecosystems in general and of the COFAV corridor in particular
Vahatra		Association for the development of research on biodiversity and ecosystems and training in Madagascar
Velondriake		A network for the sustainable management of natural resources through education of the

SIGLE	SIGNIFICANCE	DESCRIPTION
		population on the marine ecosystem and non-fishing livelihoods
VIF	Vondrona Ivon'ny Fampandrosoana	Environmental protection and community development through local management and capacity building
Voahary Salama		Platform of strong notoriety in the field of Health-Population-Environment integration so that the Malagasy population is responsible, healthy, happy and live in perfect harmony with its environment
Voarisoa		Increased awareness at all levels to mitigate the adverse effects and risks posed by inadequate management of chemicals to the environment
C3 Madagascar	Community Centred Conservation Madagascar	IEC (Information Education Communication) especially in the marine ecosystem, capacity building, protected area management, ecotourism, waste management, etc.

Madagascar National Park (MNP) represents a special type of association, as it remains under the supervision of the Ministry of Environment and Sustainable Development.

Community Organizations

Since 1996, local communities have been involved in the management of natural resources within the framework of the Natural Resource Management Transfer (NRMT) policy. More than a thousand management transfer contracts (all resources combined) have been signed (MEDD). Basic Communities (COBA) participate in the management of protected areas and their buffer zones. This phenomenon has increased with the New Protected Areas. The involvement of COBAs has been done through government projects (PNAE) but especially thanks to the initiatives of international and national NGOs, for the mobilization and social structuring, and the support in the implementation.

The effectiveness of these community-based management systems is hampered by insufficient capacities, means and resources at the administrative level (for evaluation, control and supervision, and at the Communal level for conflict resolution), at the level of the support organizations (continuous support for these grassroots communities for at least the first three years before contract renewal), and of course at the level of the COBAs (implementation of the development plan and simplified management).

In the case of marine and fisheries resources, locally managed marine protected areas are managed by community associations. For the specific case of Antongil Bay, thanks to the support of the PCDBA platform, an agreement on fishing zones and timing between artisanal and industrial fishermen was reached (Le Manach *et al.*, 2013).

Gender approach/women's groups

In general, policies, strategies and programs for development and sustainable management of natural resources (forest management, water catchment and irrigation, preparation of the REDD+ strategy, climate change, food security, risk management/disaster risk reduction, land management, etc.) take into account the gender dimension. Despite blockages, women are playing an increasingly important role in the environment sector. The table below presents some of the milestones of the last 15 years in terms of the involvement of women's associations and the integration of gender issues in the environment sector.

After the national policies and commitment, the gender approach has been widely integrated in the environmental field. During the implementation of the third environmental program (PEIII), activities supported by TFPs such as UNDP (financed by GEF), the World Bank, NGOs and other TFPs around the protected areas include support to women's groups in the communities for the implementation of income-generating activities (IGAs) such as embroidery, sewing, basketry or fruit processing. Initiatives to involve women in the implementation of reforestation activities, promotion of improved stoves, community tourism or improved agricultural practices are growing. Mining companies (QMM and Ambatovy) also support women's organizations or vulnerable households in environmentally friendly income-generating activities (sustainable management of "*mahampy*" lianas, embroidery and sewing, beekeeping, etc.). Among the interesting initiatives, Blue Ventures has adopted an integrated "population-health-environment" (PHE) approach, recognizing the links between health, gender inequality, unmet family planning needs, and environmental degradation. This organization has established family planning centers and implements outreach on women's reproductive health at the community level (Blue Ventures, 2014).

Some civil society organizations specialized on gender are also involved in the promotion of biodiversity conservation and sustainable management of natural resources, such as the Gender and Development Network of Madagascar (awareness raising on climate change, sustainable agriculture) or the National Platform of Women for Sustainable Development and Food Security (FDDSA), which supports women entrepreneurs in the field of agro-ecology and sustainable agriculture in Madagascar and Comoros (with the support of the IOC)

Summary of the activities of association groups in the field of biodiversity

The situation has hardly changed since 2014: civil society organizations working partially or fully for the environment have multiplied during the implementation of the three environmental programs (1991-2010) of the NEAP. According to the 2013 information and data provided by the Ministry of Population - the only ones that remain available at this time - 219 NGOs and associations work partially or fully in the environmental field. However, the geographical distribution of these structures is uneven: while the regions of Analamanga and Vakinankaratra see the presence of many environmental CSOs, they are very few in the regions of Atsimo Atsinanana, Sofia or Androy.

During the NEAP, national structures (associations, national NGOs, community-based organizations) acted as secondary implementing partners, while international NGOs were the structures mandated by international financial partners. In general, the situation has changed little.

Research institutions/laboratories and

Madagascar has various institutions that are partially or totally involved in training or research activities related to biodiversity conservation. We can mention : The Faculty of Sciences with its departments of animal biology, and plant biology and ecology (at the levels of 3 Universities Antananarivo, Mahajanga and Toliara); the Institut Halieutique des Sciences Marines (IHSM) which provides training and research in fisheries, aquaculture and marine and coastal environment; The Department of Water and Forests and the Applied Research Laboratory, which intervenes in the fields of forestry and hydrological resources, particularly in the areas of forestry and management, studies on ecology and biodiversity, water and soil management, economics and natural resource management policy, both within the Ecole Supérieure des Sciences Agronomiques (ESSA), the Centre National de Recherche pour l'Environnement (CNRE) under the direct supervision of the ministry in charge of higher education and research, which has as its mission to carry out research in the knowledge and preservation of biodiversity, in the improvement of the quality of life of rural and urban communities.

Other laboratories and research institutes should also be mentioned, such as the Laboratoire des Radioisotope (LRI) also within ESSA, which is a training, research and public service center using nuclear techniques in the fields of health, agronomy and the environment, the Institut et Observatoire de Géophysique d'Antananarivo (IOGA), of the University of Antananarivo ; the National Center for Agricultural Research Applied to Rural Development (FOFIFA) affiliated with the Ministry in charge of agriculture and livestock. Several NGOs and national and international associations initiate research both on their intervention sites and with respect to a well-defined species. For research activities, international institutions can also be cited, such as the Institute for Research and Development (IRD) intervening in the areas of climate change, biodiversity and soil functioning in agro-systems, population and the Center for International Cooperation in Agronomic Research for Development (CIRAD) in the areas of forests and biodiversity, sustainable cultivation and rice-growing systems such as semi-direct on plant cover or agroecology.

Foundations

There are two national foundations working specifically on biodiversity conservation in Madagascar.

The TANY MEVA Foundation, created in 1996, has a community vocation and is involved in the sustainable management of natural resources, the mitigation and adaptation to climate change, the fight against desertification and the development of the environmental reflex.

The Foundation for the Protected Areas of Madagascar (FAPBM), created in 2005, aims to provide sustainable funding for the management of Protected Areas and also provides support for activities or projects related to Protected Areas and the conservation of species and ecological habitats.

Private Sector

In recent years, private sector organizations have become more involved in environmental issues in Madagascar. The mining sector has been a pioneer in this regard, through the large-scale operations of the moment, namely the nickel-cobalt mining program in the central-eastern part of the country (Ambatovy Program), as well as the ilmenite mining program in the southeast (QMM). The companies investing in these programs focus their environmental activities on collaboration with local communities and through environmental education, reforestation and land restoration activities.

The last five years have seen the emergence of a certain interest in "Societal and Environmental Responsibility - CSR" on the part of private companies such as Société Orange and the STAR brewery, for example. However, the concept is still poorly perceived and understanding is relatively limited. Some people think that doing annual reforestation activities and conducting humanitarian actions, for example, are enough. Nevertheless, there is a willingness to understand and participate in various fairs and meetings (natural capital forum in 2021, industry fairs occurring annually).

The Axian Foundation can be cited in particular: It is mobilized to strengthen the resilience of communities facing climate disasters by supporting the construction of anti-hurricane infrastructure.

Also, MCB Madagascar, in partnership with the French Development Agency (AFD) and the European Union, is the first bank to sign a green credit line that consists in financing sustainable development projects, targeting both SMEs and large companies, through subsidized loans.

Civil society and promotion or management of protected areas in Madagascar

One of the particularities of Madagascar is that the management of almost all the protected areas is (or will be) ensured by the civil society. MNP or Madagascar National Parks manages a network of 43 IUCN category I, II and IV protected areas. Other national and international CSOs are involved as promoters or managers of New Protected Areas. Among the most important promoters are Conservation International, WWF, MBG and WCS at the international level, and FANAMBY and ASITY at the national level.

The majority of these national and international structures also intervene in the areas of awareness raising, local development by promoting alternative practices to deforestation, the establishment of income generating activities or the promotion of sustainable fishing techniques.

10.2 Comoros

Environmental conservation and protection, and environmental issues in Comoros, are part of a broader framework that involves both state institutions and bodies and civil society organizations. CSOs are key actors in the development of conservation and sustainable development activities in Comoros. There is a multitude of associations for the defense and protection of nature that play the role of relays to mobilize communities, particularly youth, towards the environmental cause.

CSOs play an important role in the implementation of several projects and programs targeting vulnerable groups. They are an interface between the population and the public programs that are supposed to respond to their needs. They often act through the implementation of actions against the destruction of forests, the extraction of marine sand and corals, the protection of water sources, the proliferation of illegal garbage dumps in urban areas, the massacre of endangered animal species (marine turtles, coelacanths). They compensate for the gaps and weaknesses of public authorities to protect, conserve and enhance ecosystems and their resources.

Community organizations

Village communities also play an important role in local development. They are at the root of many initiatives to facilitate access to water and energy in their localities. They are also key actors in reducing the pressure on ecosystems and natural resources. They participate materially and financially in interventions that promote the opening up and accessibility of the population to various services. They are a powerful support to reduce the pressures on natural resources and the rational exploitation of biodiversity.

Non-Governmental Organizations and Networks

Many NGOs specialized in environmental management are currently working in the field of environment and biodiversity conservation. These NGOs include Dahari, AIDE (Association d’Intervention pour le Développement et l’Environnement), ADDE (Action pour le

Développement Durable et l'Environnement), SYA, the Réseau National Femme et Développement, and the Réseau Ulanga.

The private sector

The Comorian private sector is organized around two employers' organizations, namely OPACO and MODEC. The sectors of intervention are trade and recently industry. However, more and more companies are being created in the agricultural, fishing and cash crop sectors and are thus interested in the management and development of natural resources. They are sensitive to the growing threats related to the non-rational use of environmental resources and can thus contribute to the vulnerabilities that the country is facing.

Research Institutions

. National Research Institute for Agriculture, Fisheries and the Environment (INRAPE)

INRAPE's missions include

- ✓ design and conduct agricultural, fisheries and environmental programs, research and studies
- ✓ Maintain relations with research organizations in the field of agriculture, fisheries and the environment
- ✓ to promote techniques and methods allowing an increase in the productivity of agriculture and fishing and the preservation of the environment
- ✓ Participate in the evaluation of the technical execution of agricultural, fisheries and environmental projects.

INRAPE is experiencing serious difficulties in fulfilling its missions. Like most Comorian administrations, the institute is faced with problems of operation and motivation of its staff.

. National Center for Documentation and Scientific Research (CNDRS)

Created on January 11, 1979, the CNDRS is a public institution with a wide range of activities, such as museology, documentation and information for the public and specialists, national archiving, scientific research, geological and spatial mapping, observation of Karthala, cultural promotion. It contributes to the dissemination and popularization of scientific information, the organization of conferences, the production of documents, both for researchers and the public, with a pronounced educational connotation. It is a reference point for all those interested in the history, geography, geology, literature, tradition, fauna, flora, religion and the environment of the archipelago, in and around the Indian Ocean, without forgetting the aspects related to the Bantu civilization.

. University of Comoros

The University of Comoros has faculties and institutes working in the field of environment and biodiversity. These include the Life Sciences and Earth and Environmental Sciences Departments of the Faculty of Science and Technology, the Geography Department of the Faculty of Letters and Humanities and the University Institute of Technology, particularly the Tourism Department. Research studies in partnership exist with international universities. For several years, the University has set up :

- A Master's Degree in Sustainable Development and Biodiversity Conservation
- A Master's Degree in Risk Management and Disaster Reduction in the Face of Climate Change
- A professional Master's degree in "Fisheries resources and sustainable fisheries management
- A Bachelor's degree in marine biology.

These Master's and Bachelor's degree courses aim to initiate and perfect students in the national, regional and global scientific field on the evolution of natural resources as well as on the short, medium and long term impacts of anthropic activities but also of the effects of climate change. These trainings aim to provide the theoretical and methodological bases necessary for the understanding and study of the dynamics of natural resources as well as ecosystems and their exploitation. They will ensure the training of technical executives who can contribute to the management of natural resources and/or advise actors involved in the varied world of biodiversity. They are the basis for local research in the field of the environment and biodiversity conservation.

10.3 Mauritius

There are nearly 11,000 voluntary organizations listed in the States-Registry of associations (govmu.org). Of these, there are several hundred organizations that fit the characteristics of NGOs. Although there are a large number of NGOs, very few are related to biodiversity conservation and environmental sustainability. The main local source of monetary support for NGOs in Mauritius is the Corporate Social Responsibility (CSR) Fund. There is no tax deduction for individual donations in the country. Under the CSR Fund, all profitable companies are required to build up their CSR Fund within a year in an amount equivalent to 2% of their actual revenue of the previous revenue year. 50%/75% will be remitted to the Mauritius Revenue Authority (depending on the date of establishment of the company) and the remaining 50%/25% of the CSR Fund will be used by the company to implement a CSR program in accordance with its own CSR framework; or to fund a non-governmental organization implementing a CSR program in the priority areas of focus, which includes social and environmental development of the country (CSRGuide.pdf (mra.mu)) There is a list of about 440 approved[34] NGOs that can receive CSR funds, of which about 10 are environmental and only 3 are conservation (1 land and 2 marine).

Some of these associations are involved in the fight against climate change in Rodrigues and Mauritius. If the actions are mainly through public awareness actions on the issues related to rising temperatures and natural disasters, some like "Environmental Protection and Conservation Organisation" (EPCO) are starting to anticipate and adapt to this change. In 2018, for example, an effort was made to improve the domestic water supply system by providing drinking water tanks to poor villages in coastal communities in Mauritius. One of the objectives of the association is also to conduct public awareness campaigns on climate change, to organize workshops on this subject in particular, and to conduct research and observation activities. It is also possible to mention other associations such as "Friends of the Environment" which is setting up a concrete example of action in favor of carbon sequestration, thus mitigating the greenhouse effect and the deleterious climate change.

The main active NGO dealing with terrestrial biodiversity in Mauritius and Rodrigues is the Mauritian Wildlife Foundation (MWF), which was established in 1984 with support from the Durrell Wildlife Conservation Trust of Jersey, UK, and other international partners. MWF focuses primarily on threatened vertebrate and plant species, and works closely with the government, managing the bird recovery program and the management of certain islets (e.g., Ile Ronde and Ile aux Aigrettes), regulated by a memorandum of understanding. In August 2013, it also took over full management of a private reserve (Mondrain), which had been entrusted to the Royal Society of Arts and Science of Mauritius for 30 years. Other NGOs that have been established in recent years include "Ecosystems Restoration Alliance," which focuses on bats.

[34] https://www.nsif.mu/organizations/

There are also other NGOs active in the environmental sector, such as Ebony Forest, and private landowners who are beginning to take an interest in planting forests for carbon sequestration and to support biodiversity. A "Tiny Forest" movement has emerged and is in contact with Earth Watch Europe.

Conversely, for marine biodiversity, several NGOs are active. The most important ones. The most important ones are :

. the Mauritius Marine Conservation Society (MMCS), which produces awareness campaigns and materials (e.g., the Diodon newsletter), and is involved in marine conservation and research (e.g., dolphin, whale and turtle monitoring, creation of artificial coral reefs, etc.) and protection of marine archaeological sites). MMCS also runs volunteer programs to generate funds for research projects.

. "The Reef Conservation Mauritius has similar activities (education, monitoring, research and training) and has been very active on the marine NGO scene in recent years, particularly in the north of Mauritius ("Voluntary Marine Conservation Areas", deployment of mooring buoys, etc.).

. Equally active is the Marine Megafauna Conservation Organization, with a strong interest in marine mammal conservation in northern Mauritius (in particular) and elsewhere. Other marine NGOs focusing on awareness and education campaigns and rehabilitation of specific sites are Lagon Bleu, which is active in southeast Mauritius (e.g., Blue Bay Marine Park, Mahébourg Bay, mangrove conservation, coral farming). A recent marine NGO has also been formed, "EcoMode Society", mainly involved in coral farming, marine studies, oil spill mitigation, etc. Association (MSDA) and the Mauritius Underwater Group (MUG). The latter two associations also support the work of MMCS and Reef Conservation.

In Rodrigues, a platform has been created to bring together all the NGOs and associations, grouped under the Rodrigues Council of Social Services (RCSS) on the island. There is only one NGO that deals with terrestrial biodiversity, MWF, which has been operating on the island since 1985. As in Mauritius, MWF has a Memorandum of Understanding with the RRA to carry out collaborative projects on biodiversity conservation in the Grande Montagne, Anse Quitor and Ile aux Cocos Nature Reserves.

On the marine side, the main NGO is Shoals of Rodrigues, which was founded in 2001. Collaboration with the UK is ongoing and local staff of Shoals of Rodrigues is involved in research, monitoring, training and awareness raising of local fishermen, and has been instrumental in determining the baseline status of biodiversity and its diversity and continuous monitoring, especially of fish catches. The Rodrigues Underwater Group, a diving association, supports Shoals in carrying out conservation work. Shoals Rodrigues also works in close collaboration with MWF Rodrigues.

In recent years, a new NGO has been created in Rodrigues, Ter-Mer Rodriguez, which is active in octopus conservation, habitat restoration and conservation.

The above NGOs work closely with the Mauritian government, for example MWF with the National Parks and Conservation Service and the Forestry Service in Mauritius, and the Rodrigues Regional Assembly in Rodrigues, marine conservation organizations with the Ministry of Blue Economy, Marine Resources, Fisheries and Shipping, and departments such as the Albion Fisheries Research Centre and the Mauritius Oceanography Institute, and RRA in Rodrigues. There are also links with local companies and international funding and research organizations and universities.

There is also a small, growing and increasingly effective grassroots movement for environmental protection and against unsustainable development, one of the most important of which is Aret Kokin Nu Laplaz (www.facebook.com/aretkokinnulaplaz).

There are also opportunities for collaboration between NGOs, communities, grassroots organizations, government, and private companies and society, as was the case during the Wakashio oil spill (De Rosnay et al 2021).

10.4 Seychelles

Civil society organizations (CSOs) play a key role in biodiversity conservation. In Seychelles, civil society engagement with environmental issues has been in place for over four decades and has increased significantly over the past 10 years. The increase in public awareness of environmental issues and climate change can be seen through this growing civil society engagement, and in particular through the increase in national campaigns on issues such as plastic pollution or tourism development (Seychelles, Sixth CBD National Report, 2020).

Most importantly, the actors in environmental conservation are diverse and include civil society, private companies and government agencies (etc.), and have complementary roles.

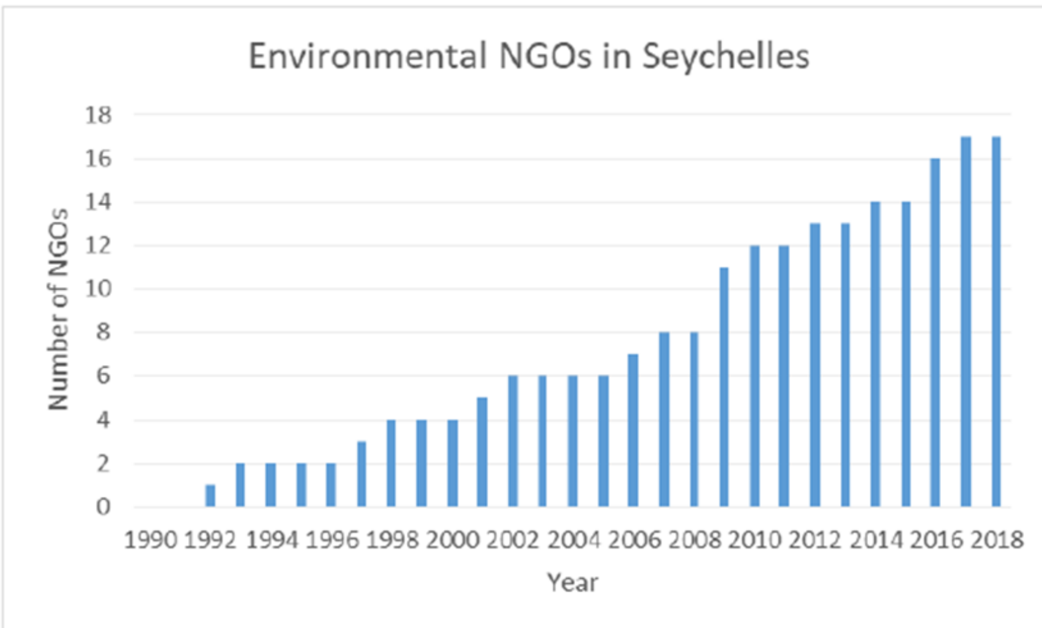

Figure 36 The evolution of NGOs in environmental conservation in Seychelles

Source: Government of Seychelles (2020). Sixth National Report to the Convention on Biological Diversity. GoS/UNEP

Many of these environmental NGOs are part of the Citizens Engagement Platform Seychelles (CEPS) (formerly LUNGOS), a national platform that seeks to represent civil society in the country and promote their involvement in national policy formulation.

A variety of actors (CSOs and also institutions and private partners) are involved in biodiversity conservation in the country:

Research institutions supported by local NGOs and parastatals

Many of the research institutions present in Seychelles are foreign, but in 2015 the Blue Economy Research Institute (BERI) at the University of Seychelles (UNISEY) was established, followed later at the same university by the "Island Biodiversity and Conservation Center," a joint venture between UNISEY and a local NGO (IBC) bringing together both resident and visiting experts affiliated with the university.

It is also important to mention the presence in Seychelles of individual experts, most of whom are active in NGOs, sometimes affiliated with scientific institutions and also serve as advisors to governmental organizations. They also play an important role in the conservation of biodiversity in Seychelles.

Parastatal agencies (or those considered as such) such as SIF, SPGA, SFA or IDC have a central role in biodiversity management issues and work closely with NGOs and other civil society organizations. Some of these, such as SPGA or SIF, play similar roles to NGOs in protected area management, monitoring and research work, public education etc.), so these entities are also eligible for public funds, as well as international donor grants and corporate funding.

Private Sector

The private sector, such as resorts or private islands, also plays an important role in biodiversity conservation, thanks to the revenues generated by nature tourism on site, but also through their involvement in island restoration projects:

1. Bird Island (private owner)
2. Blue Safaris (private operator Alphonse/Cosmoledo)
3. Resort Club Med Seychelles Sainte Anne (Sainte Anne - private operator)
4. Cousine Island (private owner)
5. D’Arros (private owner)
6. Denis Island (Mason Trip)
7. Ephelia and Lemuria Constance Resorts (Mahé and Praslin)
8. Frégate Island (private owner)
9. Hilton Resorts (Labriz Silhouette and Mahé)
10. North Island (private owner)
11. Sisters (Big Sister and Little Sister; private owner)
12. Château-de-feuilles (Relais et Châteaux) (private owner)
13. Four season stations (Mahé and Desroches)
14. Six Senses Station (Felicity)
15. Etc.

A number of “island foundations” linked to the IDC and the Island Conservation Society (which holds their secretariat), and which involve other key socio-economic partners on particular islands, are also engaged in biodiversity conservation work. Five are currently active (in order of seniority):

1. Desroches Island Foundation
2. Foundation of the Alphonse group
3. Silhouette Island Foundation
4. Foundation of the Farquhar-Providence group
5. Foundation of Cosmoledo and Astove

Other island foundations of this type have been registered for islands such as Poivre, Marie-Louise, and Desnoeufs, etc., and are expected to become active when economic activities (usually based on tourism) that generate income are developed on these islands. Another type of local foundation, the Middle Island Foundation, manages the Middle Island National Park.

Locally established yacht companies such as Silhouette Cruises, Sunsail, Dreamyacht Seychelles and many others operate in Seychelles where the yachting industry has developed over the past 20 years. There are also medium to large boats owned by foreign companies that have been active in the country’s cruise industry for many years. Nevertheless, this presence was abruptly reduced after 2008 due to the Somali piracy crisis. Ships that used to operate in the outer islands, such as the French cruise ship “Le Ponant” or the “Indian Ocean Explorer”, both of which were captured by Somali pirates in 2008-09, could for example offer very important logistical opportunities in terms of access, surveillance and monitoring of wildlife in the outer islands. The Compagnie du Ponant has also recently returned with several vessels from its fleet to Seychelles waters.

Community Organizations

Community-based organizations (CBOs) have also been around for a long time in Seychelles and are made up of volunteers who want to solve problems in their communities, including environmental problems. Their activities adapt to the needs of the community, but also to new environmental priorities such as climate change adaptation or plastic pollution. Below is a non-exhaustive list:

1. Bel Ombre District Action Team (Mahé)
2. Association of fishermen of the Bel Ombre district (Mahé)
3. Citizen Initiative of the Grand Police Force (Mahé)
4. Port Glaud District Environment Club (Mahé)
5. Roche Caiman District Environmental Action Team (Mahé)
6. Association for the Promotion of Tranquility and Respect (“Lasosyasyon pour promouvwar latrankilite e respe”) based in the district of St Louis (Mahé)
7. Plaisance District Community Outreach Association (Mahé)
8. Les Mamelles District Heritage Association (Mahé)
9. Praslin Environmental Group (PEG) (Praslin)
10. Fresh Focus (Praslin)

CBOs are encouraged to play an increasing role in nature conservation and natural resource sustainability. All CBOs and most NGOs are based and active in the main (inland) islands, where most of the population of Seychelles lives.

International NGOs

They are not very well established in Seychelles, although it is possible to find examples such as “The Save Our Seas Foundation”, which manages the private island of Arros and the atoll of St Joseph in the Amirantes. Nevertheless, some (BirdLife International, IUCN, WWF, CI) fund or support some national or regional conservation projects and have MOUs with local NGOs. Some of these local NGOs (Nature Seychelles, ICS) and also FIS are members of IUCN, as is the government of Seychelles.

In the past, two British NGOs played a major role in the conservation of biodiversity in the Seychelles in the 1970s by purchasing the Aride and Cousin islands, and turning them into nature reserves and gradually restoring them. This helped expand and promote the development of habitat and species recovery programs on private islands and properties to protect critically endangered birds and seabird colonies. The Royal Society for Nature Conservation (RSNC) (later called the Royal Society for Wildlife Trusts) is one such NGO through which its president Christopher Cadbury purchased Arid Island and helped to purchase Cousin Island and La Veuve Reserve on La Digue Island. The second is the International Council for Bird Preservation, now BirdLife International, which is the NGO that purchased Cousin Island with the help of RSNC. Nature Seychelles is now BirdLife International’s partner for the Seychelles, and ICS is the successor to RSNC/RSWT in the Seychelles via ICS UK which continues to receive support from the Cadbury family.

Table 54 Main CSOs Involved in Environmental Issues, Biodiversity Conservation and Community Environmental Engagement

Websites and links to key civil society organizations and institutions involved in biodiversity conservation in Seychelles	
NGOs, parastatals and public trusts	**Community-based organizations**
Seychelles Parks and Gardens Authority (SPGA) https://www.snpa.gov.sc/index.php	Fresh Focus (Praslin) https://www.instagram.com/sey.freshfocus/
Nature Seychelles http://natureseychelles.org/	Port Glaud Environment Club https://www.facebook.com/groups/165637133610821
Seychelles Islands Foundation (SIF) http://www.sif.sc/	Bel Ombre Action Team https://www.facebook.com/Belombre-Action-Team-435192039901121
WildLife Clubs of Seychelles (WCS) https://www.wildlifeclubsofseychelles.org	Bel Ombre Fishermen's Association https://www.facebook.com/belombre.fishermen
Marine Conservation Society, Seychelles (MCSS) http://www.mcss.sc	Grand Police Citizens Initiative https://www.facebook.com/SezGPCI
Island Conservation Society (ICS) http://www.islandconservationseychelles.com	Roche Caiman Environmental Action Team https://www.facebook.com/groups/518596041886784
Plant Conservation Action Group (PCA) http://www.pcaseychelles.org	
Save Our Seas Foundation - D'Arros Research Center https://saveourseas.com/sosf-darros-research-centre/	
Green Islands Foundation (GIF) https://greenislandsfoundation.blogspot.com/	
Environment Education Association Seychelles (EEAS) https://www.facebook.com/Environment-Education-Association-Seychelles-500012833506101/	
Seychelles Sustainable Tourism Foundation (SSTF) http://seychellessustainable.org/	

Websites and links to key civil society organizations and institutions involved in biodiversity conservation in Seychelles	
NGOs, parastatals and public trusts	**Community-based organizations**
Sustainability for Seychelles (S4S) http://www.s4seychelles.com/	
Terrestrial Restoration Action Society of Seychelles (TRASS) https://www.facebook.com/TerrestrialRestorationActionSocietyofSeychelles/	
Global Shapers - Victoria Hub https://www.facebook.com/globalshapersvictoria	
SYAH (SIDS Youth Aims Hub - Seychelles) http://syah-seychelles.weebly.com/	
Seychelles Conservation and Climate Adaptation Trust (SeyCCAT) https://seyccat.org/	
The Ocean Project, Seychelles (TOP) http://www.theoceanprojectseychelles.com/	
The Blue Economy Research Institute (BERI) - University of Seychelles https://beri.unisey.ac.sc/	
Island Biodiversity Conservation (IBC) center - University of Seychelles https://unisey.ac.sc/island-biodiversity-conservation-centre/	
Indian Ocean Tortoise Alliance (IOTA) https://www.iotaseychelles.org/	
SeyNoPlastic https://seynoplastic.com/	
Wise Oceans Seychelles https://www.wiseoceans.com/	
Danny Faure Foundation https://www.dannyfaurefoundation.org/	

10.5 Capacity and needs of civil society organizations

Madagascar

Civil society in the field of conservation in Madagascar is relatively powerful in terms of its capacity to intervene effectively in many areas. There is a diversity of structures in the country that intervene at multiple levels in the fields of sustainable natural resource management: biodiversity conservation, sustainable resource development, ecosystem services, research, education, advocacy and lobbying. Training programs, set up by international organizations and then progressively by national organizations such as Vahatra, have allowed the emergence of a dynamic and well-trained generation of conservation professionals - even if it is still insufficient compared to the needs.

However, it was emphasized that the conservation community in Madagascar remains organized around large international organizations, which represent the backbone of environmental action. With easier access to international funding, supported by their respective headquarters, mobilizing national (increasingly) and international expertise, these organizations play a major and effective role, not only in the implementation of field activities, but also in relations with the authorities or the private sector.

The weak capacity of national, regional and local structures and NGOs to mobilize funds means that they have difficulty accessing available funding and implementing their activities in the field in a sustainable manner. And if these national organizations benefit from funding, the share that they are responsible for managing is low, the majority being destined for the international organization that is responsible for them.

As a result, the national structures lack funds for their expenses and operations, pay their employees relatively little, and even their technical activities in the field are limited, rarely allowing for flexibility. It is well known that resources must be sufficient for community-based approaches, conservation and monitoring activities.

Comoros

In general, CSOs in Comoros face two problems: weak governance and lack of funding.

In terms of governance, the least common reality is accountability: only a small proportion produce activity and financial reports. Several reasons are put forward by CSOs to explain the absence of activity and financial reports: the lack of know-how of CSOs, the negligence of leaders, the deliberate desire of some association leaders who do not want transparency in the management of the association for fear of being ousted, the poor management of the association's resources, the absence of an action plan for the majority of CSOs, and the practice in many associations of waiting for activity and financial reports not at the end of each year, but at the end of the mandate.

The lack of funding comes from various sources: on the whole, the first source of funding for CSOs comes from the various dues and fees paid by their members; the second source comes from IGAs; in third place, various donations made to the associations; in fourth place, contributions from TFPs and in fifth place, support from the communities (island, communes and village); and in last place, contributions that are supposed to be from the State but which are almost non-existent.

Maurice

The main problem in Mauritius regarding CSOs in biodiversity conservation and protection is their small number. As a result, few local actors are directly involved at the expense of outreach approaches that are needed with communities on the ground.

Indeed, conservation began in the 1970s (and if you go back further, since the 1930s), dominated by a local elite and led from the outside by Western conservation organizations (WWF, International Council for Bird Preservation (ex-BirdLife), Durrell Wildlife Conservation Trust, Peregrine Fund, Kew Gardens, etc.). The creation of MWF in 1984 made it possible to respond to the emergencies of the time (e.g. Mauritius kestrel, pink pigeon, round island, reptiles, etc.).). The organization was well managed, professionally run, professionally staffed, successful in fundraising and became a reference . There was a high turnover of volunteers, mainly expatriates. This meant that few staff stayed in Mauritius or that few Mauritians stayed long enough to make their mark. The organization became more "Mauritianized" in the late 1990s, with key positions held by Mauritians or foreigners who had made Mauritius their home for decades. The Board of Directors is predominantly Mauritian.

MWF covered the ground well in Mauritius and Rodrigues, but there was little interest in conservation beyond MWF. This is changing, with former MWF staff leaving the organization to create or work in other NGOs (e.g. Ebony Forest, Ecosystems Restoration Alliance), replicating the MWF model. MWF is also in partnership with Ferney Valley.

Even today, there are no more than 4 active land-based conservation organizations in Mauritius, and these overlap with MWF. MWF is still the main actor in conservation. However, the work cannot be done by a single NGO, and there is room for other civil society and private sector actors. Some private initiatives are on the horizon as well, around the concept of corporate social responsibility.

Seychelles

It is also important to indicate the main limitations to the work of CSOs in biodiversity conservation, especially NGOs and CBOs.

In terms of funding, recently there has been a setback in the funding mechanism for NGOs and CBOs in Seychelles that rely on donations, private funding, and grants: the CSR (Corporate Social Responsibility) tax, which was created in 2013 and has long been an additional funding mechanism for NGOs and foundations, was abolished in early 2021 following the change of government in the country. For many, this removal is seen as a significant loss to NGO revenues. This tax and its removal was also raised in the CEPF stakeholder consultation process in response to a question about the existence of gaps in conservation funding in Seychelles. It was also argued by local stakeholders that while many KBAs managed by NGOs benefit from ecotourism activities, the revenue stream from these activities is not guaranteed (a reality revealed by the impact of Covid-19 on tourism) and is not sufficient to support conservation efforts in these sites.

In addition, as Seychelles is considered since 2018 as a "high income country", and as such, the problems of finding funding for conservation in the country have arisen. Indeed, this new consideration has meant, for example, that Seychelles has not been, and still is not, eligible for certain grants that had been available in the past. Stakeholders explained that this has resulted in a loss of revenue for conservation projects, inputs that have not really been replaced due to lack of local funds, and particularly in the last two years with the Covid-19 pandemic, which has seen government strategies being more geared towards economic recovery. Comments were also made about the Environment Trust Fund (ETF)) which used to be a source of funding, but is not as important today. In the last two years, it has been announced that it will disappear. However, the Seychelles Ministry of Agriculture, Climate Change and Environment announced in June 2022 that the ETF had in the past two years received over 10 million rupees in donations. This was achieved through the Seychelles Islands Travel Authorization Platform, which has been managing entries into the country since the Covid-19 pandemic and which gives the opportunity to make a donation to the protection of the Seychelles environment at the end of its online form (mandatory for anyone traveling to Seychelles, residents and Seychellois included). The question remains whether this form of fundraising for the ETF is sustainable in the long term and whether other types of donations are planned for the ETF. Finally, the proposal that the Seychelles government set up a "green economy" fund similar to the blue economy fund was also made, as terrestrial conservation is also essential to the economic and social well-being of the country.

11. CLIMATE CHANGE ASSESSMENT

11.1 Overview of the climate history of the hotspot and its influence on biota

The Indian Ocean is the third most affected region in the world by extreme weather events. And in the populated islands of the southwest, these phenomena are expected to increase in frequency and intensity under the effect of climate change (https ://ideas4development.org/). It has been observed for 50 years in the islands of the south-west Indian Ocean basin, an average warming of the air temperature of the lower layers of nearly 1 ° C, and this warming has accelerated over the past decade, with the result, episodes of sudden and intense rainfall already regularly affecting among others the four islands with steep relief. These rains are brought by storms and cyclones that cross the basin every season.
At the global level, the IPCC (2021) predicts a rise in sea level but highlights in its reports an average rise by ocean basin, including the Indian Ocean.

The most pronounced and visible impact of climate change in the region is undoubtedly coral bleaching. According to studies, the probability that these bleaching episodes will multiply with the sustained increase in sea surface temperature is very high and the confidence level of these probabilities is important. Indeed, some studies predict that corals in the Indian Ocean may disappear completely within 20 to 50 years as a result of increasingly frequent bleaching events (Sheppard, 2003). Through the degradation of corals, it is the whole of the marine ecosystems which is affected.
Furthermore, the rise in sea level and the intensification of extreme climatic events will continue to lead to the erosion of beaches and coastal ecosystems. Erosion is a phenomenon that is already present in the Indian Ocean islands but has been little studied compared to other subjects, although it is equally important.

These three phenomena, combined with the degradation of beaches and coastal areas that they will cause, will also affect the sea turtle populations that inhabit these islands. Moreover, these are also threatened by the rise in the temperature of the surface of the soil due to the rise in temperature globally caused by climate change. Indeed, this increase in sand temperature induces an imbalance in the male/female ratio of sea turtle populations, with serious consequences on the reproductive capacity and survival of these species and a relatively small increase in temperature could have direct consequences on their survival (Griessinger , 2021). In addition, migratory marine mammal populations in the Indian Ocean are likely to be affected by climate change during their feeding season in polar regions.

At the terrestrial level, the impacts of climate change on ecosystems are more difficult to measure. There are no observational data on such impacts for the entire region.

. In Madagascar, the report released by the Directorate General of Meteorology in 2019 presents some adjustments taking into account the changing climate context. The four main climatic zones (the humid east coast, the central highlands, the northwest, and the semi-arid southwest) have not changed, nor has the subdivision into two seasons: a hot and rainy season from November to April, and a cool and dry season between May and October. The hot season is characterized by the formation of cyclonic disturbances in the southwestern basin of the Indian Ocean, affecting the country on average three to five times a year. However, in the context of climate change, the rise in temperature is manifested by an increase of 0.27 ° C of the national average every 10 years and the change in the rainfall pattern is expressed by the lengthening of the dry seasons, the intensification of torrential rains and a decrease of 8% of rainfall since 1990. Between 1990 and the first quarter of this year 2022, Madagascar has recorded about 75 major climatic disasters, including at least 65 cyclonic disturbances and six episodes of severe drought. Sea level rise reached 0.6 cm per year between 1994 and 2008.

In terms of trends:

. Concerning precipitation :

Annual rainfall is decreasing at most stations in Madagascar, particularly in the eastern and southeastern parts of the island. This decreasing trend is small compared to the very high annual variation in rainfall. In terms of season, rainfall in the hot season (summer) shows a decline compared to winter rainfall. The number of days with extreme rainfall in one day is generally decreasing.

. About the temperature :

The maximum and minimum temperatures increase up to 0.04°C/year and 0.05°C/year, respectively, in Madagascar. The maximum of the maximum temperatures and the minimum of the minimum temperatures are increasing. This is likely to result in hot days and warm nights. The maximum temperatures show an increasing trend of +0.23°C/decade on an annual basis, the hot and humid season shows an increase of +0.20°C/decade. In winter, the maximum temperature trend is +0.25°C/decade.

. Concerning temperature and sea level :

The sea temperature in the Western Indian Ocean (Kenya, Mozambique, Tanzania, Madagascar, Reunion, Mayotte, Comoros, Mauritius and Seychelles) has increased by 0.60°C between 1950 and 2009.

Sea level change in Madagascar indicated a rate of change of 1.57 mm/year between 1993 and 2017 (which is less than the global rate of 2.87mm/year).

. Concerning cyclones :

No trend observed in the frequency or intensity of tropical cyclones in the southern Indian Ocean region of interest to Madagascar, according to existing studies.

In terms of projections of future climate change in Madagascar, two scenarios of greenhouse gas emissions are considered: moderate (RCP 4.5) and high (RCP 8.5). The projected changes are uncertain for precipitation. However, the precipitation pattern is expected to be significantly altered during the winter season, from May to October, with a 9.6-16% decrease in precipitation by 2080.

Furthermore, by 2100, the frequency of tropical cyclones is not expected to change significantly. On the other hand, the intensity of cyclones is expected to increase by 46% and to move northwards. It is also expected that sea level will probably rise by 0.28 to 0.48 m by 2100. Future climate projections show regional disparities in the evolution of climate parameters. The southern part, the west coast and the center of Madagascar are expected to experience an increased rise in temperatures.

. In the Comoros,

In terms of trends:

. About the temperature :

Observed temperatures over the period 1960- 2006 (McSweeney *et al.*,2008) show that the mean annual temperature has increased by 0.9°C since 1960, an average increase of 0.19°C every 10 years. This average increase is greater for the March-April-May (MAM) period, at 0.22°C per decade than the other months of the year. However, the lack of available daily temperature data did not allow the identification of trends in daily temperature extremes.

. Concerning precipitation :

These studies also note a decrease in average annual precipitation, more pronounced over the period 2000-2006 for all seasons. The decreases in rainfall are more significant in the northern part of the Comoros Islands. The lack of available daily rainfall data did not allow the identification of extreme daily rainfall, as was the case for temperature data.

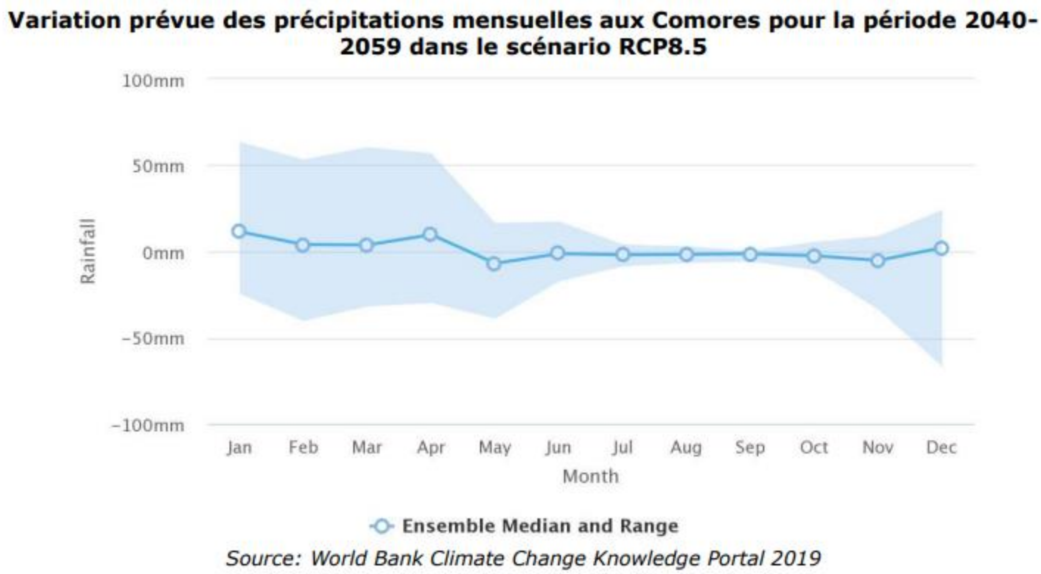

Figure 37 Expected variation of rainfall in Comoros

Data from the Moroni station over the period 1971-2000 also confirm the increase in temperature and the downward trend in rainfall. Moreover, the analysis of daily data collected at the Moroni station over the period 1971-2000 shows an increase in dry years compared to wet years. Thus the percentage of dry years increased from 20% in the first decade to 80% in the third decade. The north of Grande Comore and the regions of Anjouan (Nioumakélé and Sima, in the northern peninsula) and Moheli (Djandro), are the most arid and hot during the dry season. These regions are also the most affected by the decrease in rainfall.

In terms of forecasting and projection:

In the high volcanic islands, such as the islands of the Comoros archipelago, the rise in temperature will probably lead to a rise in altitude of certain species and a disappearance of the ridge or mountain forests. This destructuring of habitats will be to the detriment of native species and will probably accelerate the spread of invasive species that are already exerting strong pressure on the native habitats of these islands.

Between 1990 and 2050, the average temperature compared to the historical average (1951-1980) in Comoros could increase by 0.1°C to 1.7°C in the high warming scenario. The maximum increase expected in this scenario is about 2.5°C by 2050.

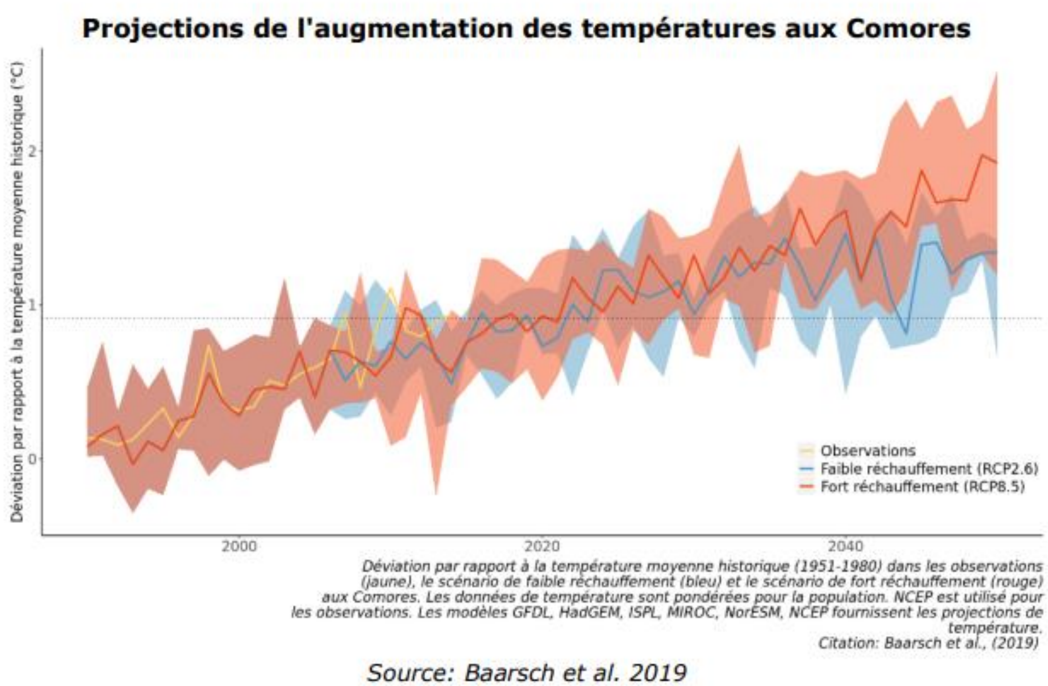

Figure 38 Projection of temperature increase in Comoros

. Mauritius, as a Small Island Developing State, is highly vulnerable to the impacts of climate change. In 2020, the World Risk Report[35] ranked Mauritius as the 51^{e} country with the highest disaster risk. Key economic sectors such as agriculture, fisheries, tourism and water are all affected. The figures showing trends in recent years are alarming.

In terms of trends:

. Concerning the rise in temperature :

Over the last 70 years, the average annual temperature on the island has increased by 1.39°C, between 1951 and 2020 compared to the period from 1961 to 1990.

For Rodrigues, the average annual temperature has increased by 1.41°C over the last 60 years (1961-2020) compared to the period between 1961 and 1990[36] .

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[35] Bundnis Entwicklung Hilft, Ruhr University Bochum - Institute for International Law of Peace and Armed Conflict (IFHV), World Risk Report 2021

[36] Ministry of Environment, Solid Waste Management and Climate Change, First Biennial Update Report (BUR1) to the United Nations Framework Convention on Climate Change, 2021

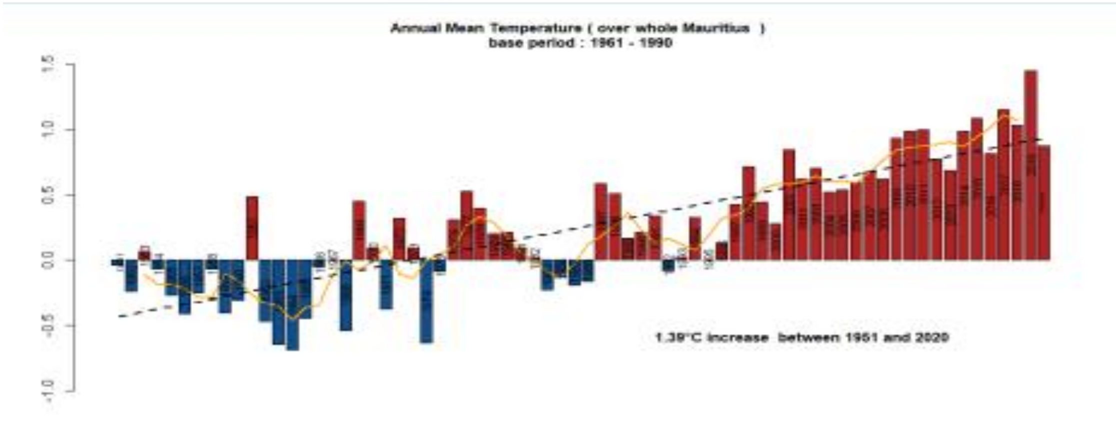

Figure 39 Average annual temperature in Mauritius between 1961 and 1990
Source: Mauritius Meteorological Services (MMS), 2021

. Concerning precipitation :

According to the MMS, the average annual rainfall on the island has decreased by 104mm over the last 70 years (1951-2020) compared to the period 1961-1990. An analysis shows a 7.7% decrease in rainfall over the last decade (2011-2020) compared to the decade of 1951-1960[37] .

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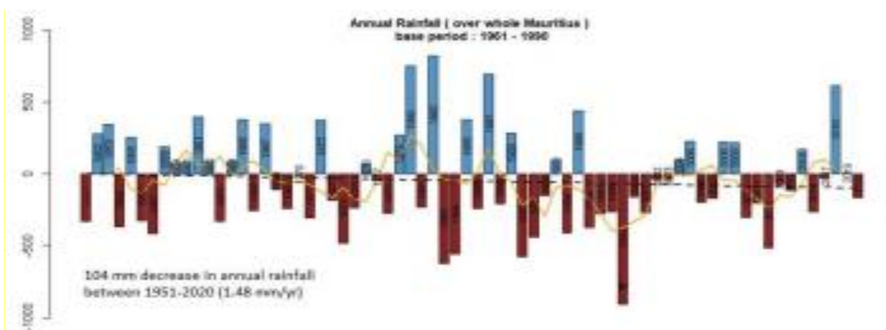


Figure 40 Average annual precipitation in Mauritius

Source: Mauritius Meteorological Services (MMS), 2021

In Rodrigues, the average annual rainfall has decreased by 234mm over the last 60 years (1961-2020) compared to the period 1961-1990.

. Regarding sea level rise, analysis of data from the Port Louis tide gauge shows an average sea level rise of 4.7mm per year over the past 33 years (1987-2020). In Port Louis, over the last decade (2011-2020), sea level has risen by 119mm compared to the 1991-2000 period.

Analysis of Port Mathurin tide gauge data shows an average sea level rise of 6.4mm per year over the last 32 years (1988-2020). At Port Mathurin, during the 2011-2020 decade, sea level rose by 144mm, compared to the 1991-2000 decade.

[37] Ministry of Environment, Solid Waste Management and Climate Change, First Biennial Update Report (BUR1) to the United Nations Framework Convention on Climate Change, 2021

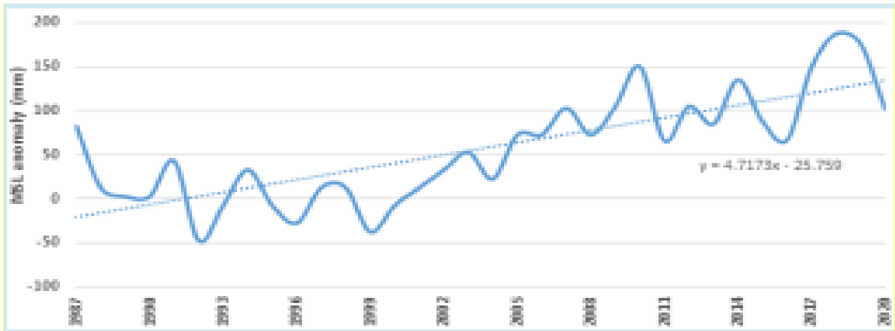
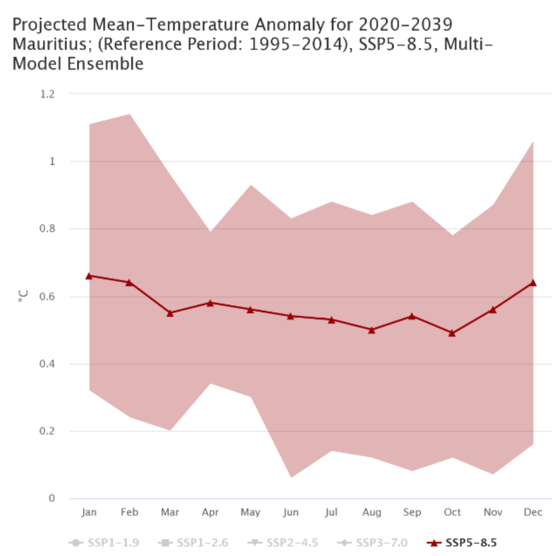


Figure 41 Sea level rise trend in Mauritius
Source: Mauritius Meteorological Services (MMS), 2021

In terms of projection:

According to the World Bank Knowledge Portal, over the period from 2020 to 2039, under an SSP5-8.5 scenario, the average annual temperature could vary by 0.57°C. Finally, precipitation variability could reach 20mm differential for the month of March and -20mm for the month of January on average.



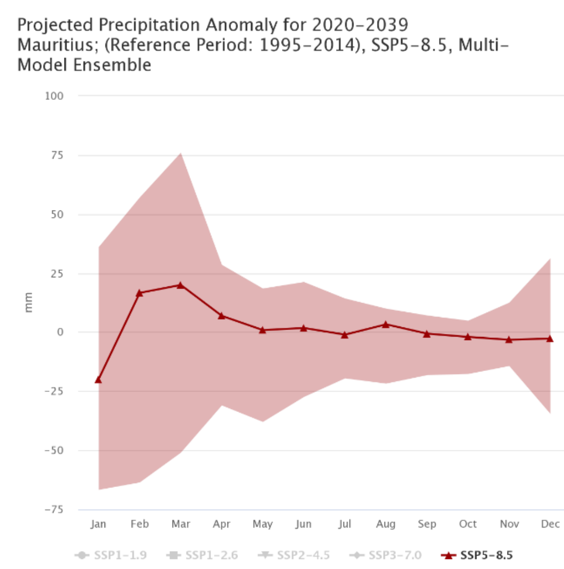


Figure 42 Projection of annual temperature variability for 2020-2039, in a SSP5-8.5 scenario

Figure 43 Projection of annual precipitation variability for 2020-2039 in a SSP5-8.5 scenario

Source: World Bank Climate Knowledge Portal, 2022

. The Seychelles[38] , due to its geographical and climatic characteristics, is a country very vulnerable to climate change. Indeed, the country has been affected several times in the past by heavy rainfall, landslides and floods, and coastal erosion is also present. Massive episodes of coral bleaching have also occurred since 1998, the latest in 2016. Periods of

38 Reference: Etongo et al. 2020

drought are also present, and water shortages are a common occurrence on the country's main islands.

In terms of trends:

. About the temperature :

According to the Seychelles Meteorological Authority, the average annual temperature in the country was estimated at 30°C from 1989 to 2018, while the minimum temperature was 25°C. Although average temperatures have not varied much from year to year over the past three decades, the differences between maximum and minimum temperatures have varied. In fact, minimum temperatures have moved closer to maximums, indicating an increasing warming of the environment over the years (Etongo et al. 2020).

. Concerning precipitation

With regard to rainfall, studies have predicted that rainfall during the rainy season will become heavier and the dry season will be drier. The average rainfall will then not be affected per se, but the intensity of the seasons in Seychelles will be affected, which could have negative impacts on the biodiversity and human population of the country.

Four major climate change issues have been raised in Seychelles over the years: increased extreme weather events, sea level rise, coastal flooding, and changing precipitation patterns. Indeed, all of these, including sea surface temperature rise and ocean acidification, will have direct and indirect impacts on biodiversity and the human population - depending on the climate scenario the world finds itself in, as well as the adaptation measures the country takes.

11.2 Overview of projected climate change impacts on human populations and biodiversity

The second part of the IPCC's Sixth Assessment Report (AR6) (April 2022) highlights the obstacles to adaptation. Indeed, the climate challenge concerns all regions of the world, but they do not all react in the same way, nor with the same degree of efficiency.

At present, there is unfortunately not enough data on the observed or potential socio-economic implications of climate change on communities in the Indian Ocean region. Only a few hypotheses have been proposed. As noted earlier, the Hotspot countries have very high population densities in the low-lying areas of their coastlines. The combination of sea level rise, degradation of the natural protection provided by coral reefs, and an increase in the number and intensity of cyclones could have dramatic consequences for the safety and livelihoods of a large number of people living in coastal areas. The displacement of coastal populations inland would constitute a new increase in land pressure, which could generate numerous social problems and jeopardize the last uninhabited natural areas.

In Madagascar, the sectoral risks related to climate change can be summarized in the following table (National Adaptation Plan, 2021):

Table 55 Potential risks from climate change in Madagascar

Climate hazard / *Sector*	Increase in temperature	Decrease in precipitation	Tropical cyclones possibly more intense	Sea level rise
Agriculture	Direct risk of increased temperatures on current crop yields. Increased risk during nighttime temperature increases. Risk of increased evapotranspiration rate, reducing soil moisture and increasing soil degradation. Risk of increased livestock mortality (especially cattle).	Risk of increased irrigation water needs, especially for rice cultivation.	Risk of damage to crops (especially plantations sensitive to such events such as bananas) and supply chains.	Risk of marine intrusion and water salinization in low-lying coastal agricultural areas with negative impacts on agricultural yields.
Public Health	Increased risk of acute respiratory illness. Risk of spreading vector-borne diseases such as malaria. Increased risk of heat stress to individuals, leading to acclimatization problems and aggravating pre-existing medical conditions such as cardiovascular problems.	Risk of lack of availability of drinking water resources. Risk of water shortage with consequences on sanitation and hygiene. Risk of evolution of transmissible vector-borne diseases due to a change in rainfall distribution between dry and wet periods.	Risk to public health due to degradation of water and sanitation quality.	Health risks related to water drilling in coastal areas (salinization of groundwater).
Water resources	Risk of increased evapotranspiration rate, reducing soil moisture and depleting groundwater replenishment. Risk of reducing runoff and surface water	Risk of increased water stress and risk of reduced drinking water resources due to lack of groundwater replenishment	Risk of damage to water infrastructure due to cyclones.	Risk of marine intrusion and salinization of surface and groundwater in coastal areas.

Climate hazard *Sector*	Increase in temperature	Decrease in precipitation	Tropical cyclones possibly more intense	Sea level rise
Risk and disaster management	Increased risk of heat stress to individuals, leading to acclimatization problems and aggravating pre-existing medical conditions such as cardiovascular problems.	Risk of drought leading to crop damage, water shortage and other socio-economic impacts.	Risk of damage to crops, infrastructure, supply chains, services, etc.	Risk of marine intrusion and salinization of surface and groundwater in coastal areas.
Infrastructure	Risk of weakening of built structures due to expansion during extreme heat events		Risk of infrastructure degradation. Risk of destruction of infrastructure	Risk of degradation of coastal infrastructure. Risk of destruction of infrastructure.
Energy	Risk of loss of flow resulting in reduced energy production.	Risk of loss of flow resulting in reduced energy production.	Risk of degradation of energy sector infrastructure.	
Coastal zone management, biodiversity and forestry	Risk of degradation of biodiversity and ecosystems, particularly increased by deforestation.	Risk of degradation of biodiversity and ecosystems, particularly increased by deforestation.	Risk of degradation of coral reefs and underwater coastal ecosystems. Risk of increased coastal flooding affecting coastal ecosystems Risk of degradation of terrestrial ecosystems	Risk of marine intrusion and salinization of surface and groundwater in coastal areas and destruction of salt-intolerant coastal terrestrial habitats
Transportation			Risk of road damage due to flooding from cyclones. Risk on other modes of transport (rail, air)	Risk of damage to road infrastructure in the immediate vicinity of the sea. Risk of damage to port infrastructure
Fishing	Risk of changes in fish populations and reproductive cycles. Risk of degradation of habitats and ecosystems (coral reefs and	Risk of lengthening low-water periods, thus disrupting the cycle of species, and potentially generating a loss of resources in fresh water.	Risk of increased production costs due to destruction of infrastructure and disruption of supply chains.	

Climate hazard *Sector*	**Increase in temperature**	**Decrease in precipitation**	**Tropical cyclones possibly more intense**	**Sea level rise**
	mangroves) and migration of fish out of historical fishing areas.			
Land use planning	Risk of reduction of cultivable land and water bodies.	Risk of reduction of cultivable land and water bodies.	Risk of infrastructure degradation Risk of degradation of agricultural land.	Risk of increased soil erosion on the coastal fringe.
Tourism	Risk of loss of tourist appeal due to worsening heat conditions, reducing the number of tourists.	Risk of loss of tourist attraction due to drought conditions affecting the green landscape, as well as biodiversity (flora and fauna).	Risk of damage to tourist infrastructure.	Risk of damage to coastal tourism infrastructure.

. In Comoros, the impact chains defined for the different sectors assessed show that the poverty of the population, the insufficient implementation and enforcement of the institutional framework, and the management of natural resources are factors that appear in all sectors and contribute to the low level of adaptive capacity. Thus, improving (and strengthening) the governance framework and poverty could lead to improved adaptive capacity in any sector.

Table 56 Some potential risks resulting from climate change in Comoros

Climate hazard	Increase in temperature	Decrease in precipitation	Tropical cyclones possibly more intense	Sea level rise
Agriculture	Direct risk of increased temperatures on the yield of current crops. Risk of increased evapotranspiration rate, reducing soil moisture and increasing soil degradation and loss of fertility.	Risk of increased irrigation water requirements, especially for market gardening.	Risk of damage to tree crops in the undergrowth such as orchards, clove and ylang plantations (in particular.	Risk of marine intrusion and water salinization in low-lying coastal agricultural areas with negative impacts on agricultural yields.
Breeding	Risk of pasture reduction due to grass desiccation Risk of wildfire and grassland for livestock grazing	Risk of reduction of the livestock by the reduction of the watering points by the drying up of the rivers and the drying up of the wetlands	Risk of death or injury to animals due to falling large Arab suites	Relocation of livestock from coastal areas to highland areas due to the absence of fodder in areas flooded by the sea
Fishing	Risk of changes in fish reproduction cycles. Risk of degradation of habitats and ecosystems (coral reefs and mangroves) and migration of fish out of the usual fishing areas	Risk of lengthening low water periods, thus disrupting the cycle of species, and the immigration of amphidromous species	Risk of increased production costs due to destruction of infrastructure and disruption of supply chains. Risk of loss of life	
Health	Increased risk of acute respiratory illnesses, increase in vector-borne diseases such as malaria. Increased risk of heat stress for people, especially the elderly with the resulting	Risk of lack of availability of drinking water resources.	Public health risk due to the degradation of water and sanitation quality and drinking water distribution infrastructures	Health risks related to the salinization of groundwater

Climate hazard	Increase in temperature	Decrease in precipitation	Tropical cyclones possibly more intense	Sea level rise
	health problems			
Infrastructure	Risk of weakening of built structures due to expansion during extreme heat events		Risk of degradation and destruction of infrastructure	Risk of degradation of coastal infrastructures and destruction of coastal infrastructures, houses Risk of flooding, losses of coastal agricultural production
Biodiversity	Risk of degradation of biodiversity and ecosystems, particularly increased by deforestation and the spread of invasive alien species.	Risk of degradation of biodiversity and ecosystems, particularly increased by deforestation and the search for new arable land	Risk of degradation of coral reefs and underwater coastal ecosystems. Risk of increased coastal flooding affecting coastal ecosystems Risk of degradation of terrestrial ecosystems	Risk of marine intrusion and salinization of surface and groundwater in coastal areas and destruction of salt-intolerant coastal terrestrial habitats

. Agriculture

The influence of climate change and climate variability on the agricultural sector is visible:

- Delayed fruit ripening due to prolonged drought and high temperatures;
- Corn production is suffering from the drought. The leading corn-producing region is also the most exposed to the decline in rainfall. The harvest fell from 4,000 tons in 1999 to 3,500 tons in 2000;
- The reproduction cycle of crop pests coincides with the harvest period. This coincidence leads to the destruction of crops. Appearance of new diseases such as the coconut whitefly (*Aleurotrachelus atratus*) leading to a decrease in production and income;
- Whitefly also deposits fumagin on associated crops (vanilla, banana, etc...) thus compromising photosynthesis;
- Development of cercosporiose (*Cercorporella fujiensis)* on banana and significant crop losses, reduced income and increased food insecurity

As almost all of the village lands are already exploited or degraded, village communities compete for the remaining spaces, which generates inter-community conflicts over the ownership of lands and natural resources. The village communities encroach on the State's domain and tend to question the public ownership of the land they occupy.

The sensitivity of the agricultural sector is very high at the national level and for each of the three islands. This is largely due to heavy deforestation on all three islands and the degradation of more than half the land.

The adaptive capacity at the national level is very low. Indeed, in addition to poverty (low incomes), there is a lack of farmer support in all three islands (access to extension, access to credit, enforcement of laws) and weak enforcement of the institutional framework.

. Breeding

The livestock is small-scale and mainly consists of poultry and ruminants. Prolonged drought leads to a reduction in pasture by the drying up of grasses. Land degradation and the disappearance of fallow land also limit the capacity for forage production. The reduction of water resources reduces watering possibilities: too often, banana trees are chopped up to be used as water for livestock. This leads to undernourishment and a high susceptibility to parasitic attacks and epidemics such as theileriosis, which has decimated 20% of the cattle in Grande Comore.

High temperatures reduce the ingestion capacity of food, especially for small-scale poultry farming, which reduces an already low production. Climate change has a negative influence on local meat production, increasing the country's dependence on protein imports. The high cost of access for the poorest people exposes them to chronic malnutrition.

- Forest

The Union of the Comoros has a forest heritage characterized by high levels of endemism. This heritage is currently undermined by significant and uncontrolled deforestation for agricultural purposes (banana and taro plantations, coconut trees, etc.) or logging for timber, fuelwood, charcoal, notably for the distillation of ylang-ylang. The forest no longer plays its role as a provider of ecological services such as the protection of water resources and soil. This degradation process has considerable impacts on coastal erosion and the regulation of the flow of springs and rivers in the archipelago.

In spite of the numerous reforestation operations carried out, the country has been facing for several years an important deforestation and an accelerated degradation of its terrestrial biodiversity. The regression of the forest continues until now.

The effects of climate change are affecting the distribution, composition, structure and health of forests. The main manifestations of the potential impact are the decrease in forest area and the loss of biodiversity. The most recent data show that from 1950 to 2016, the forest area is estimated to have decreased from 31,000ha to 3,000ha, or 2% of the national territory (FAO, 2016). Only a few relics of high altitude forest and on steep slopes currently remain. This deforestation plays a very important role in the loss of natural habitats of species and the drying up of water sources in the country. It is favored by inadequate and unsustainable cultivation and agricultural practices.

- Fishing

Fishing is a relatively dynamic sector, but it is still artisanal in nature. It is practiced in a maritime area estimated at more than 160,000 km² covering 900 km² of continental shelf and 427 km of coastline. The fishery resources of this area are estimated at 33,000 tons annually, of which 64% is currently exploited.

Significant pressure continues to be exerted on the coastal fringe by certain fishing practices such as longline fishing concentrated on the fringing coral reef, and certain destructive techniques still practiced illegally ("*uruva*" or poison extracted from *theophrosia,* phytosanitary products, dynamite, nets with too fine a mesh...). These practices as a whole threaten the balance of the food chain and the sustainability of fishery resources.

Climate and climate variability impact species migration, ecosystem degradation (reefs, mangroves) or coral bleaching. The abnormal rise in ocean temperatures causes coral bleaching leading to high coral mortality. The disappearance of reefs favors coastal erosion and accelerates the decrease of coastal fishing. Consequences: decline in fishing revenues; significant post-harvest losses due to high temperatures in the absence of means of preserving products and limited sea trips during cyclonic periods and heavy rains. The result is a chronic shortage of fish on the market and difficult access, especially for the poorest.

- Water resources

The country has a significant water potential, but it is distributed differently among the islands. Indeed, the problem of water is not the same on all the islands. There is no permanent hydrographic network in Grande Comore because of the permeability of its soils.

Due to the increase in temperature, runoff and evapotranspiration are causing a risk of a decrease in water reserves in Grande Comore. The deterioration of water quality is observed especially by the rise in sea level in the localities of Chindini, N'tsaouéni, Mitsamihouli, Chamlé, Foumbouni. As a result of the increase in temperature and a decrease in rainfall, the hydrographic network in Anjouan and Moheli is shrinking; there is a deterioration in water quality, difficulties in water supply, and a reduction in hydroelectric potential, which is fuelling the current energy crisis in these two islands.

- Health

The health sector is very sensitive because of its environment; in particular the quality of water and the state of sanitation are very unfavorable factors. The poor quality of water is considered very critical. According to the MICS 2000 findings, almost the entire population uses unsafe water, a potential source of diarrheal, infectious and parasitic diseases. Moreover, children suffering from malnutrition are the most vulnerable.

Although tangible results have been achieved in the fight against malaria, the Union of the Comoros continues to experience repeated health crises, fostered by the development of widespread insalubrity, the absence of basic hygiene and sanitation measures, and inadequate sanitary control.

Recent studies also show that eighty-eight (88) percent of diarrheal diseases are attributable to poor water quality and sanitation. There is already an increased incidence of vector-borne diseases, and some health problems are likely to increase as a result of climate change, such as vector-borne infectious diseases and marine animal poisoning (MSP) resulting from toxic algal blooms due to coral bleaching and death and pollution.

- Infrastructure

This sector concerns infrastructure such as roads, water infrastructure, hotels, ports, airports and human habitat. These sectors are experiencing varying degrees of deterioration due to climatic events, among other things. The road infrastructure sector has seen an accelerated deterioration of 70% of the roads.

Thus, the infrastructure sector is highly exposed to climatic factors and in particular to extreme events and to landslide and flood phenomena. The overall vulnerability of the infrastructure sector is high but not critical.

- Biodiversity

The Union of the Comoros has natural resources and a fairly rich biological diversity. It has an invaluable potential in terrestrial and lacunar ecosystems characterized by high levels of endemism for both flora and avifauna. This heritage is currently weakened by both anthropic actions and the effects of climate change.

Climate change favors the proliferation of invasive alien species. The latter is considered the primary cause of biodiversity erosion in small islands. In the marine environment, the rise in temperature favors the proliferation of toxic algae and bleaching with a drastic reduction in the marine fauna and flora that directly depend on these two environments, the sea grass and the reef.

This situation in marine and terrestrial environments affects vital ecological processes such as the water cycle, the fight against pollution by silting up coastal and marine areas, as well as the dynamism of buffer zones protecting against natural disasters.

The overall vulnerability of the biodiversity sector is above average and among the highest. With a very high vulnerability for Anjouan and Moheli compared to Grande Comore. The overall vulnerability index is 0.66 for the country as a whole and 0.68 in Grande Comore, 0.76 in Anjouan and 0.72 in Mohéli.

. In Mauritius, large urbanized areas on the coast, particularly exposed to the west, would be threatened by swell if the reef barriers were to disappear. The degradation of beaches and corals could hinder the development of tourism. Deterioration of the reefs could lead to the decline of many commercial fish species and cause a decrease in income for fishing communities. The economic loss to the tourism and fisheries sector from the 1998 bleaching event has been estimated to be between US$608 and US$8,026 million for the Indian Ocean as a whole (Caesar, 2003). Finally, the increase in water temperature and the degradation of coral reefs in the region create ideal conditions for the development of certain micro-algae that are highly toxic to marine fauna and humans.

Most productive sectors are likely to suffer from climate change, although the degree of vulnerability varies.

Table 57 Expected degree of vulnerability of the different sectors of the productive sector for the islands of the Western Indian Ocean, in particular for Mauritius (based on Rakotobe et al. 2012, updated 2022 in italics).

Sector	Features	Degree
Agriculture	Sugar cane cultivation can adapt to climate change. *However, the production of vegetables and fruits was affected by the climatic extremes.*	Medium
Food safety	The availability of food is highly dependent on transport costs and availability in the producing countries: if the latter is affected by CC, products will become scarcer and more expensive. *In recent years, food production has been affected by climate (droughts, floods, soil depletion), causing soil depletion and resulting in food shortages that have been overcome by food imports (even by air).*	Bottom
Artisanal fishing	Although the effect of CC on ocean fisheries is not well understood, the global change could affect fish migration and concentration. *The apparent increase in bad weather days, including torrential rains, has affected the number of fishing days, and therefore income, and the supply of fish*.	Medium
Livestock farming	Heat stress could reduce livestock productivity	Bottom
Supply of drinking water	Despite forecasts of reduced rainfall, some large hotels are legally required to desalinate water to meet demand	Bottom
Health	Climate-related diseases such as chikungunia or dengue could spread in the region, but good preventive activities have been developed.	Medium

. Overall, the projected impacts of climate change in **Seychelles** are (non-exhaustive list) :

- On biodiversity:

  - The spread of invasive alien species (IAS) will increase in a changing, and particularly warmer, climate. This could have dramatic consequences for endemic and native ecosystems that are less resilient to climate change

- Changes in rainfall patterns and the possible intensification of droughts will affect ecosystems through a range of possible consequences: forest fires and water scarcity for fauna and flora. Increased sea surface temperature and sea level rise will directly affect marine and coastal ecosystems: negative effects on marine microbiomes or coral bleaching events are two of the consequences, as well as instability or loss of the mangrove ecosystem due to possible higher wave intensity (combined with sea level rise).

- On the human population:

  - The impacts of climate change on coral reefs, plankton and the marine ecosystem in general could have a negative impact on the country's fishing activities (artisanal fisheries and part of the national culture) and industry (key economic income).
- Future water scarcity could have significant consequences for access to fresh water (especially in an island state) and food security (impacts on agriculture).
  - Intensified flooding of key areas for the human population will also be one of the consequences, affecting critical infrastructure (hospitals, roads, schools, houses) and the country's economic system.
  - The risk of increased landslides must also be considered with changes in the rainfall regime.
  - All of the above impacts could in the long run also affect the tourism industry, which is one of the main sources of income for the country.

11.3 Description of current and potential opportunities for climate adaptation and mitigation in the hotspot

Opportunities include the suitability of protected area systems for promoting resilience.

11.3.1 Madagascar

In terms of adaptation

In the National Adaptation Plan adopted in 2021, the following sectors have been prioritized: Agriculture-Livestock-Fisheries, Water Resources, Public Health, Biodiversity and Forestry, Coastal Zones, Infrastructure and Land Use Planning, Risk and Disaster Management, Housing and New Cities.

The strategic priorities proposed for these sectors are the promotion of climate change resilient activities, as well as the promotion of research and the creation of favorable conditions for the implementation of the proposed activities. Many of the planned activities are already being implemented in several regions of the country and adopt the Ecosystem-based Adaptation (EbA) approach.

In Madagascar, the adaptation approach has effectively embraced the three imperatives of EbA:

- Consideration of stressors and climate shocks,
- Consideration of the impacts on livelihoods, and thus the search for the well-being of populations,
- Actions on natural areas, restoring or strengthening ecosystem functions.

Among the priorities, the following can be cited:

Table 58 Priorities for adaptation in Madagascar

Agriculture	Breeding	Fishing	Water resources	Biodiversity and forestry	Coastal areas
- Promoting resilient agricultural systems - Securing the land - Supporting the development of resilient crops, particularly through support for agribusiness activities - Establish an early warning and disaster management system tailored to agricultural systems.	- Supporting sustainable livestock practices - Improving livestock resilience - Promote scientific and technological research to better understand the impact of climate change on livestock.	- Establish marine reserves and protect corals and mangroves - Develop and popularize new fishing techniques - Develop weather early warning systems for fishermen.	- Preserve and secure water resources through the implementation of integrated water resources management - Better manage flood and erosion risks in urban and rural areas - Supporting sustainable water management in times of drought, especially in the southern part of the country.	- Maintain existing forest cover and - Create a network of conservation forest corridors - Implement a large-scale restoration program for the most threatened ecosystems	- Develop and promote sustainable economic activities in coastal areas - Reinforce the fight against erosion and marine submersion - Ensure optimal protection of the coastline through adequate Integrated Coastal Zone Management (ICZM).

In addition to these actions, the surface area of Marine Protected Areas will be tripled (according to the Sydney Promise at the World Parks Congress in 2014).

In terms of mitigation:

Initiatives are being conducted or planned across different sectors to contribute to the mitigation of GHG emissions and in so doing, to the preservation of ecosystems and biodiversity:

Table 59 Planned mitigation actions in Madagascar

Agriculture	Scaling up Integrated Models of Resilient Agriculture, including: Intensive Rice Farming Systems and Improved Rice Farming Systems, Modernization and innovation of existing farming models, development and promotion of organic agriculture covering the main food commodities produced in the country, Scaling up of rice production improvement initiatives taking into account best low-carbon and climate-resilient techniques, covering at least the regions providing one-third of the national production, Diffusion of conservation agriculture.

Land Use and Forest Conversion (LUCF)	Strengthen the national network of protected areas by achieving an average annual deforestation rate below 0.5% in all protected areas, Conducting sustainable development actions for the population living in the vicinity of protected areas and forest zones, Strengthening of reforestation and restoration of forests and natural ecosystems. These measures ensure that the national potential for absorption and sequestration of greenhouse gases is maintained and enhanced.
REDD +	Implementation of the national strategy and regional REDD+ strategies
Energy	Scaling up access to modern lighting and electricity for isolated rural households, Energy recovery from agricultural residues and waste, Scaling up the various initiatives for the promotion and development of alternative and/or substitute energy production activities, Dissemination of fuel-efficient stoves to all charcoal-consuming areas and scaling up of bioenergy initiatives (bioethanol, biofuels) to all wood-energy consuming areas.

11.3.2 Comoros

The process of creation and operationalization of protected areas will eventually contribute to the protection of at least 46,800 ha of new terrestrial areas (Karthala forests, Ntringui mountain, Mwali rainforest), thus expanding the area of protection of terrestrial areas to 27% of the national territory. The project will also create marine protected areas (Turtle Island/North Ngazidja, Coelacanth area and Bimbini Peninsula), covering about 11,020 ha of marine areas, thus extending marine protection to some 3.8% of the territorial waters. All existing PAs/MPAs provide habitat for unique and threatened species throughout the country.

The long-term solution is to establish an effective PA management system in Comoros, consisting of terrestrial and marine protected areas, that is representative of the country's biodiversity and provides much greater protection for currently unprotected ecosystems and a refuge for threatened species. The sustainability of this system must also be assured. The establishment of PAs requires investment and commitment from both government and donors.

11.3.3 Mauritius

Since the ratification of the Paris Agreement in 2016, the Government of Mauritius has strengthened its multi-pronged approach to building resilience to climate change and moving towards a low carbon economy. In addition, the Government has proposed a series of laws to support the mainstreaming of climate change in key sectors and this culminated in the passage of a Climate Change Act in November 2020.

The upcoming Environmental Blueprint, which will provide a policy strategy for the next 10 years and a five-year action plan, also includes a dedicated climate change component with key actions that will support the goal of building our resilience to the impacts of climate change and achieving a low-carbon economy model. Several measures are included.

In terms of adaptation[39] :

Coastal resources

Of the three categories of responses required to protect human life and property, as recommended by the IPCC, the protection and accommodation options would be the most appropriate, as the size of Mauritius is too small for the withdrawal or abandonment option.

Protection options

Hard structures to protect beaches are sometimes the only viable options. However, studies need to be conducted to identify the best orientation for these structures. The use of gabion structures should be expanded and improved based on past experience.

Soft solutions, such as vegetative cover, should be adopted where appropriate. Walkways should be constructed to avoid further degradation of the already scarce beach vegetation.

Beach nourishment, a more popular form of erosion control, should be adopted. Future shoreline protection should include beach restoration and maintenance as well as dune protection from cyclonic waves.

Design options

The setback distance should be increased beyond the current 15 m from the high water mark. Steps should be taken to ensure that sand removal is completely prohibited beginning in 2001.

Existing passes through the reefs should not be expanded and new passes should be avoided altogether.

Agriculture, Land Use Change and Forestry

Agriculture

Agricultural systems have always adapted to change. The extent and nature of the impacts will determine the degree of adaptation. Adaptation will certainly depend on the degree of adoption of new technologies and management rules, but will be limited by economic and political factors. Expected adjustments will involve changes in land use, management and infrastructure. However, because of all the uncertainties associated with climate change, it is very difficult to recommend specific options.

Land use changes

Implementing land use changes does not seem to be a feasible adaptation measure since land is a limited resource. A change in crop type does not seem feasible either. Growing more drought resistant cultivars may be an interesting adaptation strategy for areas where soil moisture will become the limiting factor. A change in harvest date may also be considered to make more efficient use of environmental resources.

Changes in management and infrastructure

As crop water requirements increase under warmer conditions and with the possibility of less rainfall distribution, irrigation facilities will need to be expanded.

Fertilizer use will change and larger amounts may be required to counteract the effect of soil erosion and leaching. Agricultural infrastructure and practices may need to be modified to mitigate the effects of climate change.

Forestry

[39] Source : https://unfccc.int/resource/docs/natc/maunc1/chap3/chapter3.htm

The best option appears to be closer monitoring to prevent further degradation. More adapted species can be introduced for use in plantation forests. Ecosystems need to be monitored more closely so that prompt action can be taken if the balance of species is affected. Planting trees along riverbanks and highways should be considered.

Water resources

Adaptation options to maintain and ensure adequate water supply and quality are to:

- encourage the use of “grey” water for secondary household uses;
- Build rainwater harvesting surge tanks;
- monitor graywater sources in the outer islands;
- increase storage capacity.

In terms of mitigation:

According to the updated NDC 2021 and based on current projections, Mauritius aims to reduce overall GHG emissions by 40% in 2030 compared to business as usual (BAU) (equivalent to 2,893 ktCO_{2eq} of avoided emissions). Compared to the 2015 INDC target of 30% GHG emission reductions and given its national circumstances, Mauritius’ mitigation ambition is significantly enhanced. The table below summarizes the information on the mitigation measures and their respective targets.

Table 60 Planned mitigation actions in Mauritius by 2030

Mitigation action	Sector	Quantitative objectives	Status
Accelerating the transition to a low-carbon economy in the Republic of Mauritius	Energy	Greenhouse gas reduction of 4.27 million tCO2e over the life of the investments made	In progress
Mandatory energy labelling	Energy	Reduce household energy consumption by transitioning to more energy efficient appliances by 2030	In progress
Change to a mass transport system (light rail)	Transport	20% of bus users and 10% of personal vehicle users are expected to switch to the LRT Metro Express system, reducing traffic congestion and carbon emissions	In progress
Standards for treated manure from animal waste	Agriculture	Reduction of GHG emissions by 20% of total manure management emissions	In progress
Promotion of small livestock projects in the gardens	Agriculture	Reduction of GHG emissions by about 1 to 5% of livestock-related emissions	In progress
Tree planting and creation and maintenance of mini forests, nature walks, urban forests, parks and gardens, etc.	AFOLU	Planting of at least 100,000 trees annually (until 2024)	In progress

Mitigation action	Sector	Quantitative objectives	Status
Forest restoration - Nature reserves, mountains, rivers, forest plantations	AFOLU	75 ha of mountain reserves are restored by 2030	In progress

(Table from First Bi-annual Update Report - Republic of Mauritius.pdf (unfccc.int), 2021

The national budget released in June 2022 gave significant tax incentives for increased electricity production from solar panels, and the purchase of electric cars, in line with the policy of achieving carbon neutrality by 2070.

11.3.4 Seychelles

For Seychelles, the following opportunities for action in the context of climate change should be noted:

- Reforestation of interior forests with endemic and native species projects (e.g. TRASS)

- Mangrove planting and preservation projects

- Transition from the national energy model (fossil fuels) to renewable energies

- Ecosystem-based adaptation (EbA) actions such as the continuation of initiatives to reduce the vulnerability of Seychelles in terms of freshwater scarcity and flood risk, by implementing wetland and coastal (including coral reef) rehabilitation and watershed restoration projects with an important dimension of local community involvement. In addition, projects to raise awareness and *empower* the general public and local communities (including youth and women) on issues related to EbA should also be pursued, as should projects aimed at integrating the above elements into public policies.

- Implementation of Seychelles Marine Spatial Planning and effective management of 30% of the marine protected areas in the Seychelles Exclusive Economic Zone" (Seychelles NDC, 2021)

- Blue carbon sequestration projects: The last 5 years have seen an increased understanding of the role of seagrass beds in climate mitigation in Seychelles. The country is now among those pushing this approach at the international level. Research and conservation actions have been implemented in recent years to better understand and protect this ecosystem and the mitigation opportunities it can provide

- Strengthen the protection status of ecosystems that are critical for climate change adaptation and mitigation: 50% protection of Seychelles seagrass and mangrove ecosystems by 2025, 100% protection of seagrass and mangrove ecosystems by 2030 (Seychelles NDC, 2021)

- Establishment of a long-term monitoring program for seagrass and mangrove ecosystems (Seychelles NDC, 2021)

- Integration of climate change adaptation issues into national fisheries strategies (Seychelles NDC, 2021)

- Strengthening the use of nature-based solutions to build resilience in coastal ecosystems, and in particular nature-based blue solutions (Seychelles NDC, 2021)

- Further development of the Ridge to Reef approach and its implementation in the agriculture, environment, water resources and urban development sectors (Seychelles NDC, 2021)

- Strengthening the implementation of capacity building actions and strengthening data collection and management (Seychelles NDC, 2021).

11.4 Review of policy responses, including key climate change initiatives

This review examines the extent to which climate change analyses and policies are in place for adaptation and mitigation, and their effectiveness in integrating biodiversity considerations and potential future needs.

11.4.1 Madagascar

The various reference documents it has developed (Chapter 9) enable Madagascar to benefit from support deployed at the global level (e.g., GEF, VCF, etc.) to combat climate change and also to protect its exceptional biodiversity.

The Nationally Determined Contribution (NDC, 2015) and the National Adaptation Plan (NAP, 2021) to climate change provide the policy and strategic basis for Madagascar on climate change.

The NDC document, whose update will be finalized very soon, reflects the national and sectoral policy directions that countries will achieve to fight against global warming. For Madagascar, in 2030, the updated NDC (NDC 2), aims at a 16% reduction of greenhouse gas emissions, i.e. 28,181.5 Gg CO_2 eq. In addition to this reduction in emissions, the NDC2 aims to increase its greenhouse gas absorption capacity by 20%, i.e. -37,809 Gg CO_2 eq. of additional sequestrations. Thus, the NDC2 is a strategic planning document to fight against climate change in the short term, to which all actions at the national level should refer.

As for the NAP, it is now the reference document for all interventions of stakeholders (sectoral ministries, partners) in terms of adaptation to climate change.

The NAP was developed with a 10-year planning perspective, with the possibility of revision after 5 years, and proposes 12 structuring inter and multi-sectoral programs, reflecting the cross-cutting nature of climate change adaptation:

- Establishment of a green belt to strengthen the fight against desertification and resilience to climate change
- Strengthening agricultural sector adaptation and rural resilience in the Deep South.
- Strengthening the resilience of rural populations through the development and organization of export channels.
- Strengthening the adaptation of the fisheries sector and developing warning systems and associated action plans.
- Improving access to safe water in urban and rural areas.

Strengthening early warning systems for health sector resilience to climate change

- Acceleration of reforestation through the operationalization of the REDD+ mechanism and the development of ecosystem services

▪ Improved natural forest conservation and protected area management incorporating the development of climate refuge areas in and around the interior

▪ Protection of coastal infrastructure and economic activities (including tourism) from sea level rise

▪ Improving cyclone early warning systems as part of a regional effort in the Indian Ocean.

▪ Development of resilient, less methane-emitting rice fields.

▪ Optimizing the resilience of new cities and sustainable and innovative housing for the modernization of Madagascar.

To date, the mobilization of funding for the fight against climate change remains low in Madagascar. The NAP and the NDC thus help guide the search for funding. They also serve to inform the Conference of the Parties on the progress of the process of fighting climate change to which the country is committed.

11.4.2 Comoros

The Union of Comoros participated in the negotiations held at the 2015 Conference of the Parties in Paris (COP21). The country demonstrated its commitment and political will to mitigate and adapt to climate change and associated risks and to pursue clean carbon development strategies. It was already among the first countries to ratify the United Nations Framework Convention on Climate Change, adopted in New York on May 9, 1992 (Decree N°94-010/AF of June 6, 1994). It had to prepare three National Communications to the UNFCCC and to adopt a Program of Action for Adaptation (NAPA) in 2005.

As a signatory to the Paris Agreement and in line with its commitments, the Union of Comoros also submitted its first nationally determined contribution (NDC) in September 2015 and a revised version of its NDC in 2020. It has developed a policy and strategic framework that already partly reflects the importance of climate change and the natural environment for the country’s sustainable development. This framework specifically includes the National Environmental Policy (NEP), the National Adaptation Program of Action (NAPA) and the Nationally Determined Contribution (NDC), the Strategy for Accelerated Growth and Sustainable Development (SCA2D), and the Plan Comores Émergent (PCE).

Significant progress has been made, including the prioritization of climate change issues and the improvement of its environmental and climate governance (creation of state entities and regulatory texts dedicated to climate change). The Union of Comoros has launched its National Adaptation Plan (NAP) development process with the objective of reducing climate vulnerability in the medium and long term, and facilitating the integration of climate change adaptation, in a coherent manner, into relevant new and existing policies, programs and activities, in particular development plans, processes and strategies, in all relevant sectors and at different levels, as appropriate. The NAP is not yet fully developed and therefore not yet adopted.

Given the country’s high vulnerability to multiple hazards (cyclones, floods, drought but also earthquakes and volcanic eruptions) and the effects of these disasters compounded by natural and man-made threats, including climate change, environmental degradation, droughts, rapid and uncontrolled urbanization as well as the lack of capacity and financial resources to which the Comoros is exposed, the country has relied on a number of opportunities to build its resilience, including
- The establishment of a national platform for disaster risk prevention and reduction (Decree n°12-181/ PR).

- The development of a National Strategy for Disaster Risk Reduction 2015-2019 (SNRRC). This strategy is being revised to align it with the post-2015 conventions namely the SDGs, the Sendai framework and the Paris Climate Agreement.
- The establishment of monitoring and warning centers (Karthala Volcano Observatory, Technical Directorate of Meteorology, Epidemiological Monitoring Center).
- The development of local training and capacity building sessions.

11.4.3 Mauritius

Mauritius is committed to fully supporting the international climate negotiation process. Mauritius was among the first countries to ratify the UNFCCC (1992), the Kyoto Protocol (2001) and the Paris Agreement (2016).

The country also intends to provide a timetable for carbon neutrality by at least 2070. The Republic of Mauritius has ratified the UNFCCC, produced its third national report on climate change (for the UNFCCC) and the fourth report is currently being produced.

The Global Risk Report 2018 ranks Mauritius as the 16th highest disaster risk. To combat climate change, a dedicated division has been created in the Ministry of Environment.

Preparing to deal with worsening climate change, the Republic of Mauritius has developed a number of policy and legislative measures to build resilience to the impacts of climate change and to embark on a low-emissions pathway: the Energy Efficiency Act 2011; the Renewable Energy Strategic Plan (RESP) 2018-2023; the Nationally Determined Contributions 2021 Update, etc.

In the area of climate change, again the landscape is fragmented: while the Ministry of Environment plays a leading role in environmental management, its climate action is complemented by other ministries and in particular the Ministry of Energy and Utilities, whose action contributes directly to the mission of combating climate change. This sector plays a major role in the mission to fight against climate change, through two separate authorities: the Energy Efficiency Management Office (EEMO) and the Mauritius Renewable Energy Agency (MREA). These agencies aim to promote the efficient use of energy, raise national awareness and promote the adoption and use of renewable energy with the aim of achieving sustainable development goals.

Also, recently, in 2020, the Government of the Republic of Mauritius published the Climate Change Act creating a Climate Framework Act. This Act establishes climate institutions and agencies and sets out their functions. An Inter-Ministerial Council on Climate Change has also been established and is responsible for setting national objectives, goals and targets for climate change resilience and emission reductions. The same law establishes a Committee on Climate Change whose main function is to coordinate the preparation of reports related to climate change and to implement activities related to GHG inventory and reductions as well as activities related to the assessment of vulnerabilities and adaptation to climate change was also created.

The law is also applicable to Rodrigues and sets up dedicated institutional bodies and specific strategies and policies.

In general, Mauritius is committed to fully supporting the international climate negotiation process. Mauritius was among the first countries to ratify the UNFCCC (1992), the Kyoto Protocol (2001) and the Paris Agreement (2016). The first Nationally Determined

Contributions (NDCs) committed to reducing greenhouse gas emissions by 30% by 2030 compared to the business-as-usual scenario of 7 $MtCO_{2e}$. The country also intends to provide a timetable for achieving carbon neutrality by at least 2070. In addition, the government has proposed a series of laws to support the integration of climate change into key sectors and this has resulted in the passage of a Climate Change Act in November 2020. The next Environment Master Plan, which is being developed to provide a policy strategy for the next 10 years and a five-year action plan, also has a dedicated climate change component with key measures that will support these goals of building resilience to the impacts of climate change in order to achieve a low-carbon economy model.

According to the updated NDC 2021 and based on current projections, Mauritius aims to reduce overall GHG emissions by 40% in 2030 compared to business as usual (BAU) (equivalent to 2,893 ktCO2eq of avoided emissions). Compared to the 2015 INDC target of 30% GHG emission reductions and given its national circumstances, Mauritius' mitigation ambition is significantly enhanced.

Specifically regarding climate change adaptation, in 2021, the new National Climate Change Adaptation Policy Framework (NCCAPF) was developed and approved by the government. In alignment with the previous NCCAPF (2012) and other national priorities, the current updated NCCAPF (2021) focuses on the potential of nature-based solutions (NbS) for adaptation, as well as the creation of green jobs, thus managing the impacts of the VOCID-19 pandemic, while addressing some of the most pressing issues regarding biodiversity and sustainable resource management. In line with the National Biodiversity Strategy and Action Plan 2017-2025, the updated NCCAPF promotes ecosystem-based adaptation (EbA), which leverages biodiversity and ecosystem services to reduce vulnerability and build resilience to climate change.

11.4.4 Seychelles

Seychelles has adopted and implemented a series of plans and policies over the years regarding climate change mitigation and adaptation, beginning with the adoption of the United Nations Framework Convention on Climate Change (UNFCCC) in 1992, which advanced the creation of a National Climate Change Council (NCCC).

Seychelles' international climate change commitments and policy frameworks are outlined in Chapter 9. Nevertheless, it is important to highlight that over the past five years several plans have been updated and new measures and approaches have also been integrated into the national climate change strategy (such as the role of blue carbon mitigation), both nationally and internationally.

For example, the Coastal Management Plan (CMP) 2019-2024 was developed in 2019 for a period of five years and allowed the implementation of a coastal management strategy in some areas. In recent years, the following have been developed: the Wetlands Policy and Action Plan of 2018-2022, as well as the Water Policy in 2017 and the Blue Economy Strategic Policy Framework and Roadmap 2018-2030, the National Development Strategy [NDS] 2019-2023, and the Nationally Determined Contributions [NDC] of 2021, which established an important roadmap in terms of adaptation and mitigation for the Seychelles. Also to be considered is the 2015-2020 National Biodiversity Strategy and Action Plan (NBSAP), an updated version of which is currently being drafted.

Nevertheless, according to the Seychelles Climate Change Policy Report 2020, there is still work to be done to further develop actions and policies related to climate change mitigation and adaptation. Furthermore, these various national reports highlight some potential needs in terms of adaptation and mitigation measures for the future (Seychelles National Climate Change Policy 2020):

- integration of climate change considerations in society, including in the private sector and at all levels of government;

- Improved (long-term) research and monitoring of climate change stressors and their impacts in the Seychelles (granite and coral islands);

- Capacity building and understanding, as well as engagement at all levels of society (government, youth, civil society, private sector), to respond to and implement adaptation and mitigation challenges;

- the transition to an ambitious and sustainable low-carbon economy;

- the ambitious transition to a climate change resilient society.

11.5 Role of civil society

By definition, civil society, while not taking the place of state authorities, uses its facility to be a local interlocutor with local communities and various institutions.

The situation is not the same for the four islands regarding the existence and level of involvement of civil society members. However, they have the following points in common and that they can assume the role of relay actors for the conduct of awareness raising activities, to provide training and to accompany the monitoring on the ground and reporting to the authorities. In terms of climate change, these actions obviously focus on mitigation and adaptation efforts.

Strengthening the participation of civil society organizations and nongovernmental organizations, combined with better coordination and adequate monitoring and evaluation mechanisms, are ways to address the fragmentation of governance, limited access to information, and significant geographic distances between communities and decision-making centers. The related strategic directions also call for financial sustainability of civil society organizations and nongovernmental organizations, better clarification of roles, more widespread geographic coverage, and strengthened representative functions.

Madagascar

NGOs involved in biodiversity conservation are also “de facto” involved in the fight against climate change.

They have significantly contributed to the updating of the NCCP and the NDC. In the field, with local communities, they work in sectoral adaptation actions, particularly in agriculture, by collaborating closely and being relay partners of donors and/or international NGOs.

Furthermore, through COBAs, indigenous knowledge is taken into account in adaptation actions and paralleled with scientific approaches.

The main obstacle to civil society interventions is the lack of knowledge about access to funding and sometimes to new technologies.

Seychelles

In Seychelles, the role of civil society in biodiversity conservation has been essential for many decades, and the same is true today for climate change issues. Indeed, NGOs in

particular have done significant work over the past decade to have a positive and lasting impact on climate change adaptation and mitigation through :
1. Education and awareness programs and actions (schools and general public) ;
2. Research and monitoring on key climate stressors;
3. Building scientific cooperation with local and foreign institutions to bring benefits to climate-related work in the country;
4. Strengthening the knowledge of the Seychelles conservation community on research topics related to climate change (symposia, webinars).

There are, however, obstacles, the main ones being:

1. lack of available data - leading to not being able to conduct crucial research or projects;
2. Lack of economic resources and funds;
3. Lack of human capacity (lack of trained personnel with expertise in climate change issues, especially climate science).

11.6 Recommendations for strengthening adaptation and mitigation policies and approaches for conservation and resilience of ecosystem services

Policy strengthening must include:

- Good communication: through target-specific education approaches, continuous awareness raising and facilitating public access to information
- Transparency: in the conduct of actions, knowledge of stakeholders, management of resources
- Capacity building: through non-selective but appropriate and relevant knowledge management and dissemination
- Facilitating access to financial resources. According to the latest IPCC report, the budget/finance is a major obstacle to adaptation to climate change. If the cost of climate adaptation is estimated by UNEP (United Nations Environment Programme) between 280 and 500 billion dollars per year by 2050, it is only for developing countries. The IPCC confirms that the budget allocated to Africa for adaptation is lower than what is needed.

This approach is an open approach on which ecosystem-based adaptation is based, which promotes inclusiveness, demystification of the fight against climate change, ownership of the fight with an inter and multi-sectoral approach, and above all individual and civil society engagement.

11.7 Potential impacts of human response to climate change on protected areas, natural areas and biodiversity

For Madagascar, a study conducted in 2018 entitled "Migration, Environment and Climate Change: Information Base for Policy Development in Madagascar," conducted by a Consortium of researchers, associated with the International Organization for Migration (IOM) and the Ministry of Environment, Ecology and Forests (MEEF) and composed mainly of the Centre National de Recherches sur l'Environnement (CNRE) and the Institut de Recherche pour le Développement (IRD) can provide food for thought on the potential impacts of human response (reaction, action) to climate change.

According to this study[40] , internal travel (within the country) is an important issue adopted by men and women in the face of climate change impacts.

This assessment analyzes the policy, legal and operational framework of migration, environmental management and the fight against climate change. It also established the national mapping of vulnerabilities, as well as the causes, effects and multisectoral impacts of this interdependence through a field study on two sites, Kirindy in Menabe (west) and Marovoay in Boeny (northwest), two areas with natural resources representative of western Madagascar: dry forests with high rates of deforestation in Menabe, and rice growing in Boeny.

In a generalized precarious social and economic context in the country, migration is one of the strategies that some populations in Madagascar - especially those in the South - adopt to survive and reproduce their production system. It is a societal phenomenon associated with the chronic threat of drought and famine in the South. The "migratory culture" thus becomes an alternative or an adaptation strategy to the lack of jobs and social advancement in the migrants' areas of origin.

It is thus noted that if climate change can be an opportunity to improve living conditions, it can also be - or even more importantly - a threat to biodiversity and natural resources in general, leading to food insecurity and social insecurity. Indeed, population growth due to migration in a given area can increase pressures on the environment, while the areas that have been left behind have not experienced any restoration or recovery or adaptation actions either. These impacts can "hit" in different ways: Worsening forest clearing and degradation, limited access to water resources, land depletion, threats to marine resources and coastal areas, land, air and marine pollution.

The Union of Comoros is among the countries in the Western Indian Ocean region most exposed to extreme events. The archipelago is subject to a wide range of natural hazards such as cyclones, floods, drought but also earthquakes and volcanic eruptions. The effects of these disasters on the population are compounded by natural and man-made threats, including climate change, environmental degradation, drought, rapid and uncontrolled urbanization, and lack of capacity and financial resources. The intensity and frequency of these disasters are amplified by climate change, leading to a sharp increase in losses and damages for the population.

Seychelles

Like its neighboring islands, Seychelles expects to be increasingly affected by climate change. This is one of the greatest threats to the fragile nature of Seychelles, but also to the population and its economy. Intense rainfall, drought, coastal erosion, flooding, ocean acidification, sea level rise, etc. are causing significant damage to the landscape and ecosystems, including rare species such as certain corals and the Seychelles giant tortoise. Thus, the rise in sea level endangers the coral islands, as well as the entire coastline of the islands of the archipelago - where, in the case of the main islands, are concentrated the majority of the population and the crucial infrastructure for the country, such as schools and hospitals, or the port of Victoria through which almost all imports and exports transit, including gas and oil and food products. This fight against climate change therefore not only allows to fight against too important migration phenomena, but also to ensure the continuity of their economy and the development of the society. In order to fight against climate change, Seychelles, among the leaders in the field, has created in 2020, 13 new

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40 This study aims to provide the Government of Madagascar and national partners interested in migration, environment and climate change issues with an information base to better understand the link between migration and environmental change in Madagascar, including climate change, in order to inform public policy formulation and operational planning.

marine protected areas. The actions do not stop there, since in the development strategy (NSDS 2019-2023), adaptation to climate change is a main axis. Well aware of the situation, Seychellois see the development of resilience to climate change as essential to support a people-centered development strategy. A considerable effort to reduce GHG emissions has taken place in recent years in Seychelles, reflecting the concern over the increasing loss of their natural resources, ecosystems and territories. Thus, through an advanced sustainable development policy, Seychellois see not only an opportunity to combat climate change, but also an opportunity to take advantage of it to include social, equity and development dimensions.

12. EVALUATION OF CURRENT INVESTMENTS IN BIODIVERSITY AND CLIMATE CHANGE ADAPTATION

12.1 Madagascar

Currently, a study mandated by the National Climate Change and REDD+ Office (BNCCREDD+) and supported by UNDP is being conducted on the analysis of constraints and opportunities of climate change adaptation expenditures and allocations within the different sectors.

The analysis is not yet complete, but initial surveys of various sectoral ministries show that while a number of sectors have developed or are in the process of developing a CFA sectoral policy, the process is far from being translated into investments or budget allocations integrated into ministerial programming.

First, investments are dependent on donor allocations. Secondly, it is almost impossible to identify the amounts of investments that are exclusively targeted to CCA. Finally, while the current reference is the NAP with its 12 multisectoral national programs, many of the actions planned in these programs have not yet been initiated or are still at the start-up stage.

Also for Madagascar, only financial contributions from each financial partner to public investment for biodiversity exist for the period 2014-2018:

Table 61 Contribution of financial partners to public investment in biodiversity *(thousands of Ariary)*

ANNEE		2 014	2 015	2 016	2 017	2 018	TOTAL
EMPRUNT	FAD	12 000 000	1 000 000	440 283	4 962 000		**18 402 283**
	IDA	20 000 000	1 000 000	1 436 934	27 679 000	9 121 000	**59 236 934**
	COREE DU SUD		18 000 000	3 233 214	36 003 000	9 121 000	**66 357 214**
SUBVENTION ou AIDE	AFD	500 000	500 000	670 000	8 215 000	4 947 000	**14 832 000**
	GTZ	6 900 000	6 900 000	15 840 000	7 107 000	33 875 000	**70 622 000**
	KFW	1 879 000	1 668 000	8 240 255	8 815 000	11 214 000	**31 816 255**
	FAO	35 600 000	35 700 000	1 458 000	35 000	803 000	**73 596 000**
	JAPAN JICA	4 100 000	5 600 000	2 800 000	2 871 000		**15 371 000**
	PAM	6 600 000	10 400 000	12 300 000	15 000 000		**44 300 000**
	PNUD	1 000 000				6 425 000	**7 425 000**
	UE	2 200 000	7 200 000	5 600 000	48 149 000	32 619 000	**95 768 000**
	UNICEF	1 300 000	1 300 000	5 390 000	4 431 000	8 044 000	**20 465 000**
	PNUE		300 000	508 000	119 000		**927 000**
	IDA				2 694 000	6 489 000	**9 183 000**
	USAID			7 100 000	10 335 000	5 740 000	**23 175 000**
	Allemagne					6 000 000	**6 000 000**
	GEF					2 946 000	**2 946 000**
	GEF PNUD			4 000 000	6 263 000	3 404 000	**13 667 000**
FCV	UE			189 904	488 377		**678 281**
TOTAL		**92 079 000**	**89 568 000**	**69 206 590**	**183 166 377**	**140 748 000**	**574 767 967**

Source: BIOFIN/Madagascar Program (2021)

Three types of contributions from financial partners are distinguished:

- Counter-Value Funds (CVF): Corresponding to non-refundable aid granted by bilateral partners to promote efforts to alleviate economic difficulties and contribute to financing the balance of payments deficit granted to the State.
- Borrowing: Consists of highly concessional debt from multilateral donors in particular, and then from bilateral donors, most of whose financing is on concessional terms.
- Grants or subsidies: These are real financial aids, which are neither loans nor cash advances.

The analysis of the three types of contribution of financial partners indicates for the period 2014-2018 that external aid accounted for 74.83% (direct aid in specific state programs for the conservation of biodiversity), borrowing of 25.05% with very easy repayment terms and FVC, 0.12%.

As for civil society, the information-which represents spending on biodiversity-comes from two foundations: Fondation Tany Meva and the Fondation pour les Aires Protégées et la Biodiversité de Madagascar (FAPBM), and four international NGOs: Conservation International, WWF, WCS, and Blue Ventures.

Table 62 Annual expenditures on biodiversity by NGOs and foundations (2014-2018) *in Ariary and US dollars*

ONG et FONDATION	2 014	2 015	2 016	2 017	2 018	TOTAL
DEPENSES POUR LA BIODIVERSITE	**35 168 664 813**	**41 986 472 304**	**39 927 952 046**	**50 481 275 048**	**51 853 268 587**	**219 417 622 718**
COURS DE DOLLAR	2 555	3 166	3 280	3 192	3 455	
DEPENSES EN DOLLAR	**13 764 644**	**13 261 678**	**12 173 156**	**15 814 936**	**15 008 182**	**70 022 596**

Source: BIOFIN Report/ Madagascar (2021)

Over 5 years, their expenses represent more than 219 billion Ariary, or $70 million. This amount constitutes a large investment in financial terms. By introducing the price index in the calculation of the expenses, these expenses have decreased to $57 million, due to inflation and the devaluation of the national currency against the dollar.

The following table details the different activities and funding sources of NGOs and foundations investing in Madagascar. Most of the funds come from foreign donors. Their activities and funding are mainly related to protected areas and biodiversity conservation.

Table 63 Source of civil society funding for biodiversity in Madagascar

CIVIL SOCIETY	SOURCE OF FUNDING	ACTIVITIES
FOUNDATION	Endowment funds, funds with management mandate Contribution of the State, KFW, French Government, IDA/GEF	Financing and promoting sustainable development Financing of Protected Areas

Source: BIOFIN/Madagascar Report (2021).

For your information, some recent or ongoing flagship projects involving CCA can be cited:

Title	Trustee and/or implementing institutions	Budget	Lessors	Areas or Regions of intervention
Building Urban Resilience to Climate Change Project [2021-2023]	Ministry of Land Management and Service (MATSF)	1.5 M Euros	AFD	173 urban centers
Strengthening Conditions and Capacities for Sustainable Adaptation to Climate Change Project PRCCC [2016-2020].	GIZ / ONE	34.7 M Euros	BMZ	Analamanga, Boeny, Diana,
Landscape Resilience to Climate Change and Improved Livelihoods FFF (Forest and Farm Facility) [2013-2018]	FAO, FIFATA, Réseau SOA, PNFDDSA, MinAE, CPM, FEKRITAMA, Tranoben'ny Tantsaha Mpamokatra	18 M USD	FAO, IIED	Boeny, Diana, Sofia,
Adapting agricultural value chains to climate change PrAda [2018-2022]	GIZ/DGM / FOFIFA / MAEP/ MEDD	17.5M Euros	BMZ	Androy, Anosy, Atsimo Atsinanana,
Strengthening Urban Climate Resilience in Southeast Africa (Madagascar, Malawi, Mozambique, Union of Comoros) [2018-2021]	APRM	14 M USD	Adaptation Fund	International
Capacity Building Project for Strengthening the Conditions and Capacities for Adaptation and Resilience of Rural Communes to Climate Change PACARC [2016-2021].	MAEP / MEEF / MinEau - / MTTM	5.9 M USD	Least Developed Countries Fund	Analamanga, Androy, Anosy, Atsimo Andrefana, Atsinanana
Coastal Zone Management Adaptation to Climate Change with Ecosystems and Livelihoods Consideration Project PAZC [2014-2019]	UNEP, MEDD and partners	5.5 M USD	Least Developed Countries Fund	Atsinanana, Boeny, Menabe, Vatovavy Fitovinany
Strengthening the climatic resilience of rice farming to climate change in the Alaotra Mangoro region. [2012-	APRM	4.4 M USD	Adaptation Fund	Alaotra Mangoro,

Title	Trustee and/or implementing institutions	Budget	Lessors	Areas or Regions of intervention
2017]				
Sustainable Landscapes in Eastern Madagascar [2018-2023]	Conservation International and partners	19.3 M USD	Green Climate Fund	Analamanga, Analanjirofo, Atsimo Atsinanana
InsuResilience Project - [2019-2022]	SAF-FJKM / CARE International	2 M Euros	KFW, BMZ and Frankfurt School	National
Pilot Program for Climate Resilience in Madagascar (PPCR) [2015-2019]	CPGU	1.5 M USD	World Bank	National
Adapt'Action Facility - capacity building for climate governance and integration of adaptation into public policies	MEDD and French expertise		AFD	National
AFD - Support for the development of reference frameworks and the implementation of actions for the integration of climate change in territorial and urban planning tools	MATP / Urban Communities		AFD	National

12.2 Comoros

The Union of the Comoros is one of the countries in Africa that does not benefit from development assistance. Indeed, only 15 partners have committed funds for the year 2017, namely 7 bilateral partners and 9 multilateral partners. The overall volume of the commitment of Technical and Financial Partners amounts to 52.5 billion KMF. This amount represents 47% of the national budget for the year 2017 which amounted to 112 billion KMF. Official Development Assistance (ODA), constitutes an essential part of the Comorian budget about 43% of the total budget and 61% of the public investment budget (2017 Finance Law). These sums constitute the primary source of investment financing and the grants received amounted to 15% of GDP in 2015 and 8.9% of GDP in 2016, respectively.

The country's extreme poverty, coupled with the constraints of its international creditors, no longer allow the Comorian state to generate resources to meet international commitments or national policy and legislative arrangements for the protection of its natural environment.

Consequently, the conservation of Comoros' biodiversity and adaptation to climate change depend on the implementation of financing agreements and multilateral cooperation or bilateral cooperation frameworks, particularly with the French Republic, Comoros' main bilateral partner in terms of investment volume.

The ratification of various international and regional conventions, in particular those resulting from the 1992 Rio Conference, allow the Comorian State to access funding from these conventions to implement projects or programs related to the conservation of its biological diversity.

Between October 2015 and December 2021, with GEF funding from UNDP, a project entitled *Development of a National Network of Terrestrial and Marine Protected Areas representative of the unique natural heritage of the Comoros and co-managed by local village communities (RNAP*) was implemented. The main investments were directed towards the operationalization of a national network of protected areas with the establishment of five national parks and the implementation of climate change adaptation activities (agriculture and water).

Legislative and regulatory, policy and institutional frameworks to ensure conservation, sustainable use has been made effective by :

- The publication of the decree N°19-125/PR promulgating the law N°18- 005/AU on the national system of protected areas
- The establishment of the institutional framework governing the national system of protected areas with the creation of the National Agency for Protected Areas
- The development of a strategy for the extension of protected areas.

In 2019, France and the Union of the Comoros reaffirmed their intention to initiate a new dynamic together and that same year signed a partnership framework document which provides for reciprocal commitments including a France-Comoros development plan (PDFC) with a budget of 150 million euros over three years. Its implementation is entrusted to the AFD.

Environmental preservation and access to water are among the 3 key actions of the CMP, including the following priority actions:

- The preservation of land and marine resources, climate change, accessibility to drinking water ;
- The support of preservation actions deployed by the National Park of Moheli up to 3 million euros;
- Support for the establishment of a trust fund for the sustainable financing of protected areas in the Comoros;

- The establishment of the Adaptation Facility, over a period of four years. This facility aims to: (1) organize "climate" governance for the success of the Nationally Determined Contribution (NDC) by conducting capacity building activities, (2) translate the NDC into sectoral public policies and action plans in the field of adaptation, and possibly that of renewable energy, and (3) design concrete programs and projects with a strong focus on adaptation to the effects of climate change.

The European Union's (EU) 2021-2027 Multiannual Indicative Program (MIP) for Comoros is based on the Comoros Emerging Plan (CEP 2020-2030) of the Comorian government, a national policy that aims at the structural transformation of the country's economy. It aims to structurally transform and diversify the economy, through the development of the blue economy, agriculture and tourism. The PIM has set priority areas of intervention including the protection of the environment through the terms *Green and Blue Pact.*

Indeed, the EU will focus its priorities on the sustainable management of natural resources and biodiversity, food systems, structuring and capacity building of the private sector, vocational training and inclusive governance.

Among the 3 MIP priority areas and indicative sectors:

(1) *Green and Blue Pact* closing *General Environmental Protection and Agriculture* and *Forestry and Fishing* is placed first before the sectors

(2) *Growth and jobs* and

(3) *Governance*.

It should be noted that in addition to the priority areas, the MIP includes actions to support civil society.

It is well known that the latter is characterized by a lack of structure, a weak presence in the dialogue on public policies, and difficulties in fully playing its role in terms of control and accountability in order to become a major actor of societal change, development dynamics and environmental protection.

In view of these 3 priority areas, the indicative amount of the MIP for the initial period 2021-2024, the *Blue Green Pact* is endowed with 40% of the European investment, that is to say 18.4 M€, as shown in the table below:

Table 64 Indicative MIP amount for the initial period 2021-2024

	Montant (en EUR)	% du total
Domaines prioritaires :		
1. Pacte vert et bleu	18 400 000	40%
2. Croissance et emplois	16 100 000	35%
3. Gouvernance	7 500 000	16,3%
Mesures d'appui	4 000 000	8,7%
TOTAL pour la période initiale 2021-2024	**46 000 000**	**100%**

Table 65 Intervention framework of the Blue Green Pact in Comoros (extract from the general intervention framework of the MIP)

<table>
<tr><td colspan="4">Specific objective N°I.1: Promote the conservation and sustainable management of natural resources, biodiversity and terrestrial and marine ecosystems</td></tr>
<tr><td>Expected results</td><td>Indicators</td><td>Reference values and objectives [41]</td><td>Sources of verification</td></tr>
<tr><td rowspan="3">R.1.1 The environment is protected and biodiversity is preserved</td><td>I.1.1.2 Areas of terrestrial and freshwater ecosystems (a) under protection or (b) sustainable management (km^2) - EURF 2</td><td>Ref : 0
Targets to be specified</td><td>EU project report</td></tr>
<tr><td>I.1.1.2 Areas of terrestrial and freshwater ecosystems (a) under protection or (b) sustainable management (km^2) - EURF 2</td><td>Ref : 0
Targets to be specified</td><td>EU project report</td></tr>
<tr><td>I.1.1.3 Protected watershed area (km^2)</td><td>Ref : 0
Targets to be specified</td><td>EU project report</td></tr>
<tr><td>ES.1.2 Sustainable waste management practices are initiated</td><td>I.1.2.1 Number of waste management systems supported</td><td>Ref : 0
Targets to be specified</td><td>EU project report</td></tr>
<tr><td>R1.3 Endemic species are protected, and ecosystem services are maintained</td><td>I.3.1 Number of species conserved</td><td>Ref : 0
Targets to be specified</td><td>EU project report</td></tr>
</table>

A donor matrix showing the current indicative allocations by sector has been annexed to the MIP. Below is the priority area 1 "*Blue Green Pact*". In view of the volumes of donor investments, the EU will invest EUR 6.1 million in this area.

41 Actions are being prepared to estimate the missing targets, based on the limited data available and additional data collection. These targets will be more accurately estimated during the program formulation phase and will be available when the actions begin.

Table 66 Investment in the "Green and Blue Pact" in Comoros

	EUR (mln)
Domaine prioritaire 1: Pacte vert et bleu	**363,4**
Environnement et gestion des ressources naturelles	**329,9**
UE	6,1
France (AFD et Ambassade)	18,5
Projets du Fonds vert pour le climat	178,0
SNU	21,5
Banque mondiale	97,0
BAD	8,8
Agriculture, sylviculture et pêche (systèmes alimentaires)	**33,5**
UE	0,9
France (AFD et Ambassade)	22,0
SNU	1,6
Banque mondiale	9,0

In the context of this chapter, the table below shows the main projects that will be implemented during 2022 and that will directly or indirectly intervene in the issues of biodiversity conservation, climate change adaptation or the promotion of certain ecosystem services in Comoros.

Table 67 Main projects

Project Title:	**Objective**	**Expected result**	**Primary Funders**	**Budget**	**Period**
Technological support and capacity development of rural populations for a resilience of natural resources and the most vulnerable groups: the case of water resources and the adoption of intelligent agriculture in the face of climate change	Within 3 years, build resilience to climate change and disaster risk reduction by integrating digital technology into my management and improving knowledge of natural resources and the adoption of smart agriculture through the collection and monitoring of hydrographic data and their sharing on a digital platform, promoting food security through the development of smart and sustainable agriculture integrating digital technology and capacity building and awareness at all levels	R1: 2000 farmers are supported to strengthen and improve their agricultural productivity and resilience to the effects of climate change through the adoption of smart and sustainable agriculture. R2: Capitalization of the communication plan of the GCCA program and branding of the European Union's actions in Comoros on climate change	European Union	600000 €	2021- 2024
Protection of biodiversity through effective management of the national protected area network	Conserve the terrestrial and marine biodiversity of the Union of the Comoros by strengthening the effectiveness of the co-management of the new protected area network with local communities to support sustainable development.	Country Program Outcome (UNDAF): Outcome 1 - By 2026, state and non-state actors, the Comorian population, especially the most vulnerable, will be more resilient to climate change, natural disasters and crises, and will ensure sustainable and integrated management of terrestrial and marine ecosystems and associated ecosystem goods and services, in the context of promoting sustainable habitat with a small environmental footprint.	GEF/UNDP	4424479 US$	2022-2027
NGO Dahari - Restoration of terrestrial and marine ecosystems in Anjouan and Grande Comore	Restoration of Moya and La Grille forests, their biodiversity and the ecosystem services they provide Reef restoration in southwest Anjouan	By 2027, 1000 hectares of forest and 730 hectares of reef restored	Already pronounced: Darwin Initiative £300,000	3,7 M €	January 2022 - December 2026

Project Title:	**Objective**	**Expected result**	**Primary Funders**	**Budget**	**Period**
	Increase of agricultural yields in a sustainable way, food security		CEPF $165,000 European Union 130,000 euros		
Family Farm Productivity and Resilience Project (PREFER)	To improve the food and nutritional security and livelihoods of the rural poor. Within this framework, the Project will aim to sustainably increase the food availability and agricultural income of beneficiary households	Food, nutrition and livelihood security of the rural poor are improved	FIDA, ASAP	7 US$	2017 - 2023
NGO Banda Bitsi ; Protection and development of the Moroni Mangrove " ECOTOURISTIC PARK	1 Restore and conserve the site 2 Setting up a playground 3 Rehabilitate the existing sports complex 4 Setting up a greenhouse for the domestication of medicinal plants 5 Integrating environmental education	A secure eco-tourist park is set up in the capital Awareness of local residents and the general population	Lafarge Comores UNDP (Gouv Ngazidja) : CAON PGS/UNDP	24 M US$ 1.2 M US$ 0.850 M US$ US$ 21.5 MILLION	2017 -2020 2020-2022 2021/2022

Project "Ensuring climate change resilient water supply in the Union of Comoros	**- Strengthening water supply management by: (i) integrating climate risks into ongoing reforms of national water legislation, (ii) building the capacity of key water sector actors on climate risk management for water supply, and (iii) supporting the government to implement tariff reforms that include the additional costs of climate risk reduction;** **- Improving water quality and regulating maximum and minimum river flows induced by extreme climatic events by (i) using ecosystem-based CCA methods and improving the integrated management of the 32 watersheds in the project area (through better monitoring of water resources) and (ii) applying an early warning system to inform stakeholders and take the necessary preventive measures;** **- Strengthening the climate resilience of the water supply infrastructure network by: (i) diversifying water supply sources for 450,000 people (rainwater, surface water,**	Result 1: The institutional, regulatory and policy framework for managing and reducing climate risks to water supply is strengthened Result 2: Climate risks are integrated into water resources management through weather monitoring and forecasting and climate projections, as well as enhanced watershed monitoring Outcome 3: Climate resilient infrastructure and technologies are in place to manage and address water supply shortages caused by drought, cyclones, tropical storms and saline intrusion	Green Climate Fund	60751495 M US$	2018-2026

Project Title:	**Objective**	**Expected result**	**Primary Funders**	**Budget**	**Period**
	and groundwater); and (ii) designing and building infrastructure that takes into account climate change risks and is sized to withstand extreme weather events (drought and flooding).				
Renovation of the Biodiversity Room of the National Museum of Comoros and Study and Conservation of the Biodiversity of Comoros	This project aims to work, in collaboration between the National Museum of Natural History, Paris and scientific institutions, political authorities and associations of the Comoros, to 1) disseminate the richness and heritage value of organisms present in the Comoros Archipelago, 2) raise awareness of the public, especially the young Comorian public, to the protection of species in great danger of extinction in the face of anthropogenic threats through the enhancement of the Biodiversity Room of the National Museum of the Comoros (CNDRS). The valorization of the National Museum combines an enrichment of the Museum's collections (by the unpublished presentation of five specimens of coelacanths, adults and embryos), a renewed museography adapted to the tropical context, and a reinforcement of the capacities of the scientific and technical personnel of the Museum on the management of the patrimonial collections, 3) the study of the reproduction and development of the coelacanth, an	Strong collaborations between the National Museum of Natural History, Paris, and the scientific institutions of the Comoros, in particular the CNDRS and the INRAPE, on themes of dissemination and awareness of the richness and fragility of the biodiversity of the Comoros, and on research themes on the study and conservation of the fauna/flora biodiversity of the Comoros Collaborative research on the biology and reproduction of the Comoros coelacanths. Renovation of the biodiversity room of the National Museum of the Comoros: inauguration on 27 June 2022. Capacity building through training on heritage collection	- French Ministry of Foreign Affairs, through a FSPI Fund and a Blue Economy Fund of the French Embassy in Comoros - National Museum of Natural History, Paris	0,22 M €	2019-2023

Project Title:	**Objective**	**Expected result**	**Primary Funders**	**Budget**	**Period**
	emblematic animal of the Comoros and in great danger of extinction, thanks to the discovery of new embryonic growth stages, 4) to contribute scientifically to the conservation policy of the coelacanth population of the Comoros,	management (October 2021).			
Strengthening the Protection of the Oceans in the Comoros (R-P.O.C.)	The objective of this project is to increase the protection and resilience of the marine biodiversity of the Comoros, and therefore support local fisheries, by promoting the sustainable use of marine resources and strengthening the resilience of local communities that depend on them.	1. Promote and improve the effective implementation of three recently established coastal MPAs and improve the management of the MPA of Moheli (established in 2001), thus doubling the marine area under effective protection, for a total area of 986 km². 2. To reach the objective of 20% of the total surface of each MPA classified in integral protection zone and to extend one of the MPAs to the mesophotic zone (MPA of Mitsamiouli-Ndroude). 3. Raise awareness of the economic importance of MPAs to the national blue economy and promote the direct benefits that can accrue to local communities living near MPAs. 4. Strengthen the protection of the sea and oceans in the Comoros EEZ, with the objective of increasing from 1 to 10% (or 16,500 km²) of the marine area classified as an MPA under enhanced protection. 5. Develop marine spatial planning	OCEAN5 AND WILDOCEAN South Africa	1000000 US$	2021- 2023

Project Title:	Objective	Expected result	Primary Funders	Budget	Period
		for the Comoros Exclusive Economic Zone (EEZ) to support the national blue economy plan, which calls for 30% of the EEZ to be dedicated to the protection, resilience and restoration of marine ecosystems. 6. Increase the prestige of Comoros as a marine conservation area of global importance and a tourist destination of choice by nominating Moheli Park as a UNESCO World Heritage candidate, Moheli being already included in the list of candidates for Comoros (2007) submitted to the World Heritage Commission.			
Capacity building in sustainable tourism development and management for World Heritage in Comoros	Increase the national capacities of key stakeholders in Comoros, including the national team in charge of preparing the nomination file for the World Heritage Tentative List site of the Historic Sultanates of the Comoros, develop a sustainable tourism management plan and implementation strategy for the promotion of the cultural sector in Comoros using as a model the e-learning module (how-to guides), the expertise and resources of the UNESCO sustainable tourism program, and implement a pilot training activity for tour guides of the Historic Sultanates of the Comoros.	- Capacity building of national team members in sustainable tourism development and management; - A sustainable tourism management plan developed for the Historic Sultanates of the Comoros ; -An adopted and implemented implementation strategy that respects gender equality and promotes women's empowerment; - At least 15 tourist guides trained in the three islands of the Comoros; - Photographic exhibition on the sites of the Historical Sultanates of the Comoros realized and	UNESCO / Dutch Funds-in-Trust	US$ 49,620	September 2020 to December 2021

Project Title:	**Objective**	**Expected result**	**Primary Funders**	**Budget**	**Period**
		presented in the public at the CNDRS ; - National capacity building for the sustainable development of the cultural sector through sustainable cultural tourism; -Strengthening the cultural tourism sector in Comoros			
Conserve the forest ecosystems of the island of Moheli (rainforests as dry forests), its carbon potential and its biodiversity;	By 2026: Illegal deforestation is halted or slowed. Carbon stocks in Moheli's forests are maintained or increased. The PNM has an effective monitoring system and its land teams are trained and equipped. The rules for the use of the conservation zones of the PNM are known and popularized, the populations are informed and sensitized, the procedures for the management of wood cutting, the expulsion of illegal users and other non-regulatory activities are the subject of legal files and follow-up. The PNM is equipped with land markers. The REDD+ project supports the social acceptance of the PNM through community micro-projects. Training in good agricultural practices is implemented on the periphery of the conservation areas. Energy alternatives are proposed for domestic needs and ylang-ylang distillation. Compensatory activities are set up for people displaced from the conservation areas.		Main funder: private donor wishing to remain anonymous. 100% financing by this single donor for 5 years. Evaluation at the end of each phase, after which the project can be resized. Long-term project, theoretically 30 years.	1 M€[i]	2021-2026[ii]

i Not validated for the moment. But up to 200 000 euros / year, at least for the first 5 years (including operation, expertise, certification. That is 1 million for 5 years.

ii Period: 2021-2026 for the 1st phase. Global project 2021-2050 in theory

12.3 Mauritius

In Mauritius, there was a diversification of conservation investments since 2014, with several local developments and also new funders. Despite changes in CSR laws and how it works, CSR is still a source of funding for conservation, both through the National Social Inclusion Foundation (NSIF) or directly from companies. Some private companies have also created their own foundations and may use part of their funds for CSR actions, as approved by the NSIF. The NSIF has priority areas, including "*Environment and sustainable development*"[42] .

New funding organizations include Franklinia, BIOPAMA, and BGCI, while other conservation partners have increased their technical and financial support, e.g., Brest Botanical Gardens, Missouri Botanical Gardens, CEPF, Chester Zoo, Durrell Wildlife Conservation Trust, WIOSAP, etc.

The Mauritian private sector invests in biodiversity conservation, mainly by weeding the forest on their properties, or by supporting financially or providing volunteers to NGOs. The major players are Vallée de Ferney and Bioculture (Ebony Forest, East Valley), as well as Agria (Bel Ombre) to a lesser extent, and in Rodrigues, François Leguat Reserve.

There have also been significant sources of funding from multilateral organizations, such as the UNDP, and bilateral donors, such as the European Union, funding both land and marine projects.

Some embassies also support conservation projects such as the Australian High Commission, the British High Commission and the U.S. Embassy. Following the Wakashio oil spill, funds were mobilized for community and conservation (both marine and terrestrial) from the Japanese government and Mitsui OSK Line (MOL) (https://www.mol.co.jp). Some NGOs (EcoSud and MWF) have made local and international appeals and used participatory funding.

Funding from government sources appears to have stagnated or decreased, but requires further analysis to confirm trends.

The following tables illustrate some of the different biodiversity actions in Mauritius, as well as the sources of funding. Many of the projects not listed here are supported by the UNDP/GEF Small Grant Programme.

Table 68 List of biodiversity conservation projects funded -in progress- for the Republic of Mauritius

Project name	Financing	Rental	Amount	Dates	Implementing Agency
ASTIRIA	CEPF	Maurice	161,795 US$	Avirl 2016- September 2019	Conservatoire Botanique de Brest and Mauritian Wildlife Foundation
Mitigating climate change through reforestation in the Grande	EU	Rodrigues	808,635 €	Jan 2021 - Dec 2025	Mauritian Wildlife Foundation

[42] www.nsif.org

Project name	Financing	Rental	Amount	Dates	Implementing Agency
Montagne and Anse Quitor Nature Reserves, Rodrigues					
Developing a management plan for Mondrain Reserve (Mauritius) and improving accessibility for greater PA management effectiveness and visibility.	BIOPAMA	Maurice	42,333.79 €	December 2020 - November 2021	Mauritian Wildlife Foundation
Training local fishers on coral reef rehabilitation on Mauritius	WIOSAP	Maurice	219,444 US$	In progress	Mauritius Oceanography Institute
European Union (EU) funded project Ridge To Reef (R2R) Mauritius project on Ile D'Ambre National Park	EU	Maurice		In progress	National Parks and Conservation Service (NPCS) of the Ministry of Agro Industry and Food Security
Assessment of Blue Carbon Ecosystem (Seagrass) around the island of Mauritius	WIOSAP	Maurice	200.000 US$	In progress	Ministry of Ocean Economy Marine Resources Fisheries and Shipping - Mauritius
Restoring the integrated native terrestrial habitat and seabird community of Ile aux Aigrettes, Mauritius	WIOSAP	Maurice	US$ 224,167	2 years	Mauritian Wildlife Foundation

Project name	Financing	Rental	Amount	Dates	Implementing Agency
Avoiding tree extinctions in Mauritius - Global Trees	BGCI , Franklinia	Maurice	83,947 UKP	2019 à 2024	Mauritian Wildlife Foundation
Saving Dictyosperma album var conjugatum (title to be confirmed)	Franklinia	Maurice	TBC	In progress	Durrell
TBC	Franklinia	Maurice	TBC	TBC	Ecosystems Restoration Alliance
Forest restoration work	Franklinia	Maurice	TBC		Ebony forest
E€OFISH: Promoting innovations to transform the life of artisanal fishers in Mauritius	UNDP	Maurice	TBC	In progress	Ministry of Blue Economy, Marine Resources, Fisheries and Shipping, and the Rodrigues Regional Assembly
E€OFISH: Designing the Future of Tourism - Part II: the Integration of Artisanal Fishers in Future Community-based Tourism Models in Mauritius	UNDP	Maurice	TBC	In progress	Ministry of Blue Economy, Marine Resources, Fisheries and Shipping, and the Rodrigues Regional Assembly
Mainstreaming Invasive Alien Species: Prevention, Control and Management	UNDP	Maurice	US$ 3.8 MILLION	In progress	Ministry of Agro-Industry and Food Security (National Parks Conservation Service)

Table 69 List of grants (and type) -in progress- for the Republic of Mauritius

Organization : Local or International	Type of grant	Name of the organizations
Local	Large Grant	Ebony Forest Ltd
Local	Large Grant	Ebony Forest Ltd
Local	Large Grant	Ebony Forest Ltd
Local	Large Grant	Mauritian Wildlife Foundation
Local	Large Grant	Mauritian Wildlife Foundation
Local	Large Grant	Francois Leguat Ltd
International	Large Grant	Ter-Mer Rodriguez Association
Local	Large Grant	Ecosystem Restoration Alliance Indian Ocean
Local	Large Grant	Ecosystem Restoration Alliance Indian Ocean
Local	Large Grant	Ebony Forest Ltd

12.4 Seychelles

There are three different types of investments for nature conservation in Seychelles:

- Multilateral funding: Assistance to the government-or directly to SNPA/SPGA or large local NGOs-from international donors such as GEF/UNDP.

- Bilateral funding: direct support from governments such as the EU, FFEM/AFD (France), Darwin Initiative (UK), etc. for national projects implemented by the government/UNDP (UCP), or directly by local agencies or national trusts (Seycatt, ETF, FIS)

- Regional funding: Financial assistance for international projects executed by a regional organization (mainly IOC) in several countries and implemented by governmental or local agencies (SNPA/SPGA, local NGOs, private islands, etc.).

The Global Environment Facility (GEF) is by far the largest source of funding for biodiversity initiatives in Seychelles. For these GEF funds, UNEP, UNDP, the World Bank, and AFD are the main agencies implementing the identified actions. An example is the World Bank-supported SWIOFish3 project, funded by the GEF, in partnership with the Seychelles Ministry of Finance, Trade and the Blue Economy. The GEF small grants program will enable Seychelles to receive funding for community-based programs or NGOs, among others.

Regarding the geographical scope of the identified projects, there is a large proportion of projects on a regional scale or including several territories in the Indian Ocean, including the territory of Seychelles.

The combination of local and international funding is complementary and essential for financing actions aimed at preserving the environment, especially since these actions receive only a small amount of money compared to the money provided by ecosystem services.

The amount of funding received at the international level is significant. As mentioned above, the GEF is the main contributor with approximately US$35 million.

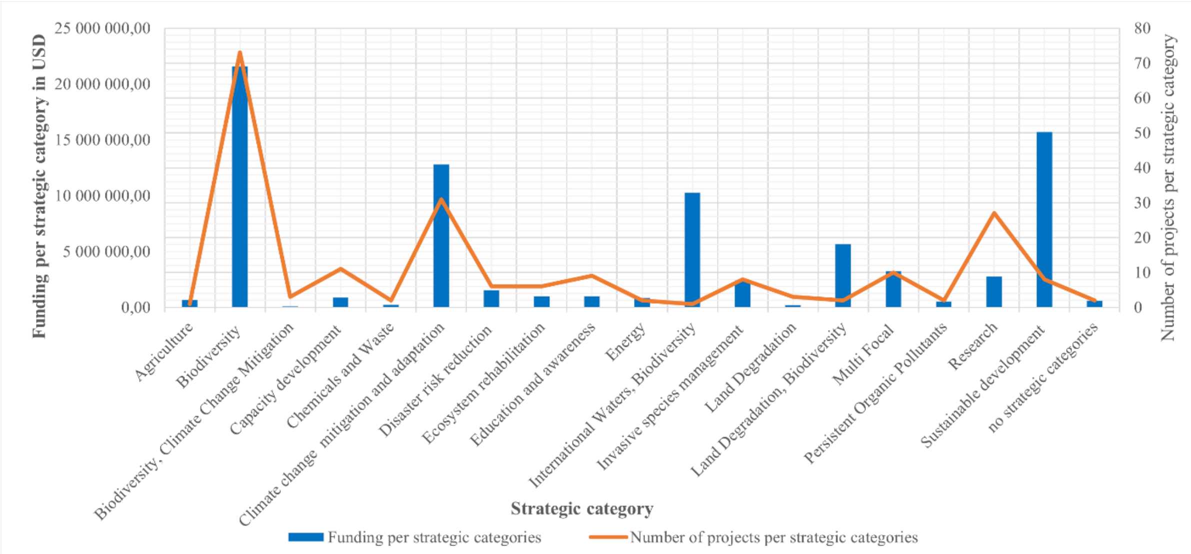

Figure 44 Amount of international financing in Seychelles by strategic category

Source: BFU-project overview-report DRAFT version

According to the above illustration, international funding for biodiversity in Seychelles over the period 1991-2020 amounts to US$ 82,153,055.03.

Many environmental issues are addressed through international funding in Seychelles. However, this is done in a rather uneven manner. Actions directly related to biodiversity are by far the most represented (over 70 projects for a total funding of about $22 million). There is also significant investment in climate change mitigation and adaptation, international waters and biodiversity, and sustainable development. Some themes are widely addressed by projects but receive little funding (e.g., research). Conversely, some themes seem to be much more overlooked, such as land degradation and chemicals, which have each received only $50,000.

In addition, a larger share of international funding goes to the marine environment, although the number of projects is relatively the same between marine and terrestrial environments. Examples include (but are not limited to) the IRD and EU-funded SEYFISH program in 2016, CEPF-funded protection of KBAs in the Grande Police wetland, and a GEF/SGP-funded mangrove restoration project in 2019.

At the national level, Seychelles has two environmental and conservation trust funds (ETF and SeyCCAT), which raise, invest and mobilize funds for environmental purposes. They have been the main contributors to the funding received locally, with SCR 44,427,020.11 and SCR 19,863,304.25 respectively, although other local donors have contributed.

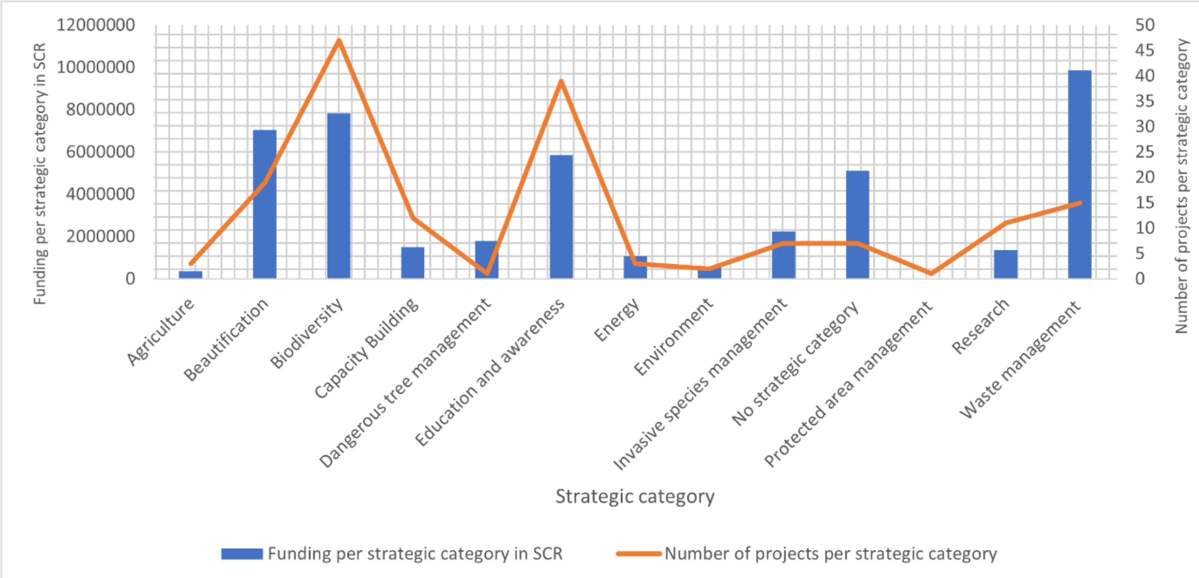

Figure 45 Amount of local financing in Seychelles by strategic category

A total of 64,436,604.36 SCR was received from local donors between 2000 and 2019. Again, all funding is unevenly distributed. While more actions directly related to biodiversity were funded at the local level, water waste received the most funding. Due to lower funding, at the local level, fewer types of actions are addressed, in contrast to the international level where GPF largely funds environment-related areas.

Over the years at the local level, more funding has been allocated to the terrestrial domain. However, starting in 2017, in line with the new blue economy policy and political commitments, funding for marine projects increased. Conversely, projects in the terrestrial domain have tended to decrease since 2019.

As for current funding, more than 400 actions have been funded since 1991. While most of them have been completed, some will still take place in 2022 (about ten). At the international level, operations in favor of biodiversity such as "capacity building for the preparation and implementation of the Seychelles National Forest Inventory Phase II" and "restoration of marine ecosystem services through the restoration of coral reefs to cope with a changing climate future", have been funded respectively by the FAO to the tune of US$258,366 (2020-2022) and by the UNDP to the tune of US$2.5 million (2020-2026).

At the local level, these include "Developing entrepreneurship in the blue economy sector through capacity building of MSME and ESA staff" funded by Seycatt with 1 million, or the "Predicting foraging hotspots for seabirds on the Great Barrier Reef" project funded by the University of Leeds with data contributions from ICS, ISPRA (Italy) and IBC-UniSey.

There has been a shift over the years towards marine-related funding. In the future, more funds may be dedicated to marine-related projects to ensure that the marine spatial plan is implemented accordingly.

Finally, the role of the private sector in biodiversity conservation in Seychelles has been important over the years, and not just as a potential source of funding. Indeed, in addition to funding, many private businesses, mostly related to tourism, have played a role in biodiversity restoration initiatives (Khan and Amélie, 2014). Resorts and hotels have been the most important stakeholders for such actions. However, in recent years, other stakeholders such as dive centers or tour guides have also started to follow this approach (e.g., facilitating transportation for marine research or doing joint hikes and cleanup activities). Private islands should also be included among these stakeholders, as some of them have carried out island restoration activities by partnering with local NGOs for conservation actions, or even creating environmental foundations (see Chapter 9 on civil society engagement in conservation).

This partnership between the private sector and local NGOs has even created some co-management approaches to projects. This has been the case for many *resorts* in the Seychelles for many years, particularly in wetland and coastal restoration and coral reef rehabilitation. This type of initiative has created wetland-tourism linkages, for example (Khan and Amélie, 2014): in addition to preserving the site, the initiative contributes to a more ecotourism approach in the Seychelles and attracting visitors. The Island Conservation Society (ICS), in partnership with the parastatal Island Development Company (IDC), and hotel and fly-fishing operators, have implemented an innovative financing and co-management system in the outer islands (Alphonse, Desroches, Farquhar, Cosmoledo-Astove) and Silhouette that has received international acclaim. The Green Island Foundation, linked to Denis Island, operates on several private granite islands.

In recent years, the ecosystem-based approach to adaptation has also made its way into NGO/CBO partnerships with resorts and the private sector. Indeed, there are opportunities for such partnerships in Seychelles: past experiences have proven this and current initiatives continue to prove it. These EbA actions focus primarily on ecosystem restoration, but the many projects that have been developed in this framework in recent years can help pave the way for different types of EbA actions. In addition, the cost-effectiveness of such projects that do not require expensive physical infrastructure is important to note (Khan and Amélie, 2014).

Warning:

The amount of money invested in the environment seems small compared to the many issues at stake, especially since the actions can be costly (e.g., NBASAP 2015-2020 which alone required 320 million Seychelles rupees; BIOFIN, 2017).

Some areas, such as waste and chemical management, are relatively untouched by funding. However, the latter represents important issues, as it can lead to environmental degradation and a significant loss of biodiversity. This problem is further compounded by climate change and extreme weather events. This has also been identified as a national priority.

Seychelles' international funding sources are being reduced due to the country's financial situation, which is now considered high income. This makes Seychelles ineligible for certain support/funds such as ODA funding, and will lead to a decrease in the amount of funding. However, Seychelles is a globally important national hotspot and has high conservation ambitions, as evidenced by actions such as the Blue Bonds.

Over the years, the amount of local funding has increased, especially with the creation of SeyCCAT, but the problem of the sustainability of funding is still present and prevents the follow-up of successful actions.

Although the trend of projects is towards marine environments, the terrestrial environment should not be neglected, as some species and environments are seriously threatened and must be the subject of protection programs. A balance of funding between the two environmental themes is necessary to ensure the effectiveness of actions on both sides.

Some of the actions that appear to be of primary importance for the Seychelles concern both the blue economy and the development of the marine space. Also, the issue of invasive species, the main cause of biodiversity loss, is common to the island context and common to the Indian Ocean hotspot.

13. CEPF INVESTMENT NICHE

The Hotspot of Madagascar and the Indian Ocean Islands has received, over the past decades, sustained attention from the international community for the preservation of its unique biodiversity. However, this observation covers very different situations depending on the country, but also within these countries (not all regions of Madagascar, for example, have benefited from comparable support) as well as in terms of the activities supported. At the same time, the indicators and trends show that while significant progress has been made, the threats remain strong and the degradation of ecosystems continues at a steady pace, threatening the long-term existence of thousands of species and the well-being of an ever-growing population that is closely dependent on ecosystems.

There is a need to define an investment niche to guide future CEPF investments in themes and geographic areas that will maximize the program's impact in terms of biodiversity conservation and climate change adaptation. The definition of a CEPF niche should also reduce the risk of duplicating initiatives already funded by other stakeholders, or avoiding investments that would have only marginal impact. The CEPF niche should also address the overall CEPF objective of strengthening the participation of civil society, such as community groups, indigenous peoples' associations, nongovernmental organizations (NGOs), academic institutions, and private companies, in biodiversity conservation and climate change adaptation actions in hotspots.

The definition of the CEPF investment niche emerged from a highly participatory process among regional stakeholders. Based on the threats identified and prioritized in previous workshops and bilateral consultations, participants were asked to identify, organize, and prioritize potential intervention themes for CEPF. These recommendations allowed for the definition of the present niche and the development of the intervention strategy presented in the following chapter.

Twenty years ago, the Madagascar and Indian Ocean Islands (MADIO) Hotspot already benefited from CEPF. First Madagascar, then Comoros, Mauritius and Seychelles were added as of 2015. The hotspot has often been considered a priority among other global hotspots, due to its extreme diversity - with about 15,000 plant species, of which more than 12,000 are endemic - but also due to the high taxonomic level of endemicity, witnessing distinct evolutionary mechanisms linked to the hotspot's isolation, and above all due to the high level of threat to its biodiversity.

From 2015 to the present, CEPF investments have not only reinforced previous experiences, but have also strengthened nationals' knowledge and experience in research: biodiversity, spatial analyses, information systems, database management, community-based approaches, etc., while improving interdisciplinary collaborations.

Like all island states, the four program countries (Madagascar, Comoros, Mauritius and Seychelles) are extremely vulnerable to climate change. Their populations, agricultural land and infrastructure are highly exposed to climate change and often, particularly in Comoros, Mauritius and Seychelles, tend to be concentrated in coastal areas where sea level rise and the increased frequency and severity of extreme weather events are most damaging.

While the combined effects of projected climate change mean that many people are at risk, the populations and economies of the program countries are highly dependent on natural resources and thus ecosystem services. Yet the natural ecosystems that provide these services are already under severe threat from human activities in all program countries, which are located in a biodiversity hotspot. As a result, the resilience and capacity of ecosystems to provide the essential ecosystem services necessary for people to adapt to climate change is diminished, further exacerbating vulnerability to climate change.

The process of updating the ecosystem profile is part of the "Ecosystem-based Adaptation in the Indian Ocean" program, developed within the framework of the Green Climate Fund (GCF) - of which AFD is an accreditation agency.

The goal of the program is to reduce the vulnerability of island populations by ensuring the essential ecosystem services they need to be resilient to climate change. The program will use proven tools and methodologies that CEPF has developed over the past 20 years to strengthen and engage civil society actors in ecosystem conservation.

The current CEPF model, which prioritizes biodiversity conservation, will be reoriented to direct investments to the highest priority geographic and thematic areas for ecosystem-based adaptation (EbA). The program will work through CSOs, help build their capacity, and assist them in developing partnerships with the private and public sectors. The program includes a component to ensure long-term sustainability and encourage replication of best practices in EAF.

The program has three components:

Component 1: Development of strategic plans for EbA in the small island biodiversity hotspot that are well aligned with national climate change strategies;

Component 2: Support for EbA activities through grants to CSOs;

Component 3: Ensure long-term sustainability and replication of success through knowledge products and tools for EbA.

EAF actions have been identified as high priority in the climate change strategies of all program countries. EAF promotes conservation, improved management, and restoration of ecosystems to provide the essential services that people need to adapt to climate variability. However, beyond a few pilot projects, funding for EbA is currently inadequate in program countries, despite the urgent need and opportunity to scale up EbA action. While the focus has been on strengthening government programs to address the impacts of climate change, less attention has been paid to the capacity of civil society to address these challenges. Despite their potential to play an effective role in addressing EAF, CSOs are generally underutilized, undervalued and underfunded by development actors. In this context, CEPF will provide specific funding for EbA through this program to mobilize CSOs.

Efforts will focus on providing the necessary funding, technical support, and capacity building for CSOs to implement EbA actions or nature-based solutions (NBS) to improve the resilience of the most vulnerable species, ecosystems, and people to climate change. Expected outcomes include increased resilience and improved livelihoods of vulnerable populations, but also improved resilience of ecosystems and ecosystem services.

A portfolio of grants to CSOs will be developed in each country, aimed at increasing the resilience of local communities to climate change through the restoration and improved management of ecosystems and ecosystem services that are essential to local or national populations.

14. CEPF INVESTMENT STRATEGY AND PROGRAM FOCUS

This chapter presents the investment strategy for CEPF in the Madagascar and the Indian Ocean Islands Biodiversity Hotspot over a five-year period from 2022 to 2027. In relation to the Green Climate Fund program *Ecosystem-based Adaptation in the Indian Ocean*, this chapter presents the Eligibility Criteria for the selection of Sub-Projects and KBAs. Specifically, to be eligible for support under this program, CEPF projects must meet the following criteria :

1. Address one or more of the priority KBAs presented in Section 14.1 below;
2. Address one or more of the Investment Priorities presented in Section 14.2 below;
3. Be implemented by civil society organizations (CSOs). Eligible CSOs may be government-owned enterprises or institutions, provided that they meet the following minimum requirements:
   i. that the enterprise or institution possesses individual juridical personality, separate from the government of the hotspot countries or any other entity;
   ii. that the enterprise or institution has the authority to apply for, enter into contracts and receive private funds on its own name and capacity; and
   iii. that the enterprise or institution shall not assert a claim of sovereign immunity. If the recipient of the Sub-Grant enjoys any privileges and immunities in the hotspot countries, the relevant Sub-Grant agreement shall include provisions by which the CSO waives such privileges and immunities and represents that its acts under such agreement constitute commercial and private acts.
4. Contribute to achieving the GCF's investment criteria, as defined in Annex III of decision B.09/05, "Initial investment framework: activity-specific sub-criteria and indicative assessment factors";
5. Demonstrate that the proposed EbA activity addresses vulnerability based on a clear climate change risk;
6. Adopt EbA approaches that increase the resilience of ecosystems and ecosystem services in the relevant priority KBA(s) that are critical to local or national populations;
7. Reflect on the climate change mitigation potential of the project;
8. Address priorities identified in the national climate change policy or strategy documents of the relevant hotspot country;
9. Avoid or fully mitigate negative environmental and social impacts, for purposes of ensuring consistency with the safeguard policies set out in CEPF's Environmental and Social Management Framework;
10. Meet the requirements of the GCF's Environmental and Social Standards and all relevant GCF policies;
11. Meet the due diligence requirements of CEPF, as set out in the Operational Manual;
12. Demonstrate positive gender impacts;
13. Demonstrate effective and efficient use of funds;
14. Demonstrate a clear strategy for achieving financial sustainability;
15. Complete implementation prior to the end date of the CEPF investment phase (currently 30 June 2027).

Priority will be given to proposed projects that are the closest fit to the investment strategy set out in section 14.2 below. Preference will also be given to projects that: (i) demonstrate a leading role for local organizations and/or an explicit focus on capacity building for local civil society; and (ii) show that they will coordinate with other organizations to prevent duplication of efforts, such by working through partnerships and alliances.

Other factors that will strengthen an application include:

- Endorsement by relevant government authorities, through the corresponding NDA;
- Clear plans for continuing the work after the CEPF grant funding has been deployed; and
- 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.

If CEPF awards grants with financial support from other funding sources, other eligibility criteria may be used.

14.1 Geographic Priorities for CEPF Investment

14.1.1 Madagascar

The following steps were adopted to determine the rank of ecosystem services, based on their importance in providing benefits to the population:

- Standardization of ecosystem services

- Aggregation of ecosystem services in KBAs

- Aggregation of ecosystem services, according to the importance given by experts and stakeholders.

In addition, the spatial weighting of KBAs was done by overlaying the vulnerability of ecosystem services to climate change and the adaptive capacity to climate change. The vulnerability to climate change and the potential to adapt to climate change stressors were derived from a study conducted by WHO.

The transformation of ecosystem service values into relative values (proportion), combined with weighting, and followed by stakeholder feedback, resulted in the identification of the top 30 ranked KBAs that contribute the most to EbA. As the main objectives of the process are to find areas where EbA activities can be implemented, some of the initially top-ranked KBAs were removed, thus changing the ranking of the 30 KBAs. The KBAs removed from this ranking are:

. KBAs that do not have a manager, project partner, or institutional structure to support the implementation of EbA activities: Mangoky River, Lake Itasy, Mahatsara (Mahambo Foulpointe), Ivoloina River, North Pangalane, Mahevatanana-Ambato-Boeni Wetlands, Ankafina (Ambohimahasoa), Mananjary River, Angavokely Forest Station, and Ambila-Lemaintso Wetland.

. KBAs, whose ecosystem services have been degraded beyond reasonable recovery efforts. KP 32 Ranobe tops the list in this category.

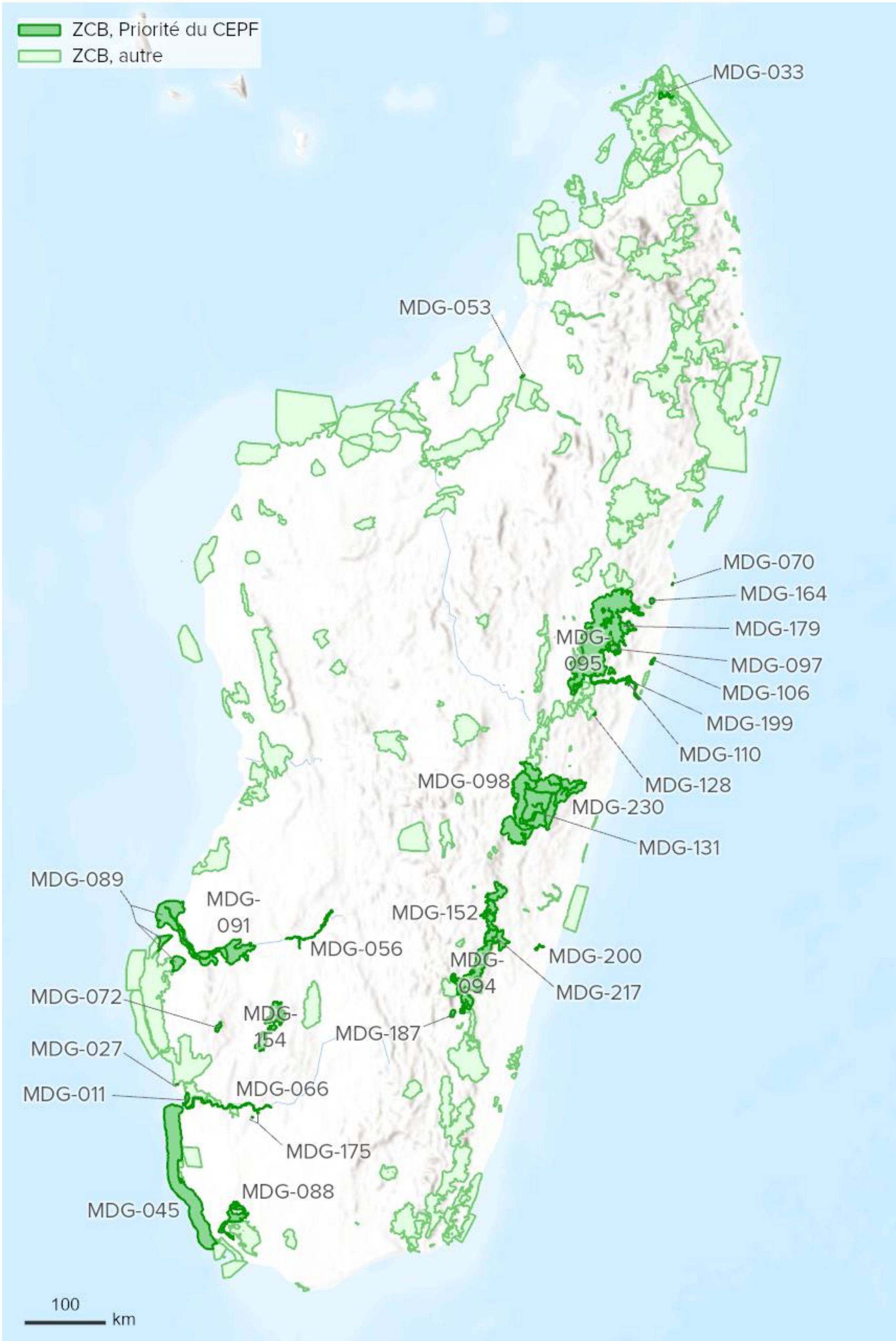

Figure 46 The 30 priority sites for Madagascar

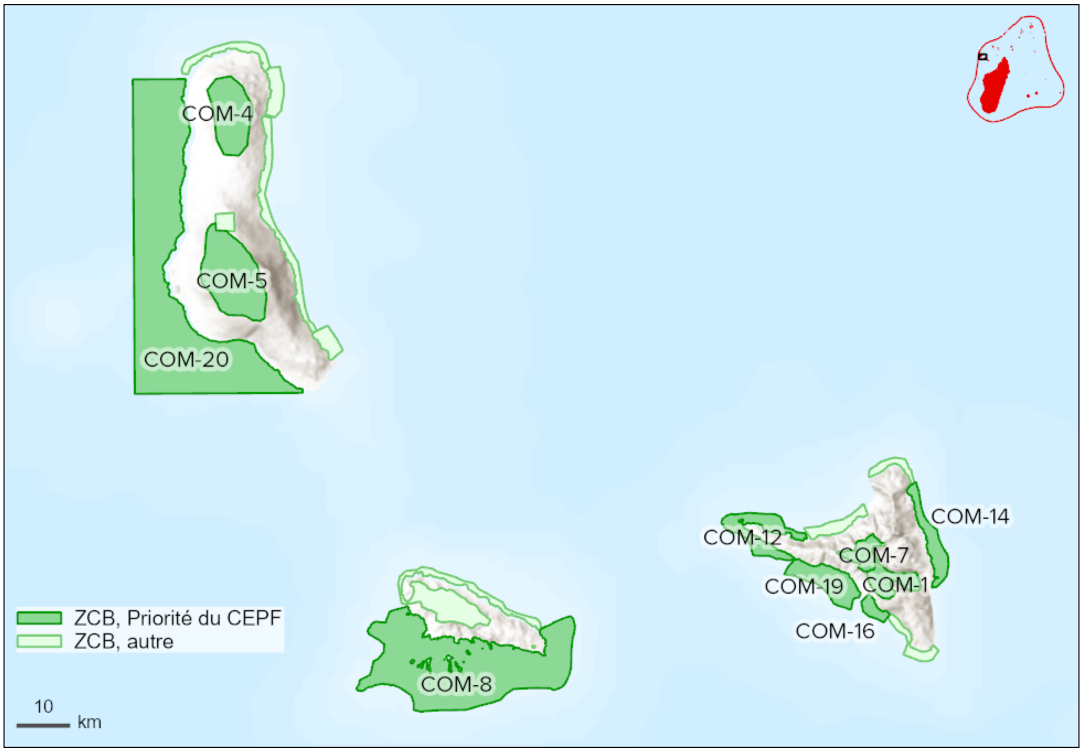

Figure 45. Priority sites for CEPF investment in the Comoros

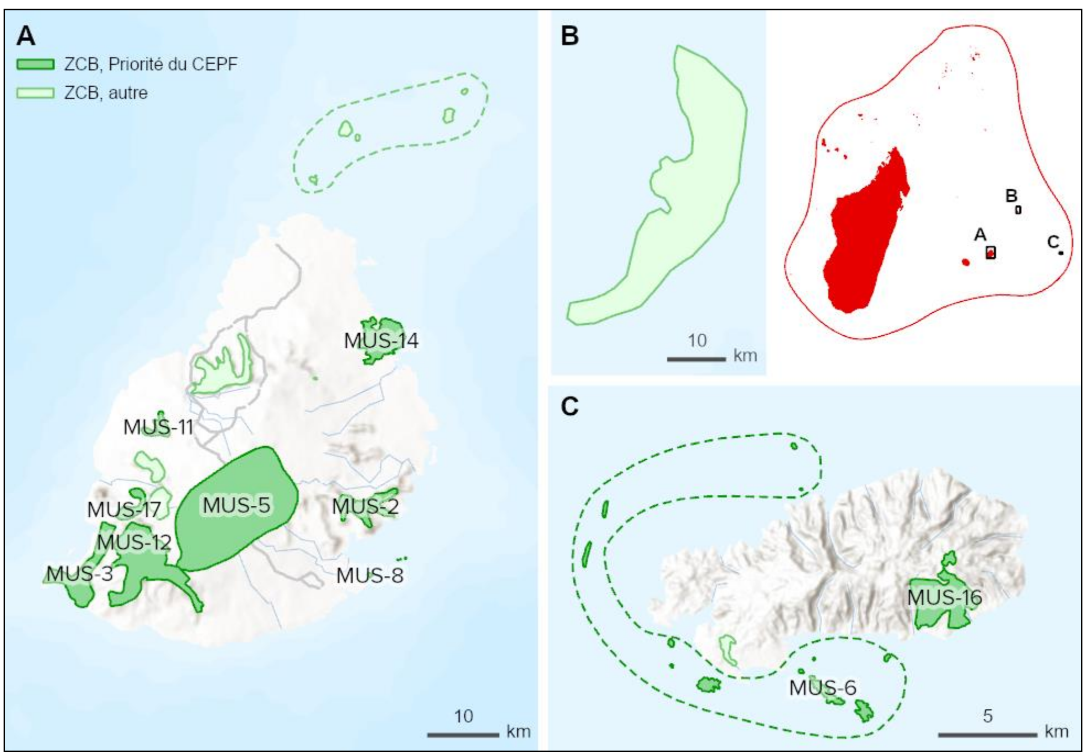

Figure 46. Priority sites for CEPF investment in Mauritius

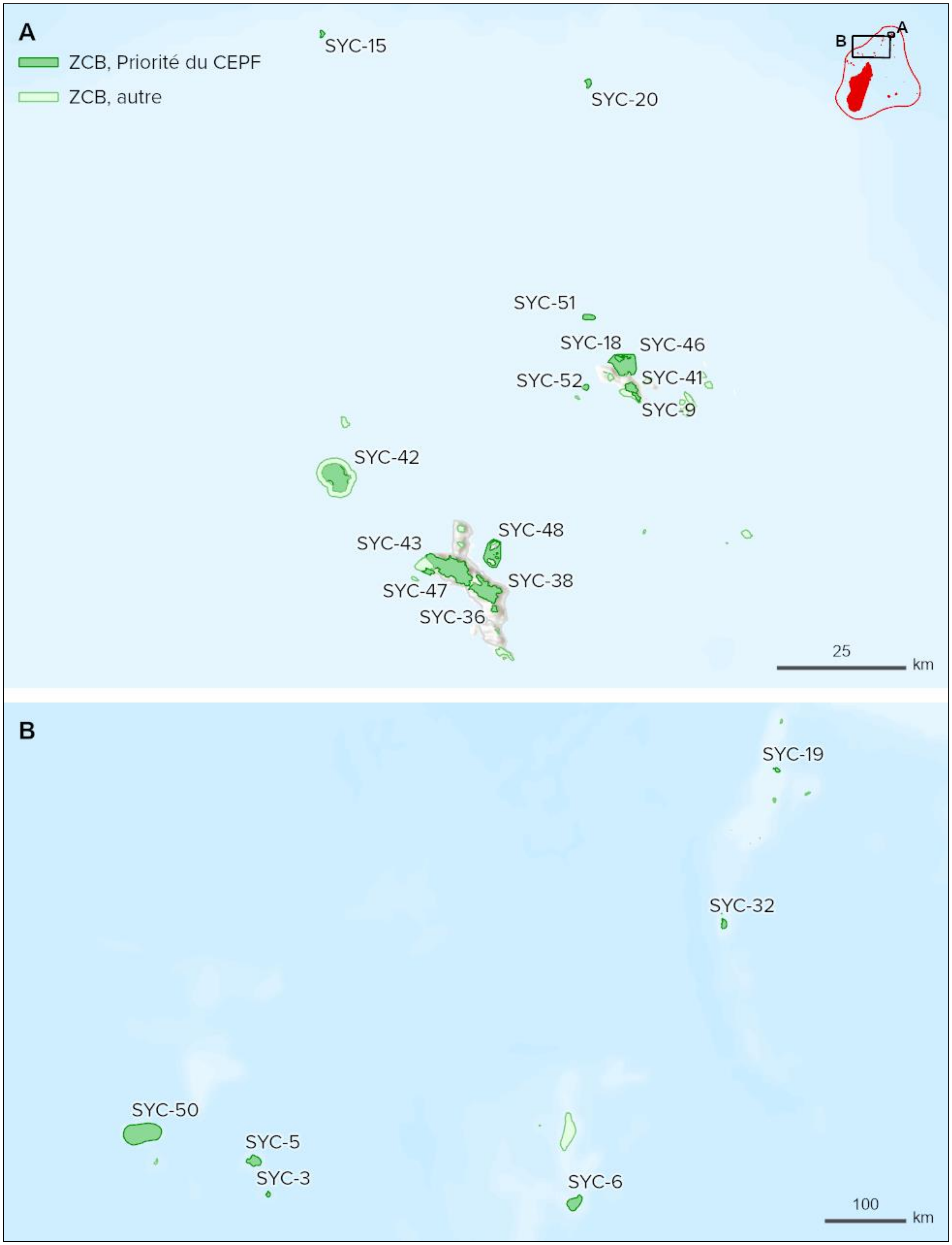

Figure 47. Priority sites for CEPF investment in the Seychelles

Table 70 Geographic priorities for Madagascar

MDG_Code	National Name	Multi-criteria analysis	Rank
MDG-199	Mangoro-Rianila River	4.75	1
MDG-110	Sahafina Forest (Anivorano-Brickaville)	4.18	2
MDG-097	Analamay-Mantadia Forest Corridor	3.43	3
MDG-131	Wetlands Nosivolo	3.29	4
MDG-066	Amoron'i Onilahy and Onilahy River	3.17	5
MDG-098	Fandriana Marolambo Forest Corridor	3.11	6
MDG-094	Ambositra Vondrozo Corridor (COFAV)	3.11	7
MDG-179	Special Reserve Mangerivola	2.88	8
MDG-164	Betampona Integral Nature Reserve	2.80	9
MDG-095	Zahamena-Ankeniheny SAPM	2.79	10
MDG-230	Ramsar site of Nosivolo	2.61	11
MDG-027	Belalanda	2.58	12
MDG-154	Zombitse-Vohibasia National Park	2.52	13
MDG-011	Tsinjoriake-Andatabo	2.48	14
MDG-128	Vohibe Ambalabe (Vatomandry)	2.43	15
MDG-089	Lake Ihotry-Mangoky Delta Complex	2.42	16
MDG-072	Analavelona	2.41	17
MDG-152	Ranomafana National Park and extension	2.37	18
MDG-217	Faraony Headwaters	2.26	19
MDG-056	Makay	2.21	20
MDG-070	Analalava Foulpointe	2.20	21
MDG-106	Vohibola classified forest	2.17	22
MDG-091	Mangoky-Ankazoabo forest complex	2.14	23
MDG-045	Great Reef of Toliary	2.06	24
MDG-200	Namorona-Faraony River	2.02	25
MDG-088	Mahafaly Plateau Forest Complex	2.01	26
MDG-033	Three-bay complex	1.97	27
MDG-175	Reserve Speciale Beza-Mahafaly	1.97	28
MDG-053	Lake Tseny	1.97	29
MDG-187	Special Reserve of Ivohibe Peak	1.97	30

14.1.2 Comoros

The priority KBAs selected for Comoros are the top ten KBAs from the ranking derived from the KBA+ methodology out of the 20 KBAs in Comoros. This list of 10 KBAs includes the KBAs with the highest scores for each of the priority ecosystem services.

Based on the list of ecosystem services and the consultations, the list of Comoros' KBAs was prioritized according to :

. Their contribution to the resilience of populations to climate change

. Available data.

The selected priority ecosystem services are from: (1) commercial fisheries, (2) water for domestic use, (3) water for irrigation, (4) hydropower, (5) wood for energy, (6) flood protection by mangroves and (7) by forests, (8) ecotourism data, and (9) known cultural values.

Table 71 Geographic investment priorities for the Comoros

Code	KBA	Multi-criteria score	Rank
COM-7	Mount Ntringui (Ndzuani Heights)	0,54	1
COM-5	Karthala Massif	0,45	2
COM-20	Coelacanth Zone	0,43	3
COM-1	Moya Forest	0,27	4
COM-14	Domoni area	0,25	5
COM-4	Massif de la Grille	0,22	6
COM-8	Ex Marine Park of Moheli	0,21	7
COM-12	Bimbini area and Ilot de la Selle	0,19	8
COM-19	Pomoni area	0,18	9
COM-16	Moya area	0,17	10

14.1.3 Mauritius

The priority KBAs selected for Mauritius are the top ten KBAs from the KBA+ methodology out of 17 KBAs in Mauritius. This list of 10 KBAs includes the KBAs with the highest scores for each of the priority ecosystem services.

Based on the list of ecosystem services and consultations, the list of KBAs in Mauritius was prioritized according to :

. Their contribution to the resilience of populations to climate change,

. Available data.

The selected priority ecosystem services are: (1) commercial fisheries, (2) water for domestic use, (3) water for irrigation, (4) hydropower, (5) cyclone protection, (6) flood protection and (7) ecotourism value.

Table 72 Geographic priorities for the Republic of Mauritius

Maurice Code	KBA	Multi-criteria score	Rank
MUS-2	Bamboo Mountain Range	0,655	1
MUS-5	Relict Forests of the Central Plateau	0,550	2
MUS-14	Plaine des Roches - Bras d'Eau	0,537	3
MUS-12	Black River Gorges National Park and surrounding areas	0,520	4
MUS-3	Chamarel - Le Morne	0,503	5
MUS-8	Mauritius South-Eastern Islets	0,395	6
MUS-16	South Slopes of Grande Montagne	0,364	7
MUS-17	Yemen-Takamaka	0,353	8
MUS-11	Guardhouse Mountain	0,343	9
MUS-6	Rodrigues' Islets	0,308	10

14.1.4 Seychelles

Based on literature reviews and consultations, each priority ecosystem service was assessed for each of the 57 KBAs in Seychelles.

Also, based on the data available in Seychelles, using the methodology assigned to this study, the key priority ecosystem services for potential community resilience to climate change were assessed, as well as the relative contribution, or importance of the Seychelles KBAs to these ecosystem services. The list of Seychelles KBAs was prioritized and the top 20 are considered the priority sites.

The selected priority ecosystem services are: (1) provision of food, (2) water, (3) forest products, and (4) medicines, (5) protection against floods, (6) and cyclones, (7) forest cover, (8) ecotourism values, (9) cultural, and (10) educational.

Table 73 Geographic Investment Priorities for Seychelles

KBA NO.	Group of islands	Name KBA	Multi-criteria score	Rank
SYC-43	Inner	Morne Seychellois National Park	0,719	1
SYC-38	Inner	Planneau Mountain (Grand Bois-Varigault-Cascade)	0,633	2
SYC-41	Inner	Praslin National Park	0,586	3

KBA NO.	Group of islands	Name KBA	Multi-criteria score	Rank
SYC-42	Inner	Silhouette National Park	0,563	4
SYC-36	Inner	Burnt Mountain-Piton de l'Eboulis	0,500	5
SYC-50	Aldabra	Aldabra Special Reserve	0,469	6=
SYC-47	Inner	Port Launay Marine National Park and coastal wetlands	0,469	6=
SYC-15	North edge	Bird Island (Ile aux Vaches)	0,469	6
SYC-5	Cosmoledo	Cosmoledo	0,453	9
SYC-51	Inner	Aride Island Special Reserve	0,445	10=
SYC-52	Inner	Cousin Island Special Reserve	0,445	10=
SYC-48	Inner	Sainte-Anne Marine National Park (SAMNP)	0,438	12
SYC-20	North edge	St. Denis Island	0,430	13
SYC-46	Inner	Curieuse Island Marine National Park	0,406	14
SYC-32	Amirantes	Saint-François and Bijoutier Islands	0,406	14
SYC-3	Cosmoledo	Astove	0,398	16
SYC-18	Inner	Curious Island	0,391	17
SYC-19	Amirantes	D'Arros Island and Saint Joseph Atoll	0,383	18
SYC-6	Farquhar	Farquhar - South Island and islets	0,375	19
SYC-9	Inner	Fond Ferdinand	0,352	20

14.2 Strategic Directions and Investment Priorities

Based on the studies and consultations that have informed this document, the strategic directions and investment priorities are

Strategic Direction 1**: **Empower communities and civil society to implement actions to improve the resilience of species, ecosystems, and human populations to climate change in priority KBAs

This Strategic Direction will focus on providing the necessary funding, technical support, and capacity building for CSOs to implement ecosystem-based adaptation (EbA) or nature-based solutions (NBS) actions to improve the resilience of the most vulnerable species, ecosystems, and people to climate change. Expected outcomes include increased resilience and improved livelihoods for vulnerable populations, but also improved resilience of ecosystems and ecosystem services.

Adaptation is the adjustment of natural or human systems in response to actual or expected climate disturbances or their effects, in order to moderate damage or maximize beneficial opportunities. It involves reducing risk and vulnerability to climate change, seeking opportunities, and building capacity to cope with climate impacts.

EAF includes the conservation, sustainable management, and restoration of natural ecosystems to help people adapt to the adverse effects of climate change. EAF interventions respond to a specific risk or pressure posed by climate change experienced by a particular human population, and they support, conserve, or restore natural areas that help regulate or mitigate these impacts.

Investment Priority 1.1: Implement Ecosystem-based Adaptation (EbA) actions, including agroforestry, "climate smart agriculture", eradication of invasive species, restoration of degraded watersheds and coastal ecosystems (including wetlands, mangroves, reefs and seagrass beds), and promotion of sustainable management of coastal and terrestrial ecosystems

Initially, actions will focus on supporting civil society organizations in the design and implementation of ecosystem-based and nature-based adaptation solutions and conservation actions that address key threats at priority sites.

Solutions will be identified by analyzing the adverse impacts of climate change on human livelihoods and proposed EbA interventions that can support, conserve, or restore species and natural areas that help regulate or diminish the negative impacts.

Once EbA priorities have been identified and planned, it will be necessary to understand their costs and have strategies to cover those costs, both during the program period and beyond, to ensure the sustainability and continuity of support to CSOs for new EbA actions.

- Interventions may include agroforestry and "climate-smart agriculture," eradication of invasive species, restoration of degraded watersheds and coastal ecosystems (including wetlands, mangroves, reefs, and seagrass beds), and promotion of sustainable management of coastal and terrestrial ecosystems Joint priorities among governments, the private sector, and CSOs can be identified in each country based on a common recognition of the KBA+ methodologies and the value of the EbA approach.

The actions that will be carried out through this investment priority also aim to promote competitive and sustainable production systems for natural products, in particular through :

- the strengthening of the factors of production and the sectors,

- improved access to national and international markets,
- capacity building in business management and entrepreneurship

The value chains will be restructured and reorganized in order to increase the sustainability, resilience and competitiveness of the production systems and to add value to them, particularly at the international level. Access to national and international markets for small and large producers will be rethought: prospecting for potential markets, transportation of goods, development of infrastructure for the collection and processing of natural products and product packaging, etc. The reorganization of access to local markets for agricultural and livestock products will also be supported. The capacities of women, men and youth in agribusiness, entrepreneurship and sustainable development of value chains will also need to be strengthened, particularly through targeted training.

Investment priority 1.2: Support the establishment and development of economic models that improve the resilience of local communities to climate change and support value chains for natural products, while strengthening ecosystem services that contribute to EbA

The objective of this priority investment is to support the emergence and implementation of natural resource management plans in priority KBAs that will ensure the long-term conservation of ecosystems, ecosystem services, and target species in the face of actual or projected climate disturbances and their effects. These plans should take into account the sustainable development needs of local communities and predictions of demographic change. These plans should be budgeted for.

Given the capacity of grassroots organizations, the development of these management plans will need to be supported initially by national and international organizations acting as mentors. Particular attention will be paid to the legitimacy of these mentoring organizations with local communities. To be eligible for CEPF funding, projects will need to demonstrate effective participation of local communities in the early stages of project design, consideration of local development and EAF expectations, and ownership by all stakeholders, including local authorities, farmers' or fishermen's associations, women's groups, and other key private sector institutions.

Strategic Direction 2: ***Support local communities and civil society to strengthen the integration of the EbA approach, ecosystem resilience and biodiversity conservation into political and economic decision-making processes and education***

The involvement of all stakeholders in society is crucial to ensure a holistic and integrated approach to the preservation and sustainability of ecosystem services. Indeed, climate change and its impacts affect the whole planet and a global response must be provided. For this to happen, all stakeholders must be made aware of and convinced of the importance of ecosystem services.

EbA is one of the proposed solutions to reconcile economic development and resilience to climate change. In order to spread this approach and to convince actors outside the environmental sector, it is important to carry out actions to raise awareness and inform the greatest number of people, both in the economic sector and among political decision makers.

The objective of this strategic direction is to support civil society in this sense so that the private sector commits itself to develop EbA actions and that political and economic decision-makers integrate this approach in their decision-making.

Investment Priority 2.1: Develop engagement strategies with private sector actors for the integration of EbA into their activities, and also for the conservation and sustainable use of biodiversity and renewable natural resources

The hotspot is undergoing steady economic development, and national strategies envisage development axes for investments in sectors sensitive to climate change.

Chapter 8 shows the potential for development of tourism activities throughout the hotspot, the importance of fishing and cash crop agriculture (vanilla, cloves, etc.) and the mining sector in Madagascar. These economic development activities, mainly based on natural living or subsoil resources, depend on the quality of ecosystem services provided by nature (fish supply, ecotourism value, etc.) while presenting risks for this same environment, especially in terms of overexploitation or pollution.

This investment priority will support civil society organizations to explore and develop partnerships with private companies operating in the key natural resource sectors of fisheries, agriculture, tourism, and mining to identify and implement pilot actions to improve environmental and social practices to ensure the quality and sustainability of ecosystem services provided by their surrounding environment. These practices could be based on the application of the mitigation hierarchy: Avoid-Reduce-Compensate, and on global standards for sustainable business practices, or any other type of mechanism adapted to the hotspot context.

CEPF will also seek to fund innovative mechanisms, including the private sector, that can provide sustainable financial incentives to local communities for managing priority KBAs, or that can provide sustainable benefits for the conservation of ecosystem services.

In parallel, initiatives that improve the climate change resilience of the private sector through WSS actions may also be funded by CEPF (e.g., integrated water resource management for hydropower actors).

Investment Priority 2.2: Support civil society to disseminate information and influence political and economic decision-making processes in favor of biodiversity conservation priorities, ecosystem services and EbA

The Profile raised the need to strengthen communication on the value of ecosystem services provided by nature and EbA to stakeholders outside the environmental arena, particularly policy makers and the private sector. Even when information exists, it is not used - or misunderstood, or misinterpreted, or ignored - by a large majority of actors, with immediate consequences for ecosystems. This observation is shared throughout the territories of the hotspot. Small or medium-scale projects to raise awareness and influence, currently little or not financed by other actors, could thus have a strong impact on ecosystem services - particularly with regard to fishing, agricultural development and the extractive sector.

The following actions may be financed under this investment priority:

- Undertake information campaigns on the concept of ecosystem services and on the EbA approach, aimed at development actors, the private sector and government authorities;
- Engage in dialogue with government authorities through the establishment of multi-stakeholder discussion platforms, to support preparatory actions in support of the adoption of legislation on specific issues;
- Support civil society participation in consultations on economic development plans and national strategies, in environmental impact assessments, and in appropriate fora, to strengthen the consideration of ecosystem services and EbA actions;
- Support through advocacy the protection of KBAs and the development of related management plans.

In the Seychelles in particular, the stakeholder consultation showed the need to support advocacy for the re-establishment of Corporate Social Responsibility (CSR) and the Environmental Trust Fund, or an equivalent instrument, as the main national sources of CSO funding for the preservation of ecosystem services.

This investment priority is not directly linked to CEPF priority sites. However, linkages to ongoing activities at these sites will be appreciated, where warranted.

Investment priority 2.3: Support civil society in the development and implementation of disaster risk reduction measures

For Madagascar in particular, this investment priority refers to the National Adaptation Plan, which calls for the establishment of an Early Warning and Disaster Management System adapted to the agricultural system. Climatic disasters are often devastating in Madagascar. Ecosystem-based disaster risk reduction measures, if they can reduce the risk of crop failures, can be very important for Madagascar. Similar approaches will be developed for the other islands.

Strategic Direction 3: Strengthen the capacity of local communities and civil society at regional and local levels to enhance adaptive capacity and reduce exposure to climate change risks

Measures to respond to the direct effects of climate change, felt at the local level, must be adapted to local conditions.

The participatory planning process at the local level, the capacities of local institutions to analyze climate risks and plan required actions, and local means of communicating climate information are conditions for successful actions to strengthen adaptive capacity and reduce exposure to climate change risks. Potential roles for civil society actors in conducting awareness raising activities, providing training, and supporting field monitoring and reporting to authorities exist. In general, through the grassroots communities, indigenous knowledge is taken into account in adaptation actions, and paralleled with scientific approaches. However, knowledge and capacity building in EbAs of stakeholders is required. Beyond a few pilot projects, funding for technical, administrative and financial capacity building of local grassroots and civil society organizations with environment and climate change related missions is currently insufficient in the hotspot countries, despite the urgent need and opportunity to scale up action on EbA. While there has been a focus on strengthening government programs to address the effects of climate change, there has been little attention on harnessing the capacity of civil society to address these challenges to date. In addition, two main barriers have also been identified that limit civil society's ability to carry out its actions effectively over the long term. The first barrier is the insufficient number of young professionals with technical capacities in areas related to adaptation actions and mainly those based on ecosystems. Supporting the emergence of a new generation of young professionals is therefore essential to ensure local community engagement in efforts to advance climate change adaptation agendas.

The second major obstacle relates to the overall capacity of national organizations in administration, management, use of new technologies, and fundraising. While national organizations often have an understanding of the local situation and strong relationships with local communities, weak capacity affects their effectiveness, limits their access to funding, and threatens their sustainability and independence. On a more positive note, the profile also highlighted the exceptional diversity of experience and skills in the hotspot. Complementarities offer extraordinary opportunities for regional cooperation, which are still underdeveloped in the fight against climate change.

Investment priority 3.1: **Strengthen the technical, administrative and financial capacities of local civil society organizations with missions related to the environment and the fight against climate change**

This investment priority will focus on projects that enhance the capacity of civil society to better integrate EbA measures into their planning and implementation projects, to improve institutional response to climate change, and to develop people's skills in planning and implementing EbA actions.

Investment Priority 3.2: Promote exchanges and partnerships between civil society organizations (at the national and regional levels) to strengthen technical, organizational, management and fundraising capacities working in the targeted KBAs

Under this investment priority, exchange programs, "twinning" (or *mentorship)* between organizations in the region, or the establishment of platforms and networks based on concrete technical cooperation will be eligible.

It will be more about "doing together" than "discussing together". The priority areas for such actions will be:

- Management of marine and coastal areas
- Wetland management
- Restoration of island ecosystems
- Invasive Species Control
- Plan to save critically endangered species
- Local community participation and co-management.

The issue of sustainable financing has emerged as a priority area where civil society feels the need to strengthen its capacity. At present, "project approaches" remain the main sources of funding. Projects are still mainly financed by official development assistance donors. However, the modalities for accessing these funds remain complex and limit their use to a limited number of organizations, mainly international. CEPF will support specific actions to strengthen the operational capacities of national civil society in the areas of project preparation, fundraising, programming and budget management, human resources, and associative governance, in order to give these organizations greater access to diversified funding sources.

Investment Priority 3.3: Support the emergence of a new generation of conservation professionals and organizations by providing small grants for technical and practical training

Training opportunities in areas related to climate change themes in general, including EbA, are not yet well developed at the hotspot level. With this investment priority, CEPF aims to help reduce this gap through training opportunities, including support for the development of short programs for community leaders, development professionals, or any other relevant stakeholder group. Small grants or *scholarships* could be awarded to young professionals, for example at the Master's level, to encourage the active participation of these future professionals in programs aimed at strengthening adaptive capacity and reducing exposure to climate risks throughout the region. Exchanges between the countries of the hotspot will be promoted. It should be noted that for procedural reasons, CEPF will not be able to provide support to students or organizations from French departments. However, it may support students or organizations from other countries to benefit from training or exchange internships in the French departments or territories of the hotspot. Under this investment priority, CEPF may also provide support to national organizations to strengthen their institutional capacities in the areas of EbAs through training or activities designed to

Strategic Direction 4*: *Support research and ensure the dissemination of results for the promotion and improvement of knowledge on EbA actions and related good practices

Investment Priority 4.1: Support applied research activities that improve understanding of the role of specific ecosystems and test the effectiveness of promising EbA techniques

Although Madagascar is a privileged research ground for the scientific community, the gaps are still extremely important, particularly with regard to the economic evaluation of natural capital. The situation seems to be the same in the other countries of the hotspot where the necessary data are very limited, which makes it difficult to identify priority EAFs and seriously handicaps planning in their implementation, both at the national and site levels.

The proposed research should allow us to know the loss and decline of the population of flagship species and their habitats in each island in the face of climate change. The same is true for invasive species and their degree of colonization of different ecosystem types. The establishment of permanent plots will be encouraged to monitor the evolution of invasive plant species as well as specific research activities related to the evaluation of the rate of deforestation and reforestation, especially in the Inner Island of Seychelles. Also, in the Indian Ocean Islands, research on soil strengthening and watershed management, as well as value chains on medicinal plants and mountain ecotourism will be promoted. As the hotspot has a very significant marine and coastal ecosystem, the development of a long-term habitat monitoring program will be a priority in enhancing EbA activities. It will also define the level of resilience of the biodiversity and surrounding communities. A study to assess the natural capital of marine and terrestrial ecosystems and ecosystem services according to an agreed methodology throughout the hotspot will be encouraged. Capitalizing on the results of previous biodiversity-focused studies used for the maintenance of ecosystem services and EbA, such as scenario building on the dynamics of species distribution and range in the face of climate change and consideration of the urban environment in close connection with the KBA+, will also be eligible.

Given the ecosystem services used in the multi-criteria analyses, in-depth knowledge of the contribution of priority ecosystems to EbA activities deserves to be explored. Given the different stages in the implementation of EbA, each of these stages will be researched to document the information needed to assess the effectiveness of the EbA activities carried out: (1) determination of the geographical context and goals of EbA, (2) vulnerability analysis, (3) identification of EbA options, (4) development of EbA strategy and adaptation measures, (5) monitoring and evaluation for learning, (6) integration of EbA into policies and promotion of synergy with other approaches.

Each of the research projects supported under this priority investment will have to integrate dissemination actions with the identification of key audiences and appropriate budgeting.

Investment Priority 4.2: Support research activities that measure and verify the impact of the grant portfolio on ecosystem services

The establishment of a baseline situation is always essential for the implementation of EbA activities at the start of the project. This baseline information will include geographic, bioecological, biophysical including climate change, and socioeconomic contexts. Human well-being and economic development are highly dependent on ecosystems and the services they provide.

The study on the availability and quality of these services after CEPF investments will be conducted as the hotspot environment remains under extreme threat from human activities with disturbances to ecosystems and biodiversity exacerbated by climate change. The implementation of additional measures needed to achieve EbA activities such as infrastructure, techniques, policies, and regulations will be assessed while measuring the reduction in vulnerability of target populations.

The indicators defined in the logical framework below will be subject to efficiency and return on investment measures in relation to the benefits obtained. In addition, studies on the capacity of ecosystems to provide ecosystem services in a sustainable manner will be carried out, taking into account the options already identified, such as the implementation of agroforestry, the protection of springs, the banks of permanent and semi-permanent rivers and freshwater lakes, and reforestation actions near springs and lakes.

Investment Priority 4.3: Support civil society to promote public awareness and education on biodiversity, conservation priorities, climate resilience, ecosystem services and EbA

Beyond training and knowledge generation, the profile raised the need to strengthen "knowledge translation," i.e., communication about the importance of ecosystem services and EbA to multisectoral stakeholders at all levels, especially policymakers, the private sector, and the development sector. Even when information exists, it is not used, misunderstood, misinterpreted, or ignored by a large majority of stakeholders, with immediate consequences for ecosystems. This observation was shared throughout the territories of the hotspot.

On a more positive note, the profile also highlighted the exceptional diversity of experience and expertise in the hotspot, which offers great potential for regional cooperation by building a regional technical and scientific platform. This platform will serve as a means of exchanging relevant data and information on the progress of the KBA+ in the implementation of the EAF. For example, Madagascar has considerable experience in engaging with local communities and jointly managing protected areas. Mauritius, facing severe habitat loss, has experimented with innovative techniques for ecosystem restoration. Seychelles has also developed extensive experience in eradicating invasive species on islets, and is far ahead in partnerships with the private sector. Comoros has a vibrant network of community-based organizations involving youth. The French departments host high-level research centers and have extensive experience in engaging with local governments. These complementarities offer extraordinary opportunities for regional cooperation, which are still underdeveloped.

In many cases, organizations must rely on experts from other countries, which can jeopardize the sustainability of their activities. Supporting the emergence of a new generation of young professionals is therefore essential to the consolidation and maintenance of a regional conservation community. It is also an important element for the integration of conservation including EbA into government and private sector actions over the long term. The second major obstacle relates to the overall administrative, management, and fundraising capacities of national organizations. While national organizations often have an understanding of the local situation and strong relationships with local communities, weak capacity affects their effectiveness, limits their access to funding, and threatens their sustainability and independence. Under this investment priority, CEPF will also provide support to national organizations to strengthen their institutional capacity in the areas of conservation, climate change, and EbA through training or custom-designed activities. In addition, CEPF intends to help expand training opportunities, including by supporting the development of short programs for community leaders, development professionals, or any other relevant stakeholder group, and by supporting the participation of beneficiaries in these trainings. Finally, the popularization of the scientific knowledge acquired for the benefit of the general public through publications or other forms of communication media will be essential.

This priority is complementary to the three previous priorities.

Strategic Direction 5: Provide strategic leadership and effective coordination of CEPF investment across the hotspot through a regional implementation team

In each hotspot approved for investment, CEPF works with a Regional Implementation Team or RIT to convert the ecosystem profile plans into a coherent portfolio of grants that exceeds in impact the sum of its parts. The RIT will consist of one or more CSOs active in conservation in the hotspot. The RIT will be selected by the CEPF Donor Council based on approved terms of reference. The team will operate in a transparent and open manner, consistent with the CEPF mission and all provisions of the CEPF Operational Manual. RIT member organizations will not be eligible to apply for other CEPF grants in the same hotspot. Grant applications from official affiliates of those organizations that have an independent board of directors will be accepted, subject to further review.

Investment Priority 5.1: Build a broad constituency of civil society groups that work across institutional and political boundaries to achieve the shared conservation goals outlined in the ecosystem profile

The RIT will provide strategic leadership and local knowledge to build a broad constituency of civil society groups working across institutional and political boundaries to achieve the conservation goals outlined in the ecosystem profile. It will implement a number of functions, as defined in the Terms of Reference, including:

- Act as an extension service to help civil society groups design, implement, and replicate successful conservation activities.

- Review all grant applications and manage external reviews with technical experts and advisory committees.

- Make small grants up to an agreed threshold amount and decide jointly with the CEPF Secretariat on all other applications.

- Lead the monitoring and evaluation of individual projects using standard tools, site visits and meetings with grantees, and assist the CEPF Secretariat in monitoring and evaluation.

- Strengthen the institutional capacity of beneficiaries to ensure efficient and effective project implementation.

- Communicate widely about CEPF’s objectives, grant opportunities, lessons learned, and results.

The RIT will directly support the strategic development of the grant portfolio and contribute its own right to the achievement of critical conservation outcomes that relate to the overall portfolio benefits. These activities may include facilitating learning exchanges among grantees and other stakeholders, identifying opportunities for leverage at the grant or portfolio level, or collaborating with other donors to align support for CSOs and their conservation projects.

Investment Priority 5.2: Improve operational and monitoring processes and coordination of CEPF grant resource allocation to ensure effective implementation and strategic guidance in an accountable and transparent manner that is fit for purpose on a country-by-country basis

To do this, a good planning basis must be established: A multi-year operational plan with clear indicators must be established, both at the country and regional levels, as a derivative of the logical framework. The multi-year plan should include the scheduling of monitoring, annual reviews and evaluations of portfolio implementation.

On the other hand, regular evaluations of the ITN performance of the project portfolio should also be planned, conducted and documented on an annual basis. Good practices, weaknesses, success factors and bottlenecks should be clearly identified in order to adjust the investment guidelines if necessary.As a further requirement, the RIT must be able to ensure the execution of strategic directions in a balanced manner.

For each country, these planning, monitoring, and evaluation processes must involve all stakeholders: local communities, civil society, researchers, devolved authorities, local governments, and key private sector actors.

The investment needs for these actions must be clarified, taking into account the specificities of each country. These specificities are of different kinds: environmental, but also social, economic and political.

From the outset, learning from the past, potential delay factors for the operational and monitoring process should be identified and assessed, and proactive measures to address them implemented.

The strategic directions and investment priorities of the MADIO hotspot are summarized in the table below:

Table 74 Strategic directions and investment priorities

Strategic Directions	**Investment priorities of the Madagascar and Indian Ocean Islands Hotspot**
1- Empower communities and civil society to implement actions to improve the resilience of species, ecosystems, and human populations to climate change in priority KBAs	1.1 Implement Ecosystem-based Adaptation (EbA) actions, including agroforestry, “climate smart agriculture”, eradication of invasive species, restoration of degraded watersheds and coastal ecosystems (including wetlands, mangroves, reefs and seagrass beds), and promotion of sustainable management of coastal and terrestrial ecosystems. Priority will be given to the following approaches: i. Promoting resilient agroforestry and developing “Climate Smart Agriculture ii. Promote the sustainable management of freshwater, wetlands, and marine and coastal ecosystems (mangroves, coral reefs, seagrass beds) iii. Strengthen watershed management of intact forest ecosystems through the implementation of protected area management plans in collaboration with local communities iv. Enhancing resilience and adaptation through ecosystems

Strategic Directions	**Investment priorities of the Madagascar and Indian Ocean Islands Hotspot**
	v. Restore degraded coastal ecosystems (wetlands, mangroves, coral reefs, sea grass beds) vi. Restore watersheds of degraded forest ecosystems vii. Promote the control and eradication of invasive alien species viii. Strengthen the capacity of local communities in participatory ecological monitoring of target species in KBAs and their habitats
	1.2 Support the establishment and development of economic models that improve the resilience of local communities to climate change and support value chains for natural products, while strengthening ecosystem services that contribute to EbA
2- Support local communities and civil society to strengthen the integration of the EbA approach, ecosystem resilience and biodiversity conservation into political and economic decision-making processes and education	2.1 Develop engagement strategies with private sector actors for the integration of EbA into their activities, and also for the conservation and sustainable use of biodiversity and renewable natural resources
	2.2 Support civil society to disseminate information and influence political and economic decision-making processes in favor of biodiversity conservation priorities, ecosystem services and EbA
	2.3 Support civil society in the development and implementation of disaster risk reduction measures
3- *Strengthen the capacities of local communities and civil society at the regional and local levels to enhance adaptive capacity and reduce exposure to climate change risks*	3.1 Strengthen the technical, administrative and financial capacities of local civil society organizations with missions related to the environment and the fight against climate change
	3.2 Promote exchanges and partnerships between civil society organizations (at the national and regional levels) to strengthen technical, organizational, management and fundraising capacities working in the targeted KBAs
	3.3 Support the emergence of a new generation of conservation professionals and organizations by providing small grants for technical and practical training
4- Support research and ensure the dissemination of results for the promotion and improvement of knowledge on EbA actions and related good practices	4.1 Support applied research activities that improve understanding of the role of specific ecosystems and test the effectiveness of promising EbA techniques
	4.2 Support research activities that measure and verify the impact of the grant portfolio on ecosystem services
	4.3 Support civil society to promote public awareness and education on biodiversity, conservation priorities, climate resilience, ecosystem services and EbA

<table>
<tr><th>Strategic Directions</th><th>Investment priorities of the Madagascar and Indian Ocean Islands Hotspot</th></tr>
<tr><td rowspan="2">5- Provide strategic leadership and effective coordination of CEPF investment across the hotspot through a regional implementation team</td><td>5.1 Build a broad constituency of civil society groups that work across institutional and political boundaries to achieve the shared conservation goals outlined in the ecosystem profile</td></tr>
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15. LOGICAL FRAMEWORK FOR THE MADIO HOTSPOT

Objective	Targets	Means of Verification	Important assumption
Engage civil society in conserving biodiversity and enhancing resilience to climate change through targeted investments that impact the most important sites for biodiversity and ecosystem services.	At least 60 CSOs, including at least 40 national organizations actively involved in conservation actions guided by the ecosystem profile. 22,000 women and 22,000 men benefit from the adoption of climate-resilient diversified livelihood options (including fishing, agriculture, tourism, etc.) 910,000 hectares of ecosystems protected and enhanced in response to climate variability and change 5 grants in the CEPF global portfolio incorporate EbA techniques developed under the program (e.g., climate-resilient agroforestry, assisted regeneration of denuded watersheds with native species, coral reef restoration with seeding units, etc.)	Extract from CEPF's tracking tools Grantee final reports; CEPF grants database. Results of independent socio-economic surveys disaggregated by gender. Gazette notifications of protected area expansion; final reports from grantees; METTs. Grantee reports with independent evaluation.	The political and economic climate remains stable, allowing CSOs to implement their activities under optimal conditions.
Outcome 1: Civil society is empowered to implement EbA actions.	22,000 women and 22,000 men in the target areas benefit from the adoption of diversified and climate-resilient livelihood options. 16,500 women and 16,500 men with increased income as a result of ecosystem-based livelihood activities (sustainable fishing, nature-based tourism, harvesting natural products, etc.). 152,500 women and 152,500 men receive non-monetary benefits other than formal training as a result of strengthened ecosystem service delivery.	Results of independent socio-economic surveys, disaggregated by gender. Final reports from grantees. Final reports from grantees.	Restoration of natural ecosystems leads to increased resilience and diverse livelihood opportunities. Civil society and beneficiary communities remain motivated in the implementation of activities and adhere to the EbA approach.

	20 economic models to improve the resilience of local communities to climate change are developed and implemented. 910,000 ha of ecosystems protected and enhanced in response to climate variability and change. 620,000 hectares of intact coastal ecosystems with enhanced management. 300,000 hectares of intact watershed ecosystems with enhanced management. 2,000 hectares of degraded coastal ecosystems restored. 1,000 hectares of degraded watershed ecosystems restored. 1,000 hectares of climate-resilient agroforestry systems implemented. 1,000 hectares of small island ecosystems where invasive alien species have been eliminated or reduced.	Final reports from grantees. Final reports from grantees. Management Effectiveness Tracking Tools; final reports from grantees.	The socio-economic context allows grantees to take an interest in the new economic models that have been put in place and allows their sustainability. Governments remain committed to increasing the coverage and strengthening the management of KBAs (e.g., by ensuring that appropriate regulations are in place, that staff are qualified, that equipment and budget are sufficient, and that a management plan is developed and implemented).

Outcome 2: Civil society has improved ability to support the integration of the EbA approach into political and economic decisions.	6 CSOs, private sector actors and/or government organizations have improved knowledge of how to integrate the EbA approach. 1 institutional and regulatory mechanism providing incentives for building climate resilience is developed and operational. 2 engagement strategies for EbA integration are prepared. 3 knowledge products (manuals, videos, etc.) on the theme of ecosystem services and/or EbA are prepared and disseminated in the region.	Published public and private sector policies and commitments. CSO strategies and public commitments. Notification of new laws, policies and regulations in official journals. Published private sector policies and commitments. Final reports from grantees.	Governments, the private sector, and CSOs in each country recognize the KBA+ methodology as a basis for defining common priorities. Government organizations, the private sector, and CSOs understand the value of the EbA approach and remain motivated in its integration. The political climate remains stable. The economic context remains stable, allowing private sector players to take an interest in EbA. Private sector actors understand and embrace EbA. Government organizations, private companies, and CSOs understand the value of the EbA approach and remain motivated to integrate it.
Outcome 3: Civil society capacity is strengthened.	5,500 women and 5,500 men from local CSOs have benefited from technical, administrative or financial capacity building. 12 local CSOs have an institutional capacity score of 80 percent or higher on the CEPF Civil Society Tracking Tool. 7 exchange and partnership activities between civil society organizations (at the national and regional levels) are carried out.	Final reports from grantees. Civil society tracking tools.	The political and socio-economic context allows CSOs to carry out their activities. The public health situation allows for regional exchanges. CSOs are interested in regional exchanges.

Outcome 4: Research on the EbA approach is conducted and results are disseminated.	2 research activities to better understand the role of ecosystems in climate change adaptation and to test the effectiveness of EbA actions are conducted. 2 research activities to measure and verify the impact of the subsidy portfolio on ecosystem services are conducted. 2 public awareness and education events on biodiversity, conservation priorities, climate resilience, ecosystem services and ecosystem-based adaptation are organized.	Final reports from grantees.	Research institutions are interested and convinced by the EbA approach. The general public is receptive to the EbA approach. The public health situation allows the organization of events with the general public.
Outcome 5: A Regional Implementation Team provides strategic leadership and effective coordination of CEPF investment in the hotspot.	95 projects receive CEPF funding in the hotspot. 60 CSOs receive CEPF funding in the hotspot. 1 regional civil society network on EbA is operational and active.	Grantee final reports. CEPF grants database. Independent evaluation report.	The RIT team is recruited and operational from the beginning of the project. There is little or no turnover in the RIT and CEPF Secretariat teams. The RIT and CEPF Secretariat keeps the motivation in the management of the funds and the animation of the network of actors.

15. Sustainability

The assessment of the sustainability of investments will be reflected in the degree to which the final objectives of the program are achieved, as well as the duration of the impacts of the actions. Strategies to ensure sustainability must be integrated into the core of the Investment Strategy itself. The approach proposed for the Madagascar and Indian Ocean Islands Hotspot has been developed with this in mind. Some of the key factors to ensure program sustainability are:

- Integration (of biodiversity issues beyond the conservation community, but fully into all approaches to sustainable development)
- Capacities (of as many stakeholders as possible to understand all issues related to KBAs, ES, and the EbA approach, and to work effectively)
- Engagement (of actors in conservation including researchers, policy makers, citizens, civil society, private sector)
- Sustainable Funding (to ensure the recurring costs of conservation)
- Partnerships (to ensure ownership and synergy of actions, and to better ensure intersectorality and sustainability).

All four countries have basic reference tools such as the NDC and/or texts, and for Madagascar in particular, a National Adaptation Plan (NAP). These tools serve as a basis for reflection and action, and facilitate the identification of the stakeholders involved, as well as their respective roles. Governments and local communities hold the most crucial positions, accompanied on both sides by civil society actors. The importance of all stakeholders is recognized in the process of developing the investment strategy, which has largely involved government representatives and local civil society organizations. In addition, attention has been paid to ensuring that the investment strategy builds on national conservation strategies and contributes to governments' efforts to meet international commitments. This is in line with the commitments of the Paris Declaration on Aid Effectiveness.

For the implementation of the program, capacity building of stakeholders, so that all of them, according to their respective positions, can play decisive roles in achieving the objectives and expected impacts, and are able to lay the foundations for the sustainability of results. The Strategic Directions are thus in line with this capacity building approach, targeting both actors and activities (conservation, research, development) in favor of the fight against climate change. However, it must be recognized that capacity building is a long process, especially when working at the grassroots level, and when continuous and sustained efforts are required to convince politicians.

It is increasingly recognized that the key factor for success is community engagement in the conservation process. It is essential that all CEPF-funded projects reflect this approach, including adopting participatory processes from the project identification stage. Efforts will enable national, regional, and international organizations capable of providing technical and financial support to build trusting relationships at the community level and, over time, support the emergence of strong local institutions capable of implementing sustainable EAF and conservation actions.

Protecting nature will always have a cost, and sustainable financing is a key element of CEPF's investment strategy. Hence the encouragement of private sector involvement, which has the potential to make a lasting difference and has already demonstrated its value in some hotspot countries, particularly Seychelles and Mauritius. Exploring innovative partnerships between civil society and the private sector is an ambitious goal, and one to which CEPF, with its flexible delivery mechanism, could make a significant contribution.

In short, sustainability is above all based on ownership by all concerned, and the actions to establish this ownership, with reference to the above and considering the factors at the beginning, will consist of:

- Capacity building of local grassroots communities (training, awareness raising), so that they internalize EbA in their practices
- Capacity building of civil society members (training, human resources, logistics), especially national ones, in developing EbA activities, so that they can effectively carry out their roles of proximity support to communities and relay to state institutions
- Collaboration with researchers and research institutes, in order to have and develop an up-to-date, reliable and accessible database system
- Developing partnerships with members of the private sector, so that they integrate ecosystem protection and climate change adaptation into their investments.

16. Conclusion

The MADIO Hotspot is one of the richest regions in the world in terms of biodiversity, due to the high level of endemicity of the fauna and flora species it contains, as well as the diversity of its ecosystems. However, this hotspot is also among the most threatened, with the greatest number of species listed as globally threatened on the IUCN Red List; a situation that worsens with every update. As a result, Madagascar and the islands of the Indian Ocean have benefited for several decades from significant funding from international and (in some countries) national donors, for the conservation of natural ecosystems, the biodiversity they support and the ecosystem services they provide. Actions on the ground have targeted grassroots communities as a priority.

Despite this scale of investment, threats to biodiversity and ecosystems persist, which are exacerbated by the impacts of climate change. In addition to the proliferation of invasive alien species, which is far from being curbed, most threats are due to human activities that destroy or degrade natural ecosystems: forestry operations; expansion of agriculture; overgrazing; mining operations; urbanization; and unsustainable fishing practices.

All countries in the hotspot have some combination of high levels of poverty, high population density and rapid population growth. Also, good environmental governance is lacking, as reflected by: gaps in legislation and regulations and/or weakness in implementation; non-application of decentralization policies; insufficient integration of conservation and the fight against climate change into spatial and sectoral plans and policies; and a lack of effective engagement of local communities as actors with agency to manage natural ecosystems, rather than just benefit passively from them. There is also a need to raise awareness and change perceptions in all sections of society, to challenge the dichotomy between economic development and conservation that exists at the community level, as well as at the level of political decision-makers and private sector actors.

If these threats continue unabated, the hotspot's natural ecosystems will continue to degrade and disappear, their capacity to provide ecosystem services will erode, the region's resilience to the effects of climate change will diminish, the rate of species extinctions will accelerate, and the risk of zoonotic disease emergence will increase.

Civil society is well positioned to act in an operational manner and collaborate with stakeholders at all levels, while sensitizing private sector leaders and policy makers to the imperative of directing investments toward a sustainable vision, considering the role of ecosystems in underpinning social and economic development. In this context, the opportunities for impact for CEPF and other donors supporting biodiversity conservation and climate change adaptation based on the EbA approach are considerable.

In order to focus CEPF grant making in the MADIO Hotspot, the geographic and thematic priorities for investment have been updated. Based on an extensive process of literature review, analysis and stakeholder consultation, the CEPF investment strategy has been updated, comprising 13 investment priorities grouped into five strategic directions. CEPF investments at the ground-level will focus on 70 priority sites, selected following the KBA+ methodology. The overall objective is to engage civil society in conserving biodiversity and enhancing resilience to climate change through targeted investments that impact the most important sites for biodiversity and ecosystem services.

Appendix 1: List of Acronyms

ACC	Adaptation to Climate Change
ACCE	Arongampanihy Communication Culture Environment
AED	Association of Students in Didactics in Action
AFD	French Development Agency
EbA	Ecosystem-based adaptation
AMCC	Global Climate Change Alliance
AMP	Marine Protected Areas
ANAE	National Association of Environmental Actions
AND	Designated National Authorities
AP	Protected Area
APD	Official Development Assistance
APLAMEDOM	Association for aromatic and medicinal plants
WMPA	World Mountain Farmers Association
ARDA	Reunion Agency for the Development of Aquaculture
AREU	Agricultural Research and Extension Unit
ARSIE	Environmental Information System Network Association
ASG	Amphibian Specialist Group
AVG	Alliance Voahary Gasy
AVSF	Agronomists and Veterinarians Without Borders
AZE	Alliance for Zero Extinction
BAD	African Development Bank
BAU	Business As Usual
BGCI	Botanic Gardens Conservation International
BIOFIN	Biodiversity Finaning (United Nations Development Programme and the Global Biodiversity Finance Initiative Team)
BIOPAMA	Biodiversity and Protected Areas Management Program
BMZ	BundesMinisterium fur witschaftlische Zusammenabei (German Federal Ministry for Economic Cooperation and Development)
BNCCREDD	National Office for Climate Change and REDD
BPO	*Business Process Outsourcing*
C3EDM	Center of Economics and Ethics for Environment and Development - Madagascar
CASE	Californian Academy of Science
CAZ	Ankeniheny - Zahamena Corridor
CBNM	National Botanical Conservatory of Mascarin
UNFCCC	United Nations Framework Convention on Climate Change
CNCC	National Committee on Climate Change
CNULCD	United Nations Convention to Combat Desertification
CDB	Convention on Biological Diversity
CDN	Contribution Determined at the National Level
CEPF	Critical Ecosystem Partnership Fund
CETAMADA	Association for the Protection of Marine Mammals and their Habitats in Madagascar
CI	Conservation International
CICES	International Classification of Ecosystem Services
CIME	Interministerial Committee for the Environment
CPB	Cartagena Protocol on Biosafety
CIRAD	Center for International Cooperation in Agricultural Research for Development
COI	Indian Ocean Commission
CTD	Decentralized Territorial Collectivity

CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CNDRS	National Center of Documentation and Research Scientific
CNRE	National Center for Environmental Research
CNRIT	National Center for Industrial and Technological Research
COAP	Protected Areas Code
COBA	Basic Communities
COFAM	Fandriana - Marolambo Corridor
COFAV	Ambositra - Vondrozo Corridor
COI	Indian Ocean Commission
COM	Comoros
COMATSA	Marojejy - Tsaratanàna Corridor
COMESA	Common Market for Eastern and Southern Africa
CPB	Cartagena Protocol on Biosafety to the Convention on Biological Diversity
CPGU	Prevention and Support Unit for Emergency Management
CR	"In Critical Danger
DBEV	Department of Plant Biology and Ecology
DEFRA	Department for Environment, Food and Rural Affairs
DGM	General Directorate of Meteorology
DNEF	National Directorate of Environment and Forestry
EDGE	Evolutionarily Distinct Globally Endangered
EEE	Invasive Alien Species
EEMO	Energy Efficiency Management Office
EIA	Environmental Impact Assessment
IN	In Danger
ENSO	El Nino and Southern Oscillation
EW	Extinct in the wild
EX	Off
FAO	Food and Agriculture Organisation of the United Nations
FAPBM	Foundation for Protected Areas and Biodiversity of Madagascar
FCPF	Forest Carbon Partnership Facility
FEKRITAMA	Fivondronamben' ny Tantsaha Malagasy (Madagascar farmers confederation)
FFEM	French Global Environment Facility
FFF	Forest and Farm Facility
FIFATA	FIkambanana FAmpivoarana ny TAntsaha
IMF	International Monetary Fund
FOFIFA	Foibe Fikarohana momba ny Fambolena (National Center for Applied Research in Rural Development)
FSPI	Solidarity Fund for innovative projects
GCF	Contractualized Forest Management
GCF- FVC	Green Climate Fund- Fonds Vert pour le Climat
GEF / FEM	Global Environment Facility / Fonds pour l'Environnement Mondial
GELOSE	Secure Local Management
GERP	Group of Study and Research on the Primates of Madagascar
GHG	Greenhouse gases
IPCC	Intergovernmental Panel on Climate Change
IWRM	Integrated Water Resources Management
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
ICZM	Integrated Coastal Zone Management
GPF	Group of French-speaking employers

GRET	Group of Research and Technological Exchanges
GSDM	Direct Seeding Group of Madagascar
GSPM	Group of Madagascar Plant Specialists
GSRI	Group for the promotion of the Intensive Rice Cultivation System
GTCC	Climate Change Working Group
IBAT	Integrated Biodiversity Assessment Tool
IBC-UniSey	Island Biodiversity Conservation Centre of Unisey
ICAM	Poisoning by Consumption of Marine Animals
ICBP	Institutional Capacity Building Project
ICRI	International Coral Reef Initiative
ICS	Island Conservation Society - Seychelles
ICZM	Integrated Coastal Zone Management
IDC	Island Development Company - Seychelles
IDE	Foreign Direct Investment
HDI	Human Development Index
IEP	Institute of Economics for Climate
IFREMER	French Research Institute for Exploitation of the Sea
IHSM	Institute of Marine Sciences
IIED	International Institute for Environment and Development
IMMA	Important Marine Mammal Area
INDC	*Intended Nationally Determined* Contributions
INRAP	*National Institute of Preventive Archaeological Research*
INRAPE	National Institute of Applied Research in Fisheries and the Environment
INSEE	National Institute of Statistics and Economic Studies
INSEED	National Institute of Statistics and Economic and Demographic Studies
INSTAT	National Institute of Statistics
IOGA	Institute and Observatory of Geophysics of Antananarivo
IRD	Institute of Research for Development
ISPRA	Instituto Superiore per la Protezione e la Ricerca Ambientale (Higher Institute for Environmental Protection and Research)
EITI	Extractive Industries Transparency Initiative
KBA / KBA	Key Biodiversity Areas / Zones-Clés pour la Biodiversité
KFW	Kreditanstalt für Wiederaufbau (German Reconstruction Bank)
KMF	Comorian Franc (Local currency in Comoros)
KP	Kyoto Protocol
LC	Least Concern
LRT	*Light-rail* transit (light exhaust system)
LWMA	Landscape and Waste Management Agency
MACCE	Ministry of Agriculture, Climate Change and Environment
MADIO	MADagascar and the Islands of the Indian Ocean
APRM	*Ministry of Agriculture, Livestock and Fisheries*
MAIFS	Ministry of Agro-Industry and Food Security
MAMABAIE	Makira - Masoala - Antongil Bay
MAREA	Mauritius Renewable Energy Agency
MATP	Ministry of Land Management and Public Works
MATSF	Ministry of Land Management and Land Service
MAVOA	Madagasikara Voakajy
MBG	Missouri Botanical Garden
MBP	Madagascar Biodiversity Paternership
MCSS	Marine Conservation Society in Seychelles
MDG	Madagascar

MECIE	Compatibility of Investments with the Environment
MEDD	Ministry of Environment and Sustainable Development (Madagascar)
MEEF	Ministry of Environment, Ecology and Forestry
MGA	Ariary (Local currency in Madagascar)
MIAR	Integrated Models of Resilient Agriculture
MICET	Madagascar Institute for the Conservation of Tropical Ecosystems
MICS	Multiple Indicator Cluster Survey
MIPSG	Group of specialists of the plants of the Mascarene Islands
MMS	Mauritius Meteorogical Services
MNHN	National Museum of Natural History
MNP	Madagascar National Parks
ME	Mauritius Oceanography Institute
MOL	Mitsui O.S.K. Lines
MSME	Micro, Small and Medium Enterprises
MRIS	Marine Research Institute, Seychelles
MSG	Multi Stakeholders Group
MTTM	Ministry of Transport, Tourism and Meteorology
WALL	Mauritian Rupee (Local currency in Mauritius)
MUS	Maurice
MWF	Mauritian Wildlife Foundation
NBGF	National Botanical Gardens Foundations
NBSAP	National Biodiversity Strategy and Action Plan
NCCC	National Climate Change Committee (Seychelles)
NCCS	Seychelles National Climate Change Strategy
NDC	Nationally Determined Contributions
NOI	Nature Indian Ocean
NPCS	National Parks and Conservation Services
NT	Near Threatened
OBC	Community Based Organizations
OECD	Organization for Economic Cooperation and Development
IOM	International Organization for Migration
WHO	World Health Organization
ONE	National Office for the Environment
NFB	National Forestry Office
NGO	Non-Governmental Organization
SOC	Civil Society Organization
PAZC	Coastal Zone Management Adaptation to Climate Change Project
PCA	Plant Conservation Action group
PCDBA	Conservation Platform for the Development of Antongil Bay
PCE	Emerging Comoros Plan
PDFC	France-Comoros Development Plan
PE	Environmental Programs
NWCMP	National Platform of Civil Society Organizations in Madagascar
PGE	General State Policy
PGC	Coastal Management Plan
GDP	Gross Domestic Product
FEET	Small Island Developing States
MIP	Multi-year indicative program
PMA	Least Developed Countries
PN	National Park
NAP	National Adaptation Plan
NEAP	National Environmental Action Plan

PNFDDSA	National Platform for Women, Sustainable Development and Food Security
PNLCC	National Policy for the Fight against Climate Change
PNM	National Park of Moheli
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
PPCR	Pilot Program for Climate Resilience in Madagascar
PREFER	Family farm productivity and resilience
PSE	Payment for Ecosystem (or Environmental) Services
PUC	Public Utilities Corporation
PVBMT	Plant Communities and Pests in Tropical Environments
QMM	Qit Madagascar Minerals
RBG	Royal Botanical Garden - Kew
REBIOMA	Madagascar Biodiversity Network
REDD	Reduced Emissions from Deforestation and Forest Degradation
REPC	Network of Conservation Educators and Professionals
RESP	Renewable Energy Strategic Plan
REU	Reunion Island
RIT	Regional Implementation Team
RNAP	National Network of Protected Areas
NRT	Integral Nature Reserve
RRA	Regional Assembly of Rodrigues
RS	Special Reserve
CSR	Corporate Social Responsibility
CFDC	Southern Africa Development Community
SAF/FJKM	Sampan'Asa Fampandrosoana / Fiangonan'i Jesoa Kristy eto Madagascar (Development Department within the Church of Jesus Christ in Madagascar)
SAGE	Environmental Management Support Service
SAPM	Madagascar Protected Areas System
SCR	Seychelles Rupee (Local currency in Seychelles)
SCV	Direct Seeding on Vegetable Covers
SDI	Islands Development Corporation
SDN	National Development Strategy
SE	Ecosystem Services
SEOR	Society of Ornithological Studies of Reunion Island
SeyCCAT	Seychelles Conservation and Climate Adaptation Trust
SGP	Small Grant Program
FIS	Seychelles Islands Foundation
SFA	Seychelles Fisheries Authority
SMN	National Meteorological Services
SNGDB	National Strategy for Sustainable Biodiversity Management
NAPS/AMPS	Seychelles National Parks Authority/Seychelles Parks and Gardens Authority
NTSRC	National Strategy for Disaster Risk Reduction
SNU	United Nations System
SPANB	National Biodiversity Strategy and Action Plan
SPGA	Seychelles Parks and Gardens Authority
SREPEN	Société Réunionnaise pour l'Étude et la Protection de l'Environnement
SRFS	Shark Research Foundation, Seychelles
SRI	Irrigated Rice Cultivation System
SSDS	Seychelles Sustainable Development Strategy

STD	Decentralized Technical Services
SYC	Seychelle
TAAF	French Southern and Antarctic Territories
TGRN	Transfer of Natural Resource Management
ICT	Information and communication technologies
TPF	The Peregrine Fund
TRASS	Terrestrial Restoration Action Association of Seychelles
TSA	Turtle Survival Alliance
UCP	Project Coordination Unit
SVP	University of the Comoros
EU	European Union
IUCN	International Union for Conservation of Nature
UNCLOS	United Nations Convention on the Law of the Sea
UNCCD	United Nations Convention to Combat Desertification in those Countries Experiencing Serious Drought and/or Desertification particularly in Africa
UNDAF	United Nations Development Assistance Framework
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCC	United Nations Framework Convention on Climate Change
UNFF	United Nations Forum on Forests
UTCAF	Land Use and Forest Diversion
VU	Vulnerable
WAVES	Wealth Accounting and Valuation of Ecosystem Services
WCS	Wildlife Conservation Society
WCS	Wildlife Clubs of Seychelles
WHC	World Heritage Convention
WIOSAP	Western Indian Ocean Action Program
WWF	World Wildlife Fund
EEZ	Exclusive Economic Zone
IBA	Areas of Importance for the Conservation of Birds
ZICP	Important Plant Conservation Areas
ZIP	Important Plant Areas
ZSL	Zoological Society of London

APPENDIX 2: TABLE OF FIGURES AND TABLES

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APPENDIX 4: ADDITIONAL INFORMATION ON CIVIL SOCIETY ORGANIZATIONS

APPENDIX 5: ADDITIONAL TABLES ON CONSERVATION INVESTMENTS

APPENDIX 6: LIST OF KEY BIODIVERSITY AREAS

MADAGASCAR

List of 235 Key Biodiversity Areas in Madagascar (2022)

KBA/KBA ID#	KBA (French name)	KBA (English name)
MDG-1	Mikea Protected Area	Mikea Protected Area
MDG-2	Ambalimbe Menabe	Ambalibe Menabe
MDG-3	Ambanitazana (Antsiranana)	Ambanitazana (Antsiranana)
MDG-4	Ambato-Boeny	Ambato-Boeny
MDG-5	Ambatofinandrahana	Ambatofinandrahana
MDG-6	Ambereny	Ambereny
MDG-7	Ambondrobe (Vohemar)	Ambondrobe (Vohemar)
MDG-8	MPA of Ambodivahibe Bay	Ambodivahibe Bay MPA
MDG-9	North Salary MPA	North Salary MPA
MDG-10	MPA of Nosy Ve Androka	Nosy Ve Androka MPA
MDG-11	Tsinjoriake-Andatabo MPA	Tsinjoriake-Andatabo MPA
MDG-12	Velondriake MPA	Velondriake MPA
MDG-13	Barren Islands MPA	Barren Islands MPA
MDG-14	AMP Iranja-Ankazoberavina-Russian Bay	Iranja-Ankazoberavina-Russian Bay MPA
MDG-15	AMP Mitsio-Tsarabanjina	Mitsio-Tsarabanjina MPA
MDG-16	Ampombofofo	Ampombofofo
MDG-17	Andravory (Andrafainkona)	Andravory (Andrafainkona)
MDG-18	Anena (Beloha)	Anena (Beloha)
MDG-19	Angodoka-Ambakoa (Besalampy)	Angodoka-Ambakoa (Besalampy)
MDG-20	Ankafina (Ambohimasoa)	Ankafina (Ambohimasoa)
MDG-21	Ankarabolava-Agnakatriky	Ankarabolava-Agnakatriky
MDG-22	Antanifotsy North (Diana)	Antanifotsy North (Diana)
MDG-23	Antanifotsy South (Diana)	Antanifotsy South (Diana)
MDG-24	Antongil Bay	Antongil Bay
MDG-25	Diego Bay	Diego Bay
MDG-26	Beampingaratsy	Beampingaratsy
MDG-27	Belalanda	Belalanda
MDG-28	Bobakindro (Salafaina)	Bobakindro (Salafaina)
MDG-29	Cap d'Ambre	Cap d'Ambre
MDG-30	Cape Saint Andrew	Cape Saint Andrew
MDG-31	Mahajamba Bay Complex - Anjavavy	Mahajamba Bay - Anjavavy Complex
MDG-32	Rigny Bay Complex	Rigny Bay Complex
MDG-33	Three Bays Complex	Three Bays Complex
MDG-34	Anjozorobe-Angavo-Tsinjoarivo Corridor	Anjozorobe-Angavo-Tsinjoarivo Corridor

MDG-35	East coast of Antsiranana	Coastal area East of Antsiranana
MDG-36	Coast from Antalaha to Mahavelona	Coastal area between Antalaha-Mahavelona
MDG-37	Lokaro, Cape Antsirabe, Bay of Gallions, Cape Malaimpioka, Coastal Cape of the Sainte Marie coast	Lokaro, Cape Antsirabe, Bay of Gallions, Cape Malaimpioka, Cape Sainte Marie coastline
MDG-38	Mananjary Coast	Mananjary coast
MDG-39	Efatsy (Farafangana)	Efatsy (Farafangana)
MDG-40	Fanambana (Vohemar)	Fanambana (Vohemar)
MDG-41	Mangoky River	Mangoky River
MDG-42	Classified Forest of Onive	Onive Classified Forest
MDG-43	Classified forest of Bidia-Bezavona	Bidia-Bezavona Classified Forest
MDG-44	Saint-Augustin Forest	Saint Augustine Forest
MDG-45	Great Reef of Toliary	Toliary Great Reef
MDG-46	Sainte-Marie Island (Ambohidena)	Sainte-Marie Island (Ambohidena)
MDG-47	Ilevika (Matsaborilava)	Ilevika (Matsaborilava)
MDG-48	Itampolo West - Mahafaly	West Itampolo - Mahafaly
MDG-49	Lake and River of Andranomalaza	Lake and river Andranomalaza
MDG-50	Lake Andrapongy and Anjingo River	Lake Andrapongy and Anjingo River
MDG-51	Lake Itasy	Lake Itasy
MDG-52	Lake Tsarasaotra	Lake Tsarasaotra
MDG-53	Lake Tseny	Lake Tseny
MDG-54	Anony and Erombo Lakes	Lakes Anony and Erombo
MDG-55	Mahatsara (Mahambo Foulpointe)	Mahatsara (Mahambo Foulpointe)
MDG-56	Makay	Makay
MDG-57	Mandraka	Mandraka
MDG-58	Nankinana (Ambodibonara-Masomeloka)	Nankinana (Ambodibonara-Masomeloka)
MDG-59	Allée des Baobabs	Avenue of the Baobabs NPA
MDG-60	Ambakoana/Analabe	Ambakoana/Analabe NPA
MDG-61	Ambatofotsy (Anosibe An’Ala)	Ambatofotsy (Anosibe An’Ala)
MDG-62	Ambatotsirongorongo	Ambatotsirongorongo
MDG-63	Ambohidray	Ambohidray
MDG-64	Ambohipiraka	Ambohipiraka
MDG-65	Ambondrobe (Belo on Tsiribihana)	Ambondrombe (Belo on Tsiribihana)
MDG-66	Amoron’i Onilahy and Onilahy River	Amoron’i Onilahy and Onilahy River
MDG-67	Ampananganandehibe-Beasina (Andilanatoby)	Ampananganandehibe-Beasina (Andilanatoby)
MDG-68	Ampasindava - East Rigny Bay	Ampasindava - Rigny Bay (East)
MDG-69	Anadabolava-Betsimalaho (Anosy)	Anadabolava-Betsimalaho (Anosy)
MDG-70	Analalava Foulpointe	Analalava Foulpointe

MDG-71	Analalava-Analabe-Betanantanana (Ambatosoratra)	Analalava-Analabe-Betanantanana (Ambatosoratra)
MDG-72	Analavelona	Analavelona
MDG-73	Andrafiamena	Andrafiamena
MDG-74	Andreba	Andreba
MDG-75	Angavo Androy	Angavo Androy
MDG-76	Anjozorobe	Anjozorobe
MDG-77	Ankafobe	Ankafobe
MDG-78	Ankeniheny-Lakato future SAPM	Ankeniheny-Lakato future SAPM
MDG-79	Ankodida future SAPM	Ankodida future SAPM
MDG-80	Ankorabe (Antadonkomby)	Ankorabe (Antadonkomby)
MDG-81	Antoetra	Antoetra
MDG-82	Antrema	Antrema
MDG-83	Archipelago Cap Anorontany	Cape Anorontany Archipelago
MDG-84	Bombetoka/Belemboka Bay and Marovoay Wetlands (Betsiboka-Tsiribihina Rivers)	Bombetoka/Belemboka Bay and Marovoay wetlands (Betsiboka-Tsiribihina rivers)
MDG-85	Beanka	Beanka
MDG-86	Bemanevika (Ankaizina Wetland)	Bemanevika (Ankaizina wetlands)
MDG-87	Complex Ifotaky future SAPM	Ifotaky Complex future SAPM
MDG-88	Mahafaly Plateau Forest Complex	Mahafaly Plateau Forest Complex
MDG-89	Lake Ihotry Complex - Mangoky Delta	Lake Ihotry - Mangoky Delta Complex
MDG-90	Makirovana-Ambatobiribiry Complex	Makirovana-Ambatobiribiry Complex
MDG-91	Mangoky-Ankazoabo Complex	Mangoky-Ankazoabo Complex NPA
MDG-92	Tsimembo-Manambolomat-Bemamba Complex	Tsimembo-Manambolomaty-Bemamba Complex
MDG-93	Vohipaho Complex	Vohipaho Complex
MDG-94	Ambositra-Vondrozo Corridor	Ambositra-Vondrozo Corridor
MDG-95	SAPM Ankeniheny-Zahamena Corridor	Ankeniheny Zahamena Corridor SAPM
MDG-96	Menabe Antimena/ Kirindy-Ambadira Corridor/ Haut de Tsiribihana and Tsiribihana	Menabe-Antimena/Kirindy-Ambadira Corridor/Upper Tsiribihana and Tsiribihana
MDG-97	Analamay-Mantadia Forest Corridor	Analamay-Mantadia Forest Corridor
MDG-98	Fandriana-Marolambo Forest Corridor	Fandriana-Marolambo Forest Corridor
MDG-99	Tsaratanana-Marojejy future SAPM	Tsaratanana-Marojejy Future SAPM
MDG-100	Crater of Nosy Be	Nosy Be Crater (Lake Mount Passot)
MDG-101	SAPM Daraina-Loky-Manambato	Daraina-Loky Manambato SAPM
MDG-102	Fierenana	Fierenana NPA
MDG-103	Classified Forest of Andavakoera	Andavakoera Classified Forest
MDG-104	Classified Forest of Bongolava (Marosely)	Bongolava Classified Forest (Marosely)

MDG-105	Classified Forest of Manombo	Manombo Classified Forest
MDG-106	Classified Forest of Vohibola	Vohibola Classified Forest
MDG-107	Classified forest of Vondrozo and surrounding areas	Vondrozo Classified Forest and surrounding areas
MDG-108	Classified Forest of Zafimaniry	Zafimaniry Classified Forest
MDG-109	Menarandra Forest	Menarandra Forest
MDG-110	Forest of Sahafina (Anivorano Brickaville)	Sahafina Forest (Anivorano-Brickaville)
MDG-111	Ibity future SAPM	Ibity future SAPM
MDG-112	Itremo Vakinankaratra future SAPM	Itremo Vakinankaratra future SAPM
MDG-113	Kianjavato	Kianjavato
MDG-114	Lake Alaotra	Lake Alaotra
MDG-115	Lake Sahaka-Analabe	Lake Sahaka-Analabe
MDG-116	Mahabo Mananivo	Mahabo Mananivo
MDG-117	Mahialambo	Mahialambo
MDG-118	Mandena	Mandena
MDG-119	Mangabe-Ranomena-Sasarotra	Mangabe-Ranomena-Sasarotra
MDG-120	Massif of Manjakatompo-Ankaratra	Manjakatompo-Ankaratra Massif
MDG-121	French Mountain	French Mountain
MDG-122	Oronjia	Oronjia
MDG-123	PK32-Ranobe	PK32-Ranobe
MDG-124	Pointe à Larrée	Pointe à Larrée
MDG-125	Sainte-Luce - Ambato Atsinanana	Sainte-Luce - Ambato Atsinanana
MDG-126	Seven Lakes	Seven Lakes
MDG-127	Tampolo	Tampolo
MDG-128	Vohibe-Ambalabe (Vatomandry)	Vohibe-Ambalabe (Vatomandry)
MDG-129	Wetland of Mahavavy-Kinkony future SAPM	Mahavavy-Kinkony future SAPM wetlands
MDG-130	Wetlands of Maevatanana Ambato Boeny	Maevatanana-Ambato-Boeny Wetlands
MDG-131	Wetland of Nosivolo	Nosivolo wetland
MDG-132	Port-Bergé wetland	Port-Bergé wetlands
MDG-133	Nosy Foty	Nosy Foty
MDG-134	Wetland Sahamalaza Bay	Sahamalaza Bay Wetlands
MDG-135	Nosy Varika	Nosy Varika
MDG-136	North Pangalane	North Pangalane
MDG-137	Andohahela National Park - Plot I	Andohahela National Park - Section I
MDG-138	Andohahela National Park - Plot II	Andohahela National Park - Section II
MDG-139	Andringitra National Park	Andringitra National Park
MDG-140	Integral Natural Reserve of Ankarafantsika, National Park and Forest Station of Ampijoroa	Ankarafantsika Strict Nature Reserve, National Park, and Ampijoroa Forestry Station
MDG-141	Kirindy Mite National Park and	Kirindy Mite National Park and

	surroundings	surrounding areas
MDG-142	Baly Bay National Park	Baly Bay National Park
MDG-143	National Park of Mananara-Nord	Mananara-North National Park
MDG-144	National Park of Mantadia and Special Reserve of Analamazaotra	Mantadia National Park and Analamazaotra Special Reserve
MDG-145	Marojejy National Park	Marojejy National Park
MDG-146	Masoala National Park	Masoala National Park
MDG-147	Masoala National Park - Plot II	Masoala National Park - Section II
MDG-148	Masoala National Park - Plot III	Masoala National Park - Section III
MDG-149	South Midongy National Park	Midongy South National Park
MDG-150	National Park of Nosy Mitsio	Nosy Mitsio National Park
MDG-151	National Park of Nosy Be and Satellite Islands (Nosy Tanihely)	Nosy Be and Satellites Islands (Nosy Tanihely)
MDG-152	Ranomafana National Park and extension	Ranomafana National Park and extension
MDG-153	National Park of Tsimanampetsotsa	Tsimanampetsotse National Park
MDG-154	Zombitse-Vohibasia National Park	Zombitse-Vohibasia National Park
MDG-155	National Park of Isalo	Isalo National Park
MDG-156	National Park of Tsingy of Namoroka	Tsingy of Namoroka National Park
MDG-157	National Park and Integral Natural Reserve of Zahamena	Zahamena National Park and Strict Reserve
MDG-158	National Park and Integral Natural Reserve of Tsingy de Bemaraha	Tsingy de Bemaraha National Park and Strict Nature Reserve
MDG-159	National Park and Special Reserve of the Amber Mountain	Montagne d’Ambre National Park and Special Reserve
MDG-160	Amber Forest	Ambre Forest
MDG-161	Humdie zone of Torotorofotsy	Torotorofotsy Wetlands
MDG-162	Makira	Makira
MDG-163	Anja Community Reserve	Anja Community Reserve
MDG-164	Integral Nature Reserve of Betampona	Betampona Strict Nature Reserve
MDG-165	Integral Natural Reserve of Lokobe	Lokobe Strict Nature Reserve
MDG-166	Tsaratanàna Integrated Nature Reserve and adjacent areas	Tsaratanana Strict Nature Reserve and adjacent areas
MDG-167	Special Reserve of Ambatovaky	Ambatovaky Special Reserve
MDG-168	Special Reserve of Ambohijanahary	Ambohijanahary Special Reserve
MDG-169	Special Reserve of Ambohitantely	Ambohitantely Special Reserve
MDG-170	Special Reserve of Analamera	Analamera Special Reserve
MDG-171	Special Reserve of Andranomena	Andranomena Special Reserve
MDG-172	Anjanaharibe-sud -Marojejy future SAPM	South Anjanaharibe -Marojejy future SAPM
MDG-173	Special Reserve of Ankarana	Ankarana Special Reserve
MDG-174	Special Reserve of Bemarivo	Bemarivo Special Reserve
MDG-175	Special Reserve of Beza Mahafaly	Beza Mahafaly Special Reserve

MDG-176	Bora Special Reserve	Bora Special Reserve
MDG-177	Special Reserve of Kalambatritra	Kalambatritra Special Reserve
MDG-178	Special Reserve of Kasijy	Kasijy Special Reserve
MDG-179	Special Reserve of Mangerivola	Mangerivola Special Reserve
MDG-180	Maningoza Special Reserve	Maningoza Special Reserve
MDG-181	Special Reserve of Manombo	Manombo Special Reserve
MDG-182	Special Reserve of Manongarivo and extension	Manongarivo Special Reserve and extension
MDG-183	Special Reserve of Marotandrano	Marotandrano Special Reserve
MDG-184	Special Reserve of Nosy Mangabe	Nosy Mangabe Special Reserve
MDG-185	Special Reserve of Tampoketsa-Analamaintso	Tampoketsa-Analamaintso Special Reserve
MDG-186	Cape St. Mary Special Reserve	Cape Sainte Marie Special Reserve
MDG-187	Special Reserve of the Peak of Ivohibe	Ivohibe Special Reserve
MDG-188	Ankavia-Ankavanana River (Antalaha)	Ankavia-Ankavanana River (Antalaha)
MDG-189	Antainambalana-Andranofotsy River (Antalaha)	Antainambalana-Andranofotsy River (Antalaha)
MDG-190	River of Bemarivo	Bemarivo River
MDG-191	River of Maevarano	Maevarano River
MDG-192	Mahanara River	Mahanara River
MDG-193	River of Mananjary	Mananjary River
MDG-194	Mangarahara-Amboaboa River	Mangarahara-Amboaboa River
MDG-195	River of Sambava	Sambava River
MDG-196	River of Sofia	Sofia River
MDG-197	Ivoloina River	Ivoloina River
MDG-198	South River of Mananara	Mananara South River
MDG-199	Mangoro and Rianala Rivers	Mangoro-Rianila rivers
MDG-200	Namorona-Faraony rivers	Namorona-Faraony rivers
MDG-201	Sahafary (Andranomena Antsiranana)	Sahafary (Andranomena Antsiranana)
MDG-202	Sorata	Sorata
MDG-203	Angavokely Forestry Station	Angavokely Forest Station
MDG-204	Forest Station of Anjiamangirana	Anjiamangirana Forest Station
MDG-205	Tarzanville (Moramanga)	Tarzanville (Moramanga)
MDG-206	Tsinjoarivo	Tsinjoarivo
MDG-207	Natural Forest of Tsitongambarika NAP	Tsitongambarika Natural Forest
MDG-208	Wetland of Ambavanankarana	Ambavanankarana wetland
MDG-209	Wetland of Ambila-Lemaintso	Ambila-Lemaintso wetland
MDG-210	Wetland of Ankobohobo	Ankobohobo wetland
MDG-211	Wetlands of the southwest coast and Nosy Manitse Island future SAPM	Southwestern Coastal Wetlands and Nosy Manitse Future SAPM Marine
MDG-212	Wetlands of Tambohorano	Tambohorano Wetlands

MDG 213	Amboaboa watershed	Amboaboa Catchment
MDG 214	Andasibe	Andasibe
MDG 215	Antsiranana	Antsiranana
MDG 216	River of Mahajilo	Mahajilo River
MDG 217	Source of Faraony	Faraony Headwaters
MDG 218	Ikopa Lakes	Ikopa Lakes
MDG 219	National Park of Isalo	Isalo National Park
MDG 220	Kinkony Lakes	Kinkony Lake
MDG 221	Lake Tseny Basin	Lake Tseny Basin
MDG 222	Bass of Ankofia	Lower Ankofia
MDG 223	Bass of Anove	Lower Anove
MDG 224	Coastal zone of Mahajanga	Mahajanga Coastal Zone
MDG 225	Mahavavy Delta	Mahavavy Delta
MDG 226	Manambato-sud	Manambato South
MDG 227	Manongarivo watershed	Manongarivo Catchment
MDG 228	Marojejyy National Park	Marojejy National Park
MDG 229	Mikea National Park	Mikea National Park
MDG 230	Ramsar site of Nosivolo	Nosivolo Ramsar Site
MDG 231	Group of Islands of Nosy-Be	Nosy Be Island Group
MDG 232	Upper river of Lokoho-sud	Southern Upper Lokoho River
MDG 233	Tolagnaro	Tolagnaro
MDG 234	Upper Kitsamby River	Upper Kitsamby River
MDG 235	Upper Mananara River	Upper Mananara river

COMOROS

KBA/ KBA ID#	KBA (French name)	KBA (English name)
COM-1	Moya Forest	Moya Forest
COM-2	Lake Dziani-Boudouni	Dziani-Boudouni Lake
COM-3	Lake Hantsongoma	Hantsongoma Lake
COM-4	Massif de la Grille	La Grille Mountains
COM-5	Karthala Massif	Karthala Mountains
COM-6	Mount Mlédjélé (Heights of Mwali)	Mount Mlédjélé (Mwali highlands)
COM-7	Mount Ntringui (Ndzuani Heights)	Mount Ntringui (Ndzuani highlands)
COM-8	Marine Park of Moheli	Moheli National Park
COM-9	Coral reefs of Anjouan	Anjouan coral reefs
COM-10	Coral reefs of Grande Comore	Great Comorecoral reefs
COM-11	Coral reefs of Moheli - outside the Marine Park	Mohéli coral reefs - outside of Marine Park
COM-12	Bimbini area and Ilot de la Selle	Bimbini area and la Selle Islet
COM-13	Chiroroni area	Chiroroni area

COM-14	Domoni area	Domoni area
COM-15	Male Zone	Male area
COM-16	Moya area	Moya area
COM-17	Mutsamudu area	Mutsamudu area
COM-18	Zone of Ndroudé and Ilot aux Tortues	Ndroudé area and Ilot aux Tortues
COM-19	Pomoni area	Pomoni area
COM-20	Coelacanth Zone	Coelacanth area

MAURICE

KBA ID#	KBA (French name)	KBA (English name)	ILE
MUS-1	Banks of Cargados Carajos	Cargados Carajos Shoals	Saint Brandon
MUS-2	Bamboo Mountain Range	Bamboo Mountain Range	Maurice
MUS-3	Chamarel - Le Morne	Chamarel - Le Morne	Maurice
MUS-4	Tamarin Falls / Mount Simonet / Cabinet Nature Reserve	Tamarind Falls / Mount Simonet / Cabinet Nature Reserve	Maurice
MUS-5	Relict forests of the Central Plateau	Relict Forests of the Central Plateau	Maurice
MUS-6	Islands of Rodrigues	Rodrigues' Islets	Rodrigues
MUS-7	Islands of the North of Mauritius	Mauritius Northern Islets	Maurice
MUS-8	Islands of the South-East of Mauritius	Mauritius South-Eastern Islets	Maurice
MUS-9	Le Pouce - Anse Courtois - Pieter Both - Montagne Longue	Le Pouce - Anse Courtois - Pieter Both - Longue Mountain	Maurice
MUS-10	Mondrain - Magenta - Trois Mamelles - Mont du Rempart	Mondrain - Magenta - Trois Mamelles - Mont du Rempart	Maurice
MUS-11	Mountain Corps de Garde	Guardhouse Mountain	Maurice
MUS-12	Black River Gorges National Park and adjacent areas	Black River Gorges National Park and surrounding areas	Maurice
MUS-13	Coral Plain	Coral Plain	Rodrigues
MUS-14	Plaine des Roches - Bras d'Eau	Plaine des Roches - Bras d'Eau	Maurice
MUS-15	Good God Bridge	Good God Bridge	Maurice
MUS-16	South side of Grande Montagne	South Slopes of Grande Montagne	Rodrigues

MUS-17	Yemen-Takamaka	Yemen-Takamaka	Maurice

SEYCHELLES

KBA ID#	KBA (French name)	KBA (English name)
SYC-1	Anse Major / Anse Jasmin (marine part of MSNP)	Anse Major / Anse Jasmin (marine area of MSNP)
SYC-2	Anse Source d'Argent-Anse Marron	Anse Source d'Argent-Anse Marron
SYC-3	Astove	Astove
SYC-4	African benches	African Banks
SYC-5	Cosmolédo	Cosmoledo
SYC-6	Farquhar - South island and islets	Farquhar - South Island and islets
SYC-7	Fond Azore (southern slopes) to Anse Bois de Rose	Fond Azore southern slopes to Anse Bois de Rose
SYC-8	Fond Diable and Pointe Joséphine	Fond Diable and Pointe Josephine
SYC-9	Fond Ferdinand	Fond Ferdinand
SYC-10	Friendship Forest	Friendship Forest
SYC-11	Coral Mountain-Southern Hills Dry Forests	Coral Mountain-Southern Hills dry forests
SYC-12	Grand Anse-Petite Anse-Fond Piment	Grand Anse-Petite Anse-Fond Piment
SYC-13	Grand Police (wetlands)	Grand Police wetlands
SYC-14	Assumption Island	Assumption Island
SYC-15	Bird Island (Ile aux Vaches)	Bird Island (Ile aux Vaches)
SYC-16	Conception Island	Island Design
SYC-17	Cousin Island	Cousin Island
SYC-18	Curious Island	Curious Island
SYC-19	Arros Island and Saint-Joseph Atoll	D'Arros Island and Saint Joseph Atoll
SYC-20	Denis Island	St. Denis Island
SYC-21	Desnoeufs Island	Desnoeufs Island
SYC-22	Desroches Island - surrounding reefs	Desroches Island - surrounding reefs
SYC-23	North Island	North Island
SYC-24	Providence Island and Banks	Providence Island and Bank
SYC-25	Alphonse Island and Lagoon	Alphonse Island and Lagoon
SYC-26	Félicité Island	Félicité Island
SYC-27	Frégate Island	Frégate Island
SYC-28	Marie-Louise Island	Marie-Louise Island

SYC-29	St. Anne’s Island	Sainte-Anne Island
SYC-30	St. Peter’s Island	Saint-Pierre Island
SYC-31	Star and Sulky Islands	Etoile and Boudeuse Islands
SYC-32	Saint-François and Bijoutier Islands	Saint-François and Bijoutier Islands
SYC-33	Frégate Island	Frégate Island
SYC-34	Pepper lagoon and surrounding reefs	Poivre Lagoon and surrounding reefs
SYC-35	Mount Signal	Mount Signal
SYC-36	Burnt Mountain-Piton de l’Eboulis	Burnt Mountain-Piton de l’Eboulis
SYC-37	Glacis Mountain - When she comes	Glacis Mountain - When she comes
SYC-38	Planneau Mountain (Grand Bois-Varigault-Cascade)	Planneau Mountain (Grand Bois-Varigault-Cascade)
SYC-39	Eagle’s Nest (ridges and eastern slopes)	Eagle’s Nest (ridge and eastern slopes)
SYC-40	Reef Island National Park	Recif Island National Park
SYC-41	Praslin National Park	Praslin National Park
SYC-42	Silhouette National Park	Silhouette National Park
SYC-43	Morne Seychellois National Park	Morne Seychellois National Park
SYC-44	National Marine Park of Cap Ternay / Ternay Bay	Cape Ternay / Ternay Bay Marine National Park
SYC-45	Cocos Island National Marine Park	Cocos Island Marine National Park
SYC-46	National Marine Park of the Curieuse Island	Curieuse Island Marine National Park
SYC-47	Port Launay National Marine Park and coastal wetlands	Port Launay Marine National Park and coastal wetlands
SYC-48	Sainte-Anne National Marine Park (PNMSA)	Sainte-Anne Marine National Park (SAMNP)
SYC-49	Silhouette National Marine Park	Silhouette Marine National Park
SYC-50	Aldabra Special Reserve	Aldabra Special Reserve
SYC-51	Special Reserve of the Arid Island	Aride Island Special Reserve
SYC-52	Special Reserve of Ile Cousin	Cousin Island Special Reserve
SYC-53	La Veuve Special Reserve	La Veuve Special Reserve
SYC-54	Kerlan River	Kerlan River
SYC-55	Rocks of Anse Petite Cour	Anse Petite Cour Boulders
SYC-56	Endor Valley	Endor Valley
SYC-57	La Misère-Dauban area : La Misère	La Misère-Dauban area: La Misère

APPENDIX 7: LIST OF SPECIES CONSIDERED FOR KBA IDENTIFICATION

Group	Family	Gender and species	IUCN Red List Category
Fish	Ariidae	*Arius festinus*	CR
Fish	Ariidae	*Arius uncinatus*	CR
Fish	Bedotiidae	*Bedotia tricolor*	CR
Fish	Cichlidae	*Paretroplus dambabe*	CR
Fish	Cichlidae	*Paretroplus gymnopreopercularis*	CR
Fish	Cichlidae	*Paretroplus maculatus*	CR
Fish	Cichlidae	*Paretroplus menarambo*	CR
Fish	Cichlidae	*Ptychochromis insolitus*	CR
Fish	Cichlidae	*Ptychochromoides betsileanus*	CR
Fish	Cichlidae	*Ptychochromoides itasy*	CR
Fish	Bedotiidae	*Rheocles derhami*	CR
Fish	Bedotiidae	*Rheocles lateralis*	CR
Fish	Eleotridae	*Typhleotris mararybe*	CR
Fish	Eleotridae	*Typhleotris pauliani*	CR
Fish	Anchariidae	*Ancharius griseus*	IN
Fish	Bedotiidae	*Bedotia albomarginata*	IN
Fish	Bedotiidae	*Bedotia geayi*	IN
Fish	Bedotiidae	*Bedotia leucopteron*	IN
Fish	Bedotiidae	*Bedotia longianalis*	IN
Fish	Bedotiidae	*Bedotia madagascariensis*	IN
Fish	Bedotiidae	*Bedotia marojejy*	IN
Fish	Anchariidae	*Gogo ornatus*	IN
Fish	Cichlidae	*Katria katria*	IN
Fish	Cichlidae	*Oxylapia polli*	IN
Fish	Aplocheilidae	*Pachypanchax omalonota*	IN
Fish	Aplocheilidae	*Pachypanchax patriciae*	IN
Fish	Aplocheilidae	*Pachypanchax sakaramyi*	IN
Fish	Aplocheilidae	*Pachypanchax sparksorum*	IN
Fish	Aplocheilidae	*Pachypanchax varatraza*	IN
Fish	Cichlidae	*Paretroplus lamenabe*	IN
Fish	Cichlidae	*Paretroplus loisellei*	IN
Fish	Cichlidae	*Paretroplus maromandia*	IN
Fish	Cichlidae	*Paretroplus nourissati*	IN
Fish	Cichlidae	*Paretroplus tsimoly*	IN
Fish	Cichlidae	*Ptychochromis inornatus*	IN
Fish	Cichlidae	*Ptychochromis loisellei*	IN
Fish	Cichlidae	*Ptychochromis oligacanthus*	IN

Fish	Cichlidae	*Ptychochromoides vondrozo*	IN
Fish	Bedotiidae	*Rheocles alaotrensis*	IN
Fish	Bedotiidae	*Rheocles vatosoa*	IN
Fish	Bedotiidae	*Rheocles wrightae*	IN
Fish	Clupeidae	*Sauvagella robusta*	IN
Fish	Atherinidae	*Teramulus waterloti*	IN
Fish	Eleotridae	*Typhleotris madagascariensis*	IN
Fish	Bedotiidae	*Bedotia masoala*	VU
Fish	Kuhliidae	*Kuhlia sauvagii*	VU
Fish	Aplocheilidae	*Pachypanchax arnoulti*	VU
Fish	Cichlidae	*Paratilapia polleni*	VU
Fish	Cichlidae	*Paretroplus damii*	VU
Fish	Cichlidae	*Paretroplus kieneri*	VU
Mollusc	LYMNAEIDAE	*Lantzia carinata*	CR
Mollusc	SPHAERIIDAE	*Pisidium betafoense*	CR
Mollusc		*Madagasikara zazavavindrano*	
Mollusc	PACHYCHILIDAE		CR
Mollusc	NERITIDAE	*Neritina coronata*	IN
Mollusc		*Corbicula madagascariensis*	
Mollusc	CYRENIDAE		IN
Mollusc	SPHAERIIDAE	*Eupera degorteri*	IN
Mollusc	PACHYCHILIDAE	*Madagasikara vazimba*	IN
Mollusc		*Africanogyrus starmuehlneri*	
Mollusc	PLANORBIDAE		IN
Mollusc	PACHYCHILIDAE	*Madagasikara johnsoni*	IN
Mollusc		*Madagasikara madagascarensis*	
Mollusc	PACHYCHILIDAE		IN
Mollusc	PALUDOMIDAE	*Paludomus ajanensis*	IN
Mollusc	PACHYCHILIDAE	*Madagasikara vivipara*	IN
Mollusc	AMPULLARIIDAE	*Lanistes grasseti*	VU
Mollusc		*Africanogyrus rodriguezensis*	
Mollusc	PLANORBIDAE		VU
Mollusc	NERITIDAE	*Clithon madecassinum*	VU
Mollusc	SPHAERIIDAE	*Pisidium johnsoni*	VU
Crab	POTAMONAUTIDAE	*Boreathelphusa uglowi*	IN
Crab	POTAMONAUTIDAE	*Seychellum alluaudi*	VU
Crayfish	PARASTACIDAE	*Astacoides betsileoensis*	VU
Crayfish	PARASTACIDAE	*Astacoides caldwelli*	VU
Crayfish	PARASTACIDAE	*Astacoides crosnieri*	VU
Crayfish	PARASTACIDAE	*Astacoides hobbsi*	VU
Shrimp	PALAEMONIDAE	*Macrobrachium hirtimanus*	IN

Plant	SAPOTACEAE	*Mimusops nossibeensis*	CR
Plant	ORCHIDACEAE	*Cynorkis marojejyensis*	CR
Plant	ORCHIDACEAE	*Tylostigma herminioides*	CR
Plant	ORCHIDACEAE	*Tylostigma filiforme*	CR
Plant	CYPERACEAE	*Rhynchospora hildebrandtii*	CR
Plant	ERIOCAULACEAE	*Paepalanthus bosseri*	CR
Plant	ORCHIDACEAE	*Eulophia nervosa*	CR
Plant	LEGUMINOSAE	*Indigofera ankaratrensis*	CR
Plant	BORAGINACEAE	*Cynoglossum tsaratananense*	CR
Plant	PODOSTEMACEAE	*Thelethylax isalensis*	CR
Plant	PANDANACEAE	*Pandanus ambalavaoensis*	CR
Plant	SCROPHULARIACEAE	*Hydrotriche mayacoides*	CR
Plant	CYPERACEAE	*Schoenoplectiella aberrans*	CR
Plant	PALMAE	*Dypsis aquatilis*	CR
Plant	BALSAMINACEAE	*Impatiens boinensis*	CR
Plant	HYDROSTACHYACEAE	*Hydrostachys perrieri*	CR
Plant	GENTIANACEAE	*Exacum nossibeense*	CR
Plant	HYDROSTACHYACEAE	*Hydrostachys monoica*	CR
Plant	PALMAE	*Ravenea musicalis*	CR
Plant	ORCHIDACEAE	*Benthamia catatiana*	CR
Plant	HALORAGACEAE	*Myriophyllum axilliflorum*	CR
Plant	ORCHIDACEAE	*Tylostigma madagascariense*	CR
Plant	HYMENOPHYLLACEAE	*Didymoglossum pygmaeum*	CR
Plant	APONOGETONACEAE	*Aponogeton dioecus*	CR
Plant	GENTIANACEAE	*Tachiadenus umbellatus*	CR
Plant	LINDERNIACEAE	*Lindernia natans*	CR
Plant	LYTHRACEAE	*Ammannia alternifolia*	CR
Plant	COMPOSITAE	*Helichrysum coursii*	CR
Plant	CYPERACEAE	*Schoenoplectiella perrieri*	CR
Plant	APONOGETONACEAE	*Aponogeton masoalaensis*	CR
Plant	GENTIANACEAE	*Exacum conglomeratum*	CR
Plant	ERIOCAULACEAE	*Eriocaulon hildebrandtii*	CR
Plant	ERIOCAULACEAE	*Eriocaulon parvicapitulatum*	CR
Plant	COMPOSITAE	*Conyza mandrarensis*	CR
Plant	ACANTHACEAE	*Hygrophila velata*	IN
Plant	GRAMINEAE	*Neostapfiella chloridiantha*	IN
Plant	APONOGETONACEAE	*Aponogeton longiplumulosus*	IN
Plant	EUPHORBIACEAE	*Phyllanthus venustulus*	IN
Plant	HYDROCHARITACEAE	*Najas madagascariensis*	IN
Plant	PANDANACEAE	*Pandanus peyrierasii*	IN
Plant	RUBIACEAE	*Pyrostria italyensis*	IN

Plant	HYDROSTACHYACEAE	*Hydrostachys trifaria*	IN
Plant	BORAGINACEAE	*Heliotropium perrieri*	IN
Plant	EBENACEAE	*Diospyros dicorypheoides*	IN
Plant	GRAMINEAE	*Sacciolepis delicatula*	IN
Plant	GRAMINEAE	*Sporobolus elatior*	IN
Plant	ORCHIDACEAE	*Benthamia calceolata*	IN
Plant	PODOSTEMACEAE	*Endocaulos mangorense*	IN
Plant	COMPOSITAE	*Helichrysum filaginoides*	IN
Plant	GRAMINEAE	*Leersia perrieri*	IN
Plant	APONOGETONACEAE	*Aponogeton schatzianus*	IN
Plant	APONOGETONACEAE	*Aponogeton viridis*	IN
Plant	COMPOSITAE	*Grangeopsis perrieri*	IN
Plant	CYPERACEAE	*Pycreus compressiformis*	IN
Plant	CYPERACEAE	*Costularia melleri*	IN
Plant	ORCHIDACEAE	*Tylostigma nigrescens*	IN
Plant	LYTHRACEAE	*Ammannia pauciramosa*	IN
Plant	CYPERACEAE	*Bulbostylis andringitrensis*	IN
Plant	GRAMINEAE	*Cenchrus pseudotriticoides*	IN
Plant	RUBIACEAE	*Anthospermum palustre*	IN
Plant	CAMPANULACEAE	*Lobelia lingulata*	IN
Plant	GENTIANACEAE	*Exacum gracile*	IN
Plant	LEGUMINOSAE	*Leptodesmia bojeriana*	IN
Plant	BUXACEAE	*Buxus itremoensis*	IN
Plant	BALSAMINACEAE	*Impatiens rudicaulis*	IN
Plant	ACANTHACEAE	*Hygrophila baronii*	IN
Plant	APONOGETONACEAE	*Aponogeton capuronii*	IN
Plant	LEGUMINOSAE	*Phylloxylon xiphoclada*	IN
Plant	CYPERACEAE	*Bulbostylis perrieri*	IN
Plant	LYTHRACEAE	*Ammannia calcicola*	IN
Plant	COMPOSITAE	*Helichrysum dubardii*	IN
Plant	HYDROSTACHYACEAE	*Hydrostachys laciniata*	IN
Plant	COMPOSITAE	*Helichrysum tanacetiflorum*	IN
Plant	COMPOSITAE	*Gerbera hypochaeridoides*	IN
Plant	LYTHRACEAE	*Ammannia quadriciliata*	IN
Plant	GRAMINEAE	*Eragrostis stolonifera*	IN
Plant	CYPERACEAE	*Cyperus ankaratrensis*	IN
Plant	MENYANTHACEAE	*Nymphoides bosseri*	IN
Plant	HALORAGACEAE	*Myriophyllum mezianum*	IN
Plant	APONOGETONACEAE	*Aponogeton tenuispicatus*	IN
Plant	ORCHIDACEAE	*Cynorkis tenerrima*	IN
Plant	HYDROSTACHYACEAE	*Hydrostachys fimbriata*	IN

Plant	GRAMINEAE	*Ischaemum heterotrichum*	IN
Plant	BEGONIACEAE	*Begonia erminea*	IN
Plant	GENTIANACEAE	*Klackenbergia stricta*	IN
Plant	SCROPHULARIACEAE	*Hydrotriche galiifolia*	IN
Plant	ERIOCAULACEAE	*Eriocaulon flumineum*	IN
Plant	CYPERACEAE	*Schoenoplectiella heterophylla*	IN
Plant	COMPOSITAE	*Grangea madagascariensis*	IN
Plant	ISOETACEAE	*Isoetes perrieriana*	IN
Plant	APONOGETONACEAE	*Aponogeton eggersii*	IN
Plant	CYPERACEAE	*Cyperus heterocladus*	IN
Plant	POTAMOGETONACEAE	*Potamogeton parmatus*	IN
Plant	CRASSULACEAE	*Kalanchoe daigremontiana*	IN
Plant	SCROPHULARIACEAE	*Hydrotriche bryoides*	IN
Plant	MENYANTHACEAE	*Nymphoides elegans*	IN
Plant	LABIATAE	*Orthosiphon discolor*	IN
Plant	RUBIACEAE	*Ixora sambiranensis*	IN
Plant	ERIOCAULACEAE	*Eriocaulon piliflorum*	IN
Plant	HYDROSTACHYACEAE	*Hydrostachys decaryi*	IN
Plant	URTICACEAE	*Elatostema subfavosum*	IN
Plant	CRUCIFERAE	*Rorippa millefolia*	IN
Plant	LYTHRACEAE	*Ammannia heterophylla*	IN
Plant	CAPPARACEAE	*Cleome augustinensis*	IN
Plant	PRIMULACEAE	*Lysimachia peploides*	IN
Plant	LEGUMINOSAE	*Indigofera pseudoparvula*	IN
Plant	ORCHIDACEAE	*Tylostigma hildebrandtii*	IN
Plant	PRIMULACEAE	*Lysimachia nummularifolia*	IN
Plant	CYPERACEAE	*Pycreus alleizettei*	IN
Plant	PLANTAGINACEAE	*Plantago tanalensis*	VU
Plant	COMPOSITAE	*Cineraria anampoza*	VU
Plant	CYPERACEAE	*Cyperus cancrorum*	VU
Plant	HYDROSTACHYACEAE	*Hydrostachys verruculosa*	VU
Plant	RUBIACEAE	*Peponidium anoveanum*	VU
Plant	COMPOSITAE	*Helichrysum flagellare*	VU
Plant	CYPERACEAE	*Isolepis humbertii*	VU
Plant	XYRIDACEAE	*Xyris baronii*	VU
Plant	THELYPTERIDACEAE	*Pneumatopteris humbertii*	VU
Plant	PALMAE	*Ravenea rivularis*	VU
Plant	PTERIDACEAE	*Trachypteris drakeana*	VU
Plant	COMPOSITAE	*Hubertia myrtifolia*	VU
Plant	ERIOCAULACEAE	*Paepalanthus itremensis*	VU
Plant	COMPOSITAE	*Conyza perrieri*	VU

Plant	EBENACEAE	*Diospyros decaryana*	VU
Plant	EBENACEAE	*Diospyros anosivolensis*	VU
Plant	HYDROSTACHYACEAE	*Hydrostachys maxima*	VU
Plant	CYPERACEAE	*Carex hildebrandtiana*	VU
Plant	CYPERACEAE	*Cyperus subaequalis*	VU
Plant	LYTHRACEAE	*Ammannia cryptantha*	VU
Plant	ELATINACEAE	*Elatine madagascariensis*	VU
Plant	GRAMINEAE	*Sacciolepis viguieri*	VU
Plant	COMPOSITAE	*Pluchea rufescens*	VU
Plant	COMPOSITAE	*Amphidoxa demidium*	VU
Odonate	ARGIOLESTIDAE	*Nesolestes pauliani*	IN
Odonate	NOT ASSIGNED	*Nesocordulia villiersi*	IN
Odonate	LIBELLULIDAE	*Thalassothemis marchali*	IN
Odonate	COENAGRIONIDAE	*Coenagriocnemis rufipes*	IN
Odonate	COENAGRIONIDAE	*Coenagriocnemis insularis*	IN
Odonate	LESTIDAE	*Lestes auripennis*	IN
Odonate	COENAGRIONIDAE	*Pseudagrion pontogenes*	VU
Odonate	AESHNIDAE	*Gynacantha bispina*	VU

APPENDIX 8: DETAILED MAPS (INCLUDING CEPF PRIORITIES) FOR THE HOTSPOT

APPENDIX 9: ADDITIONAL INFORMATION ON THE SPECIES PRESENT IN THE DIFFERENT HABITATS OF THE SEYCHELLES

Main habitats	Main species
Coastal and lowland forests (up to 200 m altitude)	**Granitic islands** **Flora:** • Littoral: *Scaevola sericea, Cocos nucifera, Calophyllum inophyllum, Hernandia nymphaefolia, Hibiscus tiliaceus, Thespesia populnea, Cordia subcordata, Tournefortia argentea, Suriana maritima, Casuarina equisetifolia, Pisonia grandis etc.* • Plain (Native) : *Terminalia catappa, C. inophyllum, Heritiera littoralis, C. subcordata* etc... (Introduced:) *Cinnamoum verum, Adenanthera pavonina, Tabebuia pallida, Cocos nucifera*, various fruiting and ornamental species. **Wildlife**: • Endemics: *Pteropus seychellensis, Coleura seychellensis, Lycognathophis seychellensis, Trachycnemis sechellensis, Copsychus sechellarum, Terpsiphone corvina, Acrocephalus sechellensis, Foudia sechellarum, Alectroenas pulcherrima, Hypsipetes crassirostris, Falco araea, Nectarinia dussumieri, Trachylepis sechellensis, Trachylepis wrightii, Phelsuma spp*, *Grandisonia spp, Aphanoconia theobaldiana* etc... • Natives : *Onychoprion fuscata, Anous stolidus, Anous tenuirostris, Gygis alba, Puffinus Pacificus, Puffinus lherminieri, Phaethon lepturus, Sterna anaethetus etc...* • Introduced: *Rattus spp, Mus musculus, Acridotheres tristis, Geopelia striata, Foudia madagascariensis, Streptopelia picturata, Felis catus, Canis familiaris, Tenrec ecaudatus, Tyto alba affinis, Achatina fulica, Achatina immaculata* etc. **Coral islands** **Flora:** • Natives: *S. sericea, Pemphis acidula, Pisonia grandis, Guettarda speciosa, Suriana maritima,* • Introduced : *Cocos nucifera, Casuarina equisetifolia* **Wildlife:** • *Onychoprion fuscata, Anous stolidus, Anous tenuirostris, Gygis alba, Puffinus Pacificus, Puffinus lherminieri, Sterna dougalli, Sterna sumatrana, Phaethon lepturus, Phaethon rubricauda, Sula spp.* • Endemic*: Dipsochelys dussumieri (Aldabrachelys gigantea/dussmieri), Cyathopoma picardense, Quickia aldabrensis, Rhachistia aldabrae* (Aldabra). • Introduced: *Rattus spp, Felis catus, Capra hircus, Sus scrofa, etc.*
Intermediate forests (200 - 500m altitude)	**Flora:** • Endemic: *Northia hornei, Dillenia ferruginea, Colea seychellarum, Campnosperma seychellarum, Aphloia seychellensis, Pandanus hornei* etc. • Introduced: *Cinnamomum verum, Adenanthera pavonina, Paraserianthes falcataria, Sandoricum koetjape, Chrysobalanus icaco, Tabebuia pallida, Alstonia macrophylla, Swietenia macrophylla* etc. **Wildlife:**

	• Endemic: *Zosterops modestus, Alectroenas pulcherrima, Hypsipetes crassirostris, Falco araea, Nectarinia dussumieri, Otus insularis* (Mahé only), *Tachycnemis seychellensis, Sooglossus gardineri, S. pipilodryas, Grandisonia spp, Phelsuma spp, Trachylepsis sechellensis, Pteropus seychellensis, Aphanoconia theobaldiana, Cyathopoma blandfordi, Pachnodus niger* etc. • Introduced: *Rattus spp, Acridotheres tristis, Geopelia striata, Foudia madagascariensis, Streptopelia picturata, Tyto alba affinis, Felis catus, Canis familiaris, Tenrec ecaudatus, Achatina fulica, A. immaculata* etc.
Mountain forests **(500 - 910m altitude)**	**Flora:** • Endemic: *Northia hornei, Dillenia ferruginea, Roscheria melanochaetes, Pandanus sechellarum, P. Multispicatus, Timonius sechellensis, Randia sericea, Nepenthes pervillei, Excoecaria benthamiana, Mimusops sechellarum etc.* • Introduced: *C. verum, P. falcataria, Pterocarpus indicus, A. macrophylla etc.* **Fauna:** • Endemic: *Z. modestus, A. pulcherrima, H. crassrostris, F. araea, N. dussumieri, O. insularis, Aerodramus elaphrus (*roosts/breeding sites*), Sooglossus sechellensis, S. thomasseti, Grandisonia spp, Phelsuma spp, T. sechellensis, Aphanoconia theobaldiana, Edentulina moreleti, Punctum seychellarum, Pilula mahesiana, Pachnodus spp.* • Introduced: *Rattus spp, A. tristis, G. striata, F. madagascariensis, T. a. affinis, F. catus, C. familiaris, T. ecaudatus etc.*
Palm forests	The islands of Praslin and Curieuse have particular climactic palm forest plant communities, including the presence of Lodoicea maldivica (endemic to both islands). Palm forest communities are also present in drier areas and on the ridges of other forest categories, such as intermediate and montane forests. **Flora:** • Endemic: *L. maldivica, Verschaffeltia splendida, Roscheria melanochaetes, Phoenicophorium borsigianum, Nephrosperma vanhoutteana, Deckenia nobilis accompanied by Pandanus spp & D. ferruginea etc.* • Introduced: *C. verum, Chrysobalanus icaco, Alstonia macrophylla,* various vine species *etc.* **Wildlife:** • Endemic*: Coracopsis nigra barklyi* (Praslin and Curieuse only), *A. pulcherrima, H. Crassirostris, Stylodonta studeriana* (P only), *Pachnodus praslinus* (P only), *P. niger subfuscus* (P only)*, Vaginula seychellensis, Ailuronyx trachygaster, A. Tachyscopaeus, Phelsuma spp etc.* • Introduced: *Rattus spp, A. Tristis, etc.*
Inselbergs	**Flora:** • Endemic: *Medusagyne oppositifolia (M only), Pandanus multispicatus, Memecylon eleagnai, Erythroxylum sechellarum, Lophoschoeneus hornei, Excoecaria benthamiana, Soulamea terminaloides, Nepenthes pervillei etc.* • Introduced: *C. verum, Annas commosus*
Riparian forest	**Flora:**

	• Endemic*: Pandanus hornei, Pandanus sechellarum, Phoenicophorium borsigianum, Verschaffeltia splendida, Pandanus balfouri and the indigenous Heritiera littoralis and Barringtonia racemosa.* • Introduced: *Paraserianthes falcataria, Artocarpus spp, Bambusa spp etc.* **Wildlife:** • Endemic: *Archaius tigris, O. Insularis etc.* • Introduced: *Rattus spp etc*.

Main habitats	Main species
Low-lying wetlands	**Flora:** Native: *Typha javanica, Eleocharis dulcis, E. Variegata, Polygonum senegalense, Cyperus spp, Fimbristylis spp, Terminalia catappa etc.* Introduced: *Eichornia crassipes, Pistia stratiotes*, *Ludwigia octovalvis, Nymphaea lotus, Alocasia macrorrhiza* **Wildlife:** Endemic: *Pelusios castanoides intergularis, P. subniger parietalis, Hypogeophis rostratus,* Native: *Ixobrychus sinensis, Gallinula chloropus,* Introduced: *Ptychadaena mascareniensis, Rattus spp, Canis domesticus, Felis catus, A. tristis, Trachemys scripta elegans* (considered extinct), *Physella acuta, Gyraulus mauritanius etc.*
Upland Wetlands	**Flora:** Endemic: *Pandanus hornei, Verschaffeltia splendida, Gynura sechellensis, Mimusops sechellarum, Randia lancifolia, Allophylus sechellensis, Campnosperma seychellarum, Canthium sechellense etc.* Introduced: *Cinnamomum verum, Chrysobalanus icaco, Paraserianthes falcataria, Alstonia macrophylla, Tabebuia pallida, Clidemia hirta etc.* **Fauna:** Endemic: *Sooglossus spp, Pachypanchax playfairii, Grandisonia spp, Trichoptera spp, Otus insularis*; *various species of mollusks, both endemic and native ** etc. Introduced: *Rattus spp, M. musculus, Tenrec ecaudatus etc.*
Rivers and streams	**Wildlife:** Endemic: *Hypogeophis rostratus, Praslina cooperi, Tachycnemis seychellensis, Pachypanchax playfairii, Parioglossus multiradiatus, Paludomis ajanensis, Seychellum alluaudi, Allolestes maclachlanii, Leptocnemis cyanops, Zygonix luctifera, Hughscotiella auricapilla, Oxyethira sechellensis, Ecnomus maheensis* Native: *Anguilla bicolor, Sesarmops impressum, Varuna litterata, Macrobrachium spp, Caridinia spp, Neritina gagates, N. Pulligera, Septaria borbonica, Ardea cinerea, Butorides striatus, Nycticorax nycticorax* Introduced: *Poecilia reticulata, Oreochromis mossambicus, Lymnaea natalensis, Gyraulus mauritanius, etc.*

Main habitats	Main species
Beach ridge and beach (and open interiors or seagrass beds on coral islands)	• **Flora:** i). Native: *Scaevola sericea, tournefortia argentea, Pemphis acidula, Sideroxylon inerme cryptophlebia, C. inophyllum, Cordia subcordata, T. catappa, Hernandia nymphaefolia, Guettarda speciosa* etc... ii). Introduced: *Cocos nucifera, Casuarina equisetifolia*. • **Fauna:** *Atactodea striata, Coenobita spp, Donax spp, Birgus latro, Ocypode spp, Eretmochelys imbricata, Chelonia mydas* (nesting habitat), wading/coastal birds etc... Sea bird colonies: *Onychoprion fuscata, Sula dactylatra, S. Leucogaster, Anous stolidus, Puffinus pacificus, Phaethon lepturus, Hydroprogne caspia, Thalasseus bergii, Sterna dougalli, S. sumatrana, etc.*
Rocky shores	• **Flora:** i). Native: *Pandanus balfouri, H. tiliaceus,* ii). Introductory: *C. nucifera, Casuarina equisetifolia*. • **Fauna:** *Grapsus spp, Geograpsus spp, Littorina spp, Cellana cernica, Tetraclita spp, Nerita spp, Chitonidae, Blennidae, Sterna anaethetus, Phaethon lepturus, Puffinus pacificus*
Vases and Mangroves	• **Flora:** *Avicennia marina, Bruguieragymnorhiza, Ceriopstagal, Lumnitzeraracemosa, Rhizophoramucronata, Sonneratia alba, Xylocarpusgranatum, X. moluccensis,* etc... • **Fauna :** *Terebralia palustris*, Bivalvia spp: Gafrariumtumidum & pectinatum, Ctenadivergens etc... *Littorina scabra*, *Cardisomac arnifex, Scylla serrata*, *Geograpsus spp*, *Metopograpsus spp, Sesarma spp, Uca spp* etc... *Periopthal muskalolo, P. argentilineatus, Fregata spp*, Ardeacinera, Butoridesstriatus, wading bird species.
Herbarium	• **Flora:** *Cymodocea rotundata, C. serrulata, Enhalus acocroides, Halodule uninervis, Halophila ovalis, Syringodium isoetifolium, Thalassodendron ciliatum, Thalassia hemprichii.* Algae: *Caulerpa spp, Codium spp* etc... • **Fauna:** Various invertebrates, e.g. polychaete worms, amphipods, molluscs, crustaceans, bivalves (e.g. *P. muricata*, Gastropods, *C. moneta, C. tigris, Strombus spp., Morula margariticola* etc... Grazing species e.g. *Siganus spp. Chelonia mydas, Eretmochelys imbricata.*
Reef flat	• **Fauna:** *Bursa bufonia, B. cruentata. Cerithium zebrum, Conus leopardus, C. litteratus, C. virgo, C. betulinus, C. quercinus. Cypraea annulus, C. Lynx, C. caurca, C. helvola. Rissoina ambigua, R. plicata. Smaragdia rangiana. Strombus gibberulus,* Holothuridae, lobster, octopus.
Coral reefs (including: reef ridge, slope, patch reefs, etc.)	• **Fauna:** 23 species of Scaridae, >30 species of Serranidae, >20 species of Lutjanidae, *Amphiprion fuscocaudatus* (endemic), Octopus, lobster spp., Eretmochelys imbricata, more than 400 coral species, numerous molluscs spp. Diverse populations of elasmobranch > 35 species.
Mahé Plateau	• Sea cucumber spp. (*Holothuria nobilis, H. fucogilva, H. fuscopunctata, H. atra, H. edulis, H. scabra* etc.) *Carangid spp* (Trevally and Bludger), *Lutjanid spp* (e.g. *Lutjanus sebae*,) Lethrinids, Serranids etc, elasmobranch spp: *C. leucas, C. limbatus, C. plumbeus, Galeocerdo cuvier, Sphyrna spp, Mobula specie,, Aetomylaeus vespertilio* etc
Pelagic	• Tuna spp: (*Katsuwomus pelamis, Thunnus albacores, T. obesus, T.alalunga* etc.). Billfish: (*Xiphias gladius, Makaira spp, Tetrapturus audax, Istiophorus platypterus*). Shark spp : (*Prionace glauca, Carcharhinus falciformis, C. longimanus, Isurus spp, Sphyrna spp, Carcharodon carcharias, Rhincodon typus* etc...). *Manta birostris* Turtles: *Chelonia Mydas, Dermochelys coriacea, Caretta caretta, Lepidochelys olivacea*.

	Marine birds: *Sterna bengalensis, S. caspia, Onychoprion fuscata, Sula dactylara, S. leucogaster, Macronectes giganteus* etc... Marine mammals: 27 species of cetaceans have been recorded in the waters of the Seychelles including: *Megaptera novaeangliae, Physeter macrocephalus* etc.
Seabed	Limited data

APPENDIX 10: TABLE OF CURRENT PROTECTED AREAS IN MAURITIUS

Name	Type	Manager	Area (ha)
Black River Gorges	National Park	NPCS	6,574.00
Water Arm		NPCS	497.00
Perrier	Nature Reserve	Forestry Service	1.44
The Ponds		Forestry Service	5.10
Gouly Pere		Forestry Service	10.95
Cabinet		Forestry Service	17.73
Dry Wood		Forestry Service	5.91
Thumb		Forestry Service	68.80
Guardhouse		Forestry Service	90.33
Osterlog Valley	Endemic Garden	Osterlog Valley Endemic Garden Foundation	275.00
Rivulet Terre Rouge Bird Sanctuary	Ramsar Site	NPCS	26.00
Pointe d'Esny Wetland		NPCS	22.00
TOTAL - MAURITUS MAINLAND			**7,594.00**
Pigeon Rock	National Park	NPCS	0.63
Amber Island		NPCS	128.00
Birds Rock		NPCS	0.10
Island of Fools		NPCS	0.30
Vacoas Island		NPCS	1.36
Fouquet Island		NPCS	2.49
Flamants Island		NPCS	0.80
Bird Island		NPCS	0.70
Round Island	Nature Reserve	Forestry Service/NPCS/ MWF	168.84
Snake Island		NPCS	31.66
Flat Island		Partially leased	253.00
Gabriel Island		Forestry Service	42.20
Gunner's Quoin		NPCS	75.98
Marianas Island		NPCS	1.98
Ile aux Aigrettes		MWF	24.96
Ile de la Passe	Ancient Monument	National Heritage Fund	2.19
TOTAL - MAURITIUS ISLETS			**735.19**
Plantations - varied	*Geometric Steps*	Forestry Service	226.00
Leased for grazing and tree planting		Forestry Service/Private sector	230.00
Unplanted, protective or to be planted		Forestry Service/Private sector	179.00
Varied	Mountain Reserve	Forestry Service/Private sector	3,800.00
Varied	River Reserve	Forestry Service/Private sector	2,740.00
Mondrain	Private Reserve[43]	Medine SE/MWF	5.00
Emile Series		Medine SE/Royal Society of Arts and Science of Mauritius	8.00
Ebony Forest (Chamarel)		BCM Ltd Mauritius	39.00
TOTAL - MAURITIUS MISCELLANEOUS PROTECTED AREAS			**6,592.00**
Blue Bay Marine Park	MPA/Ramsar site	Ministry of Fisheries	353.00
Balaclava	MPA	Ministry of Fisheries	485.00
Port Louis	Fishing Reserve	Ministry of Fisheries	330.00

43 The "private reserve" category does not yet have legal status as a protected area

Name	Type	Manager	Area (ha)
Black River		Ministry of Fisheries	780.00
Large Port-Mahebourg		Ministry of Fisheries	18300.00
Flacq-Poste Lafayette		Ministry of Fisheries	600.00
Freshwater Hole		Ministry of Fisheries	570.00
Riviere du Rempart-Poudre d'Or		Ministry of Fisheries	25400.00
TOTAL - MAURITIUS MARINE			**46,818.00**
Big Mountain	Nature Reserve	Forestry Service	13.76
Quitor Cove		Forestry Service	10.34
Francois Leguat Giant Tortoise and Cave Reserve	Private Reserve	BCM Ltd Mauritius	20.00
TOTAL - RODRIGUES MAINLAND			**44.10**
Coconut Island		Forestry Service/MWF	15.00
Ile aux Sables		Forestry Service	8.00
TOTAL - RODRIGUES ISLETS			**23.00**
South East Marine Protected Area (SEMPA)	MPA	Ministry of Fisheries	4300.00
Banana River	Marine reserve	Ministry of Fisheries	150.00
Anse aux Anglais		Ministry of Fisheries	150.00
Grand Basin		Ministry of Fisheries	1410.00
Past Half		Ministry of Fisheries	720.00
TOTAL - RODRIGUES MARINE			**6730.00**

Table 75 Prioritization of ecosystem services in Comoros

Ecosystem service	Weighting
Procurement	**0,55**
Commercial fishery	0,20
Water for domestic use	0,15
Irrigation water	0,10
Hydroelectricity	0,05
Wood energy	0,05
Regulation	**0,30**
Protection against flooding by mangroves	0,15
Protection against flooding by forests	0,15
Cultural value	**0,15**
Ecotourism value	0,10
Cultural and spiritual value	0,05
TOTAL	**1**

Table 76 Scoring of ecosystem services in Mauritius for a multi-criteria analysis

Ecosystem services	Weight
SUPPLY	**0,50**
Fishing	0,20
Water for domestic use	0,15
Water for irrigation	0,10
Hydroelectricity	0,05
REGULATION	**0,35**
Cyclone protection	0,20
Flood protection of the forest	0,15
CULTURAL VALUE	**0,15**

Ecotourism value	0,15
TOTAL	**1**

Table 77 Scoring of ecosystem services for a multi-criteria analysis for Seychelles

Ecosystem services	Weight
SUPPLY	**0,375**
Food	0,125
Water catchment	0,125
Forest products	0,09375
Medicinal plants	0,03125
REGULATION	**0,46875**
Protection against flooding	0,09375
Coastal protection	0,125
Natural processes	0,125
Local climate regulation	0,125
CULTURAL VALUE	**0,15625**
Tourism	0,09375
Cultural/spiritual and educational value	0,0625
TOTAL	**1**

Madagascar

		Provision						
KBA ID	KBA Name	Agriculture	Fresh water for the natural ecosystem	Fresh water for irrigation	Wood energy	Freshwater fish	Grazing	Commerc wood
MDG-199	Mangoro-Rianila rivers	0.07	0.07	-	0.02	0.05	-	0.07
MDG-110	Sahafina Forest (Anivorano-Brickaville)	0.07	0.03	-	0.01	0.03	-	0.09
MDG-097	Analamay-Mantadia Corridor	0.07	0.02	-	0.00	0.00	-	0.15
MDG-131	Nosivolo Wetland	0.07	0.06	-	0.02	0.01	-	0.03
MDG-066	Amoron'i Onilahy and Onilahy River	0.10	0.09	-	0.01	0.05	0.07	0.01
MDG-041	Mangoky River	0.06	0.09	0.01	0.01	0.13	0.02	0.01
MDG-098	Fandriana Marolambo Corridor	0.08	0.03	0.03	0.01	0.01	0.04	0.02
MDG-094	Ambositra Vondrozo Corridor	0.09	0.04	0.09	0.01	0.00	-	0.07
MDG-051	Lake Itasy	0.05	0.10	0.01	0.01	0.01	0.05	0.01
MDG-055	Mahatsara (Mahambo Foulpointe)	0.06	0.05	-	0.02	0.08	0.01	0.03
MDG-197	Ivoloina River	0.07	0.05	-	0.02	0.01	-	0.07
MDG-179	Mangerivola Special Reserve	0.07	0.06	-	0.00	0.00	-	0.07
MDG-164	Betampona Strict Nature Reserve	0.07	0.05	-	0.01	0.00	-	0.09
MDG-095	Zahamena-Ankeniheny SAPM	0.06	0.03	0.01	0.00	0.00	0.02	0.08
MDG-123	PK32-Ranobe	0.10	0.01	0.03	0.00	0.01	0.02	0.03
MDG-136	North Pangalane	0.07	0.09	-	0.00	0.01	-	0.02
MDG-230	Nosivolo Ramsar Site	0.07	0.03	0.00	0.01	0.01	-	0.03
MDG-027	Belalanda	0.10	0.10	-	0.00	0.04	0.04	0.00
MDG-130	Maevatanana-Ambato-Boeni Wetlands	0.00	0.08	0.02	0.01	0.12	0.03	0.01
MDG-020	Ankafina (Ambohimahasoa)	0.05	0.04	-	0.03	0.00	-	0.02
MDG-154	Zombitse-Vohibasia National Park	0.10	0.01	0.07	0.00	-	0.01	0.06
MDG-011	Tsinjoriake-Andatabo	0.10	0.01	-	0.00	0.08	-	0.01
MDG-128	Vohibe Ambalabe (Vatomandry)	0.07	0.06	-	0.01	-	-	0.04
MDG-089	Lake Ihotry-Mangoky Delta complex	0.08	0.04	0.03	0.01	0.06	0.02	0.02
MDG-072	Analavelona	0.10	0.01	0.09	0.00	-	0.01	0.03
MDG-152	Ranomafana National Park	0.11	0.05	0.04	0.01	0.00	-	0.14
MDG-217	Faraony Headwaters	0.12	0.03	0.06	0.02	0.00	-	0.08
MDG-056	Makay	0.10	0.07	-	0.00	0.03	0.01	0.03
MDG-070	Analalava Foulpointe	0.07	0.04	-	0.02	-	-	0.05
MDG-193	Mananjary River	0.12	0.10	-	0.03	0.04	-	0.03
MDG-106	Vohibola Classifed Forest	0.07	0.05	-	0.01	0.00	-	0.04

MDG-091	Mangoky-Ankazoabo Forest Complex	0.06	0.02	0.06	0.00	0.03	0.01	0.03
MDG-203	Angavokely Forestry Station	0.05	0.06	0.10	0.03	-	-	0.03
MDG-045	Grand Reef Toliary	0.10	0.01	-	0.00	0.00	0.08	0.01
MDG-200	Namorona-Faraony River	0.12	0.09	-	0.03	0.02	-	0.03
MDG-209	Ambila-Lemaitso Wetland	0.07	0.07	-	0.00	-	-	0.02
MDG-088	Mahafaly Plateau forest complex	0.10	0.01	-	0.00	0.00	0.09	0.01
MDG-033	Three Bays complex	0.00	0.07	-	0.00	0.00	0.02	0.00
MDG-175	Beza-Mahafaly Special Reserve	0.10	0.02	-	0.01	0.03	-	0.03
MDG-187	Ivohibe Special Reserve	0.01	0.03	-	0.00	-	0.04	0.09
MDG-053	Lake Tseny	0.02	0.09	-	0.01	0.15	-	0.02
MDG-044	Saint Augustine Forest	0.10	0.01	-	0.01	0.04	-	0.01
MDG-120	Manjakatompo-Ankaratra Massif	0.05	0.04	0.09	0.04	0.00	-	0.04
MDG-126	Seven Lakes	0.10	0.01	-	0.01	0.05	-	0.02
MDG-113	Kianjavato	0.12	0.06	-	0.02	0.01	-	0.07
MDG-002	Ambalimbe Menabe	0.03	0.03	-	0.00	0.08	0.01	0.01
MDG-058	Nankinana (Ambodibonara-Masomeloka)	0.07	0.05	-	0.01	-	-	0.01
MDG-052	Tsarasaotra Lake	0.05	-	0.10	-	0.13	0.10	-
MDG-048	West Itampolo Mahafaly	0.10	0.00	-	-	-	0.09	-
MDG-231	Nosy Be Island Group	0.00	0.02	-	0.01	-	-	0.00
MDG-218	Ikopa Lakes	0.00	0.03	0.01	0.01	0.07	0.02	0.01
MDG-001	Mikea Forest	0.10	0.01	0.00	0.00	0.00	0.01	0.04
MDG-229	Mikea National Park	0.10	0.01	0.00	0.00	0.00	0.01	0.04
MDG-151	Nosy Be and Satellites Islands (Nosy Tanihely)	0.00	0.02	-	0.02	-	-	0.00
MDG-224	Mahajanga Coastal Zone	0.01	0.02	-	0.00	0.00	0.02	0.01
MDG-109	Menarandra Forest/Vohidefo	0.10	0.00	-	0.00	0.00	0.05	0.01
MDG-135	Nosy Varika	0.12	0.04	-	0.02	0.01	-	0.02
MDG-211	Southwestern Coastal Wetlands and Nosy Manitse Future SAPM Marine	0.10	0.01	-	0.00	0.00	0.05	0.00
MDG-021	Ankaraobolava-Agnakatriky	0.07	0.09	-	0.05	0.02	-	0.04
MDG-004	Ambato-Boeny	0.01	0.03	0.06	0.02	0.03	0.03	0.03
MDG-100	Cratere of Nosy Be (Lake Mont Passot)	0.00	0.03	-	0.01	-	-	-
MDG-188	Ankavia-Ankavana River (Antalaha)	0.02	0.10	-	0.04	0.03	-	-
MDG-153	Tsimanampetsotse National Park	0.10	0.00	-	0.00	0.00	0.06	0.00
MDG-177	Kalambatritra Special Reserve	0.02	0.03	0.06	0.00	0.00	0.03	0.01
MDG-108	Zafimaniry Classified Forest	0.04	0.07	0.10	0.01	0.00	-	0.11

MDG-198	Mananara South River	0.01	0.10	-	0.00	0.00	-	0.01
MDG-132	Port BÃ©rgÃ© Wetlands	0.02	0.05	-	0.01	0.05	0.05	0.02
MDG-139	Andringitra National Park	0.02	0.03	-	0.00	0.00	0.02	0.04
MDG-196	Sofia River	0.02	0.08	-	0.01	0.01	0.04	0.03
MDG-012	Velondriake	0.10	0.00	-	0.00	0.00	0.01	0.01
MDG-034	Anjozorobe Angavo-Tsinjoarivo Corridor	0.04	0.04	0.10	0.01	0.00	0.02	0.08
MDG-163	Anja communuty Reserve	0.05	0.07	-	0.02	0.00	-	0.03
MDG-234	Upper Kitsamby River	0.05	0.04	0.02	0.01	0.00	0.04	0.01
MDG-165	Lokobe Strict Nature Reserve	0.00	0.01	-	0.05	-	-	-
MDG-190	Bermarivo River	0.02	0.09	-	0.03	0.08	-	0.06
MDG-009	Salary Bay	0.10	0.00	-	0.00	0.00	-	0.03
MDG-057	Mandraka	0.03	0.04	0.10	0.02	0.00	-	0.07
MDG-232	Southern Upper Lokoho River	0.02	0.05	-	0.01	0.01	-	-
MDG-081	Antoetra Ampadirana (Fohisokina)	0.04	0.05	0.10	0.01	0.00	-	0.07
MDG-149	South Midongy National Park	0.07	0.05	0.08	0.00	0.00	-	0.05
MDG-140	Ankarafantsika Strict Nature Reserve, National Park, and Ampijoroa Forestry Station	0.01	0.02	0.01	0.00	0.01	0.01	0.08
MDG-086	Bemanevika (Ankaizina wetlands)	0.02	0.05	-	0.02	0.00	0.03	0.00
MDG-144	Mantadia National Park and Analamazaotra Special Reserve	0.02	0.04	-	0.01	0.00	0.01	0.15
MDG-222	Lower Ankofia	0.02	0.04	-	0.01	0.02	0.05	0.00
MDG-221	Lake Tseny Basin	0.02	0.04	-	0.01	0.02	0.05	0.03
MDG-111	Ibity Future SAPM	0.05	0.04	-	0.01	0.00	0.04	0.01
MDG-093	Vohipaho complex	0.07	0.05	0.01	0.03	0.01	-	0.02
MDG-214	Andasibe	0.02	0.04	0.03	0.01	0.00	0.01	0.11
MDG-189	Antainambalana-Andranofotsy River (Antalaha)	0.05	0.10	-	0.04	0.12	-	-
MDG-235	Upper Mananara river	0.06	0.05	0.01	0.01	0.03	0.03	0.01
MDG-038	Mananjary coast	0.12	0.04	-	0.00	-	-	0.01
MDG-225	Mahavavy Delta	0.00	0.04	-	0.01	0.02	0.03	0.02
MDG-119	Mangabe-Ranomena-Sasarotra	0.02	0.03	0.09	0.00	0.01	-	0.08
MDG-076	Anjozorobe	0.04	0.03	0.10	0.01	0.00	-	0.04
MDG-192	Mahanara River	0.02	0.07	0.03	0.02	0.01	-	0.08
MDG-050	Lake Andrapongy and Anjingo River	0.02	0.05	-	0.01	0.01	0.04	0.00
MDG-084	Bombetoka/Belemboka Bay and Marovoay wetlands (Betsiboka-Tsiribihina rivers)	0.01	0.04	-	0.00	0.08	0.02	0.01

MDG-059	Baobab Alley	0.03	0.06	-	0.00	0.00	-	-
MDG-065	Ambondrombe (Belo on Tsiribihina)	0.03	0.03	-	0.00	0.04	-	-
MDG-191	Maevarano River	0.02	0.06	-	0.01	0.01	-	0.05
MDG-105	Manombo Classified Forest	0.07	0.04	0.05	0.02	0.01	0.02	0.03
MDG-122	Oronjia Forest	0.00	0.03	-	0.00	0.00	0.02	0.02
MDG-114	Lake Alaotra	0.02	0.07	0.00	0.00	0.07	0.02	0.01
MDG-010	Nosy Ve Androka	0.10	-	-	-	0.00	-	-
MDG-029	Cap d’Ambre	0.00	0.03	-	0.01	0.00	-	0.11
MDG-068	Ampasindava/Rigny Bay (East)	0.00	0.02	-	0.01	0.02	0.02	0.01
MDG-107	Vondrozo Classified Forest and surrounding areas	0.05	0.04	0.04	0.00	0.00	-	0.03
MDG-078	Ankeniheny-Lakato Future SAPM	0.03	0.04	0.04	0.00	0.00	-	0.08
MDG-115	Lake Sahaka/Analabe	0.02	0.10	-	-	0.01	0.02	-
MDG-040	Fanambana (VohÃ©mar)	0.02	0.03	0.02	0.01	0.01	-	0.07
MDG-042	Onive Classified Forest	0.03	0.04	0.02	0.01	0.02	-	0.07
MDG-210	Ankobohobo Wetlands	0.01	0.05	-	0.00	0.00	-	0.07
MDG-060	Ambakoana/Analabe	0.02	0.05	0.08	0.01	0.00	-	0.03
MDG-073	Andrafiamena	0.00	0.04	0.00	0.01	0.01	0.04	0.03
MDG-022	North Antanifotsy (Diana)	0.00	0.04	-	0.01	0.00	0.02	0.04
MDG-103	Andavakoera Classified Forest	0.00	0.04	-	0.01	0.00	0.04	0.02
MDG-215	Antsiranana	0.00	0.03	-	0.01	0.00	0.03	0.04
MDG-173	Ankarana Special Reserve	0.00	0.04	-	0.01	0.00	0.02	0.06
MDG-047	Ilevika (Matsaborilava)	0.00	0.03	-	0.01	0.02	-	0.03
MDG-102	Fierenana	0.02	0.07	0.01	0.01	0.00	0.01	0.05
MDG-104	Bongolava Classified Forest (Marosely)	0.02	0.02	-	0.01	0.01	0.03	0.03
MDG-194	Mangarahara-Amboamboa River	0.02	0.05	-	0.00	0.06	0.02	0.03
MDG-039	Efatsy (Farafangana)	0.07	0.04	-	0.03	0.00	-	0.05
MDG-161	Torotorofotsy Wetlands	0.02	0.04	0.01	0.02	-	-	0.09
MDG-116	Mahabo-Mananivo	0.07	0.05	-	0.02	0.00	-	0.04
MDG-213	Amboaboa Catchment	0.02	0.02	-	0.01	0.00	0.03	0.00
MDG-075	Angavo Androy	0.06	0.01	0.08	0.01	-	-	0.02
MDG-064	Ambohipiraka	0.00	0.03	-	0.02	0.01	-	0.02
MDG-216	Mahajilo River	0.05	0.02	-	0.00	0.01	0.02	0.00
MDG-204	Anjiamangirana Forest Station	0.02	0.02	-	0.01	0.00	0.03	-
MDG-159	Montagne d’Ambre National Park and Special Reserve	0.00	0.03	-	0.01	0.00	-	0.07
MDG-160	Ambre Forest	0.00	0.03	-	0.01	0.00	-	0.07

MDG-096	Menabe-Antimena/Kirindy-Ambadira Corridor/Upper Tsiribihana and Tsiribihana	0.03	0.01	-	0.00	0.01	0.01	0.00
MDG-032	Rigny Complex Bay (Antsiranana)	0.00	0.04	-	0.00	0.00	0.04	0.02
MDG-129	Mahavavy Kinkony Future SAPM Wetlands	0.01	0.04	-	0.01	0.02	0.01	0.03
MDG-181	Manombo Special Reserve	0.07	0.03	-	0.02	0.00	-	0.06
MDG-031	Mahajamba Anjajavy complex Bay	0.02	0.03	-	0.00	0.02	0.02	0.03
MDG-023	South Antanifotsy (Diana)	0.00	0.04	-	0.00	0.00	-	0.07
MDG-063	Ambohidray	0.02	0.08	-	0.01	0.00	-	0.02
MDG-227	Manongarivo Catchment	0.02	0.03	-	0.00	0.00	0.03	0.02
MDG-220	Kinkony Lake	0.01	0.03	-	0.00	0.00	0.03	0.03
MDG-176	Bora Special Reserve	0.02	0.03	-	0.00	0.00	0.04	-
MDG-008	Ambodivahibe Bay	0.00	0.05	-	0.00	0.00	0.01	0.01
MDG-121	Mountain of the French	0.00	0.03	-	0.01	0.00	-	0.06
MDG-168	Ambohijanahary Special Reserve	0.02	0.02	-	0.00	0.00	0.01	0.02
MDG-101	Daraina-Loky Manambato SAPM	0.02	0.03	0.00	0.01	0.00	0.03	0.03
MDG-208	Ambavanankarana Wetland	0.00	0.03	-	0.01	0.01	0.01	0.03
MDG-003	Ambanitazana (Antsiranana)	0.02	0.01	-	0.01	0.00	-	-
MDG-170	Analamera Special Reserve	0.01	0.03	-	0.00	0.00	0.03	0.02
MDG-172	Anjanaharibe Sud-Marojejy Future SAPM	0.02	0.06	-	0.01	0.00	-	-
MDG-212	Tambohorano Wetlands	0.01	0.02	-	0.00	0.00	0.02	-
MDG-005	Ambatofinandrahana	0.04	0.05	-	0.01	0.00	0.02	0.01
MDG-028	Bobakindro (Salafaina)	0.02	0.02	-	0.01	0.00	-	0.06
MDG-141	Kirindy Mite National Park and surrounding areas	0.03	0.01	-	0.00	0.00	0.01	0.01
MDG-090	Makirovana-Ambatobiribiry-Anjombolava-Tsihomanaomby Complex	0.02	0.02	0.01	0.01	0.02	-	0.02
MDG-092	Manambolomaty Wetland Complex and Tsimembo Classified Forest/Bemamba wetland	0.01	0.02	-	0.00	0.00	0.02	-
MDG-117	Mahialambo	0.02	0.03	0.04	0.01	-	-	0.02
MDG-006	Ambereny (Tsimembo)	0.01	0.01	-	0.00	0.00	0.03	-
MDG-180	Maningoza Special Reserve	0.01	0.01	-	0.00	0.00	0.02	0.01
MDG-202	Sorata	0.02	0.03	0.02	0.00	0.00	-	0.03
MDG-014	Iranja-Ankazoberavina-Russes bays	0.02	0.02	-	0.00	0.00	0.02	0.01
MDG-025	DiÃ©go Bay	0.00	0.03	-	0.01	0.00	0.02	0.02

MDG-185	Tampoketsa-Analamaitso Special Reserve	0.02	0.01	-	0.00	0.01	0.03	0.00
MDG-158	Tsingy de Bemaraha National Park and Strict Nature Reserve	0.01	0.02	-	0.00	0.01	0.01	-
MDG-018	Anena (Beloha)	0.06	0.01	-	0.01	-	0.03	0.01
MDG-007	Ambondrobe (VohÃ©mar)	0.02	0.02	-	0.01	0.01	-	0.03
MDG-061	Ambatofotsy (Anosibe An'Ala)	0.02	0.03	-	0.01	0.00	-	0.04
MDG-019	Angodoka-Ambakoa (Besalampy)	0.01	0.02	-	0.00	0.00	0.02	-
MDG-219	Isalo National Park	0.01	0.01	0.01	0.00	0.00	0.01	0.00
MDG-155	Isalo National Park	0.01	0.01	0.01	0.00	0.00	0.01	0.00
MDG-150	Nosy Mitsio National Park	0.00	0.06	-	0.00	-	-	0.00
MDG-037	Lokaro, Cape Antsirabe, Bay of Gallions, Cape Malaimpioka, Cape Sainte Marie coastline	0.04	0.07	-	0.00	0.00	-	0.00
MDG-169	Ambohitantely Special Reserve	0.05	0.02	0.02	0.00	-	0.01	0.01
MDG-085	Beanka	0.01	0.01	-	0.00	0.00	0.02	-
MDG-171	Andranomena Special Reserve	0.03	0.01	-	0.00	0.00	-	-
MDG-145	Marojejy National Park	0.02	0.02	-	0.01	0.00	-	-
MDG-228	Marojejy National Park	0.02	0.02	-	0.01	0.00	-	-
MDG-134	Sahamalaza Bay Wetlands	0.02	0.03	-	0.00	0.00	0.01	0.01
MDG-186	Cap St Marie Special Reserve	0.06	0.02	-	0.00	-	0.03	0.00
MDG-071	Analalava-Analabe-Betanantanana (Ambatosoratra)	0.02	0.03	-	0.01	0.00	0.02	0.01
MDG-201	Sahafary (Andranomena Antsiranana)	0.00	0.03	-	0.01	0.00	-	0.03
MDG-223	Lower Anove	0.05	0.03	0.00	0.01	0.01	-	0.10
MDG-195	Sambava River	0.02	0.07	-	-	0.02	-	-
MDG-166	Tsaratanana Strict Nature Reserve and adjacent areas	0.00	0.02	-	0.00	0.00	-	0.00
MDG-030	Cape St. Andre	0.01	0.01	-	0.00	0.00	0.01	0.01
MDG-067	Ampananganandehibe-Beasina (Andilanatoby)	0.02	0.03	-	0.01	-	0.02	0.01
MDG-099	Tsaratanana-Marojejy Future SAPM	0.02	0.02	-	0.00	0.00	0.02	0.00
MDG-054	Lakes Anony and Erombo	0.04	0.07	-	0.01	0.03	0.04	0.02
MDG-233	Tolagnaro	0.04	0.06	-	0.02	0.00	0.02	0.06
MDG-178	Kasijy Special Reserve	0.00	0.01	-	0.00	0.00	0.01	0.01
MDG-077	Ankafobe	0.05	0.02	-	0.00	-	0.01	0.01
MDG-046	Sainte Marie Island (Ambohidena)	0.05	0.02	-	0.00	-	0.00	0.01
MDG-143	Mananara-North National Park	0.05	0.04	-	0.01	0.00	-	0.07
MDG-182	Manongarivo Special Reserve	0.01	0.02	-	0.00	0.00	-	0.00

MDG-015	Mitsio Archipelago	0.00	0.04	-	0.00	-	-	0.00
MDG-156	Tsingy of Namoroka National Park	0.01	0.01	-	0.00	-	0.03	0.02
MDG-082	Antrema	0.01	0.01	-	0.00	0.00	0.01	0.01
MDG-080	Ankorabe (Antadonkomby)	0.02	0.04	-	-	0.04	-	-
MDG-026	Beampingaratsy (South Midongy-Andohahela Corridor)	0.06	0.04	0.03	0.00	0.00	-	0.05
MDG-148	Masoala National Park - Section III	0.02	0.03	-	0.01	0.01	-	-
MDG-147	Masoala National Park - Section II	0.02	0.02	-	0.01	0.01	-	-
MDG-036	Antalaha-Mahavelona coast	0.02	0.04	-	0.00	0.01	-	-
MDG-146	Masoala National Park	0.03	0.02	-	0.00	0.00	-	-
MDG-024	Antogil Bay	0.05	0.05	-	0.00	0.02	-	0.00
MDG-207	Tsitongambarika Classified Forest	0.04	0.04	-	0.01	0.00	-	0.05
MDG-118	Mandena	0.04	0.04	-	0.02	0.00	-	0.07
MDG-226	Manambato South	0.04	0.05	-	0.01	0.00	0.02	0.02
MDG-184	Nosy Mangabe Special Reserve	0.05	0.03	-	0.00	0.03	-	-
MDG-127	Tampolo	0.05	0.06	-	0.02	0.02	-	0.02
MDG-069	Anadabolava-Betsimalaho NPA (Anosy)	0.04	0.02	0.03	0.00	0.01	0.02	0.03
MDG-174	Bemarivo Special Reserve	0.01	0.01	-	0.00	0.00	0.02	-
MDG-137	Andohahela National Park - Parcel I	0.04	0.02	0.02	0.00	0.00	0.00	0.04
MDG-183	Marotandrano Special Reserve	0.02	0.01	-	0.00	0.00	-	0.01
MDG-112	Itremo Vakinakaratra Future SAPM	0.04	0.01	-	0.00	-	0.02	0.01
MDG-062	Ambatotsirongorongo	0.04	0.03	-	0.03	-	-	0.02
MDG-138	Andohahela National Park - Parcel II	0.04	0.02	-	0.01	0.00	0.02	0.05
MDG-017	Andravory (Andrafainkona)	0.02	0.02	-	0.00	0.00	-	0.02
MDG-043	Bidia-Bezavona Classified Forest	0.05	0.04	0.00	0.00	0.00	-	0.04
MDG-162	Makira	0.05	0.03	-	0.00	0.01	0.04	-
MDG-167	Ambatovaky Special Reserve	0.05	0.03	-	0.00	0.00	-	0.04
MDG-124	Pointe à LarrÃ©e	0.05	0.02	-	0.01	0.01	0.01	0.06
MDG-087	Ifotaky Complex Future SAPM	0.04	0.02	0.00	0.01	0.01	0.02	0.04
MDG-142	Baly Bay National Park	0.01	0.01	-	0.00	0.00	0.01	0.02
MDG-125	Sainte Luce/Ambato Atsinanana	0.04	0.04	-	0.00	0.00	0.02	0.01
MDG-157	Zahamena National Park and Strict Reserve	0.04	0.02	-	0.00	0.00	-	0.03
MDG-206	Tsinjoarivo	0.05	0.03	-	0.00	0.01	0.02	-
MDG-074	Andreba	0.05	0.04	-	0.00	0.00	-	0.01
MDG-079	Ankodida (Anosy Future SAPM)	0.04	0.02	-	0.01	0.00	-	0.02

MDG-035	East coast of Antsiranana	0.02	0.02	-	0.00	0.00	-	0.00
MDG-205	Tarzanville (Moramanga)	0.02	0.02	-	-	0.00	-	-
MDG-083	Cape Anorontany Archipelago	0.00	0.02	-	-	0.00	-	0.00
MDG-013	Barren Islands	0.01	-	-	-	-	-	-
MDG-049	Lake and river Andranomalaza (Maromandia)	-	-	-	-	0.02	-	-
MDG-016	Ambompofofo	-	-	-	-	-	-	-
MDG-133	Nosy Foty	-	-	-	-	-	-	-

		Regulation and maintenance					Cultural
KBA ID	KBA Name	Coastal protection	Protection against flooding	Nitrogen retention	Pollination	Protection against sedimentation	Reef ecotourism
MDG-199	Mangoro-Rianila rivers	-	0.03	0.01	0.01	0.07	-
MDG-110	Sahafina Forest (Anivorano-Brickaville)	-	0.03	0.02	0.00	0.06	-
MDG-097	Analamay-Mantadia Corridor	-	0.03	0.01	0.00	0.00	-
MDG-131	Nosivolo Wetland	-	0.01	0.01	0.04	0.02	-
MDG-066	Amoron'i Onilahy and Onilahy River	-	0.02	0.00	0.00	0.00	-
MDG-041	Mangoky River	-	0.01	0.00	0.00	0.00	-
MDG-098	Fandriana Marolambo Corridor	-	0.02	0.01	0.00	0.01	-
MDG-094	Ambositra Vondrozo Corridor	-	0.04	0.01	0.00	0.00	-
MDG-051	Lake Itasy	-	0.01	0.01	0.00	0.00	-
MDG-055	Mahatsara (Mahambo Foulpointe)	-	-	0.00	0.00	-	-
MDG-197	Ivoloina River	-	0.00	0.01	0.02	0.01	-
MDG-179	Mangerivola Special Reserve	-	0.02	0.01	0.00	0.01	-
MDG-164	Betampona Strict Nature Reserve	-	-	0.00	0.00	0.00	-
MDG-095	Zahamena-Ankeniheny SAPM	-	0.02	0.01	0.00	0.00	-
MDG-123	PK32-Ranobe	0.01	0.03	0.00	0.00	0.00	0.06
MDG-136	North Pangalane	-	0.03	0.00	0.00	-	-
MDG-230	Nosivolo Ramsar Site	-	0.02	0.01	0.02	0.01	-
MDG-027	Belalanda	-	-	0.00	0.00	0.00	-
MDG-130	Maevatanana-Ambato-Boeni Wetlands	-	0.01	0.00	0.00	0.00	-
MDG-020	Ankafina (Ambohimahasoa)	-	0.01	0.03	0.00	0.25	-
MDG-154	Zombitse-Vohibasia National Park	-	0.02	0.01	0.00	0.00	-

MDG-011	Tsinjoriake-Andatabo	0.00	0.03	0.00	0.00	0.00	0.04
MDG-128	Vohibe Ambalabe (Vatomandry)	-	0.01	0.00	0.00	0.00	-
MDG-089	Lake Ihotry-Mangoky Delta complex	0.00	0.01	0.00	0.00	0.00	-
MDG-072	Analavelona	-	0.01	0.00	0.00	0.00	-
MDG-152	Ranomafana National Park	-	0.03	0.01	0.00	0.01	-
MDG-217	Faraony Headwaters	-	0.02	0.01	0.01	0.02	-
MDG-056	Makay	-	0.01	0.00	0.00	0.00	-
MDG-070	Analalava Foulpointe	-	-	0.00	0.00	0.00	-
MDG-193	Mananjary River	-	0.02	0.00	0.02	0.00	-
MDG-106	Vohibola Classifed Forest	-	-	0.00	0.00	-	-
MDG-091	Mangoky-Ankazoabo Forest Complex	-	0.01	0.00	0.00	0.00	-
MDG-203	Angavokely Forestry Station	-	0.15	0.10	0.02	0.00	-
MDG-045	Grand Reef Toliary	0.00	-	0.00	0.00	0.00	0.02
MDG-200	Namorona-Faraony River	-	0.02	0.01	0.01	0.00	-
MDG-209	Ambila-Lemaitso Wetland	-	-	0.00	0.00	-	-
MDG-088	Mahafaly Plateau forest complex	-	0.00	0.00	0.00	0.00	-
MDG-033	Three Bays complex	0.10	-	0.00	0.01	-	0.12
MDG-175	Beza-Mahafaly Special Reserve	-	0.03	0.00	-	0.00	-
MDG-187	Ivohibe Special Reserve	-	0.03	0.00	0.00	0.00	-
MDG-053	Lake Tseny	-	0.00	0.00	0.04	0.00	-
MDG-044	Saint Augustine Forest	0.01	0.03	0.00	0.00	0.00	-
MDG-120	Manjakatompo-Ankaratra Massif	-	0.03	0.02	0.00	0.00	-
MDG-126	Seven Lakes	-	0.01	0.00	0.00	0.00	-
MDG-113	Kianjavato	-	0.02	0.01	0.01	0.00	-
MDG-002	Ambalimbe Menabe	-	0.04	0.00	0.00	0.00	-
MDG-058	Nankinana (Ambodibonara-Masomeloka)	0.01	-	0.00	0.00	-	-
MDG-052	Tsarasaotra Lake	-	0.04	0.02	0.00	0.01	-
MDG-048	West Itampolo Mahafaly	0.00	-	0.00	0.00	0.00	-
MDG-231	Nosy Be Island Group	0.06	-	0.00	0.00	-	0.13
MDG-218	Ikopa Lakes	-	0.03	0.00	0.00	0.00	-
MDG-001	Mikea Forest	0.00	0.00	0.00	0.00	0.00	0.03
MDG-229	Mikea National Park	0.00	0.00	0.00	0.00	0.00	0.03
MDG-151	Nosy Be and Satellites Islands (Nosy Tanihely)	0.05	-	0.00	0.00	-	0.13
MDG-224	Mahajanga Coastal Zone	0.10	0.00	0.00	0.00	0.00	0.11

MDG-109	Menarandra Forest/Vohidefo	-	0.00	0.00	0.00	0.00	-
MDG-135	Nosy Varika	0.05	-	0.00	0.00	0.00	-
MDG-211	Southwestern Coastal Wetlands and Nosy Manitse Future SAPM Marine	0.00	-	0.00	0.00	0.00	-
MDG-021	Ankaraobolava-Agnakatriky	-	0.03	0.00	0.10	0.00	-
MDG-004	Ambato-Boeny	-	0.04	0.00	0.00	0.00	-
MDG-100	Cratere of Nosy Be (Lake Mont Passot)	0.01	-	0.00	0.00	-	0.15
MDG-188	Ankavia-Ankavana River (Antalaha)	-	0.06	0.00	0.05	0.00	-
MDG-153	Tsimanampetsotse National Park	-	0.00	0.00	0.00	0.00	-
MDG-177	Kalambatritra Special Reserve	-	0.02	0.00	0.00	0.00	-
MDG-108	Zafimaniry Classified Forest	-	0.02	0.00	0.00	0.00	-
MDG-198	Mananara South River	-	0.02	0.00	0.00	0.00	-
MDG-132	Port BÃ©rgÃ© Wetlands	-	0.01	0.00	0.01	0.00	-
MDG-139	Andringitra National Park	-	0.02	0.00	0.00	0.01	-
MDG-196	Sofia River	-	0.01	0.01	0.00	0.01	-
MDG-012	Velondriake	0.00	-	0.00	0.00	-	0.01
MDG-034	Anjozorobe Angavo-Tsinjoarivo Corridor	-	0.03	0.01	0.00	0.00	-
MDG-163	Anja communuty Reserve	-	0.02	0.04	0.00	0.00	-
MDG-234	Upper Kitsamby River	-	0.01	0.01	0.00	0.01	-
MDG-165	Lokobe Strict Nature Reserve	0.00	-	0.00	0.00	-	-
MDG-190	Bermarivo River	-	0.02	0.00	0.01	-	-
MDG-009	Salary Bay	0.00	-	0.00	-	-	-
MDG-057	Mandraka	-	0.01	0.01	0.01	0.00	-
MDG-232	Southern Upper Lokoho River	-	0.03	0.03	0.01	0.11	-
MDG-081	Antoetra Ampadirana (Fohisokina)	-	0.02	0.00	-	0.00	-
MDG-149	South Midongy National Park	-	0.02	0.01	0.00	0.00	-
MDG-140	Ankarafantsika Strict Nature Reserve, National Park, and Ampijoroa Forestry Station	-	0.03	0.00	0.00	0.00	-
MDG-086	Bemanevika (Ankaizina wetlands)	-	0.01	0.00	0.01	0.00	-
MDG-144	Mantadia National Park and Analamazaotra Special Reserve	-	0.04	0.01	0.00	0.01	-
MDG-222	Lower Ankofia	-	0.01	0.00	0.00	0.00	-
MDG-221	Lake Tseny Basin	-	0.01	0.00	0.00	0.00	-
MDG-111	Ibity Future SAPM	-	0.01	0.01	0.00	0.01	-
MDG-093	Vohipaho complex	-	0.03	0.00	0.04	0.00	-

MDG-214	Andasibe	-	0.03	0.00	0.00	0.01	-
MDG-189	Antainambalana-Andranofotsy River (Antalaha)	0.00	0.08	0.01	0.00	0.00	-
MDG-235	Upper Mananara river	-	0.03	0.01	0.00	0.01	-
MDG-038	Mananjary coast	0.00	-	-	0.00	-	-
MDG-225	Mahavavy Delta	0.00	0.02	0.00	0.02	0.00	-
MDG-119	Mangabe-Ranomena-Sasarotra	-	0.02	0.01	0.00	0.00	-
MDG-076	Anjozorobe	-	0.02	0.01	0.00	0.00	-
MDG-192	Mahanara River	0.00	-	0.01	0.00	0.00	-
MDG-050	Lake Andrapongy and Anjingo River	-	0.01	0.00	0.00	0.00	-
MDG-084	Bombetoka/Belemboka Bay and Marovoay wetlands (Betsiboka-Tsiribihina rivers)	0.00	0.00	0.00	0.00	0.00	-
MDG-059	Baobab Alley	-	0.00	0.00	-	-	-
MDG-065	Ambondrombe (Belo on Tsiribihina)	-	0.00	0.00	-	0.00	-
MDG-191	Maevarano River	-	0.01	0.00	0.00	0.00	-
MDG-105	Manombo Classified Forest	0.00	-	0.00	0.00	0.00	-
MDG-122	Oronjia Forest	0.00	-	0.00	-	-	0.08
MDG-114	Lake Alaotra	-	0.02	0.00	0.00	0.01	-
MDG-010	Nosy Ve Androka	0.00	-	-	-	-	-
MDG-029	Cap d'Ambre	-	-	0.00	0.00	-	-
MDG-068	Ampasindava/Rigny Bay (East)	0.00	0.03	0.00	0.01	0.00	0.03
MDG-107	Vondrozo Classified Forest and surrounding areas	-	0.05	0.01	0.00	0.00	-
MDG-078	Ankeniheny-Lakato Future SAPM	-	0.02	0.00	0.00	0.00	-
MDG-115	Lake Sahaka/Analabe	-	-	0.00	0.07	-	-
MDG-040	Fanambana (VohÃ©mar)	-	0.01	0.00	0.04	0.00	-
MDG-042	Onive Classified Forest	-	0.03	0.01	0.00	0.00	-
MDG-210	Ankobohobo Wetlands	0.00	-	0.00	0.00	0.00	-
MDG-060	Ambakoana/Analabe	-	0.01	0.01	-	0.00	-
MDG-073	Andrafiamena	-	0.01	0.00	0.00	0.00	-
MDG-022	North Antanifotsy (Diana)	-	0.01	0.00	0.02	0.00	-
MDG-103	Andavakoera Classified Forest	-	0.02	0.00	0.00	0.00	-
MDG-215	Antsiranana	0.01	0.00	0.00	0.00	0.00	0.01
MDG-173	Ankarana Special Reserve	-	0.00	0.00	0.00	0.00	-
MDG-047	Ilevika (Matsaborilava)	-	0.04	0.00	0.00	0.00	-
MDG-102	Fierenana	-	0.01	0.00	0.00	0.02	-

MDG-104	Bongolava Classified Forest (Marosely)	-	0.01	0.00	0.00	0.00	-
MDG-194	Mangarahara-Amboamboa River	-	0.02	0.00	0.00	0.00	-
MDG-039	Efatsy (Farafangana)	-	-	0.00	0.01	0.00	-
MDG-161	Torotorofotsy Wetlands	-	0.02	0.00	0.00	0.00	-
MDG-116	Mahabo-Mananivo	0.00	-	0.00	0.02	0.00	-
MDG-213	Amboaboa Catchment	-	0.01	0.01	0.00	0.01	-
MDG-075	Angavo Androy	-	0.01	0.00	-	0.00	-
MDG-064	Ambohipiraka	-	0.02	0.01	0.00	0.00	-
MDG-216	Mahajilo River	-	0.01	0.00	0.00	0.00	-
MDG-204	Anjiamangirana Forest Station	-	0.01	0.00	0.00	0.00	-
MDG-159	Montagne d'Ambre National Park and Special Reserve	-	0.00	0.00	0.00	0.00	-
MDG-160	Ambre Forest	-	0.00	0.00	0.00	0.00	-
MDG-096	Menabe-Antimena/Kirindy-Ambadira Corridor/Upper Tsiribihana and Tsiribihana	-	0.02	0.00	0.00	0.00	-
MDG-032	Rigny Complex Bay (Antsiranana)	0.00	-	0.00	0.00	-	0.02
MDG-129	Mahavavy Kinkony Future SAPM Wetlands	0.00	0.01	0.00	0.00	0.00	-
MDG-181	Manombo Special Reserve	0.00	-	0.00	0.00	0.00	-
MDG-031	Mahajamba Anjajavy complex Bay	0.00	0.00	0.00	0.00	0.00	-
MDG-023	South Antanifotsy (Diana)	-	-	0.00	0.00	0.00	-
MDG-063	Ambohidray	-	0.02	0.00	0.00	0.02	-
MDG-227	Manongarivo Catchment	0.01	0.01	0.00	0.00	0.00	-
MDG-220	Kinkony Lake	-	0.01	0.00	0.00	0.00	-
MDG-176	Bora Special Reserve	-	0.01	0.00	0.00	0.00	-
MDG-008	Ambodivahibe Bay	0.01	-	-	0.00	-	0.02
MDG-121	Mountain of the French	-	-	0.00	0.01	-	-
MDG-168	Ambohijanahary Special Reserve	-	0.00	0.00	0.00	0.00	-
MDG-101	Daraina-Loky Manambato SAPM	-	0.01	0.00	0.01	0.00	-
MDG-208	Ambavanankarana Wetland	0.00	0.00	0.00	0.01	0.00	-
MDG-003	Ambanitazana (Antsiranana)	-	-	0.00	0.05	-	-
MDG-170	Analamera Special Reserve	-	0.00	0.00	0.00	0.00	-
MDG-172	Anjanaharibe Sud-Marojejy Future SAPM	-	0.02	0.01	0.00	0.01	-
MDG-212	Tambohorano Wetlands	0.00	0.00	0.00	0.00	0.00	-
MDG-005	Ambatofinandrahana	-	0.01	0.01	0.00	0.00	-

MDG-028	Bobakindro (Salafaina)	-	0.01	0.00	0.01	0.00	-
MDG-141	Kirindy Mite National Park and surrounding areas	0.00	0.00	0.00	0.00	0.00	-
MDG-090	Makirovana-Ambatobiribiry-Anjombolava-Tsihomanaomby Complex	-	0.02	0.01	0.00	0.00	-
MDG-092	Manambolomaty Wetland Complex and Tsimembo Classified Forest/Bemamba wetland	0.00	0.00	0.00	-	0.00	-
MDG-117	Mahialambo	-	0.01	0.01	-	0.00	-
MDG-006	Ambereny (Tsimembo)	-	0.00	0.00	-	0.00	-
MDG-180	Maningoza Special Reserve	-	0.00	0.00	-	0.00	-
MDG-202	Sorata	-	0.02	0.01	0.00	0.00	-
MDG-014	Iranja-Ankazoberavina-Russes bays	0.00	-	0.00	0.00	-	0.01
MDG-025	DiÃ©go Bay	0.00	-	0.00	0.00	-	0.00
MDG-185	Tampoketsa-Analamaitso Special Reserve	-	0.01	0.00	0.00	0.01	-
MDG-158	Tsingy de Bemaraha National Park and Strict Nature Reserve	-	0.00	0.00	0.00	0.00	-
MDG-018	Anena (Beloha)	-	0.01	0.00	0.00	0.00	-
MDG-007	Ambondrobe (VohÃ©mar)	-	-	0.00	0.03	0.00	-
MDG-061	Ambatofotsy (Anosibe An'Ala)	-	0.01	0.00	0.01	0.00	-
MDG-019	Angodoka-Ambakoa (Besalampy)	-	0.01	0.00	-	0.00	-
MDG-219	Isalo National Park	-	0.00	0.00	0.00	0.00	-
MDG-155	Isalo National Park	-	0.00	0.00	0.00	0.00	-
MDG-150	Nosy Mitsio National Park	-	-	0.00	-	-	0.02
MDG-037	Lokaro, Cape Antsirabe, Bay of Gallions, Cape Malaimpioka, Cape Sainte Marie coastline	0.00	-	-	-	-	0.12
MDG-169	Ambohitantely Special Reserve	-	0.01	0.00	0.00	0.00	-
MDG-085	Beanka	-	0.00	0.00	0.00	0.00	-
MDG-171	Andranomena Special Reserve	-	-	0.00	-	0.00	-
MDG-145	Marojejy National Park	-	0.03	0.01	0.00	0.01	-
MDG-228	Marojejy National Park	-	0.03	0.01	0.00	0.01	-
MDG-134	Sahamalaza Bay Wetlands	0.00	-	0.00	-	0.00	-
MDG-186	Cap St Marie Special Reserve	0.01	-	0.00	0.00	-	-
MDG-071	Analalava-Analabe-Betanantanana (Ambatosoratra)	-	0.02	0.01	0.00	0.00	-
MDG-201	Sahafary (Andranomena Antsiranana)	-	-	0.00	0.00	-	-

MDG-223	Lower Anove	0.01	0.01	0.00	0.00	0.00	-
MDG-195	Sambava River	-	-	-	-	-	-
MDG-166	Tsaratanana Strict Nature Reserve and adjacent areas	-	0.04	0.00	0.00	0.00	-
MDG-030	Cape St. Andre	0.00	-	0.00	-	0.00	-
MDG-067	Ampananganandehibe-Beasina (Andilanatoby)	-	0.01	0.01	0.00	0.00	-
MDG-099	Tsaratanana-Marojejy Future SAPM	-	0.03	0.01	0.00	0.00	-
MDG-054	Lakes Anony and Erombo	-	-	0.00	0.01	0.00	-
MDG-233	Tolagnaro	0.02	-	0.00	0.00	0.00	-
MDG-178	Kasijy Special Reserve	-	0.01	0.00	0.00	0.00	-
MDG-077	Ankafobe	-	0.01	0.00	0.00	0.00	-
MDG-046	Sainte Marie Island (Ambohidena)	0.04	-	0.00	-	-	0.08
MDG-143	Mananara-North National Park	0.00	0.02	0.00	0.00	0.00	-
MDG-182	Manongarivo Special Reserve	-	0.03	0.00	0.00	0.00	-
MDG-015	Mitsio Archipelago	-	-	-	-	-	0.03
MDG-156	Tsingy of Namoroka National Park	-	0.00	0.00	-	0.00	-
MDG-082	Antrema	0.00	-	0.00	0.00	-	0.03
MDG-080	Ankorabe (Antadonkomby)	-	-	-	-	-	-
MDG-026	Beampingaratsy (South Midongy-Andohahela Corridor)	-	0.02	0.00	0.00	0.00	-
MDG-148	Masoala National Park - Section III	0.00	-	0.00	0.00	-	-
MDG-147	Masoala National Park - Section II	-	-	0.00	0.01	-	-
MDG-036	Antalaha-Mahavelona coast	0.00	-	0.00	0.00	-	-
MDG-146	Masoala National Park	0.00	0.00	0.00	0.00	0.00	0.03
MDG-024	Antogil Bay	0.01	-	0.00	0.00	-	0.00
MDG-207	Tsitongambarika Classified Forest	-	0.02	0.00	0.00	0.00	-
MDG-118	Mandena	-	-	0.00	0.00	-	-
MDG-226	Manambato South	0.01	0.02	0.00	0.00	0.00	-
MDG-184	Nosy Mangabe Special Reserve	-	-	-	-	-	-
MDG-127	Tampolo	0.00	-	0.00	0.01	-	-
MDG-069	Anadabolava-Betsimalaho NPA (Anosy)	-	0.02	0.00	-	0.00	-
MDG-174	Bemarivo Special Reserve	-	0.00	0.00	-	0.00	-
MDG-137	Andohahela National Park - Parcel I	-	0.02	0.01	0.00	0.00	-
MDG-183	Marotandrano Special Reserve	-	0.01	0.00	-	0.00	-
MDG-112	Itremo Vakinakaratra Future SAPM	-	0.00	0.00	0.00	0.00	-
MDG-062	Ambatotsirongorongo	-	-	0.00	0.05	-	-

MDG-138	Andohahela National Park - Parcel II	-	0.02	0.00	0.00	0.00	-
MDG-017	Andravory (Andrafainkona)	-	0.01	0.01	0.00	0.00	-
MDG-043	Bidia-Bezavona Classified Forest	-	0.02	0.01	0.00	0.00	-
MDG-162	Makira	-	0.03	0.00	0.00	0.00	-
MDG-167	Ambatovaky Special Reserve	-	0.02	0.00	0.00	0.00	-
MDG-124	Pointe à LarrÃ©e	0.00	-	0.00	0.00	-	-
MDG-087	Ifotaky Complex Future SAPM	-	0.03	0.00	0.00	0.00	-
MDG-142	Baly Bay National Park	0.00	0.00	0.00	0.00	0.00	-
MDG-125	Sainte Luce/Ambato Atsinanana	0.00	-	0.00	0.00	0.00	-
MDG-157	Zahamena National Park and Strict Reserve	-	0.01	0.01	0.00	0.00	-
MDG-206	Tsinjoarivo	-	0.00	0.00	0.00	0.00	-
MDG-074	Andreba	-	-	0.00	0.00	-	-
MDG-079	Ankodida (Anosy Future SAPM)	-	0.00	0.00	0.00	0.00	-
MDG-035	East coast of Antsiranana	0.00	-	-	-	-	-
MDG-205	Tarzanville (Moramanga)	-	-	-	-	-	-
MDG-083	Cape Anorontany Archipelago	-	-	-	-	-	-
MDG-013	Barren Islands	-	-	-	-	-	-
MDG-049	Lake and river Andranomalaza (Maromandia)	0.00	-	-	-	-	-
MDG-016	Ambompofofo	0.00	-	-	-	-	-
MDG-133	Nosy Foty	-	-	-	-	-	-

Comoros

Table 78 Results of the KBA+ methodology for Comoros

KBA (name)	SUPPLY										REGULATION & MAINTENANCE				CULTURAL VALUE				Multi-criteria analysis - Total	Rank
	Commercial fishing		Wood		Water for domestic use		Water for irrigation		Water for hydroelectricity		Mangroves for flood protection		Forests for flood protection		Ecotourism value		Spiritual value			
	Yes/No (0/1)	Value of landed	Yes/No (0	No of families using	Yes/No (0	People using wa	Yes/No (0	Agricultors usi	Yes/No (0/1	Installed capa	Yes/No (0/1	Protected population	Yes/No (0	Protected population	Yes/No (0	No of visitors	Yes/No (0/1)	No of visitors		

		fis h	/1)	char coal	/1)	ter	/1)	ng wa ter	)	cit y	)		/1)		/1)					
Mount Ntringui (Ndzuani Heights)	0	0	1	409 6	1	25 77 1	1	0	1	58 5	0	0	1	4697 9	1	18 51 9	0	0	0,54	1
Karthala Massif	0	0	1	340 8	0	0	1	18 9	0	0	0	0	1	5195 7	1	18 51 9	1	18 519	0,45	2
Coelacanth Zone	1	33 04	0	0	0	0	0	0	0	0	1	2 382	0	0	1	18 51 9	1	18 519	0,43	3
Moya Forest	0	0	1	2914	1	49 47	1	0	0	0	0	0	1	15702	1	18 519	0	0	0,27	4
Domoni area	1	19 39	0	0	1	72 82	0	0	1	0	0	0	0	0	1	18 519	0	0	0,25	5
Massif de la Grille	0	0	1	932	1	12 80	1	34 7	0	0	0	0	1	10449	1	18 519	0	0	0,22	6
Ex Marine Park of Moheli	1	25 7	0	0	0	0	0	0	0	0	1	4710	0	0	1	8 039	0	0	0,21	7
Bimbini area and Ilot de la Selle	1	54 4	0	0	1	0	0	0	1	0	1	1 812	0	0	1	18 519	0	0	0,19	8
Pomoni area	1	59 0	0	0	1	11 70 2	0	0	0	0	0	0	0	0	1	18 519	0	0	0,18	9
Moya area	1	55 8	0	0	1	89 86	0	0	1	0	0	0	0	0	1	18 519	0	0	0,17	10
Coral reefs of Grande Comore	1	91 5	0	0	0	0	0	0	0	0	0	0	0	0	1	18 519	0	0	0,16	11
Mutsamudu area	1	53 4	0	0	1	57 73	0	0	0	0	0	0	0	0	1	18 519	0	0	0,15	12
Lake Hantsongo ma	0	0	1	409	0	0	1	68	0	0	0	0	1	3659	1	18 519	0	0	0,14	13
Coral reefs	1	50	0	0	0	10	0	0	0	0	0	0	0	0	1	18	0	0	0,14	14

of Anjouan		9				82										519				
Chirononi area	1	29 0	0	0	1	29 20	0	0	1	0	0	0	0	0	1	18 519	0	0	0,13	15
Male Zone	1	29 5	0	0	0	0	0	0	0	0	0	0	0	0	1	18 519	0	0	0,12	16
Mount Mlédjélé (Heights of Mwali)	0	0	1	1056	0	0	1	0	1	17	0	0	1	9760	1	8 039	0	0	0,11	17
Zone of Ndroudé and Ilot aux Tortues	1	68	0	0	0	0	0	0	0	0	0	0	0	0	1	18 519	0	0	0,10	18
Coral reefs of Moheli - outside the Marine Park	1	71 1	0	0	0	0	0	0	0	0	0	0	0	0	1	8 039	0	0	0,09	19
Lake Dziani-Boudouni	0	0	1	203	0	0	0	0	0	0	0	0	0	0	1	8 039	0	0	0,05	20

Maurice

Name (KBA)	SUPPLY								REGULATION & MAINTENANCE				CULTURAL VALUE		Multi-criteria analysis-Total	Rank
	Commercial fishing		Water for domestic use		Water for irrigation		Water for hydroelectricity		Protection against cyclones		Protection against flooding		Ecotourism value			
	Yes/No (0/1)	Rel imp	Yes/No (0/1)	Rel imp	Yes/no (0/1)	Rel imp	Yes/No (0/1)	Rel imp	Yes/No (0/1)	Rel imp	Yes/no (0/1)	Rel imp	Yes/No (0/1)	No. visitors		
Cargados Carajos Shoals	1	4	0	0	0	0	0	0	0	0	0	0	1	30 0	0,200	16
Bamboo Mountain	0	0	1	4	1	3	1	4	1	4	1	4	1	10	0,655	1

Range														0 000		
Chamarel - Le Morne	0	0	1	3	1	2	0	0	1	2	1	4	1	300 000	0,503	5
Tamarind Falls / Mount Simonet / Cabinet Nature Reserve	0	0	0	0	1	3	1	4	0	0	1	4	1	50 000	0,290	11
Relict Forests of the Central Plateau	0	0	1	4	1	4	0	0	0	0	1	4	1	500 000	0,550	2
Rodrigues' Islets	1	3	0	0	0	0	0	0	1	3	0	0	1	25 000	0,308	10
Mauritius Northern Islets	1	2	0	0	0	0	0	0	1	2	0	0	1	200 000	0,260	13
Mauritius South-Eastern Islets	1	3	0	0	0	0	0	0	0	4	0	0	1	150 000	0,395	6
Le Pouce - Anse Courtois - Pieter Both - Longue Mountain	0	0	0	4	1	3	1	2	0	0	1	4	1	100 000	0,280	12
Mondrain - Magenta - Trois Mamelles - Mont du Rempart	0	0	0	0	1	3	0	0	0	0	1	4	1	1 000	0,225	14
Guardhouse Mountain	0	0	1	2	1	4	0	0	0	0	1	4	1	60 000	0,343	9
Black River Gorges National Park and surrounding areas	0	0	1	4	1	4	0	0	0	0	1	4	1	400 000	0,520	4
Coral Plain	0	0	1	2	0	0	0	0	1	2	1	1	1	25 000	0,220	15

Plaine des Roches - Bras d’Eau	0	0	1	3	1	4	0	0	1	3	1	4	1	80 000	0,537	3
Good God Bridge	0	0	0	0	0	0	1	1	0	0	1	4	1	15 000	0,167	17
South Slopes of Grande Montagne	0	0	1	3	1	3	0	0	1	2	1	2	1	5 000	0,364	7
Yemen-Takamaka	0	0	1	1	1	3	0	0	0	0	1	4	1	300 000	0,353	8

Seychelles

Table 79 Compilation of key results for the assessment of the relative importance of the 10 ecosystem services for each of the 57 KBAs identified by CI (2014).

Code	Island Group	Terrestrial /Marine	KBA Name	Provisioning				Regulation and maintenance			
				Food (fish)	Water catchment	Forest products	Medicine	Local climate regulation	Coastal protection	Flooding protection	Natu proce es
Weight coefficient				0,125	0,125	0,09375	0,03125	0,09375	0,125	0,125	0,125
SYC-43	Inner	T	Morne Seychellois National Park	0	4	4	4	4	0	3	4
SYC-38	Inner	T	Planneau Mountain (Grand Bois-Varigault-Cascade)	0	4	2	3	4	0	4	4
SYC-41	Inner	T	Praslin National Park	0	3	4	2	3	0	2	3
SYC-42	Inner	T	Silhouette National Park	0	3	1	1	4	0	2	4
SYC-36	Inner	T	Burnt Mountain-Piton de l’Eboulis	0	1	3	3	2	0	4	3

SYC-50	Aldabra	M/T	Aldabra Special Reserve	4	1	0	0	1	1	0	4
SYC-47	Inner	M	Port Launay Marine National Park and coastal wetlands	3	0	0	0	0	3	1	3
SYC-15	North edge	T	Bird Island (Ile aux Vaches)	4	1	1	0	1	1	0	3
SYC-5	Cosmoledo	M/T	Cosmoledo	4	1	0	0	0	1	0	4
SYC-51	Inner	M/T	Aride Island Special Reserve	4	1	0	0	1	1	0	3
SYC-52	Inner	M/T	Cousin Island Special Reserve	4	1	0	0	1	1	0	3
SYC-48	Inner	M	Sainte-Anne Marine National Park (SAMNP)	3	0	0	0	0	3	0	3
SYC-20	North edge	T	St. Denis Island	4	1	1	0	1	1	0	3
SYC-46	Inner	M	Curieuse Island Marine National Park	3	0	0	0	0	3	0	3
SYC-32	Amirantes	M/T	Saint-François and Bijoutier Islands	4	0	0	0	0	2	0	4
SYC-3	Cosmoledo	M/T	Astove	4	1	0	0	1	1	0	3
SYC-18	Inner	T	Curious Island	0	1	3	0	1	0	1	3
SYC-19	Amirantes	M/T	D’Arros Island and Saint Joseph Atoll	4	1	1	0	0	1	0	3
SYC-6	Farquhar	M/T	Farquhar - South Island and islets	4	0	0	0	0	1	0	4
SYC-9	Inner	T	Fond Ferdinand	0	2	3	0	1	0	0	3
SYC-49	Inner	M	Silhouette Marine National Park	3	0	0	0	0	1	0	3
SYC-22	Amirantes	M	Desroches Island - surrounding reefs	2	1	0	0	0	2	0	2

SYC-25	Amirantes	M/T	Alphonse Island and Lagoon	2	1	0	0	0	2	0	2
SYC-39	Inner	T	Eagle’s Nest (ridge and eastern slopes)	0	2	1	0	2	0	2	2
SYC-23	Inner	T	North Island	1	1	1	0	1	1	0	3
SYC-56	Inner	T	Endor Valley	0	2	0	3	1	0	3	1
SYC-26	Inner	T	Félicité Island	1	1	1	0	1	1	0	3
SYC-17	Inner	T	Cousin Island	2	1	0	0	1	1	0	3
SYC-27	Inner	T	Frégate Island	1	1	1	1	1	0	0	3
SYC-2	Inner	T	Anse Source d’Argent-Anse Marron	1	1	1	0	1	1	0	2
SYC-44	Inner	M	Cape Ternay / Ternay Bay Marine National Park	3	0	0	0	0	1	0	2
SYC-7	Inner	T	Fond Azore southern slopes to Anse Bois de Rose	0	1	1	0	3	0	1	3
SYC-34	Amirantes	M	Poivre Lagoon and surrounding reefs	4	1	0	0	0	1	0	2
SYC-45	Inner	M	Cocos Island Marine National Park	4	0	0	0	0	1	0	1
SYC-21	Amirantes	T	Desnoeufs Island	3	1	0	0	0	1	0	2
SYC-12	Inner	T	Grand Anse-Petite Anse-Fond Piment	0	1	1	0	3	0	0	2
SYC-53	Inner	T	La Veuve Special Reserve	0	0	1	0	1	0	2	2
SYC-28	Amirantes	T	Marie-Louise Island	3	1	0	0	0	1	0	2

SYC-10	Inner	T	Friendship Forest	0	1	1	0	2	0	2	2
SYC-37	Inner	T	Glacis Mountain - When she comes	0	1	1	0	2	0	0	2
SYC-4	Amirantes	M	African Banks	4	0	0	0	0	1	0	2
SYC-24	Farquhar	M/T	Providence Island and Bank	1	0	0	0	0	1	0	4
SYC-29	Inner	T	Sainte-Anne Island	0	1	1	1	1	0	0	1
SYC-11	Inner	T	Coral Mountain-Southern Hills dry forests	0	1	0	0	2	0	0	3
SYC-13	Inner	T	Grand Police wetlands	1	0	0	0	2	0	1	1
SYC-1	Inner	M	Anse Major / Anse Jasmin (marine area of MSNP)	1	0	0	0	3	0	0	1
SYC-14	Aldabra	M/T	Assumption Island	1	0	0	0	1	1	0	3
SYC-31	Amirantes	T	Etoile and Boudeuse Islands	4	0	0	0	0	0	0	2
SYC-57	Inner	T	La Misère-Dauban area: La Misère	0	1	1	0	1	0	1	1
SYC-8	Inner	T	Fond Diable and Pointe Josephine	0	0	1	0	2	0	1	2
SYC-40	Inner	T	Recif Island National Park	1	0	0	0	0	0	0	2
SYC-35	Inner	T	Mount Signal	0	0	1	0	1	0	1	1
SYC-33	Inner	T	Frégate Island	0	0	0	0	1	0	0	2
SYC-16	Inner	T	Island Design	1	0	0	0	1	0	0	1

SYC-54	Inner	T	Kerlan River	0	1	0	0	1	0	0	1
SYC-55	Inner	T	Anse Petite Cour Boulders	0	0	0	0	1	0	0	1
SYC-30	Farquhar	T	Saint-Pierre Island	0	0	0	0	0	0	0	1

CRITICAL ECOSYSTEM PARTNERSHIP FUND