Building Regional Resilience through Strengthened Meteorological, Hydrological and Climate Services in the Indian Ocean Commission Member Countries (Hydromet Project)

Annex 6 Environmental and Social Management Framework

March 2020



AFD/DOE/CLI-DCP-2017-060

Contract #: CZZ2152-MS-2019-03

This technical assistance operation is financed by the Agence Française de Développement (AFD) as part of the Adapt'Action Facility. This Facility, launched in May 2017, supports African countries, LDCs and SIDS in the implementation of their commitments under the Paris Climate Agreement, through the financing of studies, capacity-building and technical assistance, particularly in the adaptation sector. The authors assume full responsibility for the content of this document. The opinions expressed do not necessarily reflect those of AFD or its partners.

Cover photo: new technology weather measuring and monitoring equipment at Mahé International Airport Seychelles (2019)

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ACRONYMS AND ABBREVIATIONS

AFD	Agence Française de Développement
DRR	Disaster Risk Reduction
EE	Executing Entity
E(S)IA	Environmental (and Social) Impact Assessment
ESMF	Environmental and Social Management Framework
ESMP	Environmental and Social Management Plan
ESMS	Environmental and Social Management System
ESRM	Environmental and Social Risk Management
ESS	Environmental and Social System
EU	European Union
GCF	Green Climate Fund
GFDRC	Global Facility for Disaster Reduction and Recovery
IFC	International Finance Corporation
IOC	Indian Ocean Commission
ONE	Organisation Nationale de l'Environnement (Madagascar)
PS	Performance Standard (of IFC)
SS	Safeguards Specialist (of IOC Technical Team)
SWIO	South West Indian Ocean
UNISDR	United Nations International Strategy for Disaster Reduction
UNDRR	UN Office of Disaster Risk Reduction
WMO	World Meteorological Organisation

EXECUTIVE SUMMARY

Project purpose

The proposal "Building Regional Resilience through Strengthened Meteorological, Hydrological and Climate Services in the Indian Ocean Commission Member Countries" has as its goal to strengthen the resilience and adaptive capacity of communities to climate change impacts. To achieve this, it will develop and transform national hydro-meteorological services in participant countries and foster regional cooperation and climate knowledge sharing. The proposal – otherwise known as the "Hydromet Project" – will improve and scale up climate services delivery including critical early warning systems (EWS) to reduce climate and socio-economic vulnerabilities in target countries.

The proposal is predominantly one of capacity building and institutional strengthening for these improved climate services. However, there will be an associated provision of new meteorological equipment for monitoring, measurement and data storage and sharing systems. These are specified in relation to both the needs of each country and regional requirements for coordinated regional climate services provision. An essential component of the project is the establishment of a limited number of strategically placed weather equipment facilities or stations newly equipped with state of the art technology for recording meteorological data. The collected weather data will be disseminated to government services and end users, including the general public.

Environmental and social risks

Safeguards risks are limited and are primarily associated with the installation of new meteorological equipment mounted on masts, or in the case of the Doppler radar units on small tower structures (also supplied will be work stations, computers, wiring, etc), and refurbishment of existing buildings alongside the new or rehabilitated weather stations. Modification and extension of existing buildings associated with offices and weather station facilities is possible.

A very limited area is required for each weather station – some 50-100m^2 at sites of semi-natural habitat such as airfields or government research institutes. The stations will in many cases be sited at or close to existing stations, some of which have fallen into disuse. In each of the countries it is anticipated that one Doppler Radar unit will be installed in addition to the weather monitoring facilities, and these will be mounted on a base or tower (up to some 8 metres in height). There will also be in selected locations a number of wave-monitoring buoys.

The project is classified as a Category B in the AFD system. In its Environment and Social Policy AFD classifies risks as High (A), Substantial (B+), Moderate (B) and Low (C). The project is classified as B because of the facility construction works included under Component 2. The small scale of facilities construction works for the project is such that its potential impact is likely to be limited. The new physical infrastructure element at any one location will be very modest in size (at maximum the size of a tennis court) and dispersed in siting so cumulative issues are not a relevant consideration.

Environmental Management

The process of site selection for weather station facilities to mitigate risks of minor possible direct impacts are to be addressed together with environmental management and health and safety guidance for construction safeguards. Planning requirements for the more limited number of Doppler Radar installations and the wave height monitoring buoys will also meet GCF standards and national ESIA compliance expectations. The construction safeguards are not only relevant to site

installation works but also any protection fencing to guard against third party damage. A “fit-for-purpose” approach[1] is adopted in line with the GCF risk-based approach so that the environmental and social requirements with appropriate diligence can be readily applied and by reference inform the project proponents in their specifications and monitoring of sub-contractors.

The proposed approach requires that the logic for facilities site selection be made explicit and where there are alternative options available the proponent will seek the optimal location subject to approval of the national environmental authorities. A monitoring and reporting component to the overall project will audit the implementation of the programme including setting up of new and rehabilitated weather stations to verify that safeguards are implemented.

In conclusion, negligible impacts are predicted to arise from the project and, when effectively implemented, it will provide reliable climate data of important potential advantage for climate risk adaptation and enhancing the management of natural resources, mitigating vulnerability of exposed populations and assets to climate change.

The ESMF presents actions to assure sound environmental and social implementation to meet constraints and capacity gaps, manage risks to achieve compliance with national and GCF requirements, and therefore realise the significant benefits of the project while avoiding or mitigating any adverse effects.

[1] Guiding Principle (d), GCF Environmental and Social Policy, page 5. To be understood as “adapted to the nature and scale of the operation and proportional to the levels of these risks and impacts”

1 INTRODUCTION

The present document establishes the Environmental and Social Framework of the AFD and GCF 'Hydromet' regional project to cover Comoros, Madagascar, Mauritius and Seychelles. It describes the principles, rules, guidelines and procedures to assess and manage environmental and social (E&S) risks. It contains measures and plans to avoid and mitigate safeguards risks, and recommends implementation and reporting responsibilities at appropriate levels.

1.1 Background and justification of the project

Changes in the earth's atmosphere have been observed to be causing noted changes in climate systems affecting local weather patterns and therefore prevailing conditions for the successful pursuit of human economic activities. These are predominantly seen to be negative and associated with increasing risks to, for example, agricultural productivity in tropical countries and biodiversity.

The increased severity of storms and cyclone events, and also droughts, makes livelihood systems of some of the most marginal and vulnerable groups in tropical countries increasingly precarious. Greater unpredictability of seasonal weather patterns presents special challenges for agriculture and water management, along with associated flash floods and landslides. Increasing exposure to severe cyclones and sea surges is an important threat for island countries which will be exacerbated in the future by rising sea levels.

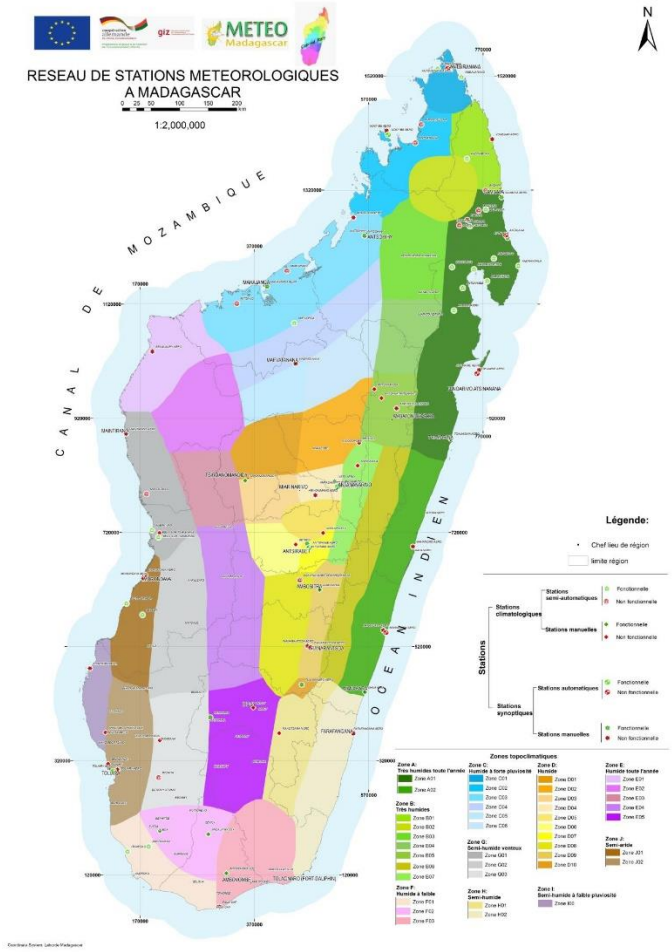
Despite these anticipated changes, climate information in the Indian Ocean Commission (IOC) countries is not readily available at the local level. Weather stations are too often defunct and not maintained even in regional airport locations. Likewise, they have fallen into disuse at agricultural research stations. IOC countries have not been immune to such challenges. It is suggested that the need for improved and fully functional climate services is particularly pronounced for the Member States of the IOC, not least because of the exposure to cyclone events.

As illustration of the problem faced from inadequate budgets and maintenance of existing facilities, three Doppler Radar units in Madagascar are reported as not functional[2]. GIZ has been equipping schools and hospitals with meteorological equipment. As of November 2017, 11 of 40 'synoptic stations' were not fully functional, nor 50% of 'climatological stations', while only 2 of 500 pluviometric stations/rain gauges were reported as functional (see Figure 1 below).[3]

[2] As reported to preparation team, June/July 2019

[3] Accompagnement de la Direction Générale de la Météorologie pour l'état des lieux du réseau des stations météorologiques et climatologique, Mai 2018.

Figure 1: Status of Meteorological Stations in Madagascar



Despite increasing recognition of the importance of these services, the region as a whole "has the least developed weather, climate and hydrology observation network, with only 1/8 of the required density and less than 300 weather stations that meet the World Meteorological Organisation (WMO) observation standards."[4] The current project is designed in a strategic context where it is recognised that quality meteorological data has not been systematically collected nor is readily available across the IOC region.

Without good meteorological and hydrological data, monitoring weather patterns and trends, and planning appropriate recommendations for sustainable development, is compromised. Sensitive and affected sectors are above all in agriculture, tourism, infrastructure and building, urban water supplies, disaster risk management, and anticipatory response.[5] There would be manifest benefits for more relevant and improved economic planning among the regional member countries, notably in their capacity to develop adaptation measures across affected sectors.

The proposed project is in concordance with Nationally Determined Contribution (NDC) documents committed to by Comoros, Madagascar, Mauritius and Seychelles. It will directly contribute to the implementation of Comoros' and Madagascar's priorities spelled out in their National Adaptation Programmes of Action (NAPA) and the national adaptation to climate change strategies and policies of all the target countries.

[5] See Feasibility Report for more detailed vulnerability analysis.

At the regional level the project is fully coherent with the IOC programme for disaster risk reduction (2016-2020) presented at the third conference of the UNISDR in Sendai and the IOC third strategic priority focusing on sustainable development and climate change, aiming at strengthening Disaster Risk Reduction and Management and Adaptation to Climate Change challenges.[6]

1.2 Baseline environmental and social features of the four countries

The IOC member states are exposed to a number of climate-related natural hazards impacting directly their populations and crucial sectors of their economies such as tourism, agriculture and fisheries. Sustaining economic growth in this region of the Indian Ocean and protecting those populations requires addressing climate risk and vulnerability through a combined approach of strengthening of hydro-meteorological data and services and impact-based early warning systems with investments in preventive measures against floods, drought and landslides.

A study conducted by the World Bank in 2017[7] confirms the increasing trend in the frequency and the intensity of extreme weather-related events across the South West Indian Ocean (SWIO) region and the exacerbating effects of climate change. During the 1964–2014 period, Comoros, Madagascar, Mauritius, and Seychelles have been affected by more than 100 disasters of which 94 (74 storms, 11 floods and 8 droughts) are related to hydro-meteorological phenomena.

The population affected by these hazards has been estimated at 14.4 million people and the physical damages resulting from climate-related events have been estimated at USD 13.1 billion.[8] The effects of climate change are already discernible in the Indian Ocean Commission region and climate scenarios indicate an increase in air and sea temperatures, as well as in the variability of precipitation, in sea level and in the intensity of extreme climatic events.

It is expected that the frequency and intensity of extreme hydro-meteorological events, as well as climate variability, will increase over time in relation with climate change. As a result of this, climate-related damages in the SWIO islands are expected to increase in the coming years with an average annual loss estimated at USD 224 million.[9]

Relevant country baseline information and vulnerability to key climate-related hazards and their impacts in Comoros, Madagascar, Mauritius and Seychelles are briefly reviewed below (Box 1).

Box 1: Regional Climate Change Hazards

- More frequent cyclone events of greater magnitude, with associated sea surge and flood potential affecting exposed assets and local populations.
- Greater occurrence of storms and extreme precipitation events (bringing increased potential damage to infrastructure (e.g. through landslides and flash floods) and to natural resource productivity, through damage to crops and enhanced exposure of soils to erosion.
- Increased prevailing temperatures which in terrestrial contexts create challenges for agriculture, especially where there is less rainfall predictability, and for forestry and biodiversity management where there is increased vulnerability to forest fires.
- Warmer seas with bleaching risks for coral reefs, affecting fisheries.

[6] Project Concept Note 2017
[7] South West Indian Ocean – Risk Assessment and Financing Initiative, 2017
[8] Concept Note Section B.2
[9] Concept Note Section B.2

- Sea level rise, which implies greater coastal erosion potential, especially when combined with the effects of storms; loss of coastline; and greater coastal inundation.
- Changes in temperatures and rainfall patterns which affect health impacts.

Associated hazards (not directly related to climate change):

- Tsunami occurrence from tectonic instability.
- Serious oil spillage from maritime transport accidents.

1.2.1 Madagascar overview

Geography, Land Use and Social Development

Madagascar is a 587,041-square kilometre island in the southwest Indian Ocean, located 400km off the southeast coast of the African continent (across the Mozambique Channel).[10] Madagascar be divided into five geographical regions: the east coast, the Tsaratanana Massif, the central highlands, the west coast, and the southwest. The highest elevations parallel the east coast, whereas the land slopes more gradually to the west coast.

Approximately 71.1% of the land area is used as agricultural land (of which 64.1% is permanent pasture, 6% is arable land, and 1% is permanent crops), 21.5% is forest, and 7.4% is other uses (including residential, transport, and other land uses).[11] The country was once covered almost completely by forests, but the practice of burning the woods to clear the land for dry rice cultivation has denuded most of the landscape, especially in the central highlands. Rain forests are concentrated on the steep hillsides along a slender north-south axis bordering the east coast, from the Tsaratamana Massif in the north to Tolagnaro in the south.

Secondary growth along the east coast and in the north has replaced the original forest and vegetation, and consists to a large extent of traveller's trees, raffia, and baobabs. The central highlands and the west coast is for the most part savanna or steppe, and coarse prairie grass predominates where erosion has not exposed the orange-red lateritic soil. In the southwest, the vegetation is adapted to desert conditions. The remaining rain forest contains a great number of unique plant species.[12]

Agriculture is the basis of subsistence for 75% of the population, and recent droughts have therefore been a major issue especially in the southern region of the country. Important agricultural products include coffee, vanilla, sugarcane, cloves, cocoa, rice, cassava, beans, bananas, peanuts, and livestock products. However, in recent years the agricultural sector's performance has slowed, contracting by 6.6% in 2017.[13]

Wood and charcoal from the forests are used to meet 80% of domestic fuel needs. As a result, fuel wood has become scarce. The World Bank in 1990 launched an environmental programme that has increased the planting of pine and eucalyptus to satisfy fuel needs.[14]

[10] Encyclopaedia Britannica, Madagascar: Land.
[11] CIA World Factbook, Madagascar: Geography.
[12] Geography of Madagascar - excerpt from US Army Country Studies: https://www.wildmadagascar.org/overview/geography.html
[13] World Bank, Madagascar Economic Update (June 2018), at pages 2-3.
[14] Geography of Madagascar - excerpt from US Army Country Studies (as above)

Vulnerability, Biodiversity and Climate Change

The country has unique and very significant biodiversity resources under constant pressure from a rapidly increasing population.

The Republic of Madagascar is an island nation with an estimated population of 27 million (as at 2019)[15] and is classified as a low-income country by the World Bank. Malnutrition is a significant problem: in 2013, 32.9% of children under 5 were underweight, placing Madagascar at 6th in the world for this metric.[16] The country currently ranks 161st out of 189 countries in the Human Development Index (HDI), which is derived from indices related to life expectancy, education, and standard of living.

The majority of Madagascar's 27 million people live on the eastern side of the island, which is cyclone prone. Only 51.5% of the population in Madagascar has access to an improved drinking water source (81.6% in urban areas and 35.5% in rural areas), and only 12% have access to improved sanitation facilities (18% in urban areas and 8.7% in rural areas). It is estimated that 63.5% of the population lives in rural areas, but only 17.3% of this rural population has access to electricity.[17] More than 60% of Madagascar's population is under 25 and the fertility rate is 4.1 children per woman.[18]

Madagascar is the most exposed of the Indian Ocean Region countries to cyclones by the fact of its location and size. Coastal livelihoods are vulnerable to climate change-related hazards while agricultural development across the country will be severely compromised by more capricious rainfall patterns. Poverty makes Madagascar especially vulnerable. Outside the main urban centres few live in masonry house constructions, which make its inhabitants particularly vulnerable to adverse impacts from cyclones.

Tropical cyclones, a key hazard in Madagascar, approach the island from the East, particularly from December to March. Two cyclones hit Madagascar in 2000 and again in February and March 2004, thousands were made homeless by tropical cyclones Elita (2004) and Gafilo (2004). In 2008, Cyclones Fame, Ivan, and Jokwe affected 342,000 people and caused an estimated USD 333 million in disaster-related damages and losses, equal to 4% of GDP.[19]

In 20 years Madagascar has suffered 35 cyclones, 8 floods and 5 periods of severe drought (three times worse than in the preceding 20 years). The cost has been estimated at USD 1 billion, affecting food security, drinking water and irrigation, health systems, environmental management and quality of life.[20]

Agriculture is negatively impacted by poor practices and degradation of soil productivity coupled with increasingly less predictable rainfall regimes, droughts and floods. Forest fires may increase due to changes in temperature and more frequent droughts. Likewise, landslides may be precipitated through extreme precipitation events. Traditional slash and burn agriculture and uncontrolled deforestation is continuing to expose increasingly large areas of land to soil erosion from torrential storms.

There are further sustainability challenges in the fisheries sector. The vast majority of individuals in the fishing sector are dependent on traditional artisanal fishing practised from small boats and outrigger canoes. Such persons may live in very isolated communities, and individuals and households may be very dependent for their subsistence on their catch. Hence artisanal fisherfolk will go out in stormy conditions. Livelihoods can be severely damaged in major unexpected cyclone events. Options are limited and many are not linked

[15] IMF, Republic of Madagascar: At a Glance.
[16] CIA World Factbook, Madagascar: People and Society.
[17] UNDP, Human Development Index 2018 Data Bank.
[18] World Bank DataBank, Madagascar Country Profile
[19] GFDRR, Madagascar.
[20] Climate Change Risk Profile of Madagascar, USAID 2016

into early warning systems. Better early warning systems in vernacular languages could at least allow basic precautionary steps to be taken on the announcement of a cyclone event or severe storm.

It is reported that a survival strategy, some who have lost their subsistence base in agriculture – following forced selling of cattle and other assets because of drought – have taken to fishing without having the traditional knowledge of coastal fishing communities who have long experience of handling outrigger canoes, the sea (tides, seasonal fishing grounds, local currents, etc) and local weather systems.[21] If climate change brings greater severity of storms this will make such vulnerable persons more exposed. Communicating weather information to them could be especially critical.

Intense rainfall events caused by strong storms and tropical cyclones, coupled with poor land use practices and increasing deforestation, can lead to significant and damaging floods across the country. Floods cause damage to roads, bridges, houses, and crops, while also threatening the lives of hundreds of people that live in the affected areas.[22]

Currently road access for buses used by the vast majority of the country is difficult already in large areas of the country. The few strategic routes may be exposed to landslides and become impassable due to erosion and downslope road undercutting, affecting both surfaced and unsurfaced roads.

Major population centres and ports exist around the coast and these are evidently exposed to storm surge events, cyclones, and local flooding. These are also locations for tourism in the form of beach holidays, natural ecotourism, marine sports, snorkelling, scuba, etc. associated with the quality of reefs. The latter are affected by sea warming and bleaching of coral will damage fisheries (breeding) potential, as well as the biodiversity and tourist interest for scuba diving and snorkelling.

1.2.2 Comoros overview

Geography, Land Use and Social Development

The Union of Comoros is composed of three main volcanic islands and has a climate characterised by a hot rainy season marked by heavy precipitation and occasional cyclones with average temperatures of around 27°C, and a cool dry season with average temperatures of 23-24°C. Significant variation exists between local microclimates due to the influence of geographic relief and morphology on the different islands.

Comoros has 340km of coastline, and its highest point at 2,360m above sea level is the active volcano, Mount Karthala. Grande Comore is the largest island, with a generally rocky surface, shallow soils, and no permanent streams. The island of Anjouan is dominated by the central volcanic Mount Ntingui. Its otherwise good soil cover is being depleted due to erosion.[23]

According to 2011 estimates 84% of the land area is used as agricultural land of which 47% is arable land, 30% is permanent crops, and 8.1% is permanent pasture, 1.4% is forest, and 14% other uses. Agriculture employs 80% of the Comorian population, contributes nearly 44.7% to GDP,[24] and provides almost all export earnings (95%). Agricultural exports are vanilla (6% of the global market), ylang-ylang (70-80% of global market) and cloves. However, 80% of crops are grown for subsistence and for limited sale in local markets; women are responsible for 70-80% of household food production.

Two agricultural zones are defined: the coastal area, which ranges in elevation from sea level to 400m and which supports cash crops such as vanilla, ylang-ylang, and cloves; and the highlands, which support

[21] Pers comm. Hazen, J (USAID/CRS), July 2019
[22] Climate Risk and Adaptation Profile, GFDRR
[23] CIA World Factbook, Comoros: Geography; Encyclopaedia Britannica, Comoros: Relief, Drainage, and Soils.
[24] Comoros Economic Outlook, 2012

cultivation of crops for domestic consumption and local sale, such as cassava, bananas and sweet potatoes. There is also a small amount of livestock farming.

The three official languages are Comorian, Arabic, and French, with French as the language of administration. 97% of the population define their ethnicity as "Comorian", which is an ethnic grouping reflecting their diverse origins: a mix of Malay immigrants, Arab and Persian traders, with groups from Madagascar and other parts of Africa.[25]

Vulnerability, Biodiversity and Climate Change

Important environment and development sustainability issues revolve around agricultural subsistence, tree crops and artisanal fisheries. For example, related to climate change, forest cover that provides an important carbon sink is being lost. The islands also have serious waste management issues and nature conservation and special biodiversity values are under pressure of human encroachment. There is a small tourism sector based around coastal tourism. However, communities at Itsamia and Niomachoua (marine national park) on Moheli provide useful models for local ecotourism potential.

Cyclones are a rarer occurrence than in other islands because the Comoros are located towards the north of the cyclone belt, and are protected by being in the leeward side of the island of Madagascar. However, Cyclone Kenneth recently (April 2019) impacted the north of Grande Comore, tracking across the top of Madagascar. It strengthened locally and was severest some 45 km off the north coast of Grande Comore. It was also felt in Moheli and Anjouan, though at much weaker wind speeds. Storms and surge are related hazards.

Extreme precipitation is a hazard for the islands. Grand Comore has limited river valleys and a dome-like relief, but exposed villages experience flash flooding. Generally there is rapid runoff to the sea on Grande Comore, and the dominant population centre of Moroni is itself mostly protected from ocean surge by natural rock. Villages are normally accessible in emergencies through the road network. However, electricity and mobile communications availability is not assured so messages are not necessarily received quickly from the risk and disaster management authority (COSEP).

Populations in villages, especially on Grande Comore, have access to masonry or concrete built structures – this can reduce loss of life, given adequate warnings. These structures are usually family investments made through family members living abroad, in Mayotte or France in particular. The islands benefit from significant remittances from populations living outside the country (principally in France and Mayotte). In terms of adaptation and coping strategies for extreme events, many families in Grande Comore have financial recourses available through these remittances. In contrast, the percentage of masonry structures is much lower in Anjouan and Mohéli.

Anjouan is more densely populated and has greater agricultural dependency for subsistence. It is particularly exposed to flash floods down short rivers to the sea. There is also significant danger of landslides due to the extent of cultivation on very steep slopes. Extended dry periods are already a particular hazard. Greater insolation and sparser water availability will put further stress on sustainable land management resistant to erosion and landslides.

Forest fires are also not adequately controlled and could become more prevalent due to climate change. This is a particular problem for the dry east side of Mohéli. There is also a danger that climate change will alter the natural fauna to the disadvantage of species that have adapted to the unique features of the islands, in particular in the mountain areas of Anjouan. Overall, tsunamis are considered the most significant hazard,

[25] Encyclopaedia Britannica, Comoros: People.

followed by tropical cyclones.[26] Volcanic eruption from Karthala which dominates Grande Comore, though like tsunamis not related to climate change, is also a significant hazard.

The Hydromet project will enable confirmation or otherwise of such trends and opportunities to adapt crops and cropping systems more closely to actual climatic regimes and influence planting dates with more accurate rainfall predictions.

In the same way the design and management of small dams for irrigation will benefit from better climate data and dissemination services. It is possible that agriculturalists can benefit from project data to manage irrigations from small retention dams in a cost-effective manner where knowledge of rainfall can be more precisely anticipated and forecast for different locations/microclimates in the islands.

The project will allow the better realisation of other initiatives to enhance the productivity and adaptive capacity of agriculture. There has been notable planning work undertaken by UNDP in particular through the "Enhancing adaptive capacity for increased resilience to climate change in the agriculture sector in the Union of the Comoros (CRCCA)" project.

Mitigating the impact of extreme events on livelihoods and enabling responses to increasingly less predictable weather will have benefits in resilience building. This information will be particularly valuable for artisanal fishermen, who can plan their outings around reliable early warning systems.

1.2.3 Mauritius overview

Geography, Land Use and Social Development

Mauritius is a 2,040 km^2 small island developing state in the southwest Indian Ocean. The main island (Mauritius) is approximately 800 km east of Madagascar. Mauritius has 177km of coastline, and at its highest it is only 828m above sea level at Piton de la Petite Rivière Noire in the southwest. The main island is volcanic and surrounded by coral reefs.

The northern part is a plain that rises to a central plateau, varying in elevation from 270-730m above sea level. The plateau is bordered by small mountains that may have formed the rim of an ancient volcano. The two major rivers, the Grand River South East and the Grand River North West, are the primary sources for hydroelectric power generation. Lake Mare aux Vacoas is the chief source of fresh water.

The climate is maritime tropical, with fairly uniform temperature throughout the year. Mean temperatures vary from the low to mid-20s C at sea level to the upper 10s C on the high plateau. Two seasons are recognised: warm (December to April) and cool (June to September). The Annual rainfall (LTM 1981-2010) varies from around 900 mm on the west , 2570 mm to the south , 2565 mm to the east, 1300 mm to the north and about 2535 over the Centre.[27].

The principal associated island is Rodrigues (550km to the east) which is also volcanic in origin with an encircling reef. The Agalega Islands are just over 900km north of the main island. Agalega is composed of two low coral islands (the North and South islands), which are covered in mangrove swamps, and likewise surrounded by coral reefs.[28] The Cargados Carajos Shoals (or St. Brandon) are a group of around 40 islets to the northeast, made up of a main reef and sandy cays. Ile Raphael is the main islet and hosts the National Coast Guard and the Mauritius Meteorological Services Stations.[29]

[26] Inform Index for Risk Management, Mid-2019.
[27] Mauritius Meteorological Services
[28] Portal of The Republic of Mauritius, Ministry of Local Government and Outer Islands: Agaléga; UNEP Islands Directory, Islands of Mauritius.
[29] Outer Islands Development Corporation, Saint Brandon.

According to the most recent (2011) estimates available, 43.8% of Mauritius' land area is used as agricultural land (of which 38.4% is arable land, 2% is permanent crops, and 3.4% is permanent pasture), 17.3% is forest, and 38.9% is other uses (including residential, transport, and other land uses).[30] Sugar was the principle crop and source of revenue for the island but tourism, fisheries and financial services are now of more importance.

Vulnerability Biodiversity and Climate Change

Mauritius is in the cyclone belt. Climate records from 1951-2018 show a significant warming trend and a decreasing trend in rainfall. Average temperature at all stations is rising 0.2°C per decade and has risen between 0.86-1.2°C when compared to the 1961-1990 long term mean.[31]

Flooding is one of the major risks identified in Mauritius, due to heavy precipitation from cyclones or local storm conditions. Flash flood occurrence has increased in the last ten years and some areas of Mauritius, like Port Louis, are particularly exposed during the rainy and hot season. Recent events recorded independently of cyclones are those in 2013, 2018, and 2019, and these can impact tourism and local residents.

The observed sea level in Mauritius based on the analysis of tide data from Port Louis tide gauge show a mean rise of 4.9 mm/yr for the period 1987 to 2019 (Mauritius Meteorological Services, 2020). A higher value of 6.4 mm/yr for Rodrigues is obtained from the analysis of observed tide data from Port Mathurin for the period 1988 to 2019 (Mauritius Meteorological Services, 2020). From a global perspective, the mean sea level has risen by a rate of about 1.7 mm/yr between 1901 to 2010 and of about 3.2 mm for period 1993 to 2010 (Stocker et al, 2013). The variation in the observed rate of sea level rise for Mauritius and Rodrigues as compared with the global mean sea level rise is attributed to the fluctuations in ocean circulation (Stocker et al, 2013).

Atmospheric warming has also impacted the hydrologic cycle over the southwest Indian Ocean. Long-term rainfall time series from 1905-2007 show a decreasing trend in annual rainfall over Mauritius – the average rate of decrease per decade is around 57mm. The total decrease during the last ten years is about 8% when compared to the 1950s. Annual rainfall over the outer islands indicate significant variation from year to year, but long-term analyses show a decreasing rainfall trend, though lesser than the main island Mauritius.[32]

1.2.4 Seychelles overview

Geography, Land Use and Social Development

Seychelles is a 455km^2 115-island archipelago in the southwest Indian Ocean, located about 1,100km northeast of Madagascar. It is made up of two main groups of islands: "the Mahé group of more than 40 central, mountainous granitic islands and a second group of more than 70 outer, flat, coralline islands."[33] The archipelago has 491km of coastline, and at its highest it is only 905m above sea level (at Morne Seychellois, Mahé). The outer islands are largely flat, composed of elevated coral reefs, and are largely waterless.[34]

The Seychelles' climate is tropical marine along the coast, with little variation throughout the year. Average temperatures range from 28.24°C in April to 25.66°C in July. Average monthly rainfall ranges from 267mm in

[30] CIA World Factbook, Mauritius: Geography.
[31] Mauritius Meteorological Service http://metservice.intnet.mu/climate-services/climate-change.php
[32] Ibid.
[33] Encyclopaedia Britannica, Seychelles: Land.
[34] CIA World Factbook, Seychelles: Geography; Encyclopaedia Britannica, Seychelles: Relief and Climate.

January to 59mm in July, although this varies significantly between islands, and even within islands: on Mahé, annual precipitation ranges from 2,300mm at sea level to 3,560mm on the hilly interior.[35]

According to the most recent (2011) estimates available, 6.5% of Seychelles' land area is used as agricultural land (of which 2.2% is arable land and 4.3% is permanent crops), 88.5% is forest, and 5% is other uses (including residential, transport, and other land uses).[36] The heavy reliance on the importation of staple foods means that food security remains an issue, despite the country becoming mostly self-sufficient in eggs, poultry and pork.

Seychelles is classified as a high-income country and has the highest per capita GDP in Africa.[37] The capital city, Victoria, is on Mahé, the largest island. The Republic of Seychelles has an estimated population of 96,000 as at 2019.[38] The constant flux of immigrants to Seychelles, initially from continental Africa, Europe and the Indian sub-continent, and more recently from China, has created an ethnically diverse population. The diversity is increased further by temporary workers, both high skilled and manual.

Vulnerability, Biodiversity and Climate Change

The Seychelles Archipelago has an Exclusive Economic Zone which extends over 1.4 million km^2 in the Indian Ocean between 4 and 10 degrees south of the equator. The Seychelles is situated to the north of the cyclone belt but Aldabra, a nature reserve at the southern extent of the Seychelles Plateau, is in the north of the cyclone belt.

The Seychelles is vulnerable to a range of natural hazards, including tropical storms, extreme precipitation events, and coastal floods, with accentuating effects of storm surge. If true cyclones are not a concern for the inhabited areas and most tourist locations, storms can be violent and extreme precipitation events are a preoccupation of the planning and disaster management (DRGM) authorities.

In 2013, Tropical Storm Felleng brought heavy rainfall, which led to severe flooding and landslides causing damage and losses. Additionally, in April 2016, Tropical Cyclone Fantala passed near the Seychelles' Farquhar Group, causing widespread damage to nearly all buildings and significantly impacting communities and livelihoods in the archipelago.[39] Less predictable seasons are noted in recent years and an out of season storm in 2017 caused major flooding in Anse aux pains.[40] When such events occur at high tide, drainage issues are exacerbated. Storms can also affect tourists' experience when they compromise island hopping and even landing at the major airports, risking flow-on economic impacts.

Reefs are damaged by coral bleaching events (particularly in 1998), which are exacerbated by ocean warming and consequent ecological impacts killing the coral, producing adverse effects on fisheries and spawning. A 40% loss of revenue from the tuna fisheries sector was reported due to the El Nino phenomenon. A major extreme weather event associated with the El Nino phenomenon was the 1998-1999 acute shortage of freshwater, which shut down public establishments.[41]

[35] World Bank Climate Change Knowledge Portal, Country Profile: Seychelles; Encyclopaedia Britannica, Seychelles: Relief and Climate.
[36] CIA World Factbook, Seychelles: Geography.
[37] World Bank DataBank, Seychelles GDP Statistics; UN Economic Commission for Africa, Country Profile 2017: Seychelles, at page 1.
[38] IMF, Republic of Seychelles: At a Glance.
[39] GFDRR Profile of Seychelles
[40] Reported to team by Seychelles Meteorological Office
[41] SWIOfish3 ESMF, World Bank, 2018

In addition, rising sea levels are already contributing to beach erosion. However, this is harder to substantiate as sand movements along coasts represent natural movements which respond to complicated geographical processes.

In many respects Seychelles has more limited exposure to natural hazards than other IOC countries, but it is notably exposed to tsunamis and is said to have a 5-hour potential warning for event like the 2004 Indonesian event (26 Dec). An event originating in the Comoros would give it a 2-hour warning. Inhabited islands have at least significant higher land as temporary refuge.

Red tides (natural phenomenon) are another hazard which has led to compensation to registered artisanal fishermen affected. These may last up to three weeks in any given location. An oil spill hazard could have serious effects on fisheries and tourism. Seychelles is also by its remoteness exposed to potential economic vulnerabilities.

1.3 Objectives of the Environmental and Social Assessment

The purpose of the ESA is to meet due diligence requirements, optimise the benefits of the Hydromet project, and avoid, minimise and mitigate any potential risks and negative impacts. Because the project is being rolled out in 4 countries and the exact nature of certain elements within it are as yet to be specified, the ESA presents an Environmental and Social Management Framework (ESMF) for implementation.

The ESMF therefore provides the guidance and tools to be applied in the sound implementation of the project proposal and its various micro-interventions, without the need to know the exact location of project facilities to be rehabilitated, constructed or installed. Most such observation facilities will involve rehabilitation, upgrading and redeployment of existing buildings and installation of new weather monitoring and observation equipment at existing locations with little or no net impact on the local environment or residents in the locality.

In so doing the design of the project must meet compliance requirements of the project-accredited agency taking ownership of the design and effective implementation of the project, which is the AFD. The ESA is undertaken also to meet the GCF's E&S policy and national environmental management agencies. For this reason, relevant policy and legislation are identified in this report with comment on how it might apply to the project as designed.

The project has been classified as a Category B project by AFD/GCF with moderate risks. These risks are associated with construction and the installation of equipment and the rehabilitation of buildings associated with meteorological offices and weather stations. This ESA seeks to take a pragmatic approach in line with GCF policy. The ESMF in Section 4 presents an environmental management framework (ESMF) aligned to the sequential decision-making processes on the project as it is implemented. Particular emphasis is paid to the siting of weather stations and the management of health and safety (H&S) aspects of the equipment installation, building refurbishment and construction works.

The risks are assessed in relation to the project components. In screening these it is evident that E&S risks will be concerned with siting options, the building or rehabilitation of facilities to accommodate offices and new equipment, the construction of weather observation stations and Doppler Radar equipment, and the installation of wave height monitoring buoys.

The ESMF contains important guidance for siting of installations, works contract stipulations and accompanying monitoring arrangements. It proposes environmental management responsibilities and budgeting requirements and recommends actions to assure sound environmental and social implementation to meet constraints and capacity gaps, and manage risks to achieve compliance with national and International Finance Corporation (IFC) requirements.

1.4 Methodological approach

The approach adopted to carry out the environmental assessment in this study is first to understand the nature and scope of the project, then to screen for potential E&S risks in the geographical, environmental and social context in which the project will be implemented. The areas of risk and their significance can thus be assessed together with the opportunities for avoidance, minimisation, and (where necessary) mitigation of impacts.

The methodological approach also seeks first to identify the stakeholders in the project, including:

a) Those responsible for implementation;

b) Those who will be the beneficiaries of the project; and, not least

c) The communities neighbouring or affected by the project works. The latter will include those employed in construction and ongoing monitoring and maintenance of facilities.

Identification of Stakeholders:

a) Project and IOC personnel, including those benefiting from training outputs

b) Ministry officials: sector officers with responsibilities in meteorology, agriculture, environment and natural resources, social development, and local government

c) Officials with responsibilities in tourism and built environment, i.e. economic and land use planning, emergency access and disaster response

d) Private sector developers and all those engaged in tourism, agriculture and fisheries

e) NGOs and representatives of directly affected communities in the vicinity of project works

f) National and regional groups and individuals benefitting from improved climate services

Sources of information:

a) Research data and secondary sources review

b) Information requests from responsible environmental agencies

c) Interviews with i) key informants and triangulation through discussions with ii) project stakeholders and iii) beneficiaries in different sectors and in affected communities

d) Field observations and application of rapid appraisal techniques

e) Discussions with officials and NGOs on status of weather data monitoring and potential for better natural resource and disaster management in the areas of i) agriculture (cultivation and husbandry) and forestry, ii) marine ecology and fisheries, iii) tourism/commercial sectors, and iv) housing/built environment.

Specific objectives/purposes:

a) To understand different country environmental and institutional contexts and engage with those who will be implementing the project.

b) To assemble legislation requirements and potential enforcement constraints.

In the first place, a review of design proposals and background information was undertaken through shared project documents and other complementary project studies available on internet sites.

Field visits were subsequently undertaken by the project design team between June and August 2019 to engage with government officials, informed NGOs and wherever possible village communities who had

experience with extreme weather events and who might be beneficiaries of improved weather data collection and dissemination, not least of early warning systems (EWS) for cyclone events in low elevation coastal villages, such as fishing communities and those hosting tourism activities.

A wide variety of stakeholder organisations have been contacted for views on climate change challenges and resilience building opportunities from improved climate services including Early warning systems (EWS). In Comoros the team visited and engaged with agricultural and fishing communities on all three of the main islands (Grande Comore, Anjouan and Mohéli). In Madagascar the team met aid agency personnel working in agriculture and in emergency response. In the Seychelles the team visited the main inhabited islands of Mahé, Praslin and La Digue, including contact with tourism and fishing industry stakeholders. For Mauritius, a desk-based review was undertaken.

Existing and new information was shared between team members while reports from international organisation projects were collected and reviewed for complementary information and to verify new findings and viewpoints presented during engagements with local communities during field visits. [Appendix A/B/C presents those individuals and organisations consulted by the project team].

2 PROJECT PURPOSE AND DESCRIPTION

2.1 Project objectives

The project development objective is to strengthen regional and national communities' resilience and adaptive capacity to climate change impacts in the South West Indian Ocean island states. The IOC states are highly vulnerable to numerous weather and climate related hazards, including floods, droughts, storms, storm surges and tropical cyclones. The region is already experiencing climate change effects, such as warming temperatures (both ocean and air temperatures), sea level rise and higher tropical cyclone frequency.

The IOC countries have different strength and weaknesses in capacity and resources to prepare and cope with the increased variability of seasons and potential changes anticipated from climate change. The project will seek to fill gaps in technical capacity and expertise through regional and national-level interventions, that are specifically adapted to each country's needs to ensure outcomes that will have national and regional added value.

The Global Framework for Climate Services (GFCS) and WMO standards provide the benchmarks for project weather data monitoring. This framework has determined the specification and provisioning of facilities and equipment and the capacity needs to be addressed in training and institutional development. Improved climate data and early warning systems are required by the island states to support better planning and adaptation to climate change events in the region.

Better availability of quality data will allow local governments to take necessary adaptation decisions in different areas, particularly in urban planning, economic sectors (tourism, agriculture, industries), and social sectors, thereby assisting highly vulnerable communities and supporting the 29 million people who are exposed in the IOC island states. The main benefits of the project include improved hydro-meteorological equipment, knowledge, and decision-making process, improved infrastructure planning, improved adaptive capacity of communities, and reduced socio-economic losses.

2.2 Components, activities and expected results

The project has been designed with three components to meet these objectives. The proposal responds to needs identified in the preparation studies and field missions undertaken during 2019.

Component 1: Capacity building, institutional development and regional cooperation

This activity will include strengthening NHMS through institutional development, adaptive capacity building, staff training and improvement of financial efficiency. To support synergy and regional integration between NHMS in the SWIO region, a Regional Climate Centre (RCC) will be established and a Regional and National Frameworks for Climate Services (RFCS) developed. This will: i) facilitate information, experience and knowledge sharing amongst Comoros, Madagascar, Mauritius and Seychelles for risk prevention/mitigation; ii) harmonize processes to monitor climate-related risks and disseminate alerts; iii) support co-development of regional climate change models and projections; and iv) support cost-efficiency by sharing facilities (i.e. a regional training center and lab for the maintenance and regular calibration of meteorological equipment instead of sending equipment overseas).

Component 2: High-quality climate-related data, and improved climate risk assessments and climate change projections

This component engages technical expertise on observations and monitoring, data management, ICT and forecasting to support the modernization of hydrometeorological data collection infrastructure, management and access to information systems for optimal utilization in Comoros, Madagascar, Mauritius and Seychelles. While new equipment will be provided or upgraded, and staff members of NHMSs will be trained, users of the CS, key sectors and communities, will also be engaged under this component to ensure a better alignment between risk monitoring systems, forecasts and users' needs. Hazard and vulnerability maps will also be developed under this component, using the improved hydromet equipment, to enhance risk understanding among NHMS and users' community, and to support the production of relevant climate services and products.

Component 3: Enhanced use of climate services for climate change adaptation and disaster risk reduction

Under this component, short- to long-range climate products and services – including daily weather forecasts, sector-based climate change adaptation plans, early warning systems and agricultural weather advisories – will be co-developed in a participatory way with the producers and users of CS. These CS will target key priority areas of the GFCS (namely food security, disaster risk reduction, health, and water[42]) as well as tourism, a key sector driving the economy of several countries in the SWIO region. Producers and users of climate services will work together to develop these products to ensure they are packaged according to end-users' needs, understandable and use the most efficient dissemination channels.

The emphasis on dissemination of climate services is intended to ensure that weather monitoring information collected and analysed is available to end users in a format that can be useful to them. Stakeholder beneficiaries include government advisory agencies, NGOs engaged in development and emergency work, and indeed members of the public, especially those living and working in hazard prone areas. In short, the target is intermediary and/or end users in sectors where climate information can enable better planning and productivity, particularly regarding the need to adapt to climate change.

Such information, with its greater local content and accuracy in relation to currently available forecasts in the region, can allow significantly more efficient management within different economic sectors – from agriculture and fisheries to tourism. Regarding early warning systems, there is significant opportunity to improve penetration of validated messages to those living in hazard prone areas who might otherwise not receive alerts for impending hazards, such as cyclones and sea surge.

The design team have been conscious of the particular vulnerability of women, youth, the elderly, people with disabilities and other population groups of concern within the context of climate change impacts and other development challenges. Gender considerations will be integrated in the project design so that outreach and extension messages derived from improved meteorological data will engage with and be relevant to women as stakeholders as well as men. See the Gender Assessment and Action Plan (Annex 8) for further analysis of these issues, along with its recommendations for project policy and implementation in each country. These concern staffing and recruitment, choice of candidates for training and managing discrimination.

GCF objectives specifically require due consideration of vulnerable and marginalised populations, groups and individuals that are affected or potentially affected by GCF-financed activities.[43] This is also a requirement of the AFD, the accredited agency for the proposed project.

[42] Energy, another key area of the GFCS, was not targeted in this project which prioritises adaptation supporting interventions.

[43] GCF Environmental and Social Policy, p3

2.3 Project Implementing modalities

It is intended that the project will be executed through the Secretariat of the Indian Ocean Commission (IOC) in Mauritius, who as Executing Entity (EE) will disburse funds and monitor activities in the four beneficiary member countries. The beneficiary stakeholders in the member countries include Meteorological Authorities, Disaster Reduction and Response (DRR) agencies and sector ministries such as agriculture, health and water. A steering committee will provide expertise and oversight to the Project Management Unit (PMU).

The project 'promoter' for the purposes of the national legislative requirement will be the national meteorological authorities, to the extent that they will be principally involved in installing equipment and developing facilities and buildings. They will be required to obtain regulatory development permits and be responsible for compliance requirements, which could involve obtaining EIA authority approval or exemptions from formal EIA requirements. It is anticipated that project interventions may not attract any formal EIA requirement, but lesser development permitting stipulations depending on siting.

The IOC will be responsible for preparing and tendering works for facilities which will require appropriate due diligence as indicated in the ESMF, and for formal permitting and compliance requirements with relevant national authorities. AFD will have their own policy requirements and ad hoc safeguards monitoring oversight for implementation compliance. AFD will receive all progress reports including environmental and social reporting as to be included in such reports. IOC will implement its role through the PMU, and this will include a dedicated environmental and social officer at its project offices in Mauritius for at least the first two years of the project while facilities are being constructed. IOC have ultimate project environmental and social safeguards compliance responsibility for safeguards implementation in each country.

The project execution partners for each member state are:

> ***Comoros***: General Directorate of Meteorology, Comoros Meteorological Services (SMC), Ministry of Production Environment Energy Industry and Handicrafts.
>
> ***Madagascar***: General Directorate of Meteorology, Ministry of Water, Ministry of Transport and Meteorology, Ministry of Environment Ecology, Sea and Forests –National Coordination of the Climate Change.
>
> ***Mauritius:*** Mauritius Meteorological Services (MMS), National Disaster Risk Reduction Management Centre (NDRRMC), Water Resources Unit (WRU), Ministry of Finance and Economic Development (MOFED).
>
> ***Seychelles***: Seychelles Meteorological Authority, Ministry of Environment and Energy – Inter-Sectoral Steering Committee.

In addition, in each country, national project coordinators will be hired by the PMU; they will be based within the national meteorological services, and work under supervision of the regional project coordinator, based within the PMU in Mauritius. The national project coordinators will be responsible for day-to-day project implementation and follow up of project activities in their respective countries, as the regional project coordinator will not be able to oversee national implementation on a daily basis. In addition to the national project coordinators, the PMU will also work with relevant national partners and the NDAs to ensure smooth implementation and the complementarity of the proposed project with other climate change-related initiatives implemented in the countries.

3 LEGAL AND INSTITUTIONAL FRAMEWORK

Following the GCF modalities, the accredited agency for the project, AFD, will be responsible for the environmental and social standards. Through the implementation of its environmental and social policy, AFD makes sure that its funded operations, at the local level, reduce the vulnerability of households, territories and ecosystems, improve people's livelihoods, and promote democratic development.

3.1 AFD Environmental and Social Standards

AFD requires environmental and social assessment procedures[44] to (i) assess the environmental and social impacts of operations, (ii) propose appropriate measures to avoid the negative impacts or, when they are unavoidable, reduce or offset them in an appropriate manner, (iii) monitor the application of such measures during the implementation phase of the operation, and (iv) conduct an ex-post evaluation of the effectiveness of the proposed measures.

AFD's due diligence approach requires analysis of the environmental and social risks and impacts during the ex-ante assessment of the operation, in a manner adapted to the nature and scale of the operation and proportional to the levels of these risks and impacts. It involves considering the environmental and social issues as early on as possible, right from the design stage and in the implementation of operations, to define appropriate measures to avoid, reduce and, where necessary, offset their significant adverse environmental and social impacts.

Under AFD's Environmental and Social Risk Management (ESRM) policy the project owners are required to comply with relevant obligations of the Environmental, Health and Safety Guidelines (EHSGs) of the World Bank Group[45]. Where existing facilities are being upgraded (restoration, rehabilitation or extension) the project owner is obliged to bring such associated facilities in line with standards for new facilities.

AFD analyses and classifies all potential projects into **High (A) – Substantial (B+) – Moderate (B) – Low (C)** environmental and social risks, depending on the extent of the potential risks borne by the operation. The classification considers the nature and scale of the operation, the location and sensitivity of the affected area, the severity of the potential environmental and social risks and impacts, and the client's capacity to manage them. This classification aims to determine:

1. The nature and depth of the environmental and social assessment required;
2. The level of environmental and social standards the project will be required to comply with;
3. The need to engage stakeholders; and
4. The level of information required.

This approach is congruent with the GCF policy for screening and assigning risk categories (ref: GCF Environmental Policy Section 6.3 para 31). GCF distinguishes three categories of project:

Category A. Activities with potentially significant adverse impacts.

Category B. Activities with limited impacts which are readily mitigated.

Category C. Minimal or no adverse impacts and/or social risks.

AFD aims to promote sustainable and equitable development in all operations funded, by ensuring that these operations effectively contribute to the objective of sustainable development (combating poverty and

[44] Refer to https://www.afd.fr/sites/afd/files/2017-10/Environmental-social-risk-management-policy-afd_0.pdf

[45] https://www.ifc.org/wps/wcm/connect/29f5137d-6e17-4660-b1f9-02bf561935e5/Final%2B-%2BGeneral%2BEHS%2BGuidelines.pdf?MOD=AJPERES&CVID=jOWim3p

ensuring the satisfaction of human needs, strengthening solidarity between human beings and between territories, preserving biodiversity, preserving habitats and natural resources, and combating climate change).

All operations financed by AFD are required to comply with the national regulations of the country where the operation is implemented, including for environmental and social issues. However, as regulations in the countries where AFD operates are sometimes incomplete or under development, AFD uses as a reference several rules, good practices and directives produced by international standard-setting organisations (in line with the 2005 Paris Declaration on Aid Effectiveness and the 2014 Law on the Orientation and Programming Development Policy and International Solidarity).

AFD has aligned its Policy with the World Bank's environmental and social standards for projects with High or Substantial environmental and social impacts[46] and the IFC.[47] The Reference E&S Standards for the AFD-GCF Programme will be national legislation and IFC Performance Standards and related Guidance Notes. AFD financing is conditional on the implementation of an Environmental and Social Commitment Plan (ESCP). Within the context of this project, IOC, the project executing entity, will be responsible for implementing the present ESMF to comply with AFD's policy. AFD will do its own due diligence to monitor E&S performance, and will oversee the ex-post evaluation.[48]

3.2 World Bank/IFC Performance Standards

The International Finance Corporation (IFC) of the World Bank Group, whose standards are explicitly subscribed to by AFD, recognises 8 Performance Standards:

1. Assessment and management of environmental and social risks and impacts
2. Labour and working conditions
3. Resource efficiency and pollution prevention
4. Community health, safety and security
5. Land acquisition and involuntary resettlement
6. Biodiversity conservation and sustainable management of living natural resources
7. Indigenous people
8. Cultural heritage

Each of these Performance Standards is listed below with comment on the extent to which they would be applicable to the project.

IFC performance standards	Objectives	Applicability to the project
Performance Standard 1: Assessment and management of environmental and social risks and impacts	Concerns the requirement for a systematic approach to assessing risks, appropriate studies, and ensuring that plans are produced to mitigate and manage such risks. Stipulates stakeholder engagement and grievance mechanisms.	It is an over-arching standard well referenced in the GCF policy and in ESMF approach to risk identification and assessment, mitigation hierarchy principles and consultation modalities. The proposal is assessed as Category B because construction works will be of limited scope and spatial requirement,

[46] World Bank Safeguard Policies for public sector financing;
[47] The IFC Performance Standards.
[48] As per E&S Framework for "Transforming Financial Systems for Climate" Programme, 2018, steps 3 and 4, p.20

IFC performance standards	Objectives	Applicability to the project
		allowing for non-controversial siting options.
Performance Standard 2: Labour and working conditions	Requires that labour and working conditions meet appropriate national and international requirements. This includes aspects of occupational health, labour hours, use of protective equipment, safe working sites, and gender-sensitive and non-exploitative construction management.	This is of relevance to the project interventions, such as the facility rehabilitation and installation, minor construction and security fencing works, but also the rewiring, painting and equipping of offices (see Section 5).
Performance Standard 3: Resource efficiency, pollution prevention and reduction	Concerns avoiding and minimising pollution and wasteful use of energy and water, and reducing GHG emissions.	Limited relevance, but solar power use is strongly recommended and in many cases may be most practical and reliable for limiting maintenance requirements in remote locations. Residual waste generated during demolition/construction to be suitably reused or disposed of.
Performance Standard 4: Community health, safety and security	To anticipate and avoid adverse impacts on the health and safety of the Affected Community.	Will have limited relevance. Communities near existing and proposed weather stations will be informed and their concerns will be addressed. Facility site selection and established procedures for minimising impacts will be followed (Section 5).
Performance Standard 5: Land acquisition and involuntary settlement	Concerns displacement of people, physically and economically, and the requirement for compensation and/or Livelihood Restoration Plan.	Unlikely to be triggered. However, selection criteria will require if there is a new site that this will be on publicly owned property and/or there will be no or compromised rights/uses.
Performance Standard 6: Biodiversity conservation and sustainable management of living natural resources	Requires protection and conservation of biodiversity, natural habitats and maintenance of ecosystem services.	Facility units/stations and associated equipment will be installed on existing sites and/or sites of semi-natural habitat of very limited spatial extent (50-100m^2). Criteria for selection (Section 5.3) among feasible alternative sites will require that sites with natural vegetation cover, habitat or biodiversity value be avoided. Sites will by definition be almost exclusively on semi-natural sites being in areas of existing meteorological station activity or adjacent to government buildings.
Performance Standard 7: Indigenous Peoples		Not triggered. Indigenous people not identified. Islands are historically mixed and multi-cultural.
Performance Standard 8: Cultural heritage	Concerns valued heritage and religious sites.	ESMF will prevent triggering of this PS. Communities will be consulted and the siting of facilities near grave sites, shrines, designated monuments, or other cultural or religious sites will be prohibited.

IFC performance standards	Objectives	Applicability to the project
		Limited spatial requirement allows alternative siting options.

3.3 Green Climate Fund Guiding Principles

The key GCF reference document is the Environmental and Social Management System: Environmental and Social Policy[49]. As with AFD E&S policy, this document follows World Bank Group policy, specifically the IFC's Performance Standards (as presented in the above section). The policy objectives are to promote a paradigm shift towards low-emission and climate-resilient development pathways in the context of sustainable development so that it will enhance equitable access to development benefits and manage environmental and social risks (Section III, 3.1 Policy Objectives).

The Guiding Principles in Section IV of the policy require that the Environmental and Social Management System (ESMS) ensures an integration of environmental and social sustainability. The proposed ESMF for the project respects these principles and in particular the specified safeguards requirement to "***do no harm***". The policy mandates a **scaled risk-based approach**[50]: The Environmental and Social Safeguards (ESS) standards require that the project "*be implemented in a risk-based manner and not in a blunt one-size-fits-all approach*", and require that the "environmental and social requirements and processes are commensurate with the level of risk".

The GCF policy also mandates a *"**fit-for-purpose approach**"* and adherence to the impact minimisation aims of the **mitigation hierarchy**. The approach adopted for the Hydromet proposal to meet these requirements is necessarily a practical approach related directly to the nature of the project and its assessed environmental and social risks. To this end adverse impacts will be avoided where possible, and where they cannot be avoided, will be minimised and mitigated.

Ultimately the project's ESMF is developed based on the GCF Guidelines, the social and environmental frameworks available in the beneficiary countries, and relevant guidelines implemented by the AFD. GCF and AFD require compliance with applicable national laws alongside international compliance, notably with IFC performance standards and EHS guidelines (see Section 5). Key elements of national ESIA legislation and procedure are presented in the following sections. Annex A provides further information about the key legislation discussed in this section.

3.4 Madagascar Legislative and Policy Framework

The Office National de l'Environnement (ONE) is the competent agency with responsibility for promoting improved natural resource management, responding to climate change and managing the ESIA process. ONE is also the organisation under the Ministry of Environment responsible for:

1. Managing the ESIA legislation for new investment projects;
2. Approval of such projects; and
3. The coordination of monitoring activities to ensure conformity with approved environmental management plans (EMPs).

[49] Document GCF/B.19/06 adopted by the GCF Board in decision B.19/10
[50] Decision B.07/02, annex 1

At the outset, ONE is the only organisation authorised to establish a risk category for investment projects that dictates the nature and detail of documentation required to be submitted for examination and approval by ONE. The brief project description to be provided is based on a succinct description of the project and reference to its categorisation policies in relation to potential risk and sensitivity of the receiving environment or geographic location.[51]

This management, decision and permitting process is conducted at national level for major projects. Capacity at the regional level is necessarily more limited. For a project with interventions of the size and type proposed in Hydromet, where there is very limited construction and rehabilitation of buildings, a formal ESIA process is not expected to be required and the responsibility for sound environmental and social management is devolved to the in country responsible 'promoter' at the meteorological or agricultural services. The Direction Générale de Météorologie (DGM) has protocols for implementing its codes of practice regarding the handling of any hazardous materials.[52]

Nevertheless, it will be incumbent on the Project Management Unit (PMU) and the regional E&S officer or Safeguards Specialist (SS) in IOC, to submit a brief project description. The most sensitive item for installation among the equipment supplied in the project will be the Doppler Radar (and possibly the wave monitoring buoy). If the radar is to be sited within the confines of an existing airport and its tower is of minimal height (i.e. 5 metres), then the environmental risk will be minimal for the natural environment and local communities.

The project ESMF must comply with the national permitting process as indicated above. There will be written plans for each new or upgraded facility (or micro-project) and these will be presented by the appointed Safeguards Specialist (SS) to the appropriate permitting/EIA authorities for national approval or further documentation. Though data collection sites are not yet determined, the project will incorporate local Ministry of Environment officers in site assessments and as appropriate in consultation processes with local communities prior to any project team decision-taking. As mentioned, if the monitoring equipment installation site is within an existing airfield or government managed institution, local community consultation may not be a relevant consideration.

The Safeguards Specialist based in IOC PMU will provide direct oversight for recommended practice in site selection and appropriate site maintenance as laid out in the generic ESMF for project implementation. Meteorological observation stations will not be proposed in sensitive areas. The project will at all times consult ONE and devolved jurisdictions of the Ministry of Environment as required concerning building regulations, waste management, and health and safety. This consultation will be ensured by the national project coordinator, working under the regional PMU.

The main social and environmental safeguards policy is ***Décret n° 99-954 du 15 décembre 1999 modifié par le décret n° 2004-167 du 03 février 2004 relatif à la mise en compatibilité des investissements avec l'environnement (MECIE).*** This decree updates ESIA legislation on eligibility and investment project approval procedures. The ***Arrêté interministériel n° 4355 du 13 mai 1997, portant définition et délimitation des zones sensibles*** presents the criteria for determining sensitive areas based on socio-economic factors or biodiversity and conservation value.

[51] https://www.pnae.mg/evaluation/eie.html
[52] As reported by ONE

3.5 Comoros Legislative and Policy Framework

In the Union of the Comoros the administrative body with supervisory authority over the environment is the Directorate-General of the Environment and Forests (DGEF), under the supervision of MAPEATU (Ministère de l'Agriculture, de la Pêche, de l'Environnement, de l' Aménagement du Territoire et de l'Urbanisme). It has three offices covering the islands of Grande Comore, Anjouan and Mohéli.

MAPEATU is the ministry that issues authorisations for new projects and is responsible for environmental compliance. The major legislative reference is ***Law No. 94-018/AF of 22 June 1994***, laying down the ***Framework Law on the Environment***. The Law aims to:

a) Preserve the integrity of the environment of the Islamic Republic of the Comoros, whose patrimony is particularly vulnerable because of its insularity;

b) Create conditions for sustainable resource use, in quality and quantity, to benefit present and future generations; and

c) Guarantee citizens a livelihood which is balanced and healthy.[53]

Decree No. 01-052/CE of 19 April 2001 governs ESIA. ***Order No.12 – 012/VP- MPEEIA/CAB of March 2012*** establishes and sets the terms of reference of the Evaluation Committee for Environmental Impact Studies (CEEIE). The Director General for Environment (DGEF) is required to ensure compliance with environmental laws and regulations and compliance with EIA where mandated.

The Executing Entity (EE) for the project will need to take particular care in surveillance of installation and construction micro-interventions, including siting, rehabilitation and/or construction activities. Siting issues should not present any significant concerns if the project implementation team follows the proposed ESMF checklists for location decisions.

It would be appropriate to use labour from the respective islands for installations on that same island, and also to ensure project gender policy is adhered to. Waste disposal, not least building waste debris disposal, remains a special challenge on all the Comorian Islands. The EE will therefore need to intervene proactively, ensuring its own due diligence with respect to health and safety in building refurbishment and construction activities.

3.6 Mauritius Legislative and Policy Frameworks

In Mauritius the Ministry of Environment, Solid Waste Management and Climate Change is responsible for the environmental assessment and approval process.

Project infrastructure proposals may be subject to a Preliminary Environmental Report (PER) which is a short form of an Environmental Impact Assessment (EIA), and is generally meant for assessing projects with lesser environmental impacts. This preliminary analysis is undertaken to identify impacts and the means of avoidance or mitigation and is an important tool for sound decision-making and for achieving sustainable development.[54]

The PER mechanism was introduced in the ***Environment Protection Act (EPA) 2002***. With the coming into force of the ***Business Facilitation (Miscellaneous Provisions) Act 2006***, undertakings which are less polluting have been waived from lengthy administrative procedures for application processing. In the same context, Part A of the First Schedule of the EPA 2002, which pertains to the list of undertakings requiring a PER, has been reviewed.

[53] Loi No 94 - 018 Article 2 regarding definitions, objectives and principles (in translation)
[54] http://environment.govmu.org/English

The Hydromet project physical infrastructure interventions are excluded from detailed ESIA requirements, and likely also excluded from PER requirements. Approvals will nevertheless need to be sought for any interventions in sensitive environmental sites, for example along the coast or affecting local landscape values.

Implementation of sound environmental practice and appropriate support of government environmental and technical authorities would not be expected to present any compliance or capacity concerns. Regarding the location and sound positioning of the several wave-monitoring buoys (and tide gauge) proposed for Mauritius and an understanding of potentially sensitive locations, it will be essential to consult and collaborate with the Mauritius Meteorological Services.

For questions of reef sensitivity at particular locations, consultation with the Reef Conservation NGO will be of value. This organisation is a reputed NGO working with government on its Eco-Schools programme. Reef Conservation also presents a potentially appropriate outreach partner for climate services capacity building due to its experience from the Eco-Schools training.

3.6 Seychelles Legislative and Policy Framework

The ***Environment Protection Act, 2016*** (Act 18 of 2016) provides for the protection, preservation and improvement of the environment and for the control of hazards to human beings, other living creatures, plants and property. The Act also provides for the coordination, implementation and enforcement of policies pursuant to the national objectives on environment protection.

Section 44(1) of the Act establishes the requirement for an Environmental Authorisation for:

a) Any development defined in the Act (e.g., land subdivisions, reclamation works, construction of new roads or sea walls, etc.);

b) Any "prescribed project or activity"; or

c) Any project or activity proposed in a protected or ecologically sensitive area.

The Environmental Authorisation is granted or denied based on the review of an Environmental Impact Assessment (EIA) Class I. Sections 45, 46 and 47 of the Act deal with EIAs.

The Ministry of Environment, Energy and Climate Change (MEECC) manages the ESIA process in the country, specifically through the Environmental Assessment and Permit Section (EAPS) within the Department of Environment. The EIA process involves meetings with the different relevant stakeholders as well as with the public, to obtain their opinions on the proposals. Based on the analysis, the promoter will be given certain conditions to abide by, and if everything goes smoothly they are given a notice of acceptance, the last step of the EIA process.

Generally, for small-scale proposals these are submitted to the planning department of the Ministry of Habitat, Lands, Infrastructure and Land Transport (MHLILT). The outline description of each proposal supplied is reviewed by planners in conjunction with the Director General of the Waste, Enforcement and Permit Division of the Ministry of Environment (MEEC) who will make any necessary determination on the requirement for an ESIA based on the scale and sensitivity of the proposal.

In the case of Seychelles, the proposals include a Doppler Radar which will likely be sited at elevation on one of the hills surrounding Mahé or otherwise distant from the Seychelles Meteorological Authority head office at the airport (or its new proposed offshore site near the airport).

The proposal for Seychelles also includes a wave-measuring buoy to be anchored offshore, and for this there will need to be consultation with Seychelles Fisheries Authority and Seychelles National Parks.

4 ENVIRONMENTAL AND SOCIAL IMPACTS ASSESSMENT

4.1 Scope of Project and Construction Requirements

As indicated under Section 2, the Project aims to enhance climate services in the target countries through the supply and installation of a wide range of new weather and hydrology monitoring equipment, the provision of capacity building and trainings, and strong involvement of climate services (CS) users in the production of such services. This section provides an analysis of the project's scope and construction requirements. Refer to Appendix D for photos of equipment and offices.

Much of the project's interventions will relate to capacity building for data collection and dissemination to potential users.

The provision by the project of equipment and built facilities for existing and/or new meteorological stations will have strictly limited direct impacts on land and natural resources, visual amenity or vegetation cover. Potential environmental and social risks may include some minimal nuisance from noise/dust nuisance over a few weeks should there be any persons living adjacent to a station under rehabilitation. Very limited clearance of vegetation in the vicinity of equipment to be installed may also be necessary. The possible noise/dust impacts in drilling and digging of foundations (for protective fencing or in building works) can be anticipated to be felt mostly by construction workers rather than local residents. Mitigation can be achieved in use of protective equipment as indicated in plans proposed (Section 5); noisy drilling will be confined to daytime hours in accordance with local regulations.

There will be minor building refurbishment or rehabilitation and construction works to expand existing offices/facilities. This may be to accommodate new meteorological equipment and, for example computer data storage units in annexes or facility housing as required.

Protective fencing will also be required at locations that lack adequate security provision. Facilities or weather stations might extend at most to $10m^2$, and many will be placed where such facilities currently exist, or where they have fallen into disuse and protective fencing has been broken down.

There is also the possibility of extension to in situ station facilities with their associated construction risks, including Doppler Radar Unit installation.

Facility locations will be optimised by the implementation team following the principles of this ESMF, and the ESMF in Section 5.

Across the region there are hundreds of existing locations of agromet gauges, weather monitoring and buildings installations many of which have fallen into disuse. From these facilities the implementation team will chose some 100 sites (including approximately 60 potential agromet data collection sites for Madagascar) for adoption, upgrading and renovation. The locations chosen will be optimised and coordinated with other organisations active in supporting climate services delivery.

In the choice of sites and implementation of the programme proposed the direct impacts of the project will be negligible or with no significant impacts. Evidently on the programme benefit side the project has as its purpose – if not its specific objective - to enable a potential for better management of natural resources, directly and indirectly in the context of climate change and water conservation. Without such facilities these essential aims in sustainable development are not achievable.

4.2 Impact and Risk Assessment

As this project is supported by the AFD in its role as GCF Accredited Entity, the project has been screened against AFD's Environmental and Social Standards Procedure. AFD analyses and classifies all potential projects into **High (A) – Substantial (B+) – Moderate (B) – Low (C)** environmental and social risks, depending on the extent of the potential risks borne by the operation. The classification considers the nature and scale of the operation, the location and sensitivity of the affected area, the severity of the potential environmental and social risks and impacts, and the client's capacity to manage them.

The environmental and social risk sensitivity for identified project works is described in the table below. The ratings evaluate the extent of the risk linked to the implementation of different interventions foreseen.[55] Against each type of intervention environmental risks are distinguished from social risks. The former primarily concerns impacts on natural resources and landscape, and the latter potential impacts or risks for health and safety of employees during construction of facilities, and in equipment installation. The project installation work is expected to be completed within 1-2 years and at each site over a much shorter period where there is little or no construction work.

The table below details the issues and risks attached to each component of the project. The E&S risk category determines:

- The level of E&S management to be conducted for the Hydromet E&S management system under different components or items
- The appropriate expectation of AFD in terms of effort and focus for the project implementing unit regarding E&S management
- The significant areas for monitoring and focus in respect of E&S accountability and reporting to be implemented during the project.

In these tables presented below regarding construction impacts the following explanations applies:

	Positive column	**Negative column**
Environmental Impacts	Indicates extent of possible opportunities as a result of the project to improve status quo situation	Indicates negative risk in terms of siting and landscaping affecting environmental values (which will have potential to be avoided as a result of sound environmental management). Evidently some impacts in transportation and use of vehicles (air pollution, etc) cannot be effectively mitigated
Social (incl. H&S Impacts):	Indicates extent of potential positive impact in relation to status quo as a result of improved landscaping, quality and safety of buildings and transfer of H&S messages through training and implementing of good practice as a result of project intervention.	Indicates risks in terms of threats to safety of construction workers and possible compromised rights of local residents under poor project proponent management.

[NB. Appendix C details for each country the contract issues to be managed as opposed to this main table which summarises global potential impacts for each project component against documents required and project phases].

Table 1: Analysis of the environmental and social risks and impacts

Component and sub-components	**Description of construction works foreseen and facility/ equipment installation**	**Environmental Impact Risk** (minor, moderate, high)		**Social impacts Risk: Health & Safety** (minor, moderate, high)		**Impact/ Risk category**	**E&S Documentation required**	**Pre-identification of environmental and social impacts** (construction phase/ operational phase)
		Positive	**Negative**	**Positive**	**Negative**	(A, B+, B or C)		
Component 1: Capacity building, institutional development, and regional cooperation	Not relevant					C		Not relevant
Component 2: High-quality climate-related data, and improved climate risk assessments and climate change projections (note: only relevant sub-components have been included below, all others are not relevant)								
2.1 Enhanced Hydromet observing, monitoring and impact forecasting services: 2.1.1 Modernise/upgrade climate observation and monitoring networks 2.1.2 Modernise/upgrade information system for telecom forecast and climatology	Weather data measuring units/ stations establishment and facility equipping	Minor	Minor	Minor	Minor	C	Progress reporting which includes information on siting and permitting of equipment/ facilities at station; also verification and auditing information	<u>Pre- Construction:</u> • Carbon footprint/ GHG of equipment manufacture and transportation • Issues of siting, but almost exclusively existing locations <u>Installation/construction phase:</u> • Waste disposal of previous equipment. Risks primarily related to labour and working conditions • Safety risks in handling materials and in electrical wiring • Temporary noise pollution <u>Operational phase:</u> • Limited relevance
	Doppler Radar unit and tower (and Upper Air Station)	Minor	Minor	<u>Moderate</u>	Minor	B/C	Project generated outline plans; permitting to conform to local buildings/ESIA	<u>Pre- Construction:</u> • Carbon footprint/ GHG of equipment and materials production and transportation • Issues of siting, but existing airfields

Component and sub-components	Description of construction works foreseen and facility/ equipment installation	Environmental Impact Risk (minor, moderate, high)		Social impacts Risk: Health & Safety (minor, moderate, high)		Impact/ Risk category	E&S Documentation required	Pre-identification of environmental and social impacts (construction phase/ operational phase)
		Positive	Negative	Positive	Negative	(A, B+, B or C)		
							regulations; CEMPc adopting project EMP, IFC standards; conformity to prof. industry codes of conduct	Construction phase: • Safety risks in construction of tower Operational phase: • Limited relevance
	Agromet and hydrology observation stations establishment (also mini observation facilities)	Minor	Minor	Minor	Minor	C	Reference in project reporting, (but these are very minor interventions)	Construction phase: Not relevant Operational phase: Not relevant
	Wave-measuring buoy placement at sea Tidal Gauge (Mareograph) shore placement Depth sounding system (with generator)	Minor	Minor	Minor	Minor	C	Project Progress Reporting which includes information on proposed siting and permitting of facilities; also verification and auditing information	Pre- Construction: • Carbon footprint/ GHG of materials production and transportation • Issues of siting Construction phase: • Waste disposal of previous equipment. Risks primarily related to labour and working conditions • Safety risks in handling materials and in electrical wiring • Temporary noise pollution Operational phase: • Negligible relevance

Component and sub-components	**Description of construction works foreseen and facility/ equipment installation**	**Environmental Impact Risk** (minor, moderate, high)		**Social impacts Risk: Health & Safety** (minor, moderate, high)		**Impact/ Risk category**	**E&S Documentation required**	**Pre-identification of environmental and social impacts** (construction phase/ operational phase)
		Positive	**Negative**	**Positive**	**Negative**	(A, B+, B or C)		
2.2. Regional Facilities for maintenance and training established: 2.2.1 Establish a maintenance and calibration laboratory 2.2.2 Refurbish regional training center of Mauritius to train observers and forecasters	Office refurbishment and equipping; Building rehabilitation and extension works (by PNUD, not covered under this project)	Minor	Moderate	Minor	Minor	B/C	Project generated outline plans; permitting to conform to local buildings/ESIA regulations; CEMPc adopting project EMP, IFC standards; conformity to prof. industry codes of conduct	Pre- Construction: • Carbon footprint/ GHG of materials production and transportation • Issues of siting, but renovation is of existing buildings Renovation/construction phase: • Waste disposal of previous equipment. Risks primarily related to labour and working conditions • Safety risks in handling materials and in electrical wiring • Temporary noise/dust nuisance Operational phase: • Negligible relevance
Component 3: Enhanced use of climate services for climate change adaptation and disaster risk reduction at regional and national levels	Not relevant					C		Not relevant

4.3 E&S Risk Classification

Following the environmental and social guidelines of GCF, the overarching principle adopted for project assessment is one of due diligence and appropriate E&S impact mitigation. The proposed Hydromet activities are screened (Section 6.4 GCF E&S Policy) overall as a Category B .

All possible impacts will be minimised and opportunities to enhance environmental and social benefits indirectly through capacity building are to be adopted. This includes training in health and safety through Component 3 in capacity building (see Diagram 2.2). The judgement that this is a moderate to low risk is determined not least by the minimal size of the potential land take for equipment installation (requiring some 10 square metres at most) and by the nature of interventions which for buildings works will in very large measure concern only renovation and refurbishment.[56] [These works are in Component 2, other components would be Category C activities.]

The buildings might for example comprise two or three small ground floor rooms. The safeguards risk for such renovation works in terms of materials supply and transportation, wastes and pollution are very limited and can be managed so that positive outcomes arise. These include better water, hygiene and waste management, with safer electrical wiring and better trained personnel – and construction workers – in managing safety on projects. In other words, positive 'global' impacts of the project can be expected, even if there are issues of risk to be manage by the designated implementation proponent.

The only direct impact on natural resources will be in implantation of new weather monitoring installation facilities and refurbishment (rewiring, painting and furnishing) of existing buildings, but also possible in situ expansion of facilities. There will therefore be minor construction works which carry risks (though limited) given the size, nature and siting of such buildings. These facilities and/or weather stations are small-scale. To ensure that mitigation is effectively conducted certain procedures are recommended in terms of a) procedure for site selection, b) minor implantation works and maintenance management, and c) any decommissioning and disposal of waste from the previous site use.

From the standpoint of AFD/GCF safeguards policy the project presents E&S risks mainly regarding building and construction work. Components in institutional strengthening, training, information dissemination and outreach would be otherwise categorised as of low/negligible or C risk. There will be a carbon footprint due to travel for project participants, implementation agents and trainees attending capacity building events, while energy use from computers and data storage is a necessary requirement. Use of solar panels for generating power is the preferred energy option and may be the only practical and reliable option in many cases of remote observation monitoring locations.

The appropriate classification of the project is deemed to be Category B for *Activities with potential limited adverse environmental and/or social risks and impacts that individually or cumulatively, are few, generally site-specific, largely reversible, and readily addressed through mitigation measures.* The complete project is therefore also classified as Category B in consideration of the very limited risks of Component 2, having moderate to negligible potential adverse impact.

[56] A new Meteorological Office building is to be financed and project managed by Seychelles government.

5 ENVIRONMENTAL AND SOCIAL MANAGEMENT FRAMEWORK

5.1 Overview of ESMF

The purpose of the ESMF is to provide the framework, guidance and tools to be applied in the sound implementation of the project proposal. The framework therefore incorporates principles and expected E&S practice for project implementation which adheres to proposed environmental plans and guidance. The exact location of, for example, the weather stations or hydrological monitoring gauges proposed in a given country may not yet be precisely known, but the siting principles in respect of the mitigation hierarchy remain pertinent.

The ESMF also addresses aspects of health and safety (H&S) in construction and the staffing and responsibilities chain for safeguards management. The approach seeks to reinforce existing government agencies with relevant roles and environmental/social responsibilities without duplicating their functions or operating in parallel.

The table below illustrates the project activities and E&S management considerations and actions relevant to implementation and installation of the physical components which are specified in particular in Project Component 2. These involve equipment and facilities expansion and construction. The accompanying environmental and social mitigation measures and risks are assessed with actions to avoid or mitigate impacts. These measures will be circumscribed by compliance with national legislation and codes of good professional practice[57] as required in IFC's EHS guidelines.

[57] A useful set of principles and codes for good practice relevant to the implementation team's responsibilities in managing small-scale building works can be found at: https://www.sheltercluster.org/sites/default/files/docs/gsc-construction-good-practices-jan2018-dp.pdf

Table 2 :E&S Mitigation measures and resulting risk assessment

Link with Project Activity	Process chronology	Process to implement activity	Actions/Mitigation Measures to avoid potential risk	Risk of Negative Outcome (with mitigation)
2.1 Enhanced Hydromet observing, monitoring and impact forecasting services Which includes: provision and installation of climate observing and monitoring equipment and telecom forecast and climatology equipment	Site selection (Weather stations, Doppler Radar unit and tower, agromet and hydrometry stations)	Use existing or adjacent site at regional airfield/ agricultural institute	Restrict extent of additional land take. There should be little potential cumulative impact either in situ or in respect of the programme due to the scale/dispersal of equipment sites. Decommission equipment no longer in use and dispose through competent authorities in waste management.	Negligible
		Select new site	+ Identify alternative feasible sites (situated away from the influence of obstructions such as trees) + AWS to be installed on sites with 10-meter height over open terrain, as per WMO standard specification requirements. + If removal of vegetation is deemed necessary, the removal will only be limited to the minimum required number of trees. + Inform and consult local community in vicinity (re any conflict in land use) + Rapid survey of such alternative sites + Assess comparative advantages according to environmental and social criteria* + Submit 'notice of impact' for preferred and alternative sites for approval by appropriate environmental authorities (local level)	Low
	Site development, foundations and fencing (Weather stations, Doppler Radar unit and tower, agromet and hydrometry stations)	Ensure local contractor for fencing has health and safety commitments in contract**	+ Active engagement of environmental officer to ensure that relevant permitting requirements will be secured + Safe transportation of materials to site + Avoidance of damage to vegetation in accessing sites + Storage of machinery materials on site (no access by children, etc) + Safe use of machinery, vehicles, grinders eg for metal fencing, wire cutting, welding + Dust and noise reduction + Personal protective equipment (PPE) worn + Preference for local employment	Low [scale for each of 10-15 stations or radar post is 50-100m^2, i.e. plots 7-10m^2 with protective fencing, where not already in secure airport perimeter location]

Link with Project Activity	Process chronology	Process to implement activity	Actions/Mitigation Measures to avoid potential risk	Risk of Negative Outcome (with mitigation)
			+ Attention to indirect impacts on local community (noise nuisance, disease risk/abuse)	
	Site Maintenance	Ensure security and prevent emergent local community conflicts	+ Subject to regular surveillance + Grievances allowed to be expressed + Monitoring	Negligeable
	Outcome Evaluation	Long term social and environmental sustainability	+ Meteorological Office to visit all sites every 6 months and file a report on soc/env aspects + Independent monitoring consultant every 2 years	Not applicable [NB sites are of very small scale, disparate around island/country so no cumulative impact issues]
	Procurement of Equipment under Component 2	Ensure procurement specifications adopt best international standards as per WMO requirements	The project will ensure that all equipment to be purchased meets international environmental, safety and technical standards.	Low
	Installation of equipment at sea, e.g. buoys	Similar issues as above plus safe work at sea requirements (life jackets and harnessing)	As above. Special sensitivity to reef damage and consultation with conservation agencies if to be sited in marine park.	Low
2.2 Establish a maintenance and calibration laboratory and refurbish regional training center	Building refurbishment /renovation	Ensure similar elements to site development [i.e. Health and safety and labour issues apply (PPE, safe working conditions, equity e.g. re work hours, pay, gender)]	+ Contractor is responsible through contract requirements and implementation performance + Supervisory responsibilities of project proponent and/or other government agencies	Low [Existing site]

* Environmental and social criteria to be applied as here indicated (see Section 5.2 and 5.3)

** Contractor requirements as indicated (see Section 5.4)

5.2 Environmental Management Planning Requirements

Environmental management plans for roll out of project facilities require responsibilities for sound E&S implementation with involvement of local environment officers in site choice, and indeed local consultation as appropriate. Section 6 describes staffing and task allocation for safeguards responsibilities. No land will be expropriated from private owners for weather station implantation. Meteorological and hydrological facilities or equipment will be sited on government (or public) land and, as indicated, airfields will be the likely location.

One of the most important aspects for project sustainability is protection of the equipment from malfeasant damage. There will therefore be strict imposition of restrictions to access by members of the public and a security fence will in most cases be required around the equipment unless, in the case of an already security-fenced airfield there is effective guarantee of denial of access to potential miscreants.

It is noted that new equipment does not require use of dangerous substances, such as mercury as used in older technology. Decommissioning of older equipment should be undertaken through the auspices of nominated government safeguards staff. They will take responsibility in line with their existing protocols for safe disposal procedures. The project is one of climate services provision and capacity building, so the project will adopt an approach that promotes continuous improvement in sensitive, sound and responsible environmental management in line with GCF policy.

5.3 Required Siting Criteria for New Weather Stations

The procedure for selecting locations for new facilities is here presented, alongside guidance for selection between alternative sites where a new location is to be adopted. The principles of the mitigation hierarchy provide essential guidance to mitigate and indeed wherever possible ‘do no harm’.

Where a new site is to be developed the facility promoter (meteorological, water authority agricultural or other service) must take into consideration the criteria developed below and in so doing propose alternative sites which are feasible for their purposes. These sites should be surveyed and comparative advantages assessed with the involvement of the regional E&S officer as appropriate, and always with documented rationale presented to the Safeguards Specialist (SS).

The following criteria will guide the selection of acceptable locations for facilities.

Positive attributes of site options:

- Acceptable to local people following consultation
- Government or public land
- Avoids need to fell trees, or clear natural vegetation
- Does not conflict with interests of local livestock herders or other valued land uses
- On prevailing flat ground so limited erosion potential
- Non-riparian site with potential for inundation/flood
- Capable of surveillance and secure from local vandalism

Negative attributes of a site:

- On land in agricultural or other valued use

- Private land requiring negotiated acquisition
- Requiring clearing of any area of biodiversity value (eg unmodified habitat)
- Impacts on heritage or cultural property, graves, shrines, etc
- On hill slope vulnerable to erosion
- Close to residential populations, inquisitive children
- Impeding local accesses and pathways of local inhabitants

Facility sites or locations which could generate negative environmental and social impacts (as in list above) will be generally proscribed. In the case of a site with negative attributes and a lack of alternative location the rationale for the siting logic will be transparently documented and permitting procedure followed. There might, for example, be a need to acquire private land which will be done with consent or otherwise by compulsory acquisition where absolutely necessary at market price and in conformity with legislation. This situation is not expected to occur.

In an ecologically sensitive site this might in very special situations lead to a need for submission of an ESIA (or 'Provisional ESIA' Mauritius) whose detail will depend on procedural requirements to meet national legislation. The siting of a mareograph/tidal gauge instrument in an ecologically sensitive coastal location or a wave-measuring buoy in a marine national park are possible case examples.

As indicated there are practical reasons why meteorological facilities such as a Doppler Radar installation needs to be sited on open ground. Such Radar installations will have more demanding requirements so that they are unimpeded by local relief.

5.4 Environmental and Social Guidelines for Contractor

The principle reference for the compliance expectations for construction and installation of facilities and project works will be the IFC Environmental and Health Guidelines,[58] national laws and regulations, including necessary permits and approvals before the work commences. The Contractor should respect applicable laws and regulations in the country on the disposal of solid and liquid wastes, noise standards, working hours, etc. The contractor will take appropriate measures to minimise environmental damage and be responsible for non-compliance.

Before starting work, the contractor must obtain all permits necessary for the implementation of works under the contract, including any authorisations from local authorities, forest services (in case of deforestation, pruning, etc.), agricultural or water authorities, etc.

The contractor and as appropriate the project proponent (representative of the Meteorological Office) will organise meetings with the authorities, representatives of the populations in the project area and the relevant technical services, to inform them in advance of the work to be performed and duration and routes and locations likely to be affected. This meeting will enable feedback from local populations, sensitisation on environmental and social issues, development of relationships with local host communities, and set expectations regarding behaviour of the contractor's workers and contractor supervisory responsibilities.

[58] IFC/World Bank Group Environmental, Health, and Safety General Guidelines, 2007 https://www.ifc.org/wps/wcm/connect/29f5137d-6e17-4660-b1f9-02bf561935e5/Final%2B-%2BGeneral%2BEHS%2BGuidelines.pdf?MOD=AJPERES&CVID=jOWim3p

These following simple clauses are intended to help the project implementation team or agent (meteorological or agricultural service) draft contracts for micro-projects such as the weather station and refurbishment contracts. Such projects may of course be let as part of a large contract. Due diligence applies to responsibilities for sub-contractors' compliance with the standards of primary contractors to which they are committed in their Contractor EMP. In any case, all companies engaged in construction and rehabilitation of structures must conform to the environmental and social stipulations in the box below. This checklist for contractors is not exhaustive and subject to review. Reference should be made to IFC requirements in preparing terms of reference for contractors.

Environmental and Social Stipulations for Contractors

(working on small-scale interventions, facilities, etc)

Legal compliance

- Ensure necessary permits in conformity with national laws and regulations in force

Community engagement

- Perform an information and sensitisation campaign for any local resident populations before works commence
- Use local workforce and engage in non-discriminatory recruitment
- Conduct awareness campaign on STI/HIV/AIDS with workers and local populations

Working conditions

- Ensure compliance measures for hygiene and safety on site in compliance with national legislation (labour law)
- Provide protective equipment to workers (boots, gloves, etc) and ensure its appropriate use
- Ensure safe methods of working and emergency resources (e.g. First Aid kit carried in vehicles and local hospital contact details)

Local Safety and Protection

- Protect persons and properties around sites from nuisance and harm (eg minimise noise and dust)
- Ensure workers respect and engage appropriately with local communities (gender/age non-discrimination, non-abuse)

Biodiversity and Conservation

- Natural habitats and protected species of flora or fauna safeguarded from worker abuse or local trapping/hunting

Waste management

- Ensure collection and legal disposal of non-biodegradable wastes

Supervision

- Lines of responsibility clear with emergency plans
- Involve local technical services in monitoring implementation

5.5 Grievance Redress Mechanism

When conflicts occur between engaged parties in a project they may be difficult to resolve without independent arbitration. Ideally the parties enter into discussion and negotiation, which can lead to a resolution. It is very difficult for employees to take cases of inadequate safety consideration against an

employer and it is for the project safeguards team to observe and listen to complaints confidentially, likewise in cases of gender discrimination, mistreatment and abuse. The project will at the outset inform local populations of their right to bring grievances without fear, and have them logged and addressed.

The project will appoint a Grievance Committee to hear grievances should complaints be escalated. This committee will meet ad hoc and no logged case should trail for more than 3 months. The Committee would include the IOC Safeguards Specialist, two independent non-government professionals with legal expertise, and have Union and NGO/civil society organisation representation. Members must be objective, impartial and reasonable. Cases might arise and be escalated or approached through the following modalities:

- In the first instance an amicable settlement is sought by mediation between the aggrieved party (person or group) and, for instance, a local contractor or other actor. The negotiation process will be arbitrated by local/traditional leadership near the site giving rise to the concern. A labour or employment dispute is a possible example in relation to hours worked or even unfair dismissal or gender discrimination. A dispute over land might also be a case that can be resolved locally.
- Where such a mediated settlement fails, an official process begins. A written appeal is made to project management at national level. A complaint against a contractor for dismissal following a work accident that incapacitates him/her without offer of recompense is a possibility. Another case might be an unfair dismissal following a gender abuse incident. Such a claim will be recorded by the relevant proponent (meteorological or agricultural office) and be reported to the project Safeguards Specialist, who will ensure that each claim is logged and gets an answer within a reasonable time (say 10 days) at the village level. The logged grievance will be registered and described in progress reports, together with the status of proposed resolution. All deliberations of the Grievance Committee will be documented.
- If the conciliation process is not successful, the complainant can refer the grievance to the jurisdiction of national law courts.
- Alternately, the complainant can lodge a case with AFD E&S Complaints Mechanism within 2 years of the original reason for the complaint. The Mechanism Secretariat ensures that matters are handled impartially through an E&S Compliance Review by a panel of independent experts.

For such a project the first and second instance reconciliation mechanisms might be expected to enable resolution of complaints. It would seem extremely unlikely on such a project that the last two instances could be invoked.[59] The precise modalities need to be aligned to realities in each separate country and particular social context.

5.6 Reporting and Monitoring

Record keeping on environmental aspects in siting and security maintenance will be a required subject of project reporting systems from the start of project implementation. Health and safety considerations are also key to sound safeguards implementation.

Reporting on monitoring requires that the locally appointed project coordinator participate fully in project roll out and decision-making. The coordinator will provide implementation progress reports to the PMU and make site visits to verify that environmental and social stipulations as presented in the table in Section 5.4 above and adopted by the Contractor (and any sub-contractor) in a CEMP are being adhered to.

[59] https://www.afd.fr/en/environmental-and-social-complaints-mechanism-afd

Safeguards Monitoring and Reporting for each site of facility installation/construction			
Generic area of reporting	**Explanation**	**Indicators**	**Means of verification**
Development permitting and approvals	Have required legal approvals from environmental agencies, electrical/water utilities, etc been obtained by contractor?	Permits obtained	Contractor enquiries and reports to be verified with assistance from SS.
Local Community engagement (and prior notice)	Have introductory meetings taken place at each new facility site to inform local persons?	Evidence of meetings held	Enquiries in local communities and with local government officials and political representatives
Employment rights and safe working conditions	Is contractor observing labour laws and own safety plans as expressed in risk assessments, safe working methods and commitments to national labour law (as to be required in his contract)? Has contractor given basic safety training to workers? Is there a responsible safety officer among supervisory staff on site and arrangements for relief/ replacement etc as required in line with a safety management system, including accident plans? Safety and tidiness of work sites Contractor staff have vehicles, tel. numbers of local clinics/hospital, etc for emergency situations Non-discrimination in gender opportunity.	Conformity of working hours with legal norms (ie workers not required to work excessive hours) Employees have contracts and there is due payment Availability and use of personal protective equipment (PPE) in workshops and on construction sites First Aid kits available at sites together with trained contractor personnel and/or emergency plans for accidents in place (re local medical facilities) Gender balance in staffing payrolls at all levels	Regular and impromptu field visits during construction period (weekly/fortnightly) Contractor reporting, monthly reporting Field observation and verification that safety equipment is both made available and supervisors are requiring its use on sites where there are hazardous activities and operations Verify existence of first aid kits and their contents, presence of safety officer, and basic training Logged discrimination, grievances reported and progress of resolution
Safety and protection of local populations (human rights)	Are local communities protected from construction nuisance in noise and dust? Are local communities hosting contractor staff or otherwise in contact with employed staff subject to sexual abuse or discrimination, child exploitation? Does Contractor have in place policies to discipline staff or hear and report grievances?	Incidents of dispute resolution Project grievance reporting	Informal and probing enquiries Field observation Engaged impartial discussion with local communities through informal and formal channels Logged grievances reported eg in land disputes and progress of resolution followed and updated in project reporting

Biodiversity/ Conservation	Are agreed sites being developed in line with siting policy? Is topsoil conserved, respect for local trees and vegetation? Is local workforce engaged in illegal and destructive activities?		
Waste management	Are construction wastes being properly disposed of in line with local regulations or through competent authorities? Contractor has responsibilities for waste and littering of staff in local environment	Site littering and spillages Effluents and toilet hygiene/sanitation	Field observation Informal and probing enquiries Observation of direct and indirect impact of contractor staff and site offices
Contractor supervision	Discipline and effectiveness of contractor safeguards staff in management of risks.	Inconsistent reporting Responsiveness to previously expressed concerns	Observation and reporting on performance re contractor safeguards systems (lines of responsibility, quality and integrity of reporting)

The implementing agency or promoter must copy its progress and maintenance reports to the appropriate national or local office to foster local ownership for safeguards implementation performance. As this is an external financed project the relevant national environment ministry must also be informed of siting proposals and the basis on which new choices are made. There will be an independent audit of works implementation by an appointed project management agent from IOC/AFD who will report to the relevant national environment ministry on the conduct of site selection and implementation of the framework guidelines.

IOC involvement in interim internal environmental/safeguards review of the compliance and adequacy of adopted project environmental and social policy implementation is proposed for 18 months into the five-year project so that lessons may be learned for roll out of further planned works. It is suggested this might be done either by a) peer review among members of different IOC countries or b) by the environment officer at IOC headquarters or c) by an appointment by the Project Management Unit in each country of a suitably qualified environmental and social safeguards consultant.

The outcomes to be verified are:

- Environmentally and socially sound weather monitoring station site selection; and
- Construction completed with due respect to health, safety and human rights of employed workers and any local residents.

5.7 Roles and responsibilities for E&S management (including TA)

The environmental and social management plans (ESMP) indicated in the ESMF will require environmental and social management technical assistance and supervision, on a punctual basis in each country when building construction and equipment installation work are required. Details of weather observation facilities and associated buildings would be finalised for each country either through the PMU (see Annex 2, FS, Chapter 5).

It is recommended that the project executing entity, the IOC, hire a Contractor EMP to ensure the incorporation of E&S risk assessment in any service providers' work plan. A single contractor might be expected to be selected per country, other than for specialised facilities (eg Doppler Radar installation or the wave monitoring buoys – see ESMF). During plan development, such companies will need to liaise with the regional contractor – the Environmental and Social Officer – and ultimately obtain plan approval.

Environmental and Social Officers (E&SO – 1 regional E&SO and 4 national E&SO for each country – on a part time basis) will be appointed as part of the PMU for approval and outline permitting by the national authorities to establish the necessary documentation for national legal compliance purposes. Local site access permits, building inspection or other requirements will be the responsibility of the contractor to obtain. The E&SO will therefore be responsible initially for facilitating national authorisations, permits and where necessary ESIA at whatever level of detail is required by national authorities.

Exceptionally certain facilities such as the Radar Doppler may be expected to require more detailed planning documentation. Where there is a national requirement for an ESIA statement, the E&SO will seek to appoint a consultant to prepare necessary documentation to meet the country requirements. This is likely to be a national consultant, and such a person will be required to visit sites and produce the detailed documentation that may be required.

The E&SO will be responsible for environmental and social due diligence in implementation and will be co-opted into siting decision-making, in particular where alternative facility sites are apparent and an optimisation choice is required. During construction the E&SO will be responsible for impromptu visits to verify that implementation is in line with permit stipulations and national legislative requirements. The implementation unit or sector promoter of the given works (e.g. meteorological office) will liaise with the E&SO and together be responsible to see that codes of good engineering and environmental practice, national legislation compliance and the IFC Guidelines on Environmental Health and Safety[60] are implemented.

The E&SO will be responsible for the progress and compliance monitoring sections of monthly progress reports during works implementation, with particular reference to health and safety performance and field observations of actual practice in implementation. The E&SO will make inspections both prior to and on completion of works and/or as instructed by the IOC Programme Director for auditing requirements to AFD. It is expected that AFD E&S safeguards specialists will themselves make impromptu inspections to hold programme management to account.

A budget for E&SO and their related tasks – including travel to project sites as relevant – has been included in the budget for the project's PMU. Travel costs will be greater for Madagascar where more dispersed sites are anticipated, and be more modest in the case of Seychelles and Mauritius as most sites are accessible within an hour by vehicle unless on outlying islands.

The appointed E&SO in each country are responsible for implementation of their own (C)EMP under the oversight of the regional E&SO. The latter (see ESMF EMP) is accountable to the IOC/PMU team leader and ultimately to AFD who are accountable to GCF. The E&SO will report to IOC on progress in implementation and compliance as owner of the project and will monitor implementation of project activities. In partnership and/or as owner AFD 'oversees the ex-post evaluation'.[61]

[60] IFC Environmental, Health, and Safety General Guidelines, 2007 https://www.ifc.org/wps/wcm/connect/29f5137d-6e17-4660-b1f9-02bf561935e5/Final%2B-%2BGeneral%2BEHS%2BGuidelines.pdf?MOD=AJPERES&CVID=jOWim3p

[61] E&S Framework for "Transforming Financial Systems for Climate" Programme, 2018, steps 3 and 4, p.20

The table below summarises roles and responsibilities for specific ESMF processes

	TA (IOC) and PMU	National Safeguards responsibility
Determination of number and location of sites	PMU, National Met Office National Project Coordinators (NPC)	National E&SO
Agreement for actual site (following plan criteria)	NPC ; E&S Officers	National E&S Officers
Documentation describing site and outline permitting	National E&SO With facilitation by NPC	Environment and/or planning ministry
Quality Assurance and permit approvals	National E&SO facilitation by NPC	Environment Ministries H&S agencies
Contract specifications to include E&S and H&S	IOC Regional TA E&SO	Met Offices and/or agriculture ministry)
Installation /construction works	NPC	National E&SO
Approval and signing off	NPC	National E&SO
Upkeep and O&M (effective outcome)	National Met Office or Agric. Services NPC	National E&SO

The IOC E&SO position is not a full-time position. The work time is estimated at 3 months per year for the first 2 years of project implementation; and 1.5 month during the project's third year. The primary responsibility will be in the first phases of the project. He/she will establish final safeguards arrangements and work with the PMU team leader to ensure contracts for facilities renovation works and equipment installations include adequate safeguards stipulations and reporting requirements.

The national E&SO will have a more limited travel and mobilisation requirement in the smaller islands than in Madagascar, where travel will be a significant commitment. It is seen as preferable that such persons be seconded from relevant existing civil service duties so that know-how stays within government services. In the first two years a quarter of their time is allocated to the project while in subsequent years just 1.5 months is allocated because project works will have been largely completed.

In most islands project sites can be visited within a day, and in most cases within 3-4 hours, except in Madagascar, which is larger in size and will require longer travel time to reach the project sites. It should not be necessary for such a person to visit every river gauge or even renovation site should there be no new land take required for facilities. The meteorological and/or agricultural, water offices or services are the ultimate 'owners' of the project and as such are responsible (with the PMU) to AFD and GFC for effective and valued project outcomes. These include sound performance in safeguards implementation.

Below is an estimated budget to support the implementation of the ESMF. These amounts have been taken into account in the project budget (see Annex 4 Budget- PMU tab).

Provisional Budget allocations				
Staff and Travel	First year	Second year	Each further year	Time input
National expertise staff budgetary allowance	3 months @ USD 2,500/month per expert	3 months @ USD 2,500/month per expert	1,5 months @ USD 2,500/month per expert	3 months input in each country in first 2 years ; 1.5 months in subsequent year
Travel	4 x 2,000	4 x 2,000	4 x 2,000	In-country travel as part of PMU travel allowance
Regional expertise Budget	3 months @ USD 3,000/month per expert	3 months @ USD 3,000/month per expert	1.5 months @ USD 3,000/month per expert	3 months input Safeguards of E&S Specialist (SS) in first 2 years ; 1.5 months in subsequent year
Regional travel	2,000	2,000		
Operations contingency	10,000	10,000	10,000	

APPENDIX A: ESIA LEGISLATION IN PARTICIPANT COUNTRIES

Mauritius

Legislation relevant to project interventions of scale anticipated by the Hydromet Project:

Section 16 of the EPA 2002 provides a general guide on a Preliminary Environmental Report (PER). According to section 16(1), a PER shall be-

(a) in conformity with such policy or environmental guidance as may be published in respect of an undertaking and in such form as may be approved by the Director;

(b) duly signed by the proponent of the undertaking or his duly appointed legal representative; and

(c) deposited at the Director's office in 10 copies or in such additional copies as the Director may request.

According to section 16(2), a preliminary environmental report shall contain a description of the undertaking with particulars of –

(a) its location and its surroundings;

(b) its process, design and size;

(c) any data or information necessary to identify and assess the effects which the undertaking is likely to have on the environment, people and society;

(d) the measures which the proponent proposes to take to avoid, reduce and, where possible, remedy any significant effect that the undertaking is likely to have on the environment; and

(e) such other aspects of the undertaking as the Director may require.

According to section 16(3), a preliminary environmental report shall be accompanied by-

(a) a site plan indicating the location of the undertaking;

(b) a non-technical summary, where the report is prepared by a consultant;

(c) a certificate issued by a notary expressing his opinion as to the ownership of

(a) the land on which the undertaking is to be executed, or where the proponent is not the owner of the land, by a written evidence of the permission of the owner, and a certificate issued by a notary expressing his opinion as to the owner's title.

Furthermore, the Director of the relevant division may request such additional information from the proponent as he thinks necessary.

Seychelles

The Ministry of Environment, Energy and Climate Change (MEECC) is responsible for administering the Environmental Protection Act, 2016 (Act 18 of 2016). The functions of the Ministry are established in Section 4 of the Act, as follows:

i) administer, implement and enforce the provisions of this Act;

ii) develop and implement policies, programmes and guidelines in pursuance of the national objectives on environment protection;

iii) co-ordinate the activities of other agencies concerned with the protection of the environment –

a) under this Act; or

b) under any other written law for the time being in force which relates to the objects of this Act;

iv) develop, evolve and where necessary adopt standards for the quality of the environment in its various aspects and for emission or discharge of environmental pollutants from any source whatsoever;

v) commission research and sponsor studies on problems relating to environmental pollution;

vi) examine such manufacturing processes, materials and substances as are likely to cause environmental pollution;

vii) identify areas in which any activity shall not be carried out or shall be carried out subject to certain safeguards;

viii) develop, evolve and where necessary adopt procedures and safeguards for the prevention of accidents which may cause environmental pollution and remedial measures for such accidents;

ix) collect and disseminate information in respect of matters relating to environmental protection;

x) co-ordinate actions required in a state of environmental emergency or any other situation which may pose a serious threat to the environment; and

xi) prepare manuals, codes or guidelines relating to environmental protection and for the prevention, control and abatement of pollution.

APPENDIX B: LIST OF PEOPLE CONSULTED

Date	City	Place	Name/Contact of person
MADAGASCAR			
12/07	Antananarivo	ONE Office Ministry of Environment	Mr. Pierre RAHAGALALA haga@pnae.mg
12/07	Antananarivo	GIZ project office Office	Mr. Jacquis TOHIZARA, Projet Adaptation des chaines de valeurs agricoles au changements Climatiques jacquis.Tohizara@afci.de Mme, Sarah FAVRICHON sarah.favrichon@giz.de
16/07	Antananarivo	AFD	Danielle RABENIRINA Chargée de projets – Secteur Environnement rabenirinad@afd.fr
	Antananarivo	Welt Hunger Hilfe	Julio Rainimananjanahary, julio.rainimananjanahary@welthungerhilfe.de
	Antananarivo	Catholic Relief Services	Jim Hazen, Chief of Party of the USAID Fararano program, james.hazen@crs.org
COMOROS			
4/07	Ndrondroni, Moheli	Ulanga NGO	Site visit in Moheli
4/07	Ndrondroni, Moheli	Ulanga NGO	Site visit in Moheli
4/07	Ouallah 1, Moheli	Ulanga NGO	Site visit in Moheli
4/07	Ndrondroni, Moheli	Ulanga NGO	Site visit in Moheli
4/07	Nioumachoua, Moheli	Ecolodge	Mr. Daniel LAILINA, Director, Park National de Moheli dalayass98@yahoo.fr Jon HILDERANDT info@lakalodge.com
5/07	Fomboni, Moheli	UNDP	Captain Said Ben OMAR, Director Mansourou Anwadhui RRC/UNDP 2 x UN volunteers Abdou Soimadou Ali MAMADI Project CRCCA abdou.soimadou@undp.org
6/07	Fomboni, Moheli	Auberge Les Abou	US Peace Corps personnel
SEYCHELLES			
22/07	Mahé	Meteo Services	Mr. Vincente AMELIE v.amelie@meteo.gov.sc

23/07	Mahé	Ministry of Environment	PS Louis Agricole (Energy/Environment, GCF NDA in Seychelles) PS Alain de COMARMON (Land Use Planning) Lambert J. WOODCOCK (ACII), HSI INSURANCE
23/07	Mahé, Mont Fleuri	DRDM	Mr. Paul LABALEINE, Director DRDM plabaleine@drdm.gov.sc Ms. Aisha RACHEL Planning, Intelligence, Research and Information Management Department of Risk and Disaster Management (DRDM) P.O Box 113 Victoria Mahe Global Village. Suite No. 3 Mont Fleuri, Mahe Republic of Seychelles aisha.rachel@drdm.gov.sc tel: + 248 4672200/226
24/07	Praslin, La Digue	Praslin, La Digue	Meteo services
25/07	Mahé, Victoria	SFA	Dr Nathalie Bodin Seychelles Fishing Authority (SFA) P.O. Box 449, Fishing Port, Victoria, Seychelles nbodin@sfa.sc tel: +248 467 0337 whatsapp: +248 256 9039 skype: natbod34
25/07	Mahe, Victoria	Waste Enforcement and Permit Division	Ms. Nanette LAURE, Waste Enforcement and Permit Division n.laure@env.gov.sc

APPENDIX C: PROPOSED INTERVENTIONS AND ISSUES OF CONTRACT RISK PER IOC MEMBER COUNTRY

A marginally higher sensitivity might be expected in respect to works undertaken in Madagascar and Comoros because of potentially more remote sites from the capital and less institutional capacity in government services, including more deficient H&S practice and waste management to be carefully supervised. In these two countries, particular attention will be given to social safeguards by the regional E&S Officer and the national project coordinator, especially in respect to H&S. Doppler units will be at existing airport premises so risk is assessed as medium or B for construction environmental considerations, but risk is accorded with respect to H&S in these two countries.

In the table below differentiation is made between environmental and social impact risks for each of the project sub-components in respect to contract management rather than 'at entry' risk assessment. In this context, environmental risks refer primarily to those around siting of facilities and transport of materials to optimise criteria presented in the ESMF of Section 5. Social risks are seen as those affecting occupational health and safety including accidents and discrimination in employment. Risk categorisation in respect to the below table differentiates a) basic (C), b) moderate (B) and c) high (A)

***Low or Basic** = relevant to contracts with basic Environmental and Social Health and Safety (ESHS) requirements (Level 1)*	**C**	*Typically for contracts in Projects with minor environmental and social construction related impacts and risks which do not require an Environmental and Social Impact Assessment (ESIA) and an Environmental and Social Monitoring Plan (ESMP). During the implementation of the works only limited occupational health and safety measures are required, e. g minor works and small-scale rehabilitation measures; few workers; low transport requirements; no worker camps required; no hazardous wastes; no working at heights or confined spaces; no heavy construction machinery; no external environmental risks like flooding, etc.*
***Moderate or Elevated** = Relevant to contracts with elevated ESHS requirements in addition to* basic or Level 1	**B**	*Typically for contracts in Projects with limited environmental and social impacts and risks which require a standard ESIA. During the implementation of the works standard occupational health and safety measures are required, e. g. less than 100 workers; less complex work site(s), transport of hazardous material, general OHS risks (welding, hazardous material) etc.*
***High =** relevant to contracts with high ESHS requirements in addition to Level2*	**A**	*Typically for contracts in Projects with significant or long term environmental and social impacts and risks which require a separate comprehensive ESIA and an ESMP. During the implementation of the works particular occupational health and safety measures are required, e. g. more than 100 workers, worker camp(s) required, significant risks at complex work sites(s), increased heavy load traffic, etc*

Madagascar

	Intervention type/ activity	**Environmental Issues & risks**		**Social and H&S issues & risks**	
Madagascar	Capacity building components, convening meetings/trainings	Transportation/travel impacts Contribution to climate change (GHG emissions)	C	Gender imbalance during capacity building events and in appointments	C
	Office refurbishment and equipping	Carbon footprint/ GHG of equipment production and transportation of materials Waste disposal of previous equipment	C	All risks related to labour and working conditions Safety risks in handling and in wiring	C

	Intervention type/ activity	Environmental Issues & risks		Social and H&S issues & risks	
	Building rehabilitation and extension works (by PNUD, not covered under this project)	Transport of materials Local Impacts possible in respect to: Water quality Release of pollutants (hazardous and non-hazardous waste materials, dust, etc) not significant	B	Construction worker occupational health and safety risks Noise for nearby population Population safety around construction	B
	Weather data measuring units/ stations	Siting of stations if not rehabilitated on existing site Potential removal of vegetation (trees) surrounding the stations (to avoid obstructing the equipment sensors)	C	Personal safety risks in erection of fencing Land use issues	C
	1 x Doppler Radar unit and tower (and Upper Air Station)	To be located at existing obs. site; issues of transportation of materials	C	Construction safety risks Visual impact Noise for nearby population Population safety around construction	C
	60 x Agromet and hydrologic observation stations (also mini obs. facilities) 2 x Vehicles	Local soil vegetation disturbance possible and soil erosion risk, if unlikely	C		C
	1 x Wave-measuring buoy 2 x Tidal Gauge (Mareograph) 1 x Depth sounding system (with generator)	Release of pollutants during transport (not significant)	C	Safety at sea	C

Comores

	Intervention type	Environmental Issues and risks		Social and H&S Issues and risks	
Comoros	Capacity building components convening meetings/trainings	Transportation/travel impacts Contribution to climate change (GHG emissions)	C	Gender imbalance during capacity building events and in appointments	C
	Office refurbishment and equipping (Moroni)	Carbon footprint/ GHG of equipment production and transportation of materials Waste disposal of previous equipment	C	All risks related to labour and working conditions Safety risks in handling and in wiring Temporary noise pollution	C
	Building rehabilitation and extension works (Moroni office by project; Anjouan and Mohéli by PNUD)	Siting; transport of materials. Local Impacts possible in respect to: water quality Release of pollutants (hazardous and non-hazardous waste) not significant Impacts on resource consumption increase in dust emissions	B	Construction safety Noise for nearby population Population safety around construction	B

	Intervention type	Environmental Issues and risks		Social and H&S Issues and risks	
	Weather data measuring units/ stations	Siting of stations if not rehabilitated on existing site Potential removal of vegetation (trees) surrounding the stations (to avoid obstructing the equipment sensors)	C	Personal Safety risks in erection of fencing Land use issues	C
	1 x Doppler Radar unit and tower (and Upper Air Station)	Siting in airport premises; issues of transportation of materials	C	Construction safety Visual and landscape impact Noise for nearby population Population safety around construction	C
	14 x Agromet/hydrologic stations (incl mini obs. facilities) 2/3 x Vehicles	Local soil vegetation disturbance possible, if unlikely Air pollution (not significant)	C		C
	3 x Wave-measuring buoy 2 x Tidal Gauge (Mareograph) 1 x Depth sounding system (and generator)	Release of pollutants during transport (not significant)	C	Safety at sea	C

Seychelles

	Intervention type	Environmental risks/impacts		Social and H&S risks/impacts	
Seychelles	Capacity building components	Transportation/travel impacts GHG emissions	C	Gender imbalance during capacity building events and in appointments	C
	Office refurbishment and equipping	Carbon footprint/ GHG of equipment production and transportation of materials Waste disposal of previous equipment	C	All risks related to labour and working conditions Safety risks in handling and in wiring Temporary noise pollution	C
	Building (by Seychelles gov), rehabilitation and extension works	Siting; transport of materials. Local Impacts possible in respect to: Possible impacts on water quality Release of pollutants (hazardous and non-hazardous waste) not significant increase in dust emissions	B	Construction safety Noise for nearby population Population safety around construction	B
	Weather data measuring units/ stations	Siting of stations if not rehabilitated on existing site Potential removal of vegetation (trees) surrounding the stations (to avoid obstructing the equipment sensors)	C	Personal Safety risks in erection of fencing	C
	1 x Doppler Radar Unit and tower (and Upper Air Station)	Siting at existing telecom location; Air pollution risks due to transportation of materials (not deemed significant)	C	Construction safety Visual and landscape impact (+/-) Noise for nearby population Population safety around construction	C
	16 x Hydrologic stations (also mini obs. facilities)	Soil and vegetation disturbance (minor) Air pollution (not of significance)	C		C

	Intervention type	Environmental risks/impacts		Social and H&S risks/impacts	
	2 x vehicles				
	3 x Wave-measuring buoy 2 x Tidal Gauge (Mareograph) 1 x Depth sounding system	Impacts on water quality (not of significance) Release of pollutants during transport (not of significance)	C	Safety at sea	C

Mauritius

	Intervention type	Environmental Issues and risks		Social and H&S Issues and risks	
Mauritius	Capacity building components	Transportation/travel impacts Contribution to climate change (GHG emissions)	C	Gender imbalance during capacity building events and in appointments	C
	Office refurbishment and equipping	Carbon footprint/ GHG of equipment production and transportation of materials Waste disposal of previous equipment (not of significance)	C	All risks related to labour and working conditions Safety risks in handling and in wiring Temporary noise pollution	C
	Building rehabilitation and extension works	Siting; transport of materials. Local Impacts possible in respect to: water quality Release of pollutants (hazardous and non-hazardous waste) not significant Impacts on resource consumption increase in dust emissions(not significant)	B	Construction safety Noise for nearby population Population safety around construction	B
	Weather data measuring units/ stations	Siting of stations when these are not rehabilitated on existing site Potential removal of vegetation surrounding the stations (to avoid obstructing the equipment sensors)	C	Personal safety risks in erection of fencing	C
	1 x Doppler Radar Unit and tower (and Upper Air Station)	Disturbance of vegetation due to siting and landscape at Rodrigues airport; air pollution due to transportation of materials	C	Construction safety Noise for nearby population Population safety around construction	C
	20 x Hydrologic stations (and mini facilities) 2 x vehicles	Possible soil and vegetation disturbance Air pollution (not of significance)	C		C
	3 x Wave-measuring buoy 4 x Tidal Gauges (Mareograph) (M, Rodrigues, Agalega, St Brandon) 3 x Depth sounding system (Rod, Ag, St Brand)	Issues in siting and care/conduct in placement of wave radar buoy and tidal gauges re sensitive seabeds Impacts on water quality Release of pollutants during transport (not significant)	C	Safety at sea	C

APPENDIX D: EXAMPLE OF EQUIPMENT AND INSTALLATIONS FORESEEN



Figure 2: Airport Meteorological Building/Office at Fomboni, Mohéli Island (Comoros), identified for refurbishment and re-equipping



Figure 3:Doppler Radar System, Mauritius



Figure 54:Old weather station with perimeter fence at Mahé Airport, Seychelles



Figure 45: New technology weather measuring and monitoring equipment at Mahé International Airport Seychelles (2019)