



ADAPTATION FUND

PRE-CONCEPT FOR A REGIONAL PROJECT/PROGRAMME

PART I: PROJECT/PROGRAMME INFORMATION

Title of Project/Programme:

Restoring marine ecosystem services by rehabilitating coral reefs to meet a changing climate future

Countries:

Republic of Seychelles and Republic of Mauritius

Thematic Focal Area¹:

Food security

Type of Implementing Entity:

MIE

Implementing Entity:

UNDP

Executing Entities:

Ministry of Environment, Climate Change and Energy,
Nature Seychelles and Seychelles National Parks
Authority; Ministry of Ocean Economy & MRSOI,
Mauritius Oceanography Institute (MOI), Albion Fisheries
Research Centre, UNDP GEF Small Grants Programme

Amount of Financing Requested:

\$4,900,000 (U.S Dollars), excluding PFGs

Project / Programme Background and Context:

Coral reefs provide a wealth of ecosystem services (food, recreational use, biodiversity benefits, and regulating services such as coastal protection) that are vital to the local economies and food security of human populations living on vulnerable Small Island Developing States (SIDS). Reef-related fisheries provide the primary protein source and livelihoods for many island communities.² Fisheries is also a key sector in the economies of both Seychelles and Mauritius.³ The total abundance of fish (and hence potential fisheries productivity) is strongly associated with the amount of live hard coral cover.⁴

Healthy reefs also serve as natural coastal breakwaters, shielding coastlines, coastal populations, properties and infrastructure against storms, flooding and erosion. The reef and diversity of live hard coral structures on fore reef slopes and shallow reef crests dampen oncoming waves, sheltering lagoons and permitting the growth of other critical habitats, including seagrass beds and mangroves. These sheltered habitats further reduce the risk of coastal erosion, through stabilizing sediments, while also providing nursery habitats for the juveniles of economically important fish and invertebrate species. A reduction in the amount of live hard coral cover, and the loss of reef framework that occurs when a reef is degraded by anthropogenic or climate change related impacts, thus directly threatens the food security and livelihoods of communities dependent on reef fisheries. It also puts these same

¹ Thematic areas are: Food security; Disaster risk reduction and early warning systems; Transboundary water management; Innovation in adaptation finance.

² e.g. Seychelles is the 3rd largest consumer of fish per capita (59.3 kg) and the percentage of fish as a contribution to animal protein is 47.6% a significant proportion of which is sourced from reef and coral associated areas (2011). SOURCE: <http://www.globefish.org/total-fish-consumption-per-capita-kg-and-fish-contribution-to-total-proteins-percent.html>

³ In Seychelles, fish catches are valued at around 35 million USD per year, representing less than 10% of GDP, but accounting for more than 90% of exports (WB data). Although most of it is attributed to high-seas and export oriented tuna fishing, artisanal fishing in Seychelles is also chiefly important for the local generation of income and employment, and for the local availability of protein (per capita consumption of fish in Seychelles is around 65kg annually, one of the highest in the world; Ibid.). In Mauritius, high-seas fishing has seen a steady decline since the mid-1990's, reducing the overall importance of the sector for the economy. Yet, since 2011 lagoon and off lagoon fishing has been contributing with some \$4.75 million annually to GDP and currently represents 40% of all fisheries. The activity also helps reduce Mauritius' need to import fish for local consumption.

⁴ e.g. Komyakova V, Munday PL, Jones GP (2013) Relative Importance of Coral Cover, Habitat Complexity and Diversity in Determining the Structure of Reef Fish Communities. PLoS ONE 8(12): e83178. doi:10.1371/journal.pone.0083178

people and property at increased risk from climate related coastal hazards. In 2011, insured losses from natural disasters, especially coastal (and riverine) hazards, reached globally US\$105 billion, an all-time high. The Indian Ocean is a disaster-prone region. It is particularly vulnerable to storms and wave surge, coastal flooding and sea-level rise. Maintaining the ecosystem services provided by healthy and actively growing reefs, with the potential to keep up with rising sea levels and a higher frequency and intensity of extreme weather, is particularly essential for SIDS.

Coral bleaching caused by warmer than normal seawater temperatures has emerged as one of the major threats to coral reefs and their associated communities (IPCC, 2013). In 1997/1998, an El-Nino coupled with an Indian Ocean Dipole event resulted in the highest seawater temperature anomalies recorded in 50 years and a world-wide mass coral bleaching event. The reefs in the western Indian Ocean (WIO) region were the most severely impacted: coral mortality was 30% at the regional level ranging from 10% in Mauritius to 80-95% on the most heavily impacted reefs in the Seychelles. While some reefs recovered naturally within 5-10 years, others remained as rubble strewn wastelands even within well-established Marine Protected Areas (MPAs). The reefs of Mauritius have since been impacted by other factors and subsequent coral bleaching events have left many reefs in a heavily degraded state. Within the West Indian Ocean region (WIO) coral bleaching has undermined existing conservation efforts and many countries have been unable to respond using conventional practices. The frequency of coral bleaching events is predicted to increase in coming decades as seawater temperatures continue to rise (IPCC, 2013). These SIDS therefore urgently need to develop new capacities to restore the ecosystem services lost after coral bleaching and build resilience.

Natural recovery processes may fail after large scale disturbances, such as coral bleaching, due to a limited supply of coral larvae and/or the substrate being unsuitable for the settlement and/or survival of coral spat. When natural recovery processes fail, it may become necessary to intervene in order rehabilitate degraded reefs and restore ecosystem services. Various reef restoration⁵ methods have been developed which include 'passive' or indirect management measures to remove the impediments to recovery, and 'active' or direct interventions such as coral gardening⁶⁷. The selection of which method, or combination of methods, is the most appropriate requires careful consideration as the answers are often site-specific. Both Seychelles and Mauritius have successfully trialled and adapted the 'coral gardening concept' method for rehabilitating reefs. The proposed project will capture and disseminate lessons from reef rehabilitation efforts from the wider region and provide the opportunity to upscale and mainstream experiences, so as to maximise long term success and achieve sustainable adaptation. Corals will be farmed as a community activity and as a mariculture venture to supply a cost effective and continuous stock of corals for transplantation into areas degraded by climate change and to restore the ecosystem services that healthy coral reefs normally deliver. The community level farming will provide not only alternative employment for local fishers, but it will also strengthen their own food security. It will also further reduce fishing pressure on coral reefs and support passive management efforts aimed at strengthening the ecological resilience of the very same reefs and of people who depend on them.

Project / Programme Objectives:

The main objective of the proposed project is to upscale and mainstream the rehabilitation of coral reefs degraded by coral bleaching in order to restore essential ecosystem services in the face of climate change threats and to generate knowledge about the most effective solutions for dissemination to SIDS and countries within the wider region. The project responds to two of the three thematic focal areas namely 'Food Security' and 'Disaster Risk Reduction' as: (i) the rehabilitation of

⁵ Ecological restoration is defined as the process of assisting the recovery of an ecosystem that has been degraded, damaged or destroyed.

⁶ Edwards, AJ, Gomez, ED (2007). Reef Restoration Concepts and Guidelines: making sensible management choices in the face of uncertainty. Coral Reef Targeted Research & Capacity Building for Management Programme: St Lucia, Australia. iv + 38 pp.

⁷ Edwards, AJ (ed.) (2010). Reef Rehabilitation Manual. Coral Reef Targeted Research & Capacity Building for Management Program: St Lucia, Australia. ii + 166 pp.

degraded reefs will restore fish habitats by increasing coral cover on degraded reefs thereby encouraging the recovery of reef associated fish communities important as food to the local communities and; (ii) the rehabilitation of degraded reefs will restore the protective barrier function provided by coral reefs through stabilising the reef substrate and planting corals. In the long-term this project will contribute to demonstrating where, when and how healthy or restored coastal ecosystems can contribute to cost-effective solutions that address current and growing risk from natural hazards and climate change. The project will demonstrate innovations in adaptation finance for transformational impact both by using new technologies and different financial models to create cost effective solutions to sustain these adaptation measures beyond the project lifespan. By adopting the regional approach, it is expected that the stakeholders involved will develop the technical and scientific partnerships as well as a common political understanding and will to promote the use of effective natural solutions in adaptation and disaster risk reduction. It will particularly enhance regional coordination, scientific exchange and learning. Ultimately it is a better option than two national projects.

Project / Programme Components and Financing:

Project/Programme Components	Expected Outcomes	Expected Outputs	Countries	Amount (US\$)
1: Scoping and technical assessments to identify nursery and rehabilitation sites and priority species				
(1a) Stakeholder engagement & analysis.	Identification of interested groups and private sector partners	Partnership agreements with private sector and /or community groups.	Republics of Mauritius & Seychelles	30,000
(1b) Scoping studies and technical assessments to identify sites and resistant/ threatened coral species for propagation	Potential coral nursery sites and priority reef sites for rehabilitation identified and justified in Mauritius and Seychelles; Update on coral faunal diversity in Mauritius	Report identifying potential mariculture sites; Coral reef status and water quality assessed and mapped; GIS maps identifying nursery and reef rehabilitation sites.; Revised "Field Guide on Corals of Mauritius	Republics of Mauritius & Seychelles	619,000
2. Improved understanding of genetic connectivity and coral recruitment patterns				
Study into the genetic connectivity of coral species between Republics of Mauritius & Seychelles	Improved understanding about the regional genetic connectivity in coral species diversity and resilience and recruitment and spawning patterns. Potential to spread risk through sharing of propagated coral stocks.	Data available on the genetic connectivity of coral species, spawning seasons and coral recruitment patterns between Republics of Mauritius & Seychelles.	Republics of Mauritius & Seychelles	244,000
3. Mainstreaming coral farming and mariculture into the Blue / Ocean Economy				
(3a) Setting up of ocean based coral mariculture operation for the large scale propagation of resistant/resilient /threatened species	New ocean-based mariculture facility established for the cost effective mass propagation of selected coral species; Maintenance of coral brood stock to retain local species and genetic diversity;	Stock of mass propagated corals available for transplantation on eroded coasts, MPAs, marinas, island resorts through commercial ventures;	Republic of Seychelles	700,000
(3b) Setting up of land-based 'Coral Sanctuary' for the mass propagation of threatened / resilient / coral species and community coral farms in proximity to degraded reef sites	Land-based 'Coral Sanctuary' established for the propagation of threatened/resistant/resilient coral species, to maintain brood stock to retain local coral species and genetic diversity; Community coral farms established providing a sustainable alternate livelihoods	Stock of corals available for transplantation; Stock of threatened coral species and long term maintenance of brood stock; General public and tourists sensitized on coral reef conservation issues.	Republic of Mauritius	700,000
4. Rehabilitation of degraded reef sites, maintenance and monitoring				

Project/Programme Components	Expected Outcomes	Expected Outputs	Countries	Amount (US\$)
Active rehabilitation of degraded reefs Maintenance and monitoring survival and growth rates of cultured and planted corals	xxx m2 of reef rehabilitated and reef ecosystem services restored in Republics of Mauritius & Seychelles. Improved survivorship of propagated coral larvae through regular maintenance;	Priority sites prepared and rehabilitated using farmed corals Survival and growth rate of farmed corals recorded and data available; Lessons learnt about methods and modes of implementation documented and shared online.	Republics of Mauritius & Seychelles	1,131,671
5. Knowledge management, capacity building and sensitization programmes				
(5a) Regional comparison of the effectiveness of 'active' and 'passive' coral reef rehabilitation methods and technical training workshops	Increased understanding of the relative costs and effectiveness of active and passive coral reef rehabilitation methods and improved regional capacity in coral rehabilitation	Cost benefit analysis of the different reef rehabilitation methods; Report on lessons learnt from coral reef rehabilitation programmes; Regional technical training workshop/s on: e.g. Habitat mapping and DNA-based approach for the identification of resilient corals.	Regional	300,000
(5b) Business planning for coral reef rehabilitation for adaptation	Financially sustainable community level coral farming and ocean-based coral mariculture for transplantation, or to supply aquaculture or tourist trade.	Business model(s) and plan(s) for ocean-based coral mariculture and community farming to ensure financial sustainability.	Republics of Mauritius & Seychelles	125,000
(5c) Certification scheme for farmed corals and training programme for coral reef rehabilitation	Certification scheme for farmed corals to replace wild-caught corals for use in tourist trade (Seychelles only). <i>In situ</i> training programme in reef restoration leading to a Certificate of Competence	Certification scheme for farmed propagated corals. Internationally recognised training programme in Coral Reef Rehabilitation Techniques.	Republic of Seychelles	150,000
(5d) Community level sensitisation and training.	Fisher communities aware of the need for reef rehabilitation, sensitised to the potential of coral farming as an alternative livelihood and provided with training in how to farm corals	Fisher / women's community groups aware of the need for coral rehabilitation and trained in how to establish and manage coral farms as an alternative livelihood.	Republic of Mauritius	50,000
6. Project/Programme Execution cost				425,215
7. Total Project/Programme Cost				4,474,886
8. Project/Programme Cycle Management Fee charged by the Implementing Entity (if applicable)				425,114
Amount of Financing Requested				4,900,000

Project / Programme Duration: 5 years

PART II: PROJECT / PROGRAMME JUSTIFICATION

The Republic of Mauritius and the Seychelles are two of four SIDS in the WIO region that share geographically common challenges and climate-induced threats (e.g. coral bleaching, due to rising seawater temperatures, sea level rise, and ocean acidification). The environmental and socio-economic status of the SIDS in this region are such that country-specific responses are needed to facilitate adaption to climate change. Yet their capacities to address all of these challenges are limited. Regional projects that support the consolidation and sharing of best practices and expertise can thus be of huge benefit to SIDS. Furthermore, Mauritius and Seychelles recently negotiated a joint extension to their Exclusive Economic Zone (EEZ) which increases both the means and motivation for sharing knowledge and expertise. In acknowledgment of the vulnerability and diversity of the SIDS in the WIO region, the proposed project will consolidate lessons learnt about the most cost-effective methods to rehabilitate reefs degraded by bleaching as a means to assist the countries to address the adverse effects of climate change and build resilience. The project will demonstrate

different methods for propagating and farming of corals, capitalising on the knowledge gained from the successful USAID and GEF-funded Nature Seychelles' Reef Rescuers Project and Albion Fisheries Research Centre (AFRC) and Mauritius Oceanography Institute (MOI). The proposed project will upscale and mainstream rehabilitation efforts through the following five components:

Component 1 will identify nursery and rehabilitation sites through field- and desk-based studies and forge partnerships with the private sector and community groups for implementation. Site selection criteria will be devised to help identify and prioritise sites where rehabilitation efforts will best help increase food security and/or shoreline protection. Coral faunal diversity will be reassessed to identify resilient/resistant/threatened species to be propagated thereby increasing the long term success of rehabilitation efforts. **Component 2** will improve understanding about the genetic connectivity of corals, and the spatio-temporal variations in coral spawning and recruitment processes between the two countries. Mauritius has the technical and institutional capacity to undertake these studies while currently Seychelles does not – hence the advantage of a regional approach. Were coral species found to be genetically identical, the propagation and maintenance of common coral stocks in both countries could spread the risk during future disturbance events. Coral recruitment monitoring will complement existing programmes and provide an early warning system to help predict future problems with reef health after major disturbances (e.g. cyclones, coral bleaching). **Component 3** will establish new coral farming facilities in both countries, which will include: (a) a large ocean-based coral mariculture facility in Seychelles, (b) a land-based "Coral Sanctuary" in Mauritius to culture the resistant/resilient/threatened coral species for reintroduction in the wild and for public sensitisation and; (c) small-scale ocean-based community coral farms around Mauritius and in Rodrigues. **Component 4** will support the preparation and planting out of farmed corals onto the priority reef sites to be rehabilitated, as well as the maintenance and monitoring of corals within the nurseries and at both control and rehabilitated reef sites. Comparative monitoring across both countries will increase knowledge about the effectiveness of the propagation and rehabilitation methods and modes of implementation to assist in the evaluation of the project and to help inform the wider region and global research community. **Component 5** will support the capture, sharing and management of knowledge. The effectiveness of active (transplantation, larval propagation) and passive (ridge-to-reef, no-take zones, MPAs) reef rehabilitation approaches will be compared using a cost benefit analysis approach and lessons learnt compiled to further existing knowledge about these adaptation techniques. Technical training courses, the sensitization of fishers, preparation of business plans and an eco-certification scheme will all help ensure the sustainability of new ventures.

Mauritius will benefit from Seychelles experiences in the establishment of a commercial-scale coral mariculture facility and professional training in reef rehabilitation techniques. Seychelles will benefit from Mauritius experiences in setting up a 'Coral Sanctuary' and community ventures, and laboratory facilities (e.g. coral genetics, identification of resistant clades and larval propagation). The advantage of the regional approach will thus reside principally in the development of real cooperation within a sector where long term success and capacity building requirement need to be ensured.

PART III: IMPLEMENTATION ARRANGEMENTS

The project will be coordinated through the **UNDP Country Office in Mauritius**, which provides UNDP representation for both countries under a single UN leadership with shared programme support services. A **Regional Steering Committee** (RSC) will be established composed of the stakeholders outlined below. The RSC will meet at least once during the concept stage, twice during the preparation phase to ensure regional aspects are taken on board and to achieve consensus, and at least annually during implementation at side events to the planned regional workshops. The **National Steering Committees** will be composed of the principal stakeholders outlined below for each country, as well as other private sector, civil society and government organisations and will meet quarterly.

In **Seychelles**, the project will be implemented by the **Ministry of Environment, Climate Change and Energy (MECCE)** which has the mandate for environmental, climate change and energy policy and management. Other key NIE will include (a) **Nature Seychelles (NS)**, an NGO that has pioneered terrestrial restoration of islands, been the recipient of GEF-funds and other large donor funded projects. NS manages the Cousin Island Special Reserve, the site of a 5,500 m² restored reef, and is registered as a Private Educational and Training Institute (under the Education Act) and; (b) **Seychelles National Parks Authority (SNPA)**, which is responsible for the management of all state owned terrestrial and marine protected areas. SNPA wishes to restore reefs within MPAs and will partner with NS and receive training for its staff.

In **Mauritius** the implementing agency will be the **Ministry of Ocean Economy, Marine Resources, Fisheries, Shipping and Outer Island (MOE) Mauritius Oceanography Institute (MOI)** established in 2000 to develop and strengthen oceanographic research, within the maritime zone of the Republic of Mauritius, with technical expertise and institutional capacity for both coral farming, species identification and coral genetics. Other key NIE will include: (a) **Albion Fisheries Research Centre (AFRC)** established in 1982 under the MOE, and responsible for stock assessment of marine resources, MPA management, also involved in coral farming and; (b) the **Rodrigues Regional Assembly's (RRA)**, which established the South East Marine Protected Area (SEMPA) will coordinate efforts in Rodrigues. The **UNDP Mauritius GEF Small Grants Programme**, will be tasked with working with community groups to implement coral restoration techniques and programmes.

PART IV: ENDORSEMENT BY GOVERNMENTS AND CERTIFICATION BY THE IMPLEMENTING ENTITY

A. Record of endorsement on behalf of the government⁸

The endorsement letters should be attached as annexes to the project/programme proposal.

Mr D D Manraj, Financial Secretary, Alternate Designated Authority, Ministry of Finance and Economic Development	Date: 08/26/2015
Mr Didier Dogley, Minister, Designated Authority, Ministry of Environment, Energy and Climate Change	Date: 08/10/2015

B. Implementing Entity certification

I certify that this proposal has been prepared in accordance with guidelines provided by the Adaptation Fund Board, and prevailing National Development and Adaptation Plans (National Climate Change Adaptation Framework) and subject to the approval by the Adaptation Fund Board, commit to implementing the project/programme in compliance with the Environmental and Social Policy of the Adaptation Fund and on the understanding that the Implementing Entity will be fully (legally and financially) responsible for the implementation of this project/programme.

Implementing Entity Coordinator:

Adriana Dinu, Executive Coordinator, UNDP-GEF

Date: 09/01/2015	Tel. and email: +1 (212) 906-5143 adriana.dinu@undp.org
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Project Contact Person: Fabiana Issler, Senior Technical Advisor

Each Party shall designate and communicate to the secretariat the authority that will endorse on behalf of the national government the projects and programmes proposed by the implementing entities.

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