



**GREEN  
CLIMATE  
FUND**

**Meeting of the Board**  
16 – 19 March 2021  
Virtual meeting  
Provisional agenda item 14

**GCF/B.28/02/Add.08**

23 February 2021

---

# Consideration of funding proposals - Addendum VIII

## Funding proposal package for FP161

---

### **Summary**

This addendum contains the following seven parts:

- a) A funding proposal titled "Building Regional Resilience through Strengthened Meteorological, Hydrological and Climate Services in the Indian Ocean Commission (IOC) Member Countries";
- b) No-objection letter issued by the national designated authority(ies) or focal point(s);
- c) Environmental and social report(s) disclosure;
- d) Secretariat's assessment;
- e) Independent Technical Advisory Panel's assessment;
- f) Response from the accredited entity to the independent Technical Advisory Panel's assessment; and
- g) Gender documentation.

## Table of Contents

Funding proposal submitted by the accredited entity	3
No-objection letter issued by the national designated authority(ies) or focal point(s)	123
Environmental and social report(s) disclosure	128
Secretariat's assessment	131
Independent Technical Advisory Panel's assessment	146
Response from the accredited entity to the independent Technical Advisory Panel's assessment	157
Gender documentation	161

# Funding Proposal

Project/Programme title:	Building Regional Resilience through Strengthened Meteorological, Hydrological and Climate Services in the Indian Ocean Commission (IOC) Member Countries
Country(ies):	Comoros, Madagascar, Mauritius and Seychelles
Accredited Entity:	French Development Agency (AFD)
Date of first submission:	<u>[2020/04/29]</u>
Date of current submission	<u>[2021/01/25]</u>
Version number	<u>[V.11]</u>



## Contents

Section A	<b>PROJECT / PROGRAMME SUMMARY</b>
Section B	<b>PROJECT / PROGRAMME INFORMATION</b>
Section C	<b>FINANCING INFORMATION</b>
Section D	<b>EXPECTED PERFORMANCE AGAINST INVESTMENT CRITERIA</b>
Section E	<b>LOGICAL FRAMEWORK</b>
Section F	<b>RISK ASSESSMENT AND MANAGEMENT</b>
Section G	<b>GCF POLICIES AND STANDARDS</b>
Section H	<b>ANNEXES</b>

### *Note to Accredited Entities on the use of the funding proposal template*

- Accredited Entities should provide summary information in the proposal with cross-reference to annexes such as feasibility studies, gender action plan, term sheet, etc.
- Accredited Entities should ensure that annexes provided are consistent with the details provided in the funding proposal. Updates to the funding proposal and/or annexes must be reflected in all relevant documents.
- The total number of pages for the funding proposal (excluding annexes) **should not exceed 60**. Proposals exceeding the prescribed length will not be assessed within the usual service standard time.
- The recommended font is Arial, size 11.
- Under the [GCF Information Disclosure Policy](#), project and programme funding proposals will be disclosed on the GCF website, simultaneous with the submission to the Board, subject to the redaction of any information that may not be disclosed pursuant to the IDP. Accredited Entities are asked to fill out information on disclosure in section G.4.

**Please submit the completed proposal to:**

[fundingproposal@gcfund.org](mailto:fundingproposal@gcfund.org)

**Please use the following name convention for the file name:**

“FP-[Accredited Entity Short Name]-[Country/Region]-[YYYY/MM/DD]”

A. PROJECT/PROGRAMME SUMMARY			
A.1. Project or programme	Project	A.2. Public or private sector	Public
A.3. Request for Proposals (RFP)	Not applicable		
A.4. Result area(s)	<p><u>Mitigation:</u> Reduced emissions from:</p> <input type="checkbox"/> Energy access and power generation: <input type="checkbox"/> Low-emission transport: <input type="checkbox"/> Buildings, cities, industries and appliances: <input type="checkbox"/> Forestry and land use:		<p><u>GCF contribution:</u>  <u>Enter number%</u>  <u>Enter number%</u>  <u>Enter number%</u>  <u>Enter number%</u></p>
	<p><u>Adaptation:</u> Increased resilience of:</p> <input checked="" type="checkbox"/> Most vulnerable people, communities and regions: <input checked="" type="checkbox"/> Health and well-being, and food and water security: <input type="checkbox"/> Infrastructure and built environment: <input type="checkbox"/> Ecosystem and ecosystem services:		<p><u>50%</u>  <u>50%</u>  <u>Enter number%</u>  <u>Enter number%</u></p>
A.5. Expected mitigation impact	<b>Not applicable</b>	A.6. Expected adaptation impact	19,453,286 direct beneficiaries (67% of the total population in the 4 countries); <b>9,788,191</b> indirect beneficiaries (33%), i.e. reaching a total of 100% of the total population
A.7. Total financing (GCF + co-finance)	<b><u>71 386 086 USD</u></b>	A.9. Project size	Medium (Upto USD 250 million)
A.8. Total GCF funding requested	<b><u>52 767 986 USD</u></b>		
A.10. Financial instrument(s) requested for the GCF funding	<p>Mark all that apply and provide total amounts. The sum of all total amounts should be consistent with A.8.</p> <input checked="" type="checkbox"/> Grant <b><u>52 767 986 USD</u></b> <input type="checkbox"/> Equity <u>Enter number</u> <input type="checkbox"/> Loan <u>Enter number</u> <input type="checkbox"/> Results-based payment <u>Enter number</u> <input type="checkbox"/> Guarantee <u>Enter number</u>		
A.11. Implementation period	5 years	A.12. Total lifespan	15 years
A.13. Expected date of AE internal approval	Approved in 18 <sup>th</sup> of June 2020	A.14. ESS category	B
A.15. Has this FP been submitted as a CN before?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	A.16. Has Readiness or PPF support been used to prepare this FP?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>

<b>A.17. Is this FP included in the entity work programme?</b>	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	<b>A.18. Is this FP included in the country programme?</b>	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
<b>A.19. Complementarity and coherence</b>	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>		
<b>A.20. Executing Entity information</b>	Regional Executing Entity (EE) – Indian Ocean Commission, intergovernmental organization created in 1984 with the Victoria Agreement. Headquarters agreement signed with Mauritius.		

**A.21. Executive summary (max. 750 words, approximately 1.5 pages)**

The Global Risk Report (2019)<sup>1</sup> indicates that extreme weather events are amongst the risks with highest impact of the global risk landscape. Among these extreme events, meteorological and hydrological hazards jointly cause more economic damages and loss of life than other disasters<sup>2</sup>. Within this region, floods induced by rainfalls from tropical cyclones and non-tropical cyclones are the most frequent catastrophic hazard, followed by droughts. From 1950 to June 2020, the Comoros, Madagascar, Mauritius and Seychelles experienced a total of 113 natural disasters due to hydrometeorological hazards, of which 88 were due to storms (including tropical and non-tropical cyclones), 14 floods and 11 droughts. The number of affected people (including depths) – estimated at 18.3 million (62% of the total population of the four countries) for the 1950–June 2020 period – and the physical damages associated to climate-related hazards in Comoros, Madagascar, Mauritius and Seychelles – estimated at USD 3.2 billion over the same period. Table 1 below provides the number of hazardous events and related impacts per country<sup>3</sup>. These are expected to increase in the context of climate change. The IPCC AR5 (2014) indicates with high confidence that current and future climate-related drivers of risks for small islands – including Comoros, Mauritius and Seychelles – during the 21<sup>st</sup> century include sea level rise, tropical and extratropical cyclones, increasing air and sea surface temperatures, and changing rainfall patterns<sup>4</sup>. Likewise, climate change in Madagascar induces more frequent droughts and floods, sea level rise and increasing temperature, which also have increasing impacts on livelihood, food security, economic development and infrastructure<sup>5</sup>.

**Table 1. Number of disasters and related impacts in the SWIO region per country, from 1950 to June 2020<sup>4</sup>**

Country	Number of Disasters	Affected Population (including depths)	Damages (million USD)
Comoros	12	538,384 (64%)	48
Madagascar	76	16,640,305 (62%)	2,343
Mauritius	21	1,059,426 (81%)	803
Seychelles	5	15,477 (16%)	11
Total (4 countries)	113	18,253,592 (62%)	3,206

Despite a long tradition of coping with weather, climate, and hydrological variability, and extreme events, countries in the SWIO region continue to face serious challenges in managing the risk of disasters. The baseline status of the NMHSs with respect to climate services implementation is detailed in the FS (Annex 2, Chapter 3), and summarized in Table 2 below, according to the GFCS categorization<sup>6</sup>. Noting that, in general, Comoros and Madagascar have low capacity not even being at the “Basic” level, and Mauritius and Seychelles being at the “Basic” level, there is a need to shift the paradigm towards improved weather, climate, and hydrological services (“Hydromet services”) in the SWIO region to increase weather and climate resilience. The proposed project will support this paradigm shift in the target region where the Hydromet value chain<sup>7</sup> is not well developed and the National Meteorological and Hydrological Services (NMHSs) are facing serious challenges in responding to increasing societal and economic demands, in particular as climate-

<sup>1</sup> [http://www3.weforum.org/docs/WEF\\_Global\\_Risks\\_Report\\_2019.pdf](http://www3.weforum.org/docs/WEF_Global_Risks_Report_2019.pdf)

<sup>2</sup> <https://www.qfdr.org/en/power-of-partnership>

<sup>3</sup> EM-DAT: The Emergency Events Database—Université catholique de Louvain (UCL), CRED, D. Guha-Sapir—www.emdat.be, Brussels, Belgium.

<sup>4</sup> WGI AR5 Chapter 14; Table 29-1

<sup>5</sup> <https://www.worldbank.org/en/news/feature/2015/12/04/building-madagascars-climate-resiliency-to-ensure-food-security-and-preserve-livelihoods>

<sup>6</sup> [https://www.wmo.int/pages/prog/wcp/ccl/mg/mgcl17/documents/CCI-MG-1-2018\\_Item3\\_Checklist\\_Climate\\_Services\\_Implementation.pdf](https://www.wmo.int/pages/prog/wcp/ccl/mg/mgcl17/documents/CCI-MG-1-2018_Item3_Checklist_Climate_Services_Implementation.pdf)

<sup>7</sup> [https://library.wmo.int/doc\\_num.php?explnum\\_id=3314](https://library.wmo.int/doc_num.php?explnum_id=3314)

induced risks and impacts shift with climate change. In particular, the proposed Hydromet project will raise the capacity of the NMHSs of Comoros, Madagascar, Mauritius and Seychelles to a higher category (see Table 2 below) in all GFCS components, with significant investments in three major components, namely “observations and monitoring”; “climate services information system”; and “user interface platform”.

**Table 2. GFCS categorization for the baseline status and after the proposed Hydromet project interventions<sup>7</sup>**

GFCS Component	Comoros		Madagascar		Mauritius		Seychelles	
	Baseline	Hydromet project	Baseline	Hydromet project	Baseline	Hydromet project	Baseline	Hydromet project
Observations and Monitoring	1	2	1	2	1	4	1	4
Research, Modelling and Predictions	< 1	1	< 1	1	< 1	2	< 1	2
Climate Services Information System	< 1	3	< 1	3	1	4	1	4
User Interface Platform	< 1	4	< 1	4	2	4	2	4
Capacity Development	< 1	1	< 1	1	1	2	1	2

Note: GFCS Categorization: < 1 – Lower than Basic (partially achieved); 1 – Basic; 2 – Essential; 3 – Full; and 4 – Advanced.

Specifically, the project will support the production of high-quality (i.e. more accurate, increased lead time, location-specific and user-tailored) impact-based climate-related products and services (CP-CS), including early warning systems (EWS), at the regional and national levels. This will be possible through both (1) the use of recent scientific and technological developments, including innovative and cost-effective solutions to ensure sustainability (e.g. by using products from advanced centers at very high-resolution<sup>8</sup> (e.g. as those generated within the framework of the Copernicus programme<sup>9</sup>), and downscaling and calibrating them to the target countries exploiting newly developments such as artificial intelligence<sup>10</sup> in combination with the expanded surface observation network); and (2) jointly developing target CP-CS with specific user groups.

CP-CS, like EWS, support the reduction of climate-induced risks and vulnerability by equipping decision-makers, climate-sensitive sectors and communities with essential information to prevent, mitigate and adapt to the impacts of climate extremes, climate variability and climate change. For example, the latest IPCC report (SROCC 2019<sup>11</sup>) indicates with high confidence that EWS are often low cost and highly cost-efficient when it comes to coastal zones and tackling sea level rise. However, CP-CS in Africa are not well developed and the wider region “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”<sup>12</sup>. In particular, the Hydromet project will support the implementation of an optimum composite surface observation network and associated ICT systems for the SWIO region aligned with the Global Basic Observing Network (GBON) requirements, which defines a minimal set of surface land-based and upper-air observing stations<sup>13</sup> for which international exchange of observational data is mandatory in support of global Numerical Weather Prediction (NWP) and climate analysis that will translate in improved climate services for everyone. Initial support (equality distributed to the four target countries) will be provided by the proposed project for the implementation of this optimum composite surface observation network and associated ICT systems; however, this support will not be sufficient to cover all investments required, especially for a large country with multiple climatic zones like Madagascar; therefore, a O&M Plan (see Annex 21) has been developed for leveraging funds, *inter alia*, from the newly GBON Systematic Observations Financing Facility (SOFF) to complement and support O&M beyond the lifetime of the project.

The proposed Hydromet project will also have a strong component related to service delivery and engagement with users/stakeholders and end-users, including last mile communities, to ensure that users (including the DRM institutions)

<sup>8</sup> <https://www.ecmwf.int/en/about/media-centre/science-blog/2020/baseline-global-weather-and-climate-simulations-1-km?fbclid=IwAR0AV9mKH1gIIxYToXYGgPko5RtXmd8mDiu2ErKCQzUU30pAEzfEDSNfnMQ>

<sup>9</sup> <https://climate.copernicus.eu>

<sup>10</sup> <https://journals.ametsoc.org/bams/article/98/10/2073/70032/Using-Artificial-Intelligence-to-Improve-Real-Time>

<sup>11</sup> <https://www.ipcc.ch/srocc/>

<sup>12</sup> <https://www.worldbank.org/en/region/afr/brief/hydromet-in-africa>

<sup>13</sup> GBON expected obligations: Surface land-based observations – WMO Members must operate surface land observing stations measuring atmospheric pressure, air temperature, humidity, horizontal wind, precipitation and snow depth, at a horizontal resolution of 200 km or better, and data must be reported hourly; Upper air stations – WMO Members must operate a set of upper air stations over land that observe temperature, humidity and horizontal wind profiles, with a vertical resolution of 100 m or higher, twice a day or better, up to a level of 30 hPa or higher, with a horizontal resolution of 500 km or better.

work closely with the NMHSs in the development, testing and validation of the multi-hazard impact-based forecasts and early warning services (MH-IBF-EWS), so that the MH-IBF-EWS are available and accessible in a more meaningful and actionable manner. This would include the establishment of a web-based knowledge and decision support system wherein color-coded risk-based warnings (regional “meteoalarm”<sup>14</sup> / “vigilance”<sup>15,16</sup>-type platform that would also contribute to the WMO Global Multi-hazard Alert System – GMAS<sup>17</sup>) can underpin early actions at the regional, national and district levels.

The proposed Hydromet project is primarily focused on preparedness; hence designed to bolster climate resilience among communities by reinforcing NMHSs, through strengthening national and regional institutional frameworks, fostering regional cooperation and expanding climate knowledge sharing. In addition, the proposed project will support improving national and local capacities in implementing a people-centered MH-IBF-EWS through coordination and collaboration with PIROI (the Indian Ocean Regional Intervention Platform, who has confirmed its full support to the implementation of the project, backed by IFRC)<sup>18</sup> and its national counterparts (i.e. national Red Cross and Red Crescent in each country) for piloting the development, testing, and validation of the MH-IBF-EWS in pilot sites in each country, which will then be expanded and rolled out nationwide using scenarios, and through the dissemination of knowledge products and outreach materials with the assistance of NGOs, in order to reach the leaders of the communities in the four countries.

The regional approach is key to underpin improvements in the production and dissemination of CP-CS, as the four target countries are vulnerable to similar climate-related hazards and face identical problems, challenges and needs – not leaving anybody behind. As shown in Table 2, proposed project investments would close the gap between the NMHSs of Comoros and Madagascar, and the NMHSs of Mauritius and Seychelles, by sharing expertise and tools to reach a similar level. This regional approach would ensure robust interoperability, efficiencies, and optimization of infrastructure costs, together with a higher level of harmonization, integration, and complementarity within the region. Table 5 (see section B1. below) provides an intercomparison between current and proposed technologies/interventions (a few examples) that would provide increased benefits from taking a regional approach. The proposed interventions/technologies follow the WMO Guidelines on Emerging Data Issues (WMO-No. 1239)<sup>19</sup>.

Given the current and expected future impacts of climate-related hazards on countries in the SWIO region, the Indian Ocean Commission (IOC) has a critical role in fostering and boosting up this approach, as it is the unique regional institution covering Comoros, Madagascar, Mauritius and Seychelles, to enable enhanced regional cooperation and knowledge sharing among these countries, with a view to reduce climate-related vulnerability. The IOC launched the design process of the proposed Hydromet project through various consultations with the beneficiary countries to define the project’s outline, and to validate all project interventions with relevant national stakeholders. The project will deliver:

- **Enhanced institutional capacities and regional cooperation to produce high-quality CP-CS, and will explore the public-private engagement:** both national and regional improvements will be achieved through appropriate frameworks and enabling environments. Regional and National Frameworks for Climate Services (R/NFCS) will be developed. A Regional Climate Centre Network (RCC-Network) strategy, alongside with an operating and action plan for implementation with definition of roles, responsibilities and functions, will be defined by the IOC and its member states; whose operationalization will be done through building the capacity of each RCC-Network node (i.e. each NMHS in the SWIO region) in their particular functions, which will be demonstrated and tested throughout a period prior to the submission to WMO for official designation as part of the WMO Global Data-processing and Forecasting System (GDPFS)<sup>20</sup>. The establishment of the RCC-Network will support synergies, complementarities, regional integration and cost-efficiency gains in the production of CP-CS in the SWIO region. At the same time, the RCC-Network strategy will also include business plans for the engagement of the relevant private sectors in the SWIO region (e.g., shipping, large scale fisheries, insurance,

<sup>14</sup> <http://www.meteoalarm.eu>

<sup>15</sup> <https://vigilance.meteofrance.fr/fr>

<sup>16</sup> <http://www.meteofrance.re/vigilance-reunion>

<sup>17</sup> <https://www.wmo.int/gmas/>

<sup>18</sup> <https://piroi.croix-rouge.fr/?lang=en>

<sup>19</sup> [https://library.wmo.int/doc\\_num.php?explnum\\_id=10124](https://library.wmo.int/doc_num.php?explnum_id=10124)

<sup>20</sup> <https://public.wmo.int/en/programmes/global-data-processing-and-forecasting-system>

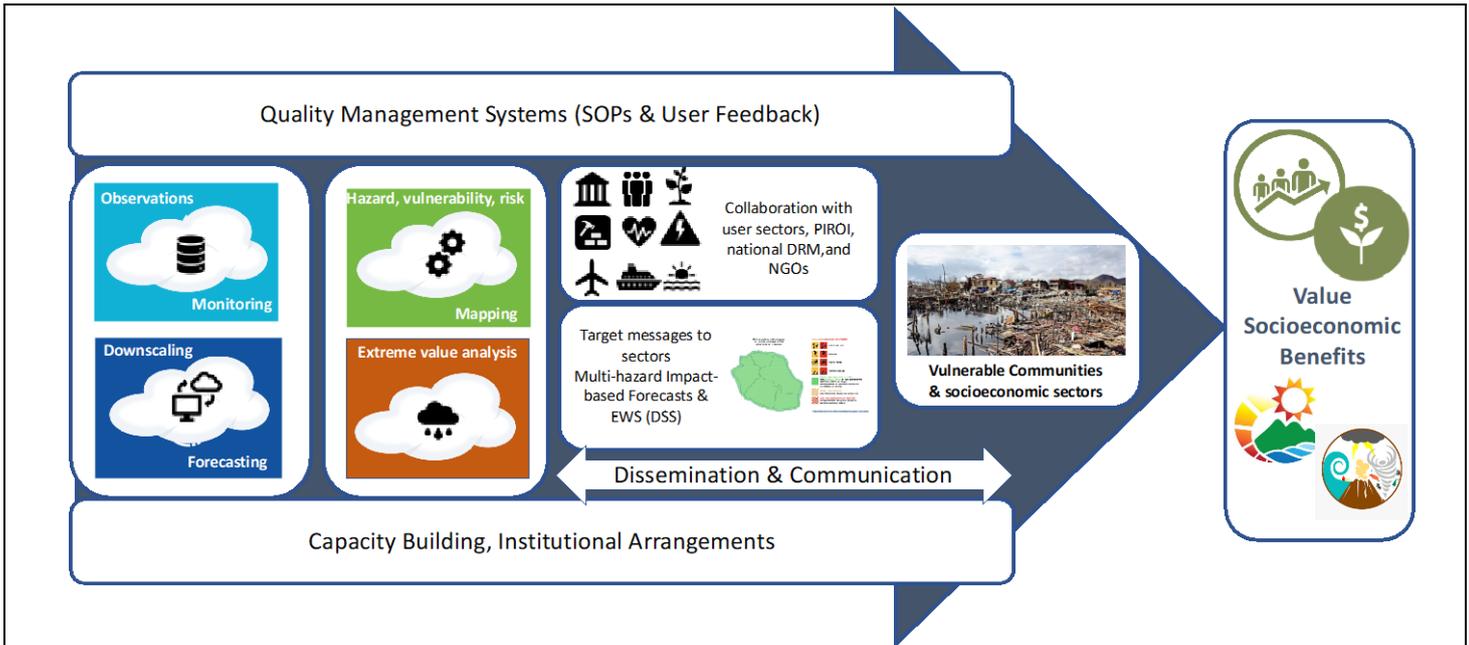
tourism, etc.), developed based on market surveys in target countries. These business plans will be implemented through consultations and engagement with the private sectors for presentation and trial the use of the newly developed CP-CS with the intention of developing and employing new business models for cost recovery that would support investments in the climate information and early warning services (CIEWS). This will enable improved forecasting of climate-related hazards, and enhanced risk and climate change impact assessments and management at regional and national levels. At the national level, NMHSs' staff will receive core trainings in climate risk management; the operational structure and financial efficiency of their institutions will be enhanced. As part of improving national institutional capacities, two main activities will be put in place: (1) the development and implementation of capacity development plans and career paths for retaining the trained and talent staff; and (2) the revision of the hydromet laws to define roles and responsibilities of public and private sectors, as well as the establishment of Trust Funds (hereafter referred to Climate Information and Early Warning System (CIEWS) Funds) to support O&M (see Annex 21 for the O&M Plan and Annex 2C for the description of the CIEWS).

- **High-quality climate-related data, improved multi-hazard impact-based forecasts and EWS, and climate risk assessments:** the technical expertise of NMHSs' staff on observations and monitoring, data management, ICT, modelling, and weather forecasting and climate prediction will be enhanced through a "learning by doing" process, including training, experience and exposure. Moreover, hydro-meteorological data collection infrastructure, management and information systems will be modernised, with a view to improve climate-related prediction and risk assessment among the four target countries – this will be done through data integration and establishment of data centers at regional and national levels (exploring/evaluating physical and cloud-service solutions). Quality Management Principles will be introduced following the WMO Guidelines on Quality Management in Climate Services<sup>21</sup>, so that well-established standardized processes are in place. Training and capacity building to downscale climate change projections in each country will be implemented to enhance understanding of climate change impacts on development processes and key economic sectors for the four target countries. Given the countries' exposure to floods, specific training in hydrology will be provided; likewise, given the significance of agriculture, fisheries and tourism sectors for the four target countries, training to provide specific user-centered impact-based weather advisories for these sectors will be provided. Multi-hazard impact-based forecasting and early warning system/services capability<sup>22</sup> will be built through shifting from deterministic to probabilistic forecast techniques that highlight not only the most likely impact, but also reasonable worst-case scenarios, which are often the cause of avoidable disasters. Extreme value analysis will be done for establishing threshold values that will cause flooding and other climate-related hazards. By working with the DRM authorities and the various sectors, (1) undertake risk analysis incorporating hazard, exposure and vulnerability, and assess potential impacts from extreme weather- and climate-related events by making use of the risk matrix; and (2) develop target messages to sector-specific. Improved climate-related data quality, and increased their variety and frequency will enable downscaling and calibration, thus more accurate hydro-meteorological forecasts and warnings, as well as climate change impact assessments on key sectors through the production of hazard and vulnerability maps thus supporting climate change adaptation planning.

Figure 1 – Diagram with the various elements supported by the proposed project in the "hydromet value chain"

<sup>21</sup> [https://library.wmo.int/doc\\_num.php?explnum\\_id=5174](https://library.wmo.int/doc_num.php?explnum_id=5174)

<sup>22</sup> <https://public.wmo.int/en/resources/world-meteorological-day/wmd-2018/multi-hazard>



- **Enhanced accessibility and use of climate services for climate change adaptation, and improved capabilities implementing a people-centered MH-IBF-EWS for disaster risk reduction:** CP-CS – including daily weather forecasts and EWS, downscaled agrometeorological advisories, and risk management and climate change adaptation plans– will be co-developed, based on the enhanced expertise and high-quality data supported by the project, and in a participatory way between producers and users of CP-CS. These services will especially target key sectors underpinning the economy of the four target countries, namely agriculture, fisheries and tourism. These sectors are highly vulnerable to climate change impacts, but key to support the livelihoods of the vast majority of the population in the SWIO region. Producers and users of climate services will work together to develop high-quality products to ensure they are packaged according to end-user needs and use the most efficient channels for dissemination to end-users. User feedback mechanism will be put in place to improve communication processes and support product development. A web-based knowledge and decision support system with multi-hazard impact-based forecasts and color-coded risk-based warnings (regional “meteoalarm”<sup>23</sup> / “vigilance”<sup>24,25</sup>-type platform that would also contribute to the WMO Global Multi-hazard Alert System – GMAS<sup>26</sup>) will be jointly develop with stakeholders to support early actions by the regional, national and local DRM authorities. Regional, national and local capacities in implementing a people-centered MH-IBF-EWS will be improved through coordination and collaboration with PIROI (the Indian Ocean Regional Intervention Platform)<sup>27</sup> and its national counterparts (i.e. national Rec Cross and Red Crescent in each country) for piloting the development, testing, and validation of the MH-IBF-EWS in pilot sites in each country, which will then be expanded and rolled out nationwide using scenarios, and through the dissemination of knowledge products and outreach materials with the assistance of NGOs, in order to reach the leaders of the communities in the four countries. Collaboration and collaboration will also be in place to follow PIROI’s plans, in coordination with the German Red Cross and the IFRC, for the implementation of the Forecast-based Action / Financing (FbA/FbF) models in the SWIO region, in order to align the science-based developments supported by the proposed Hydromet project.

Noting that DRM institutions in the SWIO region have been benefiting from the support of the Indian Ocean Regional Intervention Platform (PIROI), the weakest link in EWS in the SWIO region lies in the ability to detect, monitor, forecast,

<sup>23</sup> <http://www.meteoalarm.eu>

<sup>24</sup> <https://vigilance.meteofrance.fr/fr>

<sup>25</sup> <http://www.meteofrance.re/vigilance-reunion>

<sup>26</sup> <https://www.wmo.int/gmas/>

<sup>27</sup> <https://piroi.croix-rouge.fr/?lang=en>

and generate and disseminate meaningful and actionable warnings (see Annex 2 – FS, for further details on the SWOT analysis and case studies). Hence, the proposed Hydromet interventions have been designed to support a cost-effective and locally-appropriate modernisation of NMHSs, including infrastructure, tools and services; as well as the uptake of improved CP-CS products and services, including MH-IBF-EWS, by users/stakeholders (e.g. DRM authorities and relevant socioeconomic sectors) and end-users, including local communities. Through coordination and collaboration with PIROI and national counterparts, Standard Operating Procedures (SOPs) and early action protocols will need to be developed and/or revised accordingly for each hazard at certain impact levels. Key sectors have been selected based on in-country consultations (namely, agriculture, fisheries and tourism), and relevance in terms of reducing vulnerability to climate change. Engagement with the private sector (e.g., shipping, large scale fisheries, insurance, tourism, etc.) will be sought for exploring the establishment of a ring-fenced CIEWS funding mechanism at regional and national levels for sustainability of the investments beyond the lifetime of the project. Climate change impacts will be mainstreamed into CP-CS not only to reduce impacts of climate-related risks, but also to ensure enhanced climate change resilience of 67% the total population in Comoros, Madagascar, Mauritius and Seychelles. The proposed project will also enable sustained economic growth in key sectors. Through sector-target interventions, 67%<sup>28</sup> of the population in the four countries (about 19,354 million people) will benefit directly from the project.

The executing entity (EE) will be the Indian Ocean Commission (IOC), which will manage the project in close collaboration with AFD, the accredited entity (AE). The IOC will support four National Project Coordinators (NPCs) based in the NMHSs of Comoros, Madagascar, Mauritius and Seychelles. PIROI and its national counterparts and their network of NGOs will serve as partners in the development, testing, and validation of the MH-IBF-EWS, as well as in the dissemination of knowledge products and outreach materials in order to reach the leaders of the communities in the four countries. The government of these four countries, as well as users and end-users of CP-CS such as sectoral ministries, private sector and local communities, have been consulted during the process of preparing this proposal.

The project was endorsed at the political level by the IOC council of ministries; is well aligned, and supports several policies and strategies currently implemented at IOC level and in the four countries, especially their NDCs. The Hydromet project follows the WMO technical regulations<sup>29</sup> that define the standards, and is aligned with the GFCS<sup>30</sup>, and the World Hydrological Cycle Observing System<sup>31</sup> (WHYCOS). Finally, the project is fully compliant with the Global Alliance for Hydromet<sup>32</sup> (GAH) endorsed by the GCF during COP25, and thus aim to be one of the pioneer projects to be implemented under this new initiative. The Hydromet project is designed to enable Sendai Framework<sup>33</sup> targets for Disaster Risk Reduction (SF-DRR) and to support risk informed sustainable development.

The project will scale up current initiatives and national ongoing projects financed by climate facilities, development partners and implemented by beneficiary countries. AFD, with the support of IOC and NMHSs/NDAs, will take the necessary steps to ensure coordination and leadership with development partners to integrate and build synergies with current and future initiatives and projects on hydromet services and disaster risk reduction at national and regional levels.

The cost of GCF Hydromet Project will amount to **USD71,386,086 million** comprised of **USD 52,767,986 million** applied from the GCF, **USD 5,504 million** in co-financing contributions by French Development Agency( AFD); **USD 6,172 million** from EU Intra APC Climate Services Program and **USD 6,941 million** from beneficiary countries contributions.

---

<sup>28</sup> Refer to Feasibility Study Annexes for the beneficiary calculations

<sup>29</sup> WMO-No. 49, WMO Technical Regulations, <https://public.wmo.int/en/resources/standards-technical-regulations#standards>

<sup>30</sup> <https://gfcs.wmo.int/what-are-climate-services>

<sup>31</sup> <https://hydrohub.wmo.int/en/world-hydrological-cycle-observing-system-whykos>

<sup>32</sup> <https://public.wmo.int/en/media/press-release/alliance-hydromet-development-launched>

<sup>33</sup> <https://www.undrr.org/implementing-sendai-framework/what-sf>

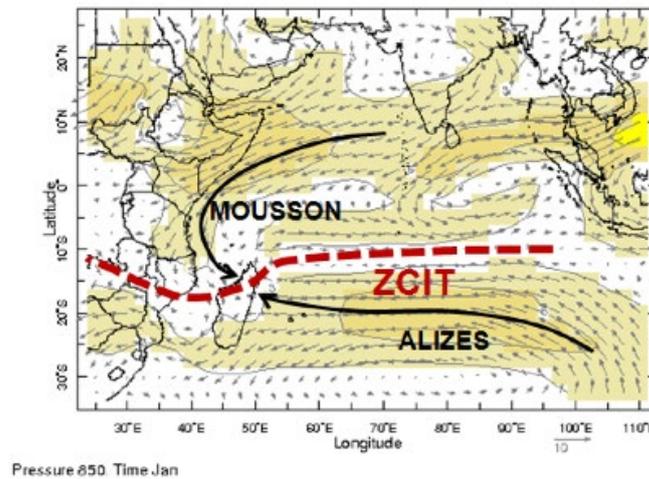
## B. PROJECT/PROGRAMME INFORMATION

### B.1. Climate context (max. 1000 words, approximately 2 pages)

#### 1- Regional climate overview

The regional climate of the South-west Indian Ocean (SWIO) is influenced by the following atmospheric features: (a) the Inter Tropical Convergence Zone (ITCZ), responsible for the convergence of the Monsoon and trade winds (privileged zone for cyclone genesis, and convective precipitations), (b) sub-tropical Highs, responsible for the trade winds; and (c) the high level jets (i.e. the subtropical western jet and the near tropical eastern jet)<sup>34</sup> (Figure 2). SWIO regional climate in terms of season is mainly driven by the Monsoon annual cycle. These features represent expansive bands of large-scale wind convergence and high rainfall, which strongly influence intra-annual and inter-annual variability in rainfall, winds, and tropical cyclone tracks. The interplay between these climate drivers causes dramatic changes in weather in the SWIO countries, most obviously during El Niño and La Niña events, and their connection with the Indian Ocean Dipole (IOD)<sup>37</sup>.

Figure 2 – SWIO atmospheric features.<sup>37</sup>



#### State of the climate

Vincent et al (2011)<sup>35</sup> produced an analysis of climate trends for the countries of the SWIO (i.e. the four target countries – Comoros, Madagascar, Mauritius and Seychelles – plus La Réunion), including those targeted in this proposed Hydromet project. The analysis of the temperature and precipitation indices for 1961-2008 reveals some consistent changes in means and extremes during these 48 years in the countries of the western Indian Ocean. However, observed changes in temperature indices have a better spatial coherence than in precipitation indices, and this is mainly due to higher spatial and temporal variability in precipitation as compared to temperature. Table 3 presents the regional trends per decade for 1961–2008 and 1975–2008 for each of the chosen indices.

#### Temperature

Warming is observed in the SWIO countries. Regional average series indicate significant trends of 0.19 and 0.21°C per decade from 1961 to 2008 for TXMean and TNMean, respectively (Table 3), and the regional series show a gradual increase for these 48 years (Figure 3). At a majority of the stations, an increase of 0.15 to 0.25°C per decade is observed over 1961–2008 in their daytime and night-time temperatures and trends are significant at most stations (Figure 4). No spatial coherent change is observed in the diurnal temperature range (Figure 4); the regional average series suggests a small and insignificant decrease of 0.03°C per decade for these 48 years (Table 3 and Figure 4). The results for 1975–2008 are very similar for these three temperature indices.

<sup>34</sup> [https://gfcs.wmo.int/sites/default/files/MF-DIROI\\_ClimateDrivers\\_SWIO.pdf](https://gfcs.wmo.int/sites/default/files/MF-DIROI_ClimateDrivers_SWIO.pdf)

<sup>35</sup> <https://agupubs.onlinelibrary.wiley.com/doi/pdf/10.1029/2010JD015303>

Summer days (SU25) and tropical nights (TR20) occur very often in the SWIO. Regional trends suggest 4.72 more summer days and 5.14 more tropical nights per decade for 1961–2008, but less pronounced over 1975–2008 (Table 3).

Table 3. Trends per Decade for the SWIO<sup>38</sup> (values for trends significant at the 5% level are shown in boldface)

Element	Index	1961–2008	1975–2008	Unit
Temperature	TXMean	<b>0.19</b>	<b>0.17</b>	°C
	TNMean	<b>0.21</b>	<b>0.20</b>	°C
	DTR	-0.03	-0.04	°C
	SU25	<b>4.72</b>	<b>3.20</b>	days
	TR20	<b>5.14</b>	<b>4.32</b>	days
	TX90P	<b>3.75</b>	<b>5.37</b>	%
	TX10P	-1.28	-0.44	%
	TN90P	<b>3.83</b>	<b>5.65</b>	%
	TN10P	-1.03	-0.12	%
	TXx	<b>0.23</b>	<b>0.33</b>	°C
	TXn	<b>0.09</b>	0.05	°C
	TNx	<b>0.21</b>	<b>0.28</b>	°C
	TNn	<b>0.25</b>	0.17	°C
Precipitation	PRCPTOT	-2.63	-0.20	%
	SDII	-0.09	-0.01	mm
	CDD	1.94	-0.48	days
	CWD	0.04	0.09	days
	R10mm	-1.22	-0.63	days
	R20mm	-0.75	-0.40	days
	RX1day	-1.77	-1.26	%
	RX5day	-1.22	1.31	%

Figure 3 – Regional average of station’s anomalies for TXMean, TNMean and DTR. The linear trend for 1961-2008 is represented by the dashed line.<sup>38</sup>

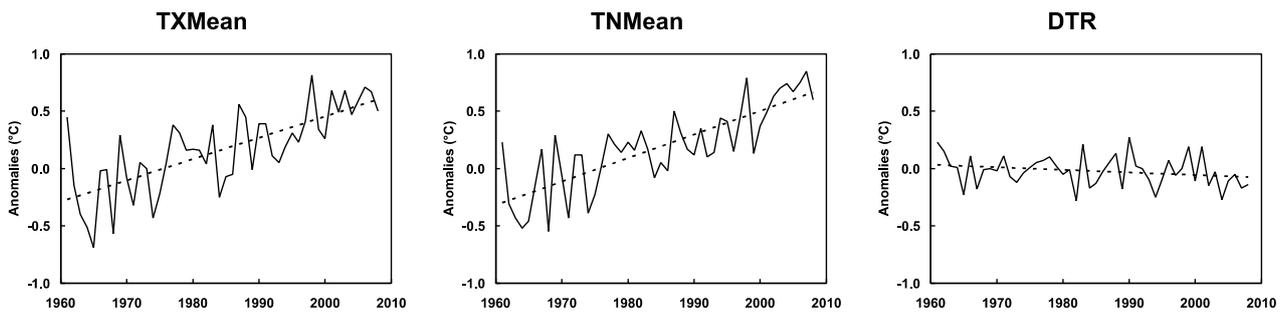
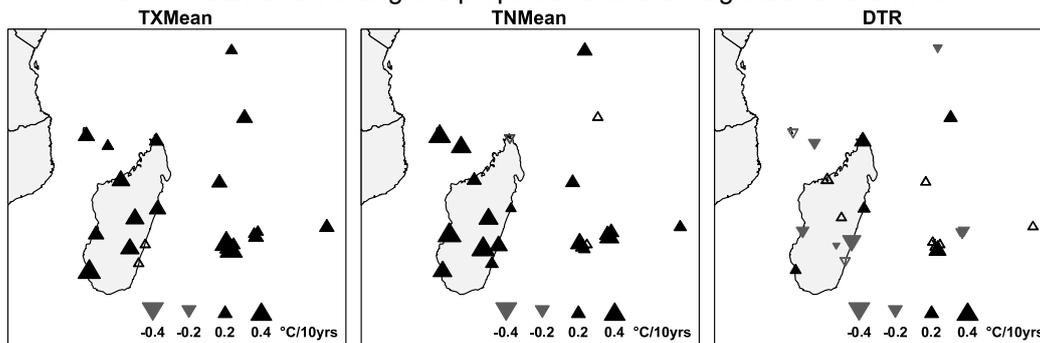


Figure 4 – Trends in TXMean, TNMean, and DTR for 1961–2008. Upward (black) and downward (grey) pointing triangles indicate positive and negative trends, respectively. Solid triangles correspond to trends significant at the 5% level. The size of the triangle is proportional to the magnitude of the trend.<sup>38</sup>



As for the extreme temperatures, changes are spatially coherent across the region, even though changes are more significant in the extreme highs than the extreme lows.

The regional average series indicate that the warm days (TX90P) and warm nights (TN90P) have significantly increased by 3.75 and 3.83% per decade, respectively (Table 3 and Figure 5). Significant increasing trends ranging from 2 to 6% were also found at most stations (Figure 6). Observed changes in cold extremes are smaller than in warm extremes; with an insignificant decrease of 1.28% per decade in the percentage of cold days (TX10P) while a significant decrease of 1.03% per decade is found in the percentage of cold nights (TN10P) (Table 3 and Figure 5). Most stations show a coherent pattern of decreasing trends ranging from -1 to -3% per decade (Figure 6). The analysis of the annual highest and lowest daily maximum and minimum temperatures confirm the previous results. The regional average series suggest significant increases of 0.23 and 0.21°C per decade in the annual high maximum (TXx) and minimum (TNx) temperatures, respectively, while significant increases of 0.09 and 0.25°C per decade are observed in the annual low maximum (TXn) and minimum (TNn) temperatures.

Figure 5 – Regional average of the station’s anomalies for TX10P, TX90P, TN10P, and TN90P. The linear trend for 1961–2008 is represented as a dashed line.<sup>38</sup>

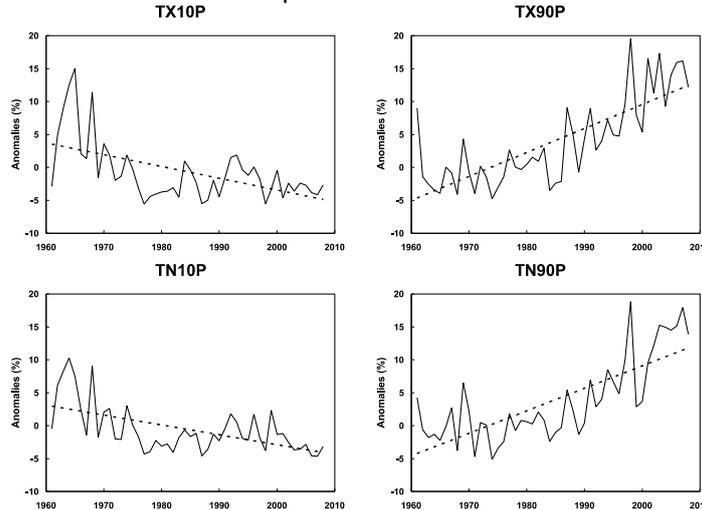
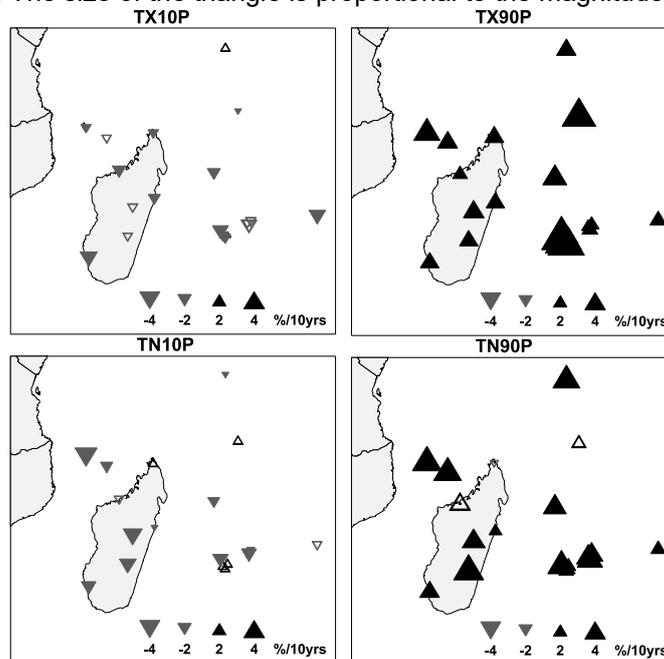
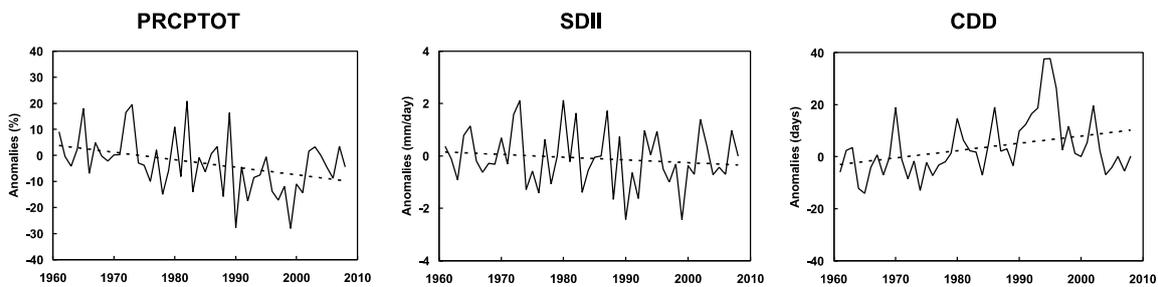


Figure 6 – Trends in TX10P, TX90P, TN10P, and TN90P for 1961–2008. Upward (black) and downward (grey) pointing triangles indicate positive and negative trends, respectively. Solid triangles correspond to trends significant at the 5% level. The size of the triangle is proportional to the magnitude of the trend.<sup>38</sup>



The results for the precipitation indices show less evidence of changes and spatial agreement compared to the temperature indices. The regional average series indicate a significant decrease in the annual total precipitation amount (PRCPTOT) of 2.63% per decade (Table 3 and Figure 7). Most stations show decreasing trends ranging from -2 to -6% per decade (Figure 8). Some weak increasing trends were also found at some stations in Madagascar and Seychelles. The annual precipitation intensity (SDII) shows very little change with an insignificant regional trend of -0.09 mm per decade (Table 3 and Figure 7). Individual stations indicate either an insignificant positive or negative trend across the region (Figure 8). Consecutive dry days (CDD) have increased by 1.94 days per decade but the trend is not significant (Table 3 and Figure 7). Consecutive dry days have mainly increased over land primarily in Madagascar (Figure 8).

Figure 7 – Regional average of the station's anomalies for PRCPTOT, SDII, and CDD. Linear trend for 1961–2008 is represented in dashed line.<sup>38</sup>



Overall, the results show small and insignificant decreases in precipitation extremes. Regional average series indicates fewer days with rain above 10 and 20 mm (R10mm and R20mm); however, trends are not significant at the 5% level (Table 3 and Figure 9). Most individual stations show a decrease of 1 to 3 days in R10mm and R20mm and several significant decreasing trends are found across the region (Figure 10). A decrease is also observed in the regional series of the annual highest daily precipitation (RX1day) and the highest 5 consecutive days of precipitation (RX5day); however, these trends are not significant (Table 3 and Figure 9). Stations show both increasing and decreasing insignificant trends across the region although more decreasing trends are observed (Figure 10).

Figure 8 – Trends in PRCPTOT, SDII, and CDD for 1961–2008. Upward (black) and downward (grey) pointing triangles indicate positive and negative trends, respectively. Solid triangles correspond to trends significant at the 5% level. The size of the triangle is proportional to the magnitude of the trend.<sup>38</sup>

### Correlation with the Sea Surface Temperature (SST)

Vincent et al (2011)<sup>38</sup> also demonstrated that there is a correlation between the changes in temperature and precipitation indices and the SST, by comparing each regional averaged index with the SST of the area. Results are presented in Table 4. Sea surface temperatures for the western Indian Ocean show an increase of 0.12°C per decade over 1960–2009 (Figure 11).

Figure 9 – Regional average of the station's anomalies for R10mm, R20mm, RX1day, and RX5day. Linear trend for 1961–2008 is represented in dashed line.<sup>38</sup>

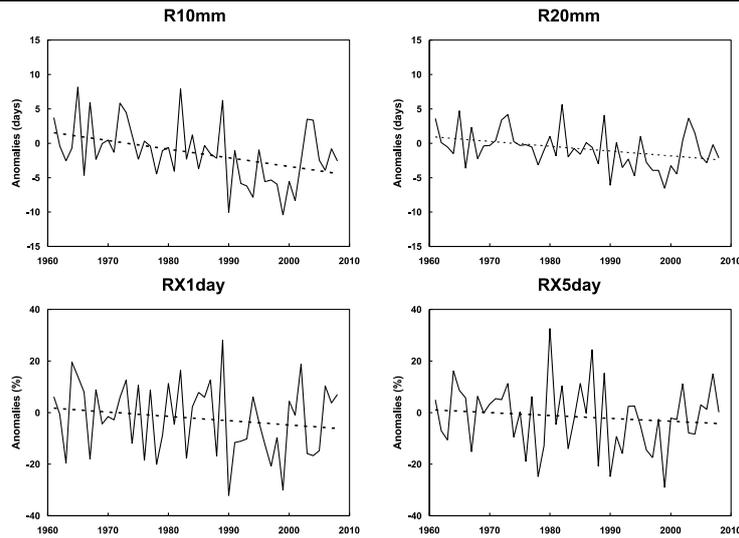


Figure 10 – Trends in R10mm, R20mm, RX1day, RX5day for 1961–2008. Upward (black) and downward (grey) pointing triangles indicate positive and negative trends, respectively. Solid triangles correspond to trends significant at the 5% level. The size of the triangle is proportional to the magnitude of the trend.<sup>38</sup>

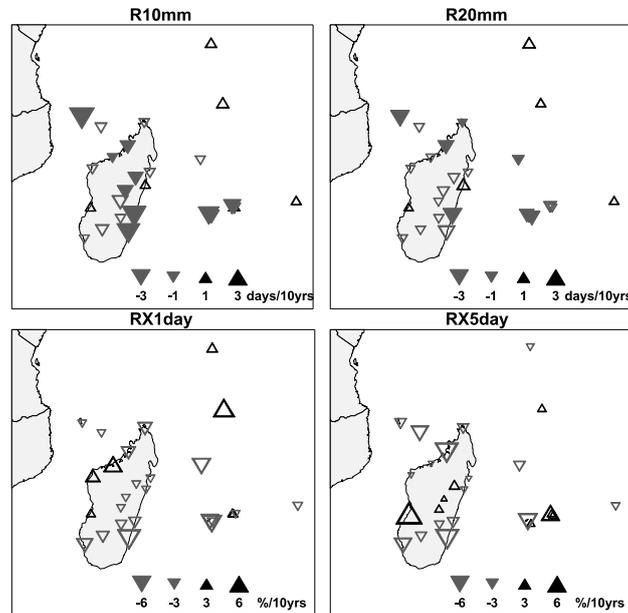


Figure 11 – Sea surface temperature monthly anomalies averaged for the grid points between 30°E and 70°E and between 40°S and the equator.<sup>38</sup>

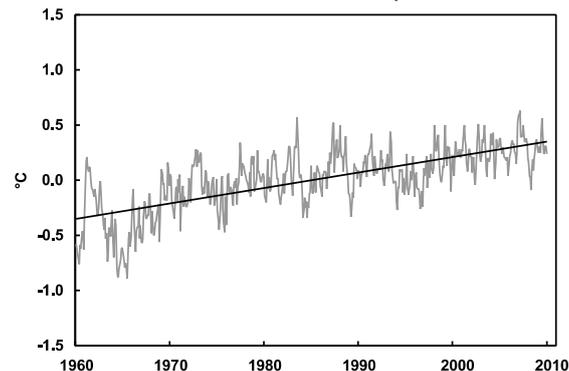


Table 4 shows that the annual mean of daily maximum and minimum temperature (TXMean and TNMean) and number of summer days and tropical nights (SU25 and TR20) are highly correlated with the annual average of SST

and correlation coefficients range from 0.85 to 0.87. The correlation between warm and cold extremes (TX90P, TX10P, TN90P and TN10P) and SST vary from 0.66 to 0.84 (cold extremes have negative correlations). The highest and lowest values of the year (TXx, TXn, TNx and TNn) have lower correlation with SST and their values range from 0.60 to 0.66. Coefficients of determination (values multiplied by 100 in Table 4) indicate that 75% of the total variation in TXMean is explained by SST. Table 4 also indicates that there is almost no evidence of linear association between precipitation indices and the annual SST.

Table 4. Correlation between each index and the regional average annual anomalies SST computed over the SWIO<sup>38</sup> (percentage of the total variability in each index accounted for by the relation between SST and the index )

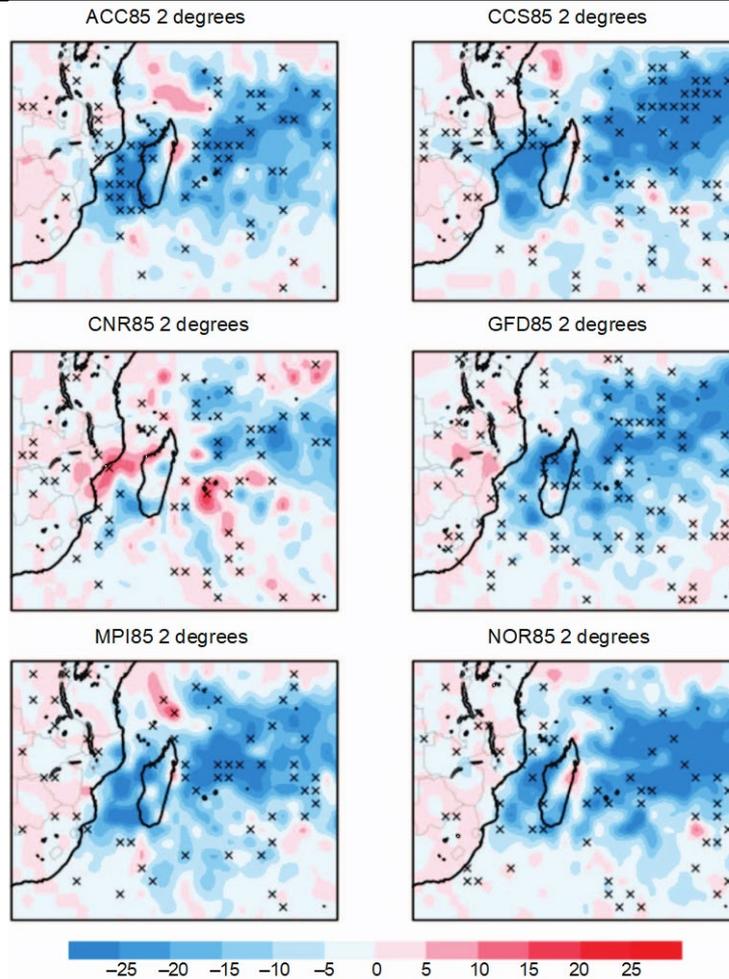
Element	Index	Correlation	Percent of Variability Explained by SST
Temperature	TXMean	0.87	75.0
	TNMean	0.85	71.8
	DTR	0.02	0.3
	SU25	0.86	73.5
	TR20	0.85	74.0
	TX90P	0.74	54.1
	TX10P	-0.84	70.2
	TN90P	0.66	43.0
	TN10P	-0.80	63.5
	TXx	0.66	43.5
	TXn	0.65	42.8
	TNx	0.60	35.5
	TNn	0.61	37.5
Precipitation	PRCPTOT	-0.25	6.4
	SDII	-0.05	0.3
	CDD	0.22	4.7
	CWD	0.03	0.1
	R10mm	-0.25	6.4
	R20mm	-0.18	3.4
	RX1day	-0.21	4.5
RX5day	-0.11	1.1	

### Projected changes in Tropical Cyclones over the SWIO

On average, the SWIO experiences nine tropical cyclones annually. Muthige et al (2018)<sup>36</sup> studied the potential changes in tropical cyclone tracks over the SWIO under different extents of global warming (1.5 °C, 2 °C and 3 °C of warming with respect to pre-industrial conditions), relative to the present-day baseline period of 1971–2000. Based on 6 model simulations (CORDEX) under the RCP8.5 scenario (a low mitigation future), it is projected that the number of tropical cyclones making landfalls over southern Africa under global warming will decrease, with 2 °C being a critical threshold, after which the rate of cyclone frequency with further temperature increases no longer has a diminishing effect. The lower tropical cyclone frequencies across the main tropical cyclone formation region of the SWIO is demonstrated (Figure 12) by larger and more intense negative anomalies associated with stronger global warming, in particular over the Mozambique Channel, and the north and northeast of Mauritius. While the downward trend in simulated tropical cyclone-like vortices is consistent, there is some spread among the models in their magnitude of projected change. Associated with the lower frequency of tropical cyclones simulated, there is also a decrease ranging between 25% and 50% in landfalls simulated.

Figure 12 – Simulated change in the frequency of tropical cyclone-like vortices per 2° grid point across six downscaling's under 2° C of global warming. The area where the changes are significant are indicated by crosses.<sup>39</sup>

<sup>36</sup> <https://iopscience.iop.org/article/10.1088/1748-9326/aabc60>



### Climate variability in the Indian Ocean

As shown above, there is a correlation between the SST and temperature and precipitation. Predicting changes in the pattern and magnitude of sea surface temperature (SST) fluctuations over the tropical oceans is critical for attributing changing climate variability and extreme weather. While considered a minor driver of climate variability as compared with the Pacific or the Atlantic oceans, the Indian Ocean is experiencing changes in its mean state that could favour stronger SST variations. These long-term changes appear to be forced by increasing greenhouse gas (GHG) concentrations; however, models are inconclusive on whether SST variability will increase or not.<sup>37</sup>

DiNezio et al (2020)<sup>38</sup> analyzed an ensemble of simulations of 21st-century climate performed by 36 models participating in the Coupled Model Intercomparison Project 5 (CMIP5). The simulations indicate that under greenhouse warming and Last Glacial Maximum (LGM) conditions<sup>39</sup>, the Indian Ocean can exhibit increased SST variability in the eastern Equatorial Indian Ocean (Figure 13, A and B). This pattern of intensification resembles modern variability in the other tropical oceans and represents a pronounced departure from current variability in the Indian Ocean, which is minimal along the equator (Figure 14).

<sup>37</sup> X.-T. Zheng, S.-P. Xie, G. A. Vecchi, Q. Liu, J. Hafner, Indian ocean dipole response to global warming: Analysis of ocean–atmospheric feedbacks in a coupled model. *J. Clim.* **23**, 1240–1253 (2010).

<sup>38</sup> <https://advances.sciencemag.org/content/advances/6/19/eaay7684.full.pdf>

<sup>39</sup> LGM - a past climatic interval ~21,000 years before present when the IO exhibited a similarly altered mean state featuring stronger upwelling and an eastward shoaling thermocline.

Figure 13, A and B – Simulated changes in the Indian Ocean climate variability and mean state under glacial conditions (A) and greenhouse warming (B) – SST variability.<sup>41</sup>

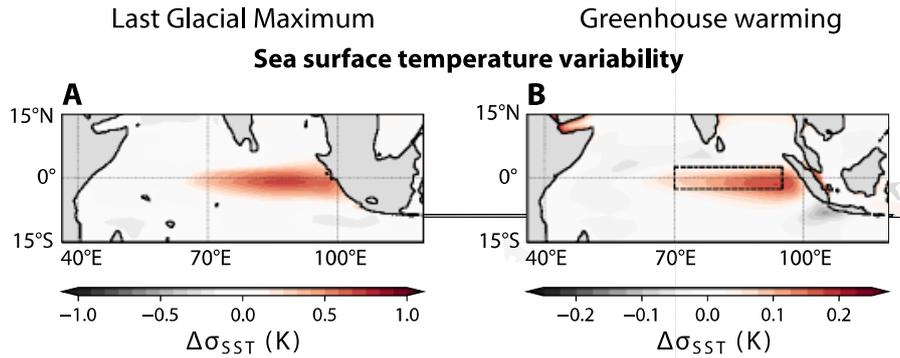
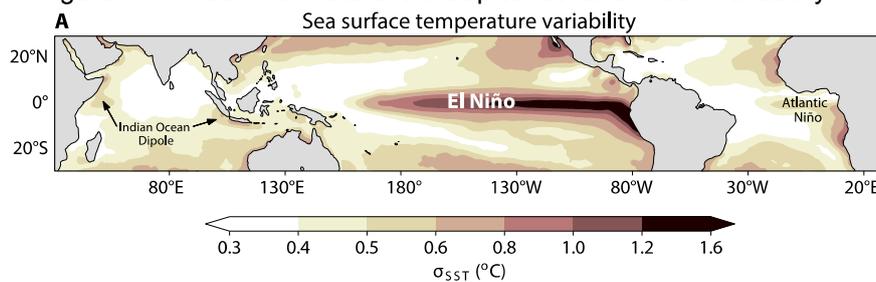


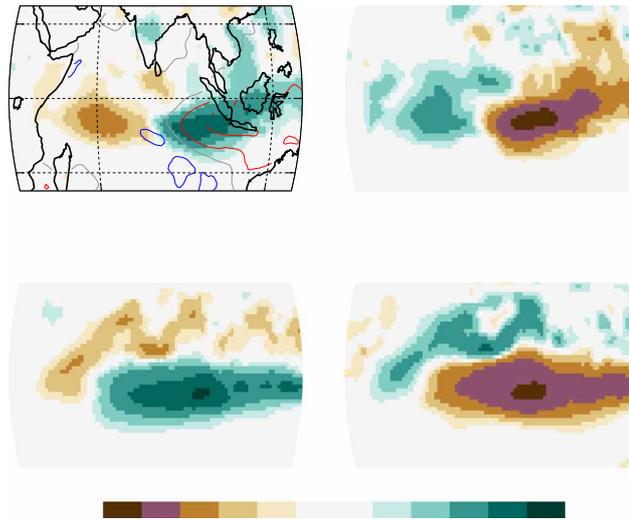
Figure 14 – Modern climate of the tropical oceans – SST variability.<sup>41</sup>



DiNezio et al (2020)<sup>41</sup> concludes that the emergence of the equatorial mode could drive rainfall variability with stronger amplitude and altered patterns over the Indian Ocean and surrounding land masses relative to currently experienced. Warm events, with their positive SST anomalies spanning much of the equatorial Indian Ocean, could drive rainfall deficits over the western Indian Ocean, in addition to increased rainfall over the eastern Indian Ocean (Figure 15C). Rainfall anomalies with such patterns and magnitudes have not been observed during the historical period because warm Indian Ocean Dipole (IOD) events are extremely weak and their rainfall impacts are restricted to the south-eastern Indian Ocean (Figure 15A). On the other hand, cold events associated with the equatorial mode could drive rainfall anomalies with a similar spatial pattern and magnitude as the warm events, but with opposite polarity and subtle, yet important differences for terrestrial precipitation (Figure 15D).

The emergence of the equatorial mode could make these high-amplitude SST anomalies a common occurrence by the second half of the 21st century when CMIP5 models predict two to four events (warm or cold) per decade (range was estimated from the subset of models with mode activation). Over the western Indian Ocean, the associated rainfall fluctuations could represent a surplus (or deficit) of current seasonal rainfall. Thus, predicting and attributing changing distributions of future extremes in a warming climate must consider these dynamical changes in rainfall variability alongside with thermodynamic effects.

Figure 15 – Modern climate of the tropical oceans – SST variability.<sup>41</sup>



## 2- Regional climate vulnerabilities and impacts

Comoros, Madagascar, Mauritius and Seychelles, located in the SWIO region, are extremely vulnerable to natural hazards and climate change<sup>40</sup>, especially tropical cyclones and heavy rainfalls, leading to floods, flash floods and landslides, droughts, increased temperatures, and sea level rise<sup>41</sup>. Tropical cyclones (TC) are the most frequent catastrophic hazards in the SWIO region and have been responsible for significant historical economic losses and casualties<sup>42</sup>. Three of SWIO countries - Comoros, Mauritius and Seychelles - are Small Island Developing States (SIDS) because of their own idiosyncratic vulnerabilities and characteristics, including 'their small size, remoteness, narrow resource and export base, and exposure to global environmental challenges and external economic shocks, including to a large range of impacts from climate change and potentially more frequent and intense natural disasters. Two - Comoros, Madagascar - are Least Developed Countries (LDCs), recognized as some of the most vulnerable countries in the world to climate change and the least able to recover from their impacts. Each year, Comoros, Madagascar, Mauritius and Seychelles face up collectively to USD 251.45 million losses due to natural hazards. According to the SWIO-RAFI analysis<sup>43</sup> (Table 3), in Comoros, a 100-year return period tropical cyclone event could produce direct losses of USD 43 million, equivalent to 75% of the 2014 GDP, and require approximately USD 9.9 million in emergency costs. In Madagascar, the study suggests that a 100-year return period tropical cyclone event could produce direct losses of USD 813 million, equivalent to 8% of the 2015 GDP, and require approximately USD 187 million in emergency costs. In Mauritius, the losses would be of USD 1.9 billion, equivalent to 16% of the 2015 GDP, and require approximately USD 430 million in emergency costs. Finally, in Seychelles, a 100-year return period could produce direct losses of USD 16 million, equivalent to 1% of the 2015 GDP, and require approximately USD 4.3 million in emergency costs. Related threats to livelihoods and economic growth in these island countries are increasing, exacerbating the baseline situation as detailed in Annex 2.

**Table 3. Average annual losses (all hazards) per country<sup>40</sup>**

	Comoros	Madagascar	Mauritius	Seychelles
--	---------	------------	-----------	------------

<sup>40</sup> World Bank, 2017. 'South West Indian – Risk RAFI <https://www.gfdr.org/sites/default/files/publication/116342-WP-PUBLIC-52p-SWIO-RAFI-Summary-Report-2017-Publish-Version.pdf>

<sup>41</sup> WGI AR5 Chapter 14; Table 29-1; Nematchoua *et al.* (2018). A detailed study of climate change and some vulnerabilities in the Indian Ocean: A case of Madagascar island. *Sustainable Cities and Society*, vol. 41, pp.886-898

<sup>42</sup> AIR Worldwide, South West Indian Ocean Risk Assessment and Financing Initiative (SWIO-RAFI), Final Report Submitted to the WBG,

<sup>43</sup> <https://www.gfdr.org/sites/default/files/publication/116342-WP-PUBLIC-52p-SWIO-RAFI-Summary-Report-2017-Publish-Version.pdf>

Average Annual Losses (all disasters) in US \$ (2017)	5,700,000	101,900,000	113,200,000	2,800,000
%GDP loss for a 100-year return period tropical cyclone	75% (2014 GDP)	8% (2015 GDP)	16% (2015 GDP)	1% (2015 GDP)

**Comoros** Comoros is a 2,235 km<sup>2</sup> group of islands, including Anjouan, *Grande Comore* and Moheli, with a total population of 872,000 in 2019<sup>44</sup>. Comoros is classified as a LDC by the World Bank<sup>45</sup> and a SIDS; approximately 45% of the Comorian population live below the poverty line<sup>46</sup>.

Comoros is very vulnerable to the impacts of climate change, due to an economy largely based on subsistence agriculture and fisheries. These two key economic sectors (see Annex 3a, Economic Analysis, for details) are already severely impacted by climate change and related hazards. Agriculture – which engages about 55% of the population – is highly dependent on the rainfall regime and therefore sensitive to changes in temperatures and rainfall patterns, more frequent extreme events and sea level rise. The impacts of climate-related hazards, including water stress, soil and coastal erosion, soil salinization, and flooding, particularly affect staple crops and cash crops. It should be noted that women in Comoros are particularly vulnerable to climate change as 67% of them are employed in the agricultural sector. Fisheries, which also play an important role in the country's food security is facing a modification and reduction of marine habitats, as well as the proliferation of toxic algae and the disappearance of nursery areas for marine wildlife, including corals and mangroves. Finally, fishermen are vulnerable to storms (including tropical cyclones), which threaten fishing trips and safety at sea, as well as boats and equipment.

### Madagascar

Madagascar is a 587,041 km<sup>2</sup> island with an estimated population of 27 million (as of 2019)<sup>47</sup>. Madagascar is classified as a least developed country by the World Bank<sup>48</sup>. 75% of Malagasy lived below the global poverty in 2018<sup>49</sup>. The population is predominantly rural, and agriculture is the main economic activity in Madagascar.

Climate change is particularly harmful to two key sectors for the country, agriculture and water management; in fact, climate-related hazards have already been threatening the country's food and water security. For example, the 2014 and 2015 cyclones devastated more than 40,000 hectares of rice fields, destroyed two water reservoirs and carried large volumes of sediment into the fields.

### Mauritius

The Republic of Mauritius is an island nation with an estimated population of 1.3 million in 2019<sup>50</sup>. Mauritius is considered an upper middle-income country<sup>51</sup>. The country has developed a mixed economy based on manufactured exports, agriculture, tourism, and financial services.

Climate change impacts on coastal development are a significant threat for the tourism industry, which accounts for 8% of GDP and 10% of total employment in 2017 and is one of the main drivers of the economy of the country.<sup>52</sup> The sector is seen as a driver for future economic development by the government. Most hotels and tourism infrastructure are located on the coastline, and thus directly exposed to coastal inundation, sea level rise, beach erosion and tropical cyclones. Sea-level rise and more frequent extreme events and heavy rainfalls will accelerate coastal erosion and cause increasing damages and losses of key infrastructure supporting tourism activities, including water reservoirs, overhead cables for electricity supply, roads, buildings and hotels. Agriculture, which also drives the economic development of Mauritius in particular through the sugar production<sup>53</sup>, is also sensitive to shifts in temperatures, rainfall patterns, and extreme events, like tropical cyclones. The resulting decrease in food-crop production could have serious impacts on nutrition and health in the country.

<sup>44</sup> IMF, [Union of the Comoros: At a Glance](#).

<sup>45</sup> World Bank, [Comoros Country Statistics CP-CS](#).

<sup>46</sup> <https://www.worldbank.org/en/country/comoros/publication/latest-report-on-poverty-in-the-comoros>

<sup>47</sup> IMF, [Republic of Madagascar: At a Glance](#).

<sup>48</sup> BBC, [Madagascar country profile](#).

<sup>49</sup> <https://www.worldbank.org/en/country/madagascar/overview>

<sup>50</sup> IMF, [Mauritius: At a Glance](#).

<sup>51</sup> OECD, [DAC List of ODA Recipients](#) and [History of DAC Lists of aid recipient countries](#).

<sup>52</sup> The total number of tourists visiting Mauritius in 2017 was 1 341 860 people and gross earnings from tourism are estimated to 60.2 billion Rs by the Bank of Mauritius (*Handbook of statistical data on tourism, 2017, according to Bank of Mauritius*)

<sup>53</sup> Encyclopaedia Britannica, [Mauritius: Economy](#).

## Seychelles

Seychelles is a 455 km<sup>2</sup>, 115-island archipelago, with an estimated population of 96,000 as of 2019.<sup>54</sup> In addition to its resident population, Seychelles hosts large numbers of visitors – over 300,000 in 2016<sup>55</sup>. With a 2018 GDP of USD 1.6 billion, and per capita GDP of USD 16,434, Seychelles is considered as a high-income country.<sup>56</sup>

Seychelles' high-income status is particularly threatened by climate change, due to its small island status and economic reliance on tourism - employing 26% and accounting for more than 55% of GDP – followed by fisheries (particularly tuna). Over half of the climate hazards-related damages are caused to the residential sector, followed by the commercial sector which includes hotels and other tourism-related infrastructure. This is because many buildings and infrastructure of the residential and tourism sector (90% of them) are located in risk-prone areas – essentially along the coastline. The tourism sector is not only affected by the direct impacts of climate change e.g. in terms of damages to infrastructure, but also by its indirect impacts, such as the deterioration of the natural environment – biodiversity and landscape. With regards to the fisheries sector, which is key to food security, climate change particularly affects artisanal fisheries as the degradation of coral reef and mangrove habitat generates a reduction in fish stock. This sector is also extremely vulnerable to extreme rainfall events, having experienced the greatest economic losses due to extreme rainfalls events in the periods 1997-1998 and 1998-2000, amounting 45% of the total estimated losses.

### 3- Regional and National Climate Change Adaptation Strategies

Governments of Comoros, Madagascar, Mauritius and Seychelles countries are committed to initiate and support climate-resilient interventions to reduce the vulnerability of their countries and population to climate change impacts. This commitment is reflected in several policies, strategies, programmes and projects pertaining to climate change adaptation and climate services.

All four countries have adopted the Nationally Determined Contributions (NDCs); and Comoros and Madagascar have submitted their National Adaptation Programmes of Action (NAPA). All countries, except Seychelles, are in the process of developing their National Adaptation Plan (NAPs). Other relevant domestic policies include Comoros' National Strategic Plan 2017-2020<sup>57</sup>, Madagascar's National Climate Change Management Policy (NCCMP, 2012), Mauritius' National Climate Change Adaptation Policy Framework (2012), and Seychelles' National Climate Change Strategy (2009) and the Climate Change Policy<sup>58</sup> (currently under development). See Annex 2 for details on existing policies.

The proposed Hydromet project will contribute to achieve the objectives of the SAMOA pathway, in particular goals (i) gaining access to technical assistance and financing for early warning systems, disaster risk reduction and post-disaster response and recovery, risk assessment and data, land use and planning, observation equipment, disaster preparedness and recovery education programmes and disaster risk management; (ii) promoting cooperation and investment in disaster risk management in the public and private sectors; (iii) strengthening and supporting contingency planning and provisions for disaster preparedness and response; (v) harmonizing national and regional reporting systems; and (vii) increasing participation in international and regional disaster risk reduction initiatives. Through Hydromet, investments will be made to improve the technical capacity of NMHSs, as well as the production, dissemination and uptake of CP-CS, including early warnings, by users/stakeholders and end-users, including last mile communities. The project will harmonize climate forecast and monitoring processes in the IOC region, as well as risk management by establishing a WMO-designated RCC-Network and related protocols. Disaster preparedness and emergency response interventions will be enhanced, through coordination and collaboration with PIROI and its national counterparts, and directly involving the local organisations and communities (last mile partners) at the forefront of risk management. Finally, the project will contribute to increase participation of the target countries in international and regional risk reduction initiatives, including, *inter alia*, (1) the RCC-Network contribution to the WMO's Global Data-processing and Forecasting System (GDPFS); and (b) the web-based knowledge and decision support system with multi-hazard impact-based forecasts and color-coded risk-based warnings (regional

<sup>54</sup> IMF, [Republic of Seychelles: At a Glance](#).

<sup>55</sup> World Bank Climate Change Knowledge Portal, [Country Profile: Seychelles](#).

<sup>56</sup> World Bank DataBank, [Seychelles GDP Statistics](#); UN Economic Commission for Africa, [Country Profile 2017: Seychelles](#), at page 1.

<sup>57</sup> IOC Climate Change Portal. 'Document cadre pour la stratégie régionale d'adaptation au changement climatique des pays membres de la Commission de l'océan Indien 2012-2020'. Accessed 18<sup>th</sup> August 2019.: [https://prodigious-lab.com/loi/wp-content/uploads/2018/01/DR-Document-cadre-pour-la-strate%CC%81gie-re%CC%81gionale-d\\_adaptation-au-changement-climatique-des-pays-membres-de-la-COI.pdf](https://prodigious-lab.com/loi/wp-content/uploads/2018/01/DR-Document-cadre-pour-la-strate%CC%81gie-re%CC%81gionale-d_adaptation-au-changement-climatique-des-pays-membres-de-la-COI.pdf)

<sup>58</sup> <http://regionalclimate-change.sc/en/>

“meteoalarm”<sup>59</sup> / “vigilance”<sup>60</sup> -type platform) contribution to the WMO Global Multi-hazard Alert System – GMAS<sup>62</sup>; and (2) GBON compliance with the mandatory requirements.

The proposed Hydromet project will contribute to sustainable economic growth and development in the target countries, as promoted by the blue economy approach and the African Union’s Agenda 2063. Through the proposed interventions, it is expected that impacts of climate-related hazards on economic sectors, especially agriculture, fisheries, and tourism, will be reduced; allowing for increased economic gains and reduced losses in the target countries (see Annex 3, economic analysis). Improving food security, e.g. through developing seasonal forecasts and agricultural advisories for farmers, generating hazard and risk alerts for fishermen, and ensuring an appropriate dissemination and uptake of multi-hazard impact-based forecasts and early warnings to key economic sectors in each target country, will also contribute to implement sectoral frameworks of the Agenda 2063, in particular the Comprehensive African Agricultural Development Programme.

Because of the regional nature of climate extremes (such as tropical cyclones), of their shared vulnerability to climate change and climate-related hazards (such as floods and landslides), and of their recognition for the need to strengthen forecasting and climate adaptation in their respective countries, Comoros, Madagascar, Mauritius and Seychelles have adopted the IOC strategy: « *Document cadre pour la stratégie régionale d’adaptation au changement climatique des pays membres de la Commission de l’océan Indien 2012-2020* ». This strategy, coordinated by IOC, provides the guideline to foster climate change adaptation in the SWIO region. In particular, it recommends enhancing regional coordination, hydrometeorological forecasting and risk assessment, and knowledge exchange for climate change resilience. The IOC also takes the lead in organising the SWIO Climate Outlook Forums (SWIOCOF), and in disseminating seasonal outlooks through a Regional Climate Portal. Hence, the IOC is the unique institution in the SWIO region in position (i) to initiate and/or enhance synergies, cooperation, collaboration, and harmonization of efforts for climate-related hazard monitoring, modeling, forecasting, and service delivery; and (ii) to support the development and implementation of risk adaptation and mitigation strategies in the SWIO region.

#### 4- Scaling up on past and ongoing initiatives and projects

The regional Hydromet project will build on, scale up, and complement past and ongoing regional and national initiatives and projects. To ensure complementarity and identify synergies with existing and planned projects, several meetings were conducted in the four target countries with development partners (such as UNDP, WB, JICA, and EU), which are strongly involved in the region, specifically in developing Hydromet projects. The most relevant projects per country are described in Table 4 below, alongside with an analysis of the synergies with the proposed Hydromet project; while the full list of projects is discussed in Annex 2 (section 2.2.3). In addition, the proposed Hydromet project will also build on the ClimDev-Africa Initiative – Result Area I<sup>63</sup>, especially those aspects target to the small islands, including the inventory of operational solutions for the detailed design and technical specifications of the investments supported by the proposed project.

**Table 4. List and description of relevant projects, alongside with the synergies with the proposed Hydromet project**

Project Details	Description: purpose, key activities (relating to Hydromet) and location	Complementarity with Hydromet
-----------------	--	-------------------------------

<sup>59</sup> <http://www.meteoalarm.eu>

<sup>60</sup> <https://vigilance.meteofrance.fr/fr>

<sup>61</sup> <http://www.meteofrance.re/vigilance-reunion>

<sup>62</sup> <https://www.wmo.int/gmas/>

<sup>63</sup> [https://gfcs.wmo.int/sites/default/files/Intsiful\\_SADC%20CIS%20Vic%20Falls%20Presentation.pdf](https://gfcs.wmo.int/sites/default/files/Intsiful_SADC%20CIS%20Vic%20Falls%20Presentation.pdf)

<p>COMOROS “<a href="#">Ensuring climate resilient water supplies in the Comoros Islands</a>” (FP094) 2018-2026 Funding entities: UNDP, GCF Budget: US\$ 60.8m</p>	<p>Contributions to improving water resource data management through installation of 10 hydrological (surface water) gauging stations in Anjouan and Mohéli and 30 groundwater piezometers on <i>Grande Comore</i> and 13 across Anjouan and Mohéli. All water related monitoring stations will be coupled with the existing synoptic stations (4), automatic weather stations (10) or with the 90 rain gauges already installed. Technicians will be trained on monitoring system operation and management. Data will be captured, processed, and shared by the Directorate of Meteorology. A simple flood alert early warning system using total rainfall and rainfall intensity from selected automated rainfall gauges will be developed to provide a flood risk warning system for each island. This will be connected to the mobile phone system and provide SMS flood warning messages.</p>	<p>The equipment installed for water monitoring will be completed by additional hydrological stations through the proposed project Activity 2.1.1; training provided, and data and climate services developed by this project, will be complemented by the proposed project Activity 2.1.2 to upscale impacts in terms of improved flood risk management and resilience in Comoros.</p>
<p>MADAGASCAR « Adaptation des chaînes de valeur agricoles au changement climatique (PrAda) » (Adaptation of agricultural value chains to climate change) 2017-2022 Funding entity: GIZ</p>	<p>Under this project, agricultural value chain players will benefit from better access to agrometeorological and agricultural advisory services, which allows them to adapt production to climate change. In addition, the project also aims to improve structural framework conditions. These include the development of a quality agricultural policy, the organisation of actors and cooperation between them. Access to operating resources is simplified and production techniques are adapted. Finally, the project supports the establishment of climate risk insurance. DAPV is working with GIZ on PRADA project which aims at translating climate information into agrometeorological advisories and disseminate them at the local level using mobile phones.</p>	<p>The agriculture-related data and climate services developed by this project will be complemented and upscaled in other regions, for other crop varieties and using different communication means to increase outreach through the proposed Hydromet project. Note that agriculture was selected as one of the key sectors for Madagascar.</p>
<p>MAURITIUS “Land Drainage Master Plan” Planned to start late 2019 for 15 months Funding Entity: AFD Budget: EUR 1,5 million</p>	<p>The LDMP will include a: a) detailed inventory of the infrastructure and hydraulic diagnosis on the island drainage infrastructure and mapping of all flooded and vulnerable areas on the basis of field surveys; b) technical and economic comparison between different levels of protection scenarios and recommendations for optimal design drainage network frequency and c) studies will be produced in the most critical sites using an integrated ridge-to-reef approach. At the national scale, a detailed map of vulnerable areas will be produced. A set of specific structural and non-structural measures in each of the local critical sites.</p>	<p>The flood forecasting and flood hazard maps produced through this project will be complemented by the proposed Hydromet project, which will build on data and training in hydrology conducted by this initiative.</p>
<p>SEYCHELLES “SeyCCAT (Seychelles’ Conservation and Climate Adaptation Trust)”, 2015-present, NatureVest (the conservation impact investing unit of The Nature Conservancy) and the Government of Seychelles Budget: funded by a sovereign US\$15m Blue Bond</p>	<p>SeyCCAT is an independent, nationally based, public-private trust fund, established through the Conservation and Climate Adaptation Trust of Seychelles Act of 2015. It “strategically invests in ocean stakeholders to generate new learning, bold action and sustainable blue prosperity in Seychelles.” Ongoing projects include Blue Grants Fund #1: empower the fisheries sector with robust science and knowhow to improve governance, sustainability, value and market options.<sup>64</sup></p>	<p>Information and climate services generated by Hydromet can be used to support these efforts to empower the fisheries sector with robust science, by providing the necessary information on which to base decisions and further innovation. Fisheries were indeed selected as a key climate-sensitive sector in Seychelles for the development of tailored CS.</p>

AFD, the accredited entity for the proposed project, is also taking part in the Africa Hydromet program<sup>65</sup> and is in continuous liaison with World Bank team and other development partners. Moreover, the improvements to the observation network in target countries (proposed in the Hydromet project) are designed in line with the commitments

<sup>64</sup> SeyCCAT. Ongoing Projects. Accessed 26 September 2019. Available at: <https://seyccat.org/projects/#on-going>

<sup>65</sup> [https://www.worldbank.org/en/programs/africa\\_hydromet\\_program](https://www.worldbank.org/en/programs/africa_hydromet_program)

of the Global Alliance for Hydromet Development<sup>66</sup> (GAHD), endorsed by the GCF during COP25. In particular, the proposed Hydromet project supports the implementation of an optimum composite surface observation network and associated ICT systems for the SWIO region aligned with the Global Basic Observing Network (GBON) requirements, and finances a minimum set of stations so that the target countries be able to achieve full compliance with the GBON by 2025, in terms of type, number and location of the stations, as well as the exchange of their data internationally for improved NWP and climate analysis. Thus, arrangements are being done between the four target countries and the WMO for securing the GBON Systematic Observations Financing Facility (SOFF) support beyond the project lifetime. Moreover, WMO was involved during the feasibility study drafting and approval by beneficiary countries. As a result of this fruitful coordination, the regional component of the WHYCOS<sup>67</sup> program, developed in 2019 by WMO, is included as part of the proposed project to avoid duplication.

### 5- Addressing current gaps and barriers

It is globally recognized that to improve delivery of national CP-CS, it is critical to pursue regional hydromet strategies (as the once adopted by IOC – see Section B.1., item 2. above), as well as effective regional cooperation, collaboration, and harmonization of efforts. This approach in turn will help enable appropriate adaptation and mitigation measures to be developed and implemented. Integration of the region’s hydromet systems provides opportunities to lower required investment while increasing accuracy of forecasts. Observed data from the hydromet monitoring networks needs to be shared with other NMHSs through regional data exchange in order to improve monitoring of hazardous hydromet conditions, numerical modelling, and forecasting. The optimum regional composites for each of the subsystems—hydromet observational networks, modelling, forecasting, and service delivery that meet the existing and future needs of societies due to climate change— would ensure robust interoperability, efficiencies, and optimization of infrastructure costs, together with a higher level of harmonization, integration, and complementarity within the region. Following the WMO Guidelines on Emerging Data Issues (WMO-No. 1239)<sup>68</sup>, the technical specifications for the various hydromet subsystems will explore the use of innovative technologies (such as those described in Table 5), cost sharing and, due to the limited staff in individual NMHSs, the development of a regional pool of experts that would work together towards common objectives and results, for sustainability of investments. The installation of new stations may impact the environment, and therefore careful consideration need to be taken in site selection – this includes avoiding contributing to noise, contaminated land, water quality, river bank erosion, among other Ambient environmental aspects. Physical cultural heritage and landscape, as well as protected environmental areas and areas with protected species will also be avoided. There might be a need for vegetation clearing, and any possible impacts must be assessed together with the local authorities. In relation to potential social impacts, any future installations will require the engagement of local communities, in order to assess the risks and take appropriate mitigation measures. With the engagement of the local communities, there will also an opportunity for raising awareness of weather and climate-related risks.

The regional approach is key to underpin improvements in the production and dissemination of CP-CS. As shown in Table 2 above, proposed project investments would close the gap between the NMHSs of Comoros and Madagascar, and the NMHSs of Mauritius and Seychelles, by sharing expertise and tools to reach a similar GFCS category. Table 5 below provides an intercomparison between current and proposed technologies/interventions (a few examples) that would provide increased benefits from taking a regional approach.

**Table 5. Examples of current and proposed interventions/technologies, and associated benefits**

GSCF Component	Current situation	Proposed interventions	Technical Benefits
Observations and Monitoring	<ul style="list-style-type: none"> <li>National design of the networks not aligned with the GBON mandatory requirements</li> <li>Observation network with various technical specifications</li> </ul>	<ul style="list-style-type: none"> <li>National design of the networks not aligned with the GBON mandatory requirements</li> <li>Expanded networks at the national level with common technical specifications</li> </ul>	<ul style="list-style-type: none"> <li>Alignment to GBON mandatory requirements, promoting complementarity for improved forecasting</li> <li>Common technical specifications facilitate O&amp;M, and calibration as</li> </ul>

<sup>66</sup> <https://public.wmo.int/en/resources/bulletin/alliance-hydromet-development>

<sup>67</sup> <https://hydrohub.wmo.int/en/world-hydrological-cycle-observing-system-whykos>

<sup>68</sup> [https://library.wmo.int/doc\\_num.php?explnum\\_id=10124](https://library.wmo.int/doc_num.php?explnum_id=10124)

	<ul style="list-style-type: none"> <li>No capacity to calibrate sensors and need to send equipment to Continental Africa</li> </ul>	<ul style="list-style-type: none"> <li>Regional calibration laboratory</li> </ul>	<p>staff of NMHSs would be specialized and would perform based on regional knowledge</p> <ul style="list-style-type: none"> <li>Explore innovative technologies such as IoT for data transmission and wireless private network</li> <li>Cost-effectiveness, and cost savings</li> <li>Sustainability</li> </ul>
Research, Modelling and Predictions	<ul style="list-style-type: none"> <li>Limited human and infrastructure capacity individually in each country</li> <li>Some NWP experiments</li> </ul>	<ul style="list-style-type: none"> <li>Use a regional platform (through cloud-services) for improving modeling and predictions</li> <li>Establish a verification system over the four target countries and feedback mechanism to global centers</li> <li>Carry out jointly research on downscaling and calibration of models over the SWIO countries, using the most up-to-date science and technologies (e.g. artificial intelligence)</li> </ul>	<ul style="list-style-type: none"> <li>Build a pool of capable experts</li> <li>Harmonization of approaches</li> <li>Explore innovative technologies such as cloud-services to establish a platform for regional NWP developments with contributions from all target countries</li> <li>Improved regional modeling and forecasting capabilities</li> <li>Cost savings</li> <li>Sustainability</li> <li>Ownership</li> </ul>
Climate Services Information System	<ul style="list-style-type: none"> <li>Limited human and infrastructure capacity individually in each country</li> <li>Participation at Regional Climate Outlook Forums (RCOFs), which are not carried out regularly</li> </ul>	<ul style="list-style-type: none"> <li>Establish a Regional Climate Center (RCC) Network, wherein each country will serve as a Node that will carry out different and complementary functions</li> <li>Develop regional CS-CP taking into account the region's characteristics</li> <li>Implement regular RCOFs</li> <li>Apply common downscaling techniques in support of National Climate Outlook Forums (NCOFs)</li> </ul>	<ul style="list-style-type: none"> <li>Build a pool of capable experts</li> <li>Harmonization of approaches</li> <li>Improved climate services capabilities</li> <li>Cost savings</li> <li>Sustainability</li> <li>Ownership</li> </ul>
User Interface Platform	<ul style="list-style-type: none"> <li>Weather forecast bulletins</li> <li>No multi-hazard impact-based forecasts and early warning systems/services</li> <li>Limited or no interactions with users, including DRM authorities</li> </ul>	<ul style="list-style-type: none"> <li>Climate Portal with regional and national CP-CS</li> <li>Web-based knowledge and decision support system/tool at regional, national and district levels, with multi-hazard impact-based forecasts and early warning systems/services</li> <li>Well-established interactions with users, including DRM authorities</li> </ul>	<ul style="list-style-type: none"> <li>Underpin actions at regional, national and district levels</li> <li>Explore innovative technologies such as cloud-services to establish a user interface platform providing regional, national and sub-national information</li> <li>Improved relationship between NMHSs in the SWIO region and users, including DRM authorities</li> </ul>
Capacity Development	<ul style="list-style-type: none"> <li>Staff trained overseas, in most cases in advanced NMHSs, with different environment conditions than those in the SWIO region's NMHSs (disconnect</li> </ul>	<ul style="list-style-type: none"> <li>Establishment of a training center at the regional level, wherein training programs will be designed based on the requirements of the 4 target countries, using</li> </ul>	<ul style="list-style-type: none"> <li>Improved capabilities and performance of the staff with quicker and more effective results</li> </ul>

	between the training provided and applicability at the SWIO region's NMHSs)	hands-on training with similar environment conditions as in individual countries	
--	---	--	--

The livelihoods and economies of the SWIO countries depend heavily on the ocean and climate-sensitive sectors such as agriculture, fisheries, and tourism. Changes in temperature and precipitation<sup>69</sup> are already having devastating effects on the availability of fresh water and agricultural yields. Fisheries are under threat, as well as the fishing-tourism with the so-called 'sardine-run' and the progressive delays in the timing of the sardine migration in the SWIO<sup>70</sup>, which coincides with a poleward shift in the position of the 21°C mean annual SST isotherm – the threshold temperature for sardine populations – the strength of the run is strongly associated with ENSO conditions. Lives, livelihoods, assets and infrastructure are threatened by several climate-related hazards. Current forecasts issued by the NMHSs in the SWIO region are not sufficiently reliable and downscaled for use in disaster risk management (DRM) and socio-economic sectors (such as agriculture, fisheries and tourism). Essential services provided by NMHSs underpin economic growth and sustainable development and yet they cannot be consistently provided across the region. Their weather, climate, water and ocean information services are critical to the safety and livelihoods of SWIO island populations, but communication of the information is not reliably reaching the people who need it. These services are crucial to enhancing resilience and reducing vulnerability of SWIO people to climate-related hazards and the effects of climate change. Governments in the four target countries in the SWIO need support in integrating climate information from their NMHSs into their planning and management processes.

The proposed Hydromet project will address constraints including gaps in geographical coverage (e.g. of ocean areas); lack of capacity to deal with multiple aspects of climate-related risks and hazards; lack of end-to-end climate and ocean information services, from data collection, monitoring, modelling, forecasting, to service delivery and response of users; inadequate communication and outreach systems, especially to communities on remote areas (such as the case in Madagascar which is a large country, and disperse small islands in the other three countries in the SWIO region); and a lack of comprehensive and people-centred multi-hazard impact-based forecast and early warning systems for DRM, and specialized CP-CS to socio-economic sectors.

The common vulnerabilities, climate change impacts and capacity challenges in the four target countries (outlined above) limit the ability of these countries to provide reliable, timely advisory and early warning on their local weather, climate and ocean environments; as well as science-based information that would feed the adaptation planning for longer term climate change impacts. This restricts their capability to safeguard vulnerable island populations and assets against multiple and compounding climate-related hazards.

A "business as usual" scenario is likely to continue (characterised by the poorly coordinated use of insufficient CP-CS) if no action is taken. NMHSs in the SWIO region will continue to generate basic weather forecasts and seasonal predictions but their information will be based on deficient and incomplete data (particularly for ocean areas) and it will not always reach its intended audiences in timely and useful manner. Communities will find traditional forecasting systems less and less reliable as CP-CS rarely reach them, and at times that they are received, they are not well-understood due to the technical jargon, thereby, in most of the cases, are not used. So, loss of lives, assets and livelihoods will continue and may escalate as extreme events become more common and less predictable. The preferred solution is to implement integrated climate and ocean information services, multi-hazard impact-based forecast and EWS, and CP-CS across the SWIO region, simultaneously addressing the major barriers to coherent systems. While the ongoing projects and initiatives are often focused on one specific sector, a country and/or a limited area of intervention within a country, the Hydromet project proposes such a regional integrated approach, while supporting national investments.

This will address the common vulnerabilities of the target four countries' populations, their livelihoods and assets to climate change impacts and climate-related hazards. As they confront common challenges and vulnerabilities, these four countries have indicated interest in adopting demand-driven solutions that establish sustainable climate information and multi-hazard impact-based forecast and early warning systems in the same timeframe and in a harmonized approach. If NMHSs in the SWIO region are equipped with improved hydromet infrastructure and tools (as those highlighted in Table 5 above), and work closely with socio-economic sectors, DRM and communities, then the four target countries in the SWIO region will become more resilient to climate change, because they will be able

<sup>69</sup> <https://agupubs.onlinelibrary.wiley.com/doi/pdf/10.1029/2010JD015303>

<sup>70</sup> <https://www.sajs.co.za/article/view/5887>

to produce and make use of more accurate, timely and reliable CP-CS including MH-IBF-EWS, target to the users (which are the socio-economic sectors and communities). This will be achieved through:

- a) **Strengthened institutional capacities and regional cooperation through improved governance mechanisms;**
- b) **Strengthened capacities and capabilities for detection and monitoring climate-related hazards;**
- c) **Improved quality of forecasts and warnings, which in turn will be integrated in the decision-making processes;**
- d) **Enhanced preparedness and response capability with improved gender and vulnerable people inclusiveness across the EWS value chain.**

The proposed Hydromet project will ensure that: (a) governments in the four target countries implement policies, plans, and early actions based on more accurate, timely and reliable CP-CS and MH-IBF-EWS, underpin on investments in infrastructure and tools (as those described in table 5 above); (b) integrated CP-CS including MH-IBF-EWS are in place in Comoros, Madagascar, Mauritius and Seychelles, and sustained in response to continued demand, in recognition of the added- and practical value; and (c) communities and socio-economic sectors adopt new climate-resilient livelihood practices by using improved CS-CP, risk knowledge and MH-IBF-EWS, through co-production of CS-CP, and test, validation and demonstration of the benefits of MH-IBF-EWS.

The IOC, as the executing entity for the Hydromet project, is the unique institution in the SWIO region in position (i) to initiate and/or enhance synergies, cooperation, collaboration, and harmonization of efforts in climate-related hazard monitoring, modeling, forecasting, and service delivery; and (ii) to support the development and implementation of climate change adaptation and risk mitigation strategies in the SWIO region. This will result in cost savings and promote efficiency and effectiveness in the systems, while contributing to improved monitoring and increased accuracy of forecasts, as well as underpins successful, cost-efficient climate risk mitigation and climate change adaptation in the SWIO region; over the longer term, it can increase savings and sustainability of the investments. By adopting a regional approach to risk reduction and adaptation, by targeting various sectors – from agriculture, fisheries, and tourism – and building upon or scaling up other projects and initiatives, the Hydromet project will trial an innovative regional approach to improve climate resilience in the SWIO region; the success of a regional approach to monitor and manage climate variability and change, thereby improving the region's socio-economic development, which has been demonstrated in other regions of the world, i.e. the Caribbean region<sup>71</sup> and in the Southwest Pacific region.

In this context, the proposed Hydromet project investments will focus on harmonization of approaches and join efforts for the generation of science-based multi-hazard weather and climate risk information by adopting multi-hazard impact-based forecasting and early warning systems/services (MH-IBF-EWS). This will include shifting from deterministic to probabilistic forecast techniques that highlight not only the most likely impact, but also reasonable worst-case scenarios, which are often the cause of avoidable disasters. Extreme value analysis will be done for establishing threshold values that will cause flooding and other climate-related hazards. Throughout the project implementation, the NMHSs will work with the DRM authorities and the various sectors, (1) to undertake risk analysis incorporating hazard, exposure and vulnerability, and assess potential impacts from extreme weather- and climate-related events by making use of the risk matrices; and (2) develop target messages to sector-specific. Training of NMHSs and stakeholders is critical for the successful uptake, and will be an important component of the proposed Hydromet project. Improved climate-related data quality, and increased their variety and frequency will enable downscaling and calibration, thus more accurate hydro-meteorological forecasts and warnings, as well as climate change impact assessments on key sectors through the production of hazard and vulnerability maps thus also supporting climate change adaptation planning.

---

<sup>71</sup> <http://rcc.cimh.edu.bb/>

Annex 2 – FS, SWOT analysis and case studies demonstrate that DRM institutions in the SWIO region have been supported by the Indian Ocean Regional Intervention Platform (PIROI) in coordination with IFRC, and therefore, identified priority investments in support climate change adaptation and disaster risk reduction include activities that will improve the ability to generate, disseminate and uptake meaningful and actionable warnings. These aspects require strong collaboration and partnership between NMHSs and DRM institutions. Hence, in addition to the support for the generation of science-based multi-hazard weather and climate risk information (described in the above paragraph), the proposed Hydromet project will support the development and implementation of a web-based knowledge and decision support system with multi-hazard impact-based forecasts and color-coded risk-based warnings (regional “meteoalarm”<sup>72</sup> / “vigilance”<sup>73,74</sup>-type platform that would also contribute to the WMO Global Multi-hazard Alert System – GMAS<sup>75</sup>), that will be jointly develop with stakeholders to support early actions at regional, national and local levels. Regional, national and local capacities in implementing a people-centered MH-IBF-EWS will be improved through coordination and collaboration with PIROI (the Indian Ocean Regional Intervention Platform)<sup>76</sup> and its national counterparts (i.e. national Red Cross and Red Crescent in each country) for piloting the development, testing, and validation of the MH-IBF-EWS in pilot sites in each country, which will then be expanded and rolled out nationwide using scenarios, and through the dissemination of knowledge products and outreach materials with the assistance of NGOs, in order to reach community leaders in the four countries. Collaboration and collaboration will also be in place to follow PIROI’s plans, in coordination with the German Red Cross and the IFRC, for the implementation of the Forecast-based Action / Financing (FbA/FbF) models in the SWIO region, in order to align the science-based developments supported by the proposed Hydromet project. In addition, the proposed Hydromet project will support consultations and engagement with key sectors in the four countries for development of target products. Private sector in these sectors (e.g., shipping, large scale fisheries, insurance, tourism, etc.) will also be involved with a view of exploring the possibility of establishing ring-fenced CIEWS funding mechanisms at national levels for sustainability of the investments beyond the lifetime of the project (see Annex 2C on the pathway to establish CIEWS Funds).

## **B.2. Theory of change (max. 1000 words, approximately 2 pages plus diagram)**

Through GCF support, the proposed project will overcome key barriers to increasing the climate change resilience of communities by bridging and front-loading the investment gaps on the hydromet services in the region. Business-as-usual Hydromet projects (small-scale, without user-centered approaches) do not allow full resilience and risk-informed sustainable development and economic growth. Without the leverage of the GCF, Comoros, Madagascar, Mauritius and Seychelles will be and remain increasingly hampered by climate-related risks and changes; community livelihoods will be continuously threatened by changes in temperature and rainfall patterns, as well as the increased frequency and intensity of climate extremes, such as tropical cyclones.

To overcome the barriers to provide timely, accurate, reliable and user-friendly climate services, interventions with the most transformative impact on reducing disaster risk and will foster adaptation to climate change, have been identified based on extensive in-country consultations in the four target countries. These interventions (see section B.3) will support the strengthening of NMHSs to produce target impact-based forecasts (IBF), and the timely dissemination of accurate and high-quality CP-CS, including multi-hazard early warnings (MHEW). The activities will also enhance regional cooperation, harmonization, and knowledge sharing between Comoros, Madagascar, Mauritius and Seychelles, facilitated by the IOC acting as the executing entity for this project. IOC’s historical role in the SWIO region (created 36 years ago by SWIO region countries) and core experience in climate monitoring for the region (supporting several projects such as BRIO and Indian Ocean Data Rescue Project<sup>77</sup>) makes the commission the most appropriate institution to gather the SWIO countries within the proposed Hydromet project, and coordinate its activities to ensure harmonization of efforts in climate-related hazard monitoring, modeling, forecasting, and

<sup>72</sup> <http://www.meteoalarm.eu>

<sup>73</sup> <https://vigilance.meteofrance.fr/fr>

<sup>74</sup> <http://www.meteofrance.re/vigilance-reunion>

<sup>75</sup> <https://www.wmo.int/gmas/>

<sup>76</sup> <https://piroi.croix-rouge.fr/?lang=en>

<sup>77</sup> [http://www.wmo.int/pages/prog/wcp/wcdmp/CDM\\_2.php](http://www.wmo.int/pages/prog/wcp/wcdmp/CDM_2.php)

service delivery. See Section B.1., item 4. Above for further details on the regional approach and IOC's role. The Hydromet project is built around three components to be implemented at both regional and national levels.

Component 1: Capacity building, institutional development, regional cooperation and public-private engagement

Component 2: High-quality climate-related data, improved multi-hazard impact-based forecasts and EWS (MH-IBF-EWS), and climate risk assessments

Component 3: Enhanced accessibility and use of climate services for climate change adaptation, and improved capabilities in implementing a people-centered MH-IBF-EWS for disaster risk reduction

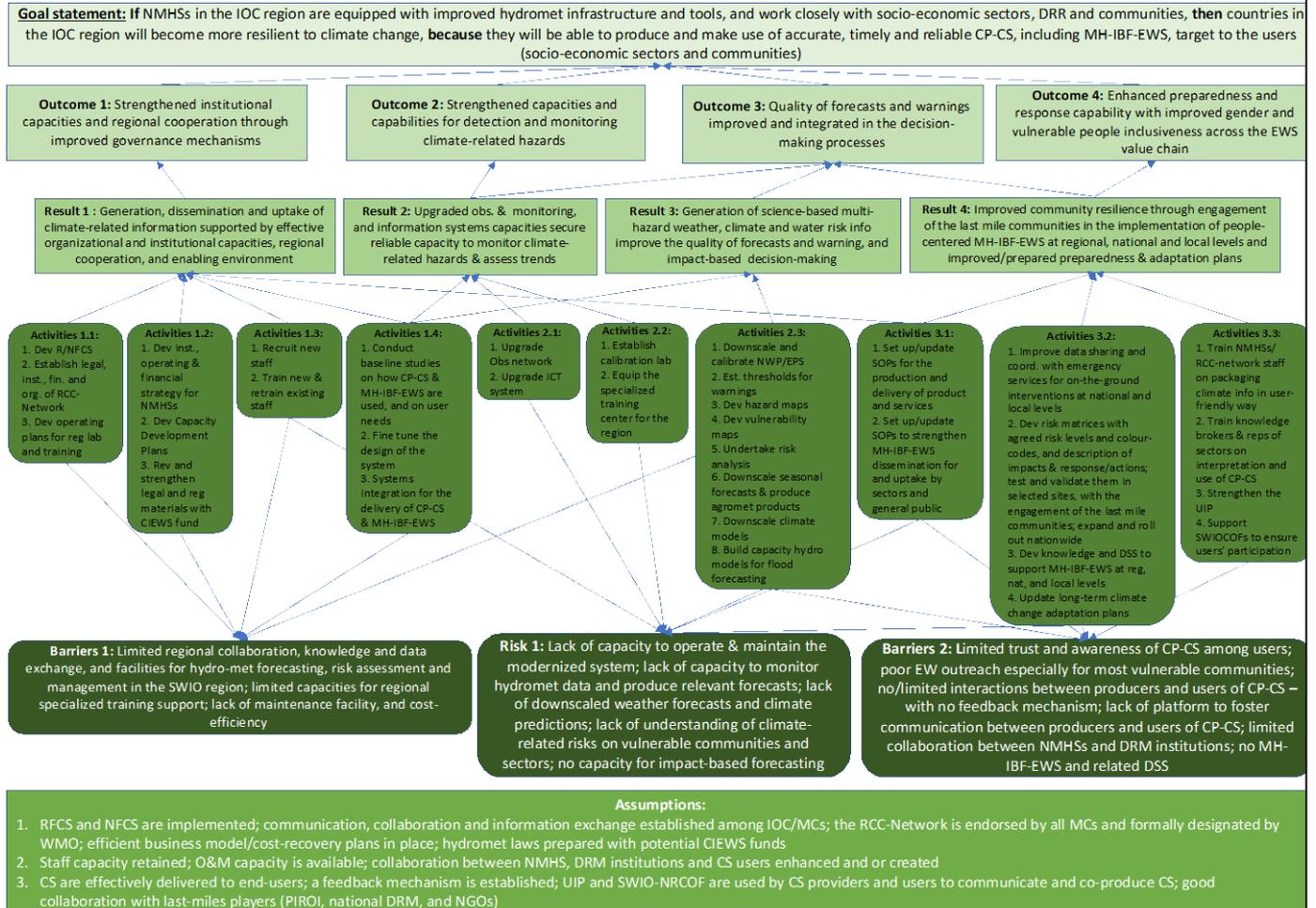


Figure 1: Theory of Change for the Hydromet project

1- The Baseline problems and climate change issues are developed under Section B.1.

2- Barriers in the value chain of Hydromet Services to climate change adaptation

At the regional level, IOC and its member countries do not have a regional framework and facilities to harmonise hazard monitoring and forecasting processes, collaborate and synergise efforts for climate risk assessment, downscale climate change impacts from the regional to the national level, and share risk-related information and risk management experience.

At national level, the NMHSs of these four countries have limited institutional, financial and technical capacities to monitor climate and weather and to produce location-specific forecasts to inform decision-making processes (see Annex 2). This is particularly the case in Comoros and Madagascar due to the limited number of stations and appropriate tools for forecasting. Institutional weaknesses have also been noted in the NMHSs of the four countries along with limited staffing, as indicated in Annex 2. There is also limited interactions between the NMHSs and the

DRM institutions in the four countries; and there is no regional hydrometeorological counterpart (except the link with the Regional Specialized Meteorological Center for Tropical Cyclone Forecasting in *La Réunion*) to work with PIROI on MH-IBF-EWS. As a result, there is limited production and timely dissemination of user-centered climate services including the implementation of people-centered MH-IBF-EWS at regional, national and local levels that can help reduce risk exposure and vulnerability among communities and economic sectors; this is further exacerbated by the lack of updated climate change projections downscaled at the level of each country to support climate change adaptation and risk mitigation strategies at the national level. Throughout the implementation of the proposed Hydromet project, relationships between NMHSs and national DRM institutions will be strengthened, as well as the between the RCC-Network (to be established under the project) and PIROI. This is particularly important for strengthening regional early warning / early action, and for developing, testing, and validating the MH-IBF-EWS in the four countries. While noting that the implementation of the Forecast-based Action / Financing (FbA/FbF) models in the SWIO region is not directly supported by the proposed Hydromet project, coordination and collaboration will be in place to ensure that the science-based developments supported by the project are aligned with the PIROI's plans on these aspects, which are supported by the German Red Cross and the IFRC, under other initiatives and projects.

Finally, there are limited interactions between the producers and users of weather and climate services, and therefore limited feedback mechanisms to ensure the effective production and delivery of relevant, high-quality and accurate climate services. The financial resources to overcome these barriers are also not sufficient or not available within the IOC and its member states, because of their LDC/SIDS status and climate change-related threats on their economy, highly dependent on climate-sensitive sectors. In this context, the proposed Hydromet project will support market surveys and the review of the hydromet regulatory materials in target countries to help establishing or strengthening existing national funds for climate information and early warning services (CIEWS).

### 3- Project activities to overcome barriers and catalyse transformational change

The three components are designed to achieve the paradigm shift of improved monitoring and management of climate, weather and hydrological risks in the short-, medium-, and long-term, that will facilitate growth in key climate sensitive target sectors (agriculture, fisheries and tourism), and enable resilience and adaptation to climate change impacts.

This project provides an opportunity for countries to leverage each other's strengths, deploy complementary fields of expertise and risk management capacity, and capitalise on successful regional and national initiatives. The regional scope of this project, fostered by IOC, underpins its success to improve climate risk assessment, and promote climate-resilient socio-economic growth in the long-term. The IOC is the only regional institution created and financed by island states of the South-West Indian Ocean Region; it already leads regional initiatives for climate risk management (see Section B. 1). Through its regional status, IOC will champion increased collaboration among the target countries for climate-related hazard monitoring, modelling, forecasting and service delivery. Increased regional cooperation, collaboration and harmonization of efforts will also be fostered with the design of optimum regional composites for each of the subsystems—hydromet observational networks, modeling, forecasting, and service delivery that meet the existing and future needs of societies; data and warning sharing; the establishment of the RCC-Network; strengthening regional training and calibration facilities; and using of a regional communication platform (such as the UIP) for dissemination of CP-CS and MH-IBF-EWS, and the regional discussion forums (i.e. the SWIOCOF). Thought collaboration with PIROI, these investments will be a major contribution to strengthen regional early warning / early action.

**The proposed project impact will be achieved through a mutually-reinforcing integrated approach.**

**Improvement of climate services delivery (Component 3) can only be achieved if supported by appropriate institutional strengthening and regional collaboration and experience exchange (Component 1) and acquisition of specialised equipment and expertise (Component 2).**

- Through Component 1, regional cooperation will be strengthened through establishing an RCC-Network, whose mandate, organisation and facilities will be shared among IOC member countries. RFCS and NFCS will be prepared to enable the development and delivery of climate services at the regional and national levels. Institutional strengthening, including the development of nationally-appropriate business models/plans for the National Meteorological Services – will also be implemented in the four target countries to support robust NMHS

institutions, ensure financial returns and retain skilled staff. Hydromet regulatory material for each of the four target countries will be reviewed, alongside with market surveys, to explore opportunities to establish or strengthen existing national funds for CIEWS.

- Through Component 2, hydro-meteorological systems and equipment will be modernised to support enhanced monitoring of weather, climate and hydrological hazards, and to increase understanding of climate change impacts on the region/countries. While expanding surface land-based observation networks in compliance with the GBON requirements for improved NWP and climate analysis, radar and satellite technologies will also be put in place to monitor both tropical cyclones and the rapid onset climate-related hazards. The maintenance and calibration of this equipment will be facilitated and optimized by establishing a regional maintenance and calibration laboratory (WMO Regional Instrument Centre<sup>78</sup>), attached to the RCC-Network, while training and activities to better understand and forecast climate-related hazards, assess the risks, and develop MH-IBF will be organised within the regional facilities. Innovative solutions (e.g. IoT, Big data analytics, cloud-services), will be considered, as detailed in Table 5 above. Data and systems' integration will be pursued through the establishment of data centers at regional and national levels (exploring/evaluating physical and cloud-service solutions). Quality Management Systems (QMS) will be put in place to ensure streamlining the processes. Multi-hazard impact-based forecasting and early warning system/services capability<sup>79</sup> will be built through shifting from deterministic to probabilistic forecast techniques. Extreme value analysis will be done for establishing threshold values that will cause flooding and other climate-related hazards. By working with the DRM authorities and the various sectors, undertake risk analysis incorporating hazard, exposure and vulnerability, and assess potential impacts from extreme weather- and climate-related events by making use of the risk matrices.
- Finally, through Component 3, the co-production of accurate CP-CS with their users in vulnerable sectors and end-user communities, including MH-IBF-EWS, and their timely dissemination using appropriate communication means will be fostered; communication between users and producers of CP-CS – including a feedback mechanism from users to producers on the CP-CS – will also be enhanced and sustained through the User Interface Platform (UIP) and the SWIOCOF. The UIP will include a web-based knowledge and decision support system with MH-IBF and color-coded risk-based warnings (regional “meteoalarm”<sup>80</sup> / “vigilance”<sup>81,82</sup>-type platform that would also contribute to the WMO Global Multi-hazard Alert System – GMAS<sup>83</sup>), that will be jointly develop with stakeholders to support early warnings / early actions at regional, national and local levels. Regional, national and local capacities in implementing a people-centered MH-IBF-EWS will be implemented through coordination and collaboration with PIROI and its national counterparts (i.e. national Red Cross and Red Crescent in each country) for developing, testing, and validating MH-IBF-EWS in pilot (most vulnerable) sites in each country, which will then be expanded and rolled out nationwide using scenarios, and through the dissemination of knowledge products and outreach materials with the assistance of NGOs and through the community leaders, in order to reach all population in the four countries. The implementation of the Forecast-based Action / Financing (FbA/FbF) models in the SWIO region will not be directly supported, but coordination will be in place with PIROI, who is leading these developments in the region with the support of the German Red Cross and the IFRC (e.g. in Mozambique), to ensure that the science-based developments supported by the proposed Hydromet project are aligned. In addition, the proposed Hydromet project will support consultations and engagement with key sectors in the four countries for development of target products.

Taking advantage of these improvements in the production and dissemination of CP-CS, the four NMHSs will more systematically and efficiently consider needs of CP-CS users and end-users to develop target products for an increasing number of sectors. In addition, through collaboration between NMHSs and DRM institutions, there will be improved capacities in implementing people-centered MH-IBF-EWS. This will: i) promote the generation and use of

<sup>78</sup> <https://www.wmo.int/pages/prog/www/IMOP/instrument-reg-centres.html>

<sup>79</sup> <https://public.wmo.int/en/resources/world-meteorological-day/wmd-2018/multi-hazard>

<sup>80</sup> <http://www.meteoalarm.eu>

<sup>81</sup> <https://vigilance.meteofrance.fr/fr>

<sup>82</sup> <http://www.meteofrance.re/vigilance-reunion>

<sup>83</sup> <https://www.wmo.int/gmas/>

climate information in decision making; ii) strengthen adaptive capacity and reduce exposure to climate-related risks; and iii) strengthen awareness of climate threats and risk reduction processes within the SWIO region.

**As a result, these components will support the paradigm shift towards resilient states, institutions, economies, populations and livelihoods to climate-related hazards and to achieve risk-informed sustainable development.** Please refer to Annex 2 for details on the project components and their alignment with the GFCS led by WMO.

### B.3. Project/programme description (max. 2000 words, approximately 4 pages)

#### 1- Project development objective and contribution to climate change adaptation

The project objective is to strengthen adaptive capacity and climate resilience of the vulnerable communities and economic sectors of Comoros, Madagascar, Mauritius and Seychelles. This will be achieved through (1) institutional strengthening and reforms, and capacity building at regional and national levels, and public-private engagement; (2) improvement and modernisation of hydro-meteorological systems and services, which will equip users with timely, reliable, and accurate information to prevent, mitigate and adapt to climate-related hazards and climate change; and (3) enhancing the use of climate services, establishing MH-IBF-EWS supported by knowledge and decision support system, and improving the capabilities to implement a people-centered MH-IBF-EWS. These investments will contribute to climate change adaptation and disaster risk reduction<sup>84</sup>. Indeed, these services enable risk prevention and preparedness, emergency response and adaptation planning; by providing decision-makers in climate-sensitive sectors with the needed and required information (see Annex 2). As such, the benefits of the proposed project will support the implementation of NDCs, national adaptation and disaster risk reduction plans, and the achievement of Sendai targets.

The proposed interventions will contribute to achieve the GCF fund-level impact A1.0 Increased resilience and enhanced livelihoods of the most vulnerable people, communities and regions and A2.0 Increased resilience of health and well-being, and food and water security. For example, more accurate and location-specific weather forecasts, produced under the proposed project, will facilitate agricultural planning and adjustment to agriculture calendars; weather forecasts will also facilitate risk prevention measures; and timely early warnings will enable the protection of lives, buildings, fisheries, tourism or agricultural equipment and harvests, among other assets.

The four case studies and SWOT analysis of NMHS and DRM institutions, presented as part of the project Feasibility Study (see Annex 2, Chapter 4), demonstrated the need and demand for improved climate services in Comoros, Madagascar, Mauritius and Seychelles. To illustrate, there are many shortcomings to effective, reliable CP-CS in the four target countries at present:

- In Comoros and Madagascar, a key weakness is the limited number of functional weather stations for weather/climate observation and monitoring, the lack of upper air station and doppler radar, and lack of human and technological capacities within the NMHS. As a result, there is a small range of forecast products (e.g. weather or seasonal forecasts, timely alerts for fishermen) available.
- Mauritius needs to improve the density of upper air station in order to monitor atmospheric instability and to produce more accurate, locally-relevant forecasts and seasonal outlooks. Both Mauritius and Seychelles lack adequate staffing capacity with relevant specializations to produce more diverse and/or localised CP-CS that respond to the needs of users in all climate-sensitive sectors, e.g. in agriculture, fisheries and tourism sectors.
- The 4 countries rely on deterministic numerical weather prediction (NWP) products, publicly available on the Internet, for forecasting. These NWP models will always produce the same single outcome for the sole initial condition or state. Given the uncertainty in the initial state of the atmosphere, which cannot be perfectly observed and the approximations in the numerical representation of processes in the models, the outcome is intrinsically probabilistic – meaning that small changes in the initial state of the atmosphere and the processes in the model that cannot be directly predicted (model parameterizations) lead to a range of plausible forecast results, whereas a deterministic forecast, which produces a single outcome may inevitably lead to significant mistakes – many false forecasts. Therefore, and aligned with the vision for NWP in 2030<sup>85,86</sup>, there is an absolute requirement to shift towards using ensemble prediction systems (EPS) and probabilistic forecasts.

<sup>84</sup> Bapon S.H.M. Fakhruddin and Lauren Schick, 2019, "Benefits of economic assessment of cyclone early warning systems - A case study on Cyclone Evan in Samoa", in Progress in Disaster Science

<sup>85</sup> <https://www.gweforum.org/category/webinars/>

<sup>86</sup> <https://arxiv.org/abs/2007.04830>

The proposed project will support the access and use of high-resolution EPS and probabilistic forecasts with full data assimilation, which are generated from reliable sources, such as those working within the framework of the Copernicus programme<sup>87</sup>. The proposed project will also support downscaling and calibration of the model outputs to the SWIO region and countries, using innovative techniques such as Artificial Intelligence and by utilizing the observations from the expanded network also supported by the project; which will also contribute to improvements in global NWP/EPS through the GBON commitment to share internationally these data through the WMO Information System/Global Telecommunication System.

Dissemination and communication and engagement with the users of CP-CS to produce timely, high-quality services is also limited in the four target countries. Overall, there is a lack of procedures in place to co-produce climate information with users, collect their feedback and improve the range of CP-CS. For example:

- There is no operational service dedicated to agriculture which relates to precipitation forecasting, temperature and humidity in Comoros. Concerning fisheries, there is no efficient marine weather service to alert fishing communities in the event of strong winds or swells.
- In Madagascar, the hydrological monitoring is weak while floods are a predominant risk. Though crops calendars for the rainy season for each type of culture and for each region are made available to farmers, their accuracy is limited due to a lack of downscaled forecasts and climate data at district level<sup>88</sup>.
- In Mauritius, Emergency Operations Procedures (EOP) are in place for all the major hazards like tropical cyclones, however, there is a lack of resources and capacities at local scale (local authorities) to implement them.
- With regards to fisheries, Seychelles' NMHS delivers marine forecast to fishermen on harbour, but they do not have relevant equipment to warn fishermen on sea. Finally, no river hydrology monitoring is available for settling relevant flood alert system with high water thresholds referring to water catchment hydraulic behaviour.
- None of the target countries have the capacity for MH-IBF-EWS; and therefore, the proposed project has a strong component on building such capacity.

The four countries are committed to address these shortcomings by improving the production and delivery of timely, accurate CP-CS; this can be illustrated through their engagement within the Sendai Agreement as well as other strategies and plans like the NAP and NDC. Moreover, consultations conducted during the project development phase indicated that sector users, including the departments of agriculture, fisheries and tourism (see details in section D.5 and in Annex 07), are in need of better CP-CS, including timely alerts for cyclones, floods, and storms, accurate daily forecasts, and seasonal weather advisories. It is likely that the project will create new demands for CP-CS, based on further consultations and engagement with stakeholders and end-users.

Several GCF outcomes for adaptation will also be achieved through the proposed project, namely:

- A5.0 Strengthened institutional and regulatory systems for climate-responsive planning and development
- A6.0 Increased generation and use of climate information in decision-making
- A7.0 Strengthened adaptive capacity and reduced exposure to climate risks
- A8.0 Strengthened awareness of climate threats and risk-reduction processes

## 2- Scope of the project and description

The proposed Hydromet project is designed to scale up current initiatives supporting climate services in Comoros, Madagascar, Mauritius and Seychelles. This will be achieved by building on investments to:

- i) Improve weather and climate monitoring techniques and downscale climate change projections, while complementing existing weather observation network or planned hydrological networks,
- ii) Enhance the production and dissemination of climate services by scaling up existing initiatives in the production of agrometeorological advisories and early warnings for tropical cyclones, develop new services for the fisheries and tourism sectors, disseminate timely, reliable and accurate MH-IBF-EWS, and produce or update risk management and adaptation plans,

<sup>87</sup> <https://climate.copernicus.eu>

<sup>88</sup> Personal communication with DAPV, Direction de l'agriculture en appui à la production végétale

- iii) Foster collaboration and knowledge exchanging for hazard monitoring and risk management through sustaining and strengthening of the SWIOCOF and the UIP,
- iv) Improve capabilities in implementing a people-centered MH-IBF-EWS through collaboration between NMHSs and DRM institutions at regional, national and local levels.

All supported by regional collaboration and national institutional development, including capacity building. The proposed interventions have been developed with the end-users of CP-CS in mind to provide improved CP-CS addressing their needs. Users will be engaged in project interventions to better understand the risks and vulnerability associated to climate-related hazards, and to ensure that information is packaged to inform decision-making processes at the local level, using the best communication channels for each specific group of users.

**Component 1: Capacity building, institutional development, regional cooperation and public-private engagement**

This Component will set up the basis for a regional approach and collaboration for weather and climate monitoring and risk reduction. It will support the adoption of a Regional Climate Services Framework (RFCS) that will contribute to developing a common risk culture among IOC member states that reinforces weather data and information sharing in order to better understand, monitor and prevent hydro-meteorological hazards in the region (i.e. tropical cyclones, storms with strong winds and heavy rainfall). The establishment of an RCC-Network under the aegis of IOC and as a formal designated centre by WMO, will provide the following services and facilities to IOC member states (mandatory functions) (i) operational activities for long-range forecasting (LRF); (ii) operational activities for climate monitoring; (iii) operational climate data services; and (iv) training in the use of operational RCC products and services. Additional functions, not mandatory but highly recommended by WMO, for the RCC-Network will also be implemented. These include: (a) climate prediction and climate projection (beyond 2 years' timeframe); (b) research and development; (c) non-operational data services; and (d) coordination functions – IOC would have a clear role in the implementation of the last two. Attached to the RCC-Network, there will be the establishment of a WMO Regional Instrument Centre, for the calibration and maintenance services for the hydro-meteorological equipment, and of a regional center for specialized training and capacity building, to complement the existing training in the region; and the development of a UIP for the dissemination of the RCC-Network products and tools within SWIO region. This platform will also be used for experience and knowledge sharing for adaptation and disaster risk reduction (complementing the SWIOCOF), and for dissemination of MH-IBF-EWS and the SWIO climate outlooks.

The modalities under which the RCC-Network will be hosted and run will be determined in the RCC-Network strategy and operating plan. Once the RCC-Network strategy and operating plan, including the roles and responsibilities of each 'RCC-Network node', is endorsed by the WMO Regional Association I (Africa) and approved by IOC Member States, multi-lateral agreements between member countries and the IOC will be prepared, following WMO recommendations<sup>89</sup>.

The DRM institutions in the SWIO region have been benefiting from the support of the Indian Ocean Regional Intervention Platform (PIROI). In addition, the SWOT analysis done of the NMHS and DRM institutions in the four countries has demonstrated that the weakest link in EWS lies in the ability to generate, disseminate and uptake meaningful and actionable warnings. These aspects require strong collaboration and partnership between NMHSs and DRM institutions. This component will then support strengthening this partnership at regional and national levels, and building the capacity of stakeholders to ensure effective uptake of the new CP-CS.

The SWIOCOF will be convened by IOC, in coordination with the RCC-Network and the NMHSs. To support the long-term production of regional services, the multi-lateral agreements will provide details of how each Member State will financially contribute to the running costs of the RCC-Network and attached facilities beyond the project's lifetime – e.g. finance for the maintenance and calibration laboratory, the specialized training center, the UIP and the SWIOCOF.

<sup>89</sup> WMO Manual on the Global Data-processing and Forecasting System, 2019 edition: [https://library.wmo.int/doc\\_num.php?explnum\\_id=10164](https://library.wmo.int/doc_num.php?explnum_id=10164)

A regional business model/plan will also be developed to identify additional sources of funding for the RCC-Network from public and private sectors, e.g. through commercialisation of regional CP-CS (see Annexes 3a and 21). Capacity development plans will be developed to support 'organisational change' required to support the 'digital transformation' of the NMHSs, as well as to establish career paths that would support retaining the trained, skilled and talent staff (see Annex 2D).

The NMHSs of the target countries in the SWIO region are not Agencies; and therefore a mechanism needs to be sought to ensure that they are able to manage revenues and incomes from their commercial services and cost-recovery that would support O&M. Therefore, the Hydromet legal and regulatory material for each of the four target countries will be reviewed to either transform the NMHS in an Agency with financial autonomy for managing funds from commercial services and cost-recovery, or establishment of a CIEWS Fund to manage such funds, that is managed by a Central Committee chaired by the related Ministry and membership from the stakeholders (see Annex2C). Market surveys will also be carried out to explore opportunities to establish or strengthen existing national funds for CIEWS.

A baseline study on how CP-CS and MH-IBF-EWS for hydrometeorological hazards are used in each beneficiary country, and on user requirements for improving such services will be carried out in order to reconfirm the sector needs basis and take into consideration any new conditions (such as those arise from the COVID-19 pandemic) for fine-tuning the design of the hydromet observation, modeling, forecasting and service delivery systems. In general, users want more accurate, reliable, timely and location-specific forecasts, provided with a user-friendly terminology. However, for products and services be target to specific user sectors, this general statement is not sufficient. For instance, for the development of target products for the agriculture sector, detailed user requirements are needed, *inter alia*: (a) the time and frequency this sector needs the agromet advisory; (b) the user's preferable channel to receive the information; (c) the required content of the agromet advisories (i.e. variables, locations, observations, forecasts for various timescales). With these information, it will be possible to: (a) fine-tune the design of the agromet network to provide the data for the required locations and variables; (b) use the agromet data to calibrate forecast data from NWP; (c) define the channels for dissemination of the agromet advisories; (d) etc.

In addition, noting that the proposed Hydromet project will partly support the optimum composite surface observation network and associated ICT systems for the SWIO region aligned with the Global Basic Observing Network (GBON) concept, at the initial phase of the project, options will be explored for leveraging funds from the newly GBON Systematic Observations Financing Facility (SOFF) for the completion of the implementation of the network.

Component 1 will also strengthen institutional and financial status of NMHSs with particular attention given to retaining skilled staff, which underpins the long-term generation of timely, high-quality climate information products and services; provide core training to NMHS' staff members and ensure the harmonization of climate-related products and services across countries, based on international good practices and WMO technical regulations that defined the standards.

While the level of the NMHSs of the 4 countries is different (please see Table 2 in section A.21), they all face similar institutional and capacity problems and therefore, regional collaboration is critical. In this sense, the activities under Component 1 will be implemented equality across the four countries.

The following Outcomes, Expected Results, Outputs and Activities (summary below and detailed description provided in section E.6.) are planned under Component 1:

Outcome 1: Strengthened institutional capacities and regional cooperation through improved governance mechanisms

Expected Result 1: Generation, dissemination and uptake of climate-related information supported by effective organizational and institutional capacities, regional cooperation, and enabling environment

- Output 1.1 A Regional Climate Centre Network (RCC-Network) and frameworks for CS established
  - Activity 1.1.1 Develop regional and national frameworks for climate services (RFCS & NFCS)

Under this activity, each country will develop a National Framework for Climate Services (NFCS) to coordinate, facilitate and strengthen collaboration among national institutions for enhanced use of CP-CS and to facilitate a long-term sustainable business model for national climate services.<sup>90</sup>

At a same time, under the leadership of IOC, a Regional Framework for Climate Services (RFCS) will be developed to coordinate, facilitate and strengthen collaboration among regional institutions (e.g. PIROI) for enhanced use of CP-CS; and at the same time to introduce an harmonized approach across the region and input to the NFCS.

- *Activity 1.1.2 Establish the legal, institutional, financial and organisational model for the establishment of the RCC-Network; define a strategy and develop an operating plan for setting up and operationalize it; reach formal designation by WMO*

This activity includes the development of a legal, institutional, financial and organizational model for the establishment of the RCC-Network. This will be done through regional meetings and workshops led by IOC, with the participation of the four countries.

As each country will have, a particular function(s) in the RCC-Network, this need to be discussed and agreed at the national level with the relevant authorities, and therefore, NMHSs of the four countries will be responsible for coordinating the inputs and organize the relevant consultative meetings and workshops at the national level.

- *Activity 1.1.3 Define strategies and develop operating plans for the establishment of (i) a regional laboratory for maintenance and annual calibration of equipment as a WMO Regional Instrument Centre; and (ii) a regional centre for specialized training (centre/lab will be set up under Output 2.2)*

At the regional level, led by IOC, there will be regional workshops with the participation of the four countries to refine the requirements and develop strategies for the establishment of a regional laboratory in Seychelles and a regional training for specialized training in Mauritius.

At the national level, there will be initial meetings for development of the operating plans, and follow up meetings/field visits to assess progress in the establishment of a regional laboratory in Seychelles (led by the NMHS of Seychelles) and a regional training for specialized training in Mauritius (led by the NMHS of Mauritius).

- *Activity 1.1.4 Prepare a strategy to improve Regional Numerical Weather and Climate Prediction (NWP/NCP)*

The development of the Regional Numerical Weather and Climate Prediction strategy will be done at the regional level. Led by IOC, there will be consultative workshops with the participation of the four countries and partners, including the relevant WMO global and regional centers.

- **Output 1.2 Institutional arrangements for NMHS operation strengthened and hydromet laws prepared with potential CIEWS funds established**

- *Activity 1.2.1 Strengthen the institutional, operating and financial strategy of NMHSs for each target country*

Under this activity, each country will review existing arrangements and will develop institutional, operating and financial strategies of their NMHSs.

---

<sup>90</sup> WMO, 2018. Step-by-step Guidelines for Establishing a National Framework for Climate Services

- *Activity 1.2.2 Develop the transition plan support required for each NMHS, DRM institutions and relevant sectoral ministries (Capacity Development plans)*

Under this activity, each country will develop capacity development plans (see Annex 2D ) to support 'organisational change' required to support the 'digital transformation' of the NMHSs, as well as to establish career paths that would support retaining the trained, skilled and talent staff .

- *Activity 1.2.3 Review and/or strengthen legal and regulatory materials, including the establishment of a CIEWS fund*

Under this activity, each country will review their legal and regulatory materials; and review and evaluate all possible mechanisms to establish a CIEWS fund. Based on this analysis, each country will revise / strengthen their respective legal and regulatory materials. This activity relates to procuring the technical assistance for the review of the possible mechanisms and preparation of the required documentation for the establishment of the CIEWS fund (see Annex 2C).

- **Output 1.3 Improved staffing capacity and capability of the RCC-Network, NMHSs and other relevant institutions**

- *Activity 1.3.1 Recruit new staff members for the RCC-Network and NMHSs*

Under this activity, each country will assess its NMHS needs in terms of human resources to carry out both its national responsibilities and its functions as part of its RCC-Network node. Based on the result of the assessments, there will be recruitment of staff in each country. GCF proceeds will not be used to support this activity.

- *Activity 1.3.2 Train new and retrain existing staff, in accordance with the WMO Standards for Education and Training in Meteorology and Hydrology<sup>91</sup> (Basic Instruction Packages for meteorologists and meteorological technicians; and for hydrologists and hydrological technicians)*

Under this activity, in each country, new and existing staff will be trained/retrained at national/regional universities and research institutions. Twinning arrangements with WMO global and regional centers will also be considered.

- **Output 1.4 Fine tune the design to develop technical specification, system integration and tendering process of Project Activities prepared and implemented**

- *Activity 1.4.1 Conduct baseline study on how CP-CS and MH-IBF-EWS for hydrometeorological hazards are used in each beneficiary country, and on user requirements for improving such services*

Under this activity, each country will conduct studies to reconfirm the access to, and use, of CP-CS, as well as the status of the EWS at the baseline level, and take into consideration any new conditions (such as those arise from the COVID-19 pandemic); these will be re-assessed at project mid- and end-term to demonstrate progress/achievements throughout project implementation.

- *Activity 1.4.2 Fine tune the design of the hydromet observational networks, modelling, forecasting, and service delivery systems, for each NMHS, taking a regional harmonized approach*

- Under this activity, each country will develop the detailed/fine-tuned systems technical specifications, while the tender process will be carried out by IOC. The detailed list of equipment and information systems per country is provided under Activities 2.1.1 and 2.1.2, respectively. *Activity 1.4.3 Ensure full system integration from observation stations to delivery of CP-CS to end-user*

This activity includes the development of step-by-step practices and procedures for system integration and coordination of project activities in each country. Various networks and even the same type of network but from different manufacturers use different datalogger software which collect data in different

<sup>91</sup> [https://www.wmo.int/pages/prog/dra/etrp/documents/1083\\_Manual\\_on\\_ETS\\_en\\_rev.pdf](https://www.wmo.int/pages/prog/dra/etrp/documents/1083_Manual_on_ETS_en_rev.pdf)

formats. Their associated data management systems only allow the display of the data coming from the same network and same manufacturer. This activity will therefore support the development of a data integration “architecture” where the all data from the various networks and within the same network from different manufacturer be transmitted to a centralized Datacenter (to be established under the proposed project) and converted in the WMO standard formats. All these standardized data will then be integrated and displayed in a single data management system (rather than those individual systems provided by the different manufacturers/suppliers) – the standardized WMO Climate Data Management System (please see [https://www.wmo.int/pages/prog/wcp/wcdmp/CDM\\_3.php](https://www.wmo.int/pages/prog/wcp/wcdmp/CDM_3.php)). As part of this activity, a detailed study of the various networks and types of equipment, data formats and transmission will be study with the intend to develop the data integration “architecture” and implement/develop the various scripts required to ensure the transmission, conversion, standardization, as well as automation of the data management.

### **Component 2: High-quality climate-related data, improved multi-hazard impact-based forecasts and EWS (MH-IBF-EWS), and climate risk assessments**

Under Component 2, equipment for observation and monitoring networks, and information systems will be modernised in the project target countries, following the WMO technical regulations / standards. Moreover, the technical capacities and expertise of NMHS’ staff members will be improved through specialized and hands-on training aligned with the NMHSs competencies, and Research & Development (R&D) activities and their operationalization. Stakeholders and other users will also be trained under this component.

To facilitate hydro-meteorological equipment maintenance and organisation of trainings, a regional specialized training and a regional maintenance and calibration centre (WMO Regional Instrument Centre) will be set up and/or refurbished and run attached to the RCC-Network. These activities will also enhance regional collaboration, enable cost saving and support the long-term production of effective CP-CS, which require high-quality, well-maintained equipment (e.g. sensors).

To further support CP-CS, understanding of climate-related risks on economic sectors and communities will be improved through trainings and the production of hazard and vulnerability maps. Such maps will be developed taking into account climate change impacts on return periods/intensity of selected hazards; moreover, they will be produced using participatory approaches with NMHSs, DRM institutions, local authorities of hazard-prone areas, and public and private sectors representing agriculture/fisheries, tourism, water resource management sectors and communities at-risk.

The purpose will be to identify main assets at stake and most vulnerable people affected by the selected hazards from a local point of view, based on how people/assets were affected during past events. By indicating the location, frequency, intensity and impacts of hazards, these maps will be useful to develop risk prevention plans, under Component 3.

Multi-hazard impact-based forecasting and early warning system/services capability<sup>92</sup> will be built through shifting from deterministic to probabilistic forecast techniques. NMHSs will make use of recent scientific and technological developments, including innovative and cost-effective solutions to ensure sustainability by using ensemble prediction system products from advanced centers at very high-resolution<sup>93</sup> (e.g. as those generated within the framework of the Copernicus programme<sup>94</sup>), and will carry out downscaling and calibration of these products to the target countries exploiting newly developments such as artificial intelligence<sup>95</sup>. This will result in more accurate forecasts of the likelihood and severity of the events, which will lead to increasing confidence of end-users in using such forecasts and warnings in their decision-making processes. Thresholds values for issuing warnings will be determined based

<sup>92</sup> <https://public.wmo.int/en/resources/world-meteorological-day/wmd-2018/multi-hazard>

<sup>93</sup> <https://www.ecmwf.int/en/about/media-centre/science-blog/2020/baseline-global-weather-and-climate-simulations-1-km?fbclid=IwAR0AV9mKH1gIIxYToXYGgPko5RtXmd8mDlu2ErKQCzUU30pAEzfEDSNfnMQ>

<sup>94</sup> <https://climate.copernicus.eu>

<sup>95</sup> <https://journals.ametsoc.org/bams/article/98/10/2073/70032/Using-Artificial-Intelligence-to-Improve-Real-Time>

on extreme value analysis and review of historical hydrometeorological events. By working with the DRM institutions and the various sectors, risk analysis will be undertaken, incorporating hazard, exposure and vulnerability data, and assess potential impacts from extreme weather- and climate-related events. The implementation of MH-IBF-EWS will be done under component 3.

Climate change projections, downscaled to specific sectors, and maps produced under this Component will be shared with stakeholders in climate-sensitive sectors through the UIP, run in association with the RCC-Network, and strengthened under Component 3.

As none of the target countries have the capacity for end-to-end MH-IBF-EWS; and the Component 2 of the proposed project has a strong focus on building such capacity, from detection and monitoring the hazardous hydromet events, making use of advanced modelling techniques and downscaling to the country/district levels for improved forecasting, production of target products to user sectors, and proper dissemination of forecasts and warnings. Aligned with the GFCS components, Table 2 in section A.21 describes the GFCS categorization for the baseline status and after the proposed Hydromet project interventions. In general, all activities under Component 2 are to be implemented by the 4 countries, however the level of which the NMHSs will be reaching is quite different, especially in the “Observations and Monitoring” component of GFCS, where investments in Madagascar and Comoros are on the critical and absolutely required networks, i.e. categorized as “Essential” under GFCS (those that the NMHS will be able to operate and maintain in order to be sustainable); while Mauritius and Seychelles will be able to operate and maintain an advanced observation and monitoring, in a sustainable way (Output 2.1). As the observational data generated by the new networks supported by the proposed project under this Component will be shared within the SWIO region, all countries will benefit, even if there are different levels of investment.

Significant investments are also in the GFCS Component “Climate Services Information System (CSIS)”, which the current baseline for the 4 countries is at the “Basic” level, so interventions will be done equally across all countries, to reach “Full” in the GFCS categorization for Comoros and Madagascar, and “Advanced” in Mauritius and Seychelles – this difference relates to the fact that these countries will be hosting the “regional calibration lab” and the “regional training center” (Output 2.2). Activities under the Output 2.3 will be equally implemented in all four countries, none of these countries have been applying innovative and cost-effective techniques to generate science-based hydromet information.

The following Outcomes, Expected Results, Outputs and Activities (summary below and detailed description provided in section E.6.) are planned under Component 2:

Outcome 2: Strengthened capacities and capabilities for detection and monitoring climate-related hazards

Expected result 2: Upgraded obs. & monitoring, and information systems capacities secure reliable capacity to monitor climate-related hazards & assess trends

- **Output 2.1 Enhanced hydro-meteorological observation and monitoring, by making use of innovative technologies for cost-effectiveness**

- *Activity 2.1.1 Modernise/upgrade climate-related observation and monitoring network<sup>96</sup>*

Under this activity, the networks will be modernised in each country based on the detailed plan and specifications produced under output 1.4.

In Comoros: Rehabilitation/extension of the building where the National Meteorological Service is based, upgrade the national synoptic networks (meteorological stations following the Feasibility Study recommendations – Annex 2; and hydrologic stations following HYCOS recommendation), sub-synoptic rainfall network in flood-prone areas, agrometeorological observing network, AWOS and ASOS, meteorological oceanographic buoys, Upper air radiosounding system, Doppler radar, Tower for radar.

In Madagascar: Upgrade national synoptic networks (meteorological stations following the Feasibility Study recommendations – Annex 2; and hydrological stations following HYCOS recommendations), sub-synoptic rainfall network in flood-prone areas, agrometeorological observing network, Upper air radiosounding system, Doppler radar, Tower for radar.

<sup>96</sup> The proposed interventions are based on missions in the four beneficiary countries; they also take into account the recommendations of HYCOS feasibility study which was conducted in June-September 2019.

In Mauritius: Upgrade national synoptic networks (AWS and hydrological stations following HYCOS recommendation), sub-synoptic rain network in flood-prone areas (Port-Louis), Wave radar for North Mauritius, Rodrigues and Agalega, Maregraph for North Mauritius, Rodrigues and Agalega and Brandon, Lightning detection network station at Rodrigues, Upper air radiosounding system for Agalega, Saint Brandon and Rodrigues, Doppler radar for Rodrigues, Tower for radar.

In Seychelles: Upgrade national synoptic networks (AWS and hydrological stations following HYCOS recommendations), sub-synoptic rainfall network in flood-prone areas (Mahé, Praslin and La Digue), Wave radar for Mahé, Praslin and La Digue, Tide gauge for Mahé, Praslin and La Digue, Lightning detection network stations for Mahé, Praslin and La Digue, Doppler radar for Mahé, Tower for radar.

- *Activity 2.1.2 Modernise/upgrade the information and communication technology systems*

In each of the four countries, the following systems will be upgraded and/or set-up:

- Data collecting system
- Automatic Meteorological Switching System
- Data center
- Storage and archive of national data
- Forecaster workstation
- Climatological Database Management System
- Service delivery platform (i.e. end user production system)

- **Output 2.2 Regional facilities for maintenance and training established**

- *Activity 2.2.1 Establish a maintenance and calibration laboratory (WMO Regional Instrument Centre)*

A regional maintenance laboratory (WMO Regional Instrument Centre) will be built and equipped in Seychelles to do support maintenance work and calibration of the existing and new acquired hydromet equipment for the four countries in the region, following the strategy developed under Activity 1.1.3.

- *Activity 2.2.2 Equip the specialized training centre for the region, hosted by Mauritius NMHS (which will contribute to the WMO Global Campus<sup>97</sup> by making available training materials at the center to all WMO Members)*

A specialized training center for the region will be equipped in Mauritius to support training in the region, for the four countries and also contribute to the WMO Global Campus by making available the training materials developed by this training center, following the strategy developed under Activity 1.1.3.

Outcome 3: Quality of forecasts and warnings improved and integrated in the decision-making processes

Expected result 3: Generation of science-based multi-hazard weather, climate and water risk info improve the quality of forecasts and warning, and impact-based decision-making

- **Output 2.3 Science-based multi-hazard weather and climate risk information generated**

- *Activity 2.3.1 Downscale and calibrate meteorological forecasts by making use of numerical weather prediction/ensemble prediction systems (NWP/EPS) and applying modern techniques such as artificial intelligence – these developments will be done at a regional platform (in a cloud) with contribution of experts from the four NMHSs*

Aligned with the strategy to improve Regional Numerical Weather and Climate Prediction developed under Activity 1.1.4, staff from the four NMHSs will be on hands-on training at the regional center in Mauritius. This activity will be coordinated by IOC, and includes the participation of international experts as lecturers, for the common training sessions for the four countries. This activity also includes individual tasks such as forecast verification and downscaling to national level for each of the four countries.

<sup>97</sup> For WMO Global Campus, see <https://public.wmo.int/en/resources/meteoworld/wmo-global-campus>

- *Activity 2.3.2 Establish threshold values for issuing warnings based on extreme value analysis and review of historical hydrometeorological events*

This is an activity carried out at the national level in each country, with workshops with NMHSs and DRM institutions and other stakeholders (including NGOs) to agree on national threshold values for issuing warnings based on extreme value analysis and review of historical hydrometeorological events in each country.

- There will be also regional workshops led by IOC, with the participation of the four NMHSs and of PIROI, for harmonization of threshold warnings across the region to facilitate integration of warning information into the regional “meteo-alarm” type dissemination.

- *Activity 2.3.3 Develop hazard maps*

This is an activity carried out at the national and local levels in each country, with workshops with NMHSs and DRM institutions and other stakeholders (including NGOs) to understand the frequency and intensity of selected hazards, and develop or update the hazard maps using the monitoring equipment established under Activity 2.1.1 and based on return period of the hazards.

- *Activity 2.3.4 Develop vulnerability maps*

This is an activity carried out at the national and local levels in each country. Based on the hazard maps produced under Activity 2.3.3, a mapping exercise for climate-risk vulnerability – of people and assets – will be conducted in a participative way with the NMHS, local authorities of hazardous-prone areas, public and private sectors representing agriculture/fisheries, tourism, health, water sectors and at-risk communities. There will also be workshops at national and local levels to raise awareness of climate-related vulnerability and shifts in the context of climate change.

- *Activity 2.3.5 Undertake risk analysis incorporating hazard, exposure and vulnerability to identify potential impacts from extreme events*

This is an activity carried out at the national and local levels in each country. This activity will involve compilation of various datasets available for characterizing hazard, vulnerability and exposure to develop a tool in quantifying risks, i.e. potential impacts. This tool will therefore be used to analyse exposure and determine potential physical, environment, social and economic impacts in the four countries due to their respective hazards. This risk analysis tool or methodology will be used in generating multi-hazard impact-based forecasts and early warnings and visualization maps through the knowledge and decision support system that will be developed in Output 3.2.

- *Activity 2.3.6 Carry out downscaling of global and regional seasonal forecasts to national level, and use them to produce agrometeorological products*

Aligned with the strategy to improve Regional Numerical Weather and Climate Prediction developed under Activity 1.1.4, staff from the four NMHSs will be on hands-on training at the regional center in Mauritius. This activity will be coordinated by IOC, and includes the participation of international experts as lecturers, for the common training sessions for the four countries. This activity also includes individual tasks such as downscaling of global and regional seasonal forecasts to national level and production of agrometeorological products for each of the four countries.

- *Activity 2.3.7 Build the capacity to downscale climate models for national purposes*

Aligned with the strategy to improve Regional Numerical Weather and Climate Prediction developed under Activity 1.1.4, staff from the four NMHSs will be on hands-on training at the regional center in Mauritius. This activity will be coordinated by IOC, and includes the participation of international experts as lecturers, for the common training sessions for the four countries. This activity also includes individual tasks such as downscaling of climate models to national purposes in each of the four countries.

- *Activity 2.3.8 Build the capacity for hydrological modelling for flood forecasting (i.e. flood propagation model)*

Under this activity, staff from the four NMHSs will be on hands-on training at the regional center in Mauritius. This activity will be coordinated by IOC, and includes the participation of international experts

as lecturers, for the common training sessions for the four countries. This activity also includes individual tasks such as hydrological modelling for flood forecasting in each of the four countries.

### **Component 3: Enhanced accessibility and use of climate services for climate change adaptation, and improved capabilities in implementing a people-centered MH-IBF-EWS for disaster risk reduction**

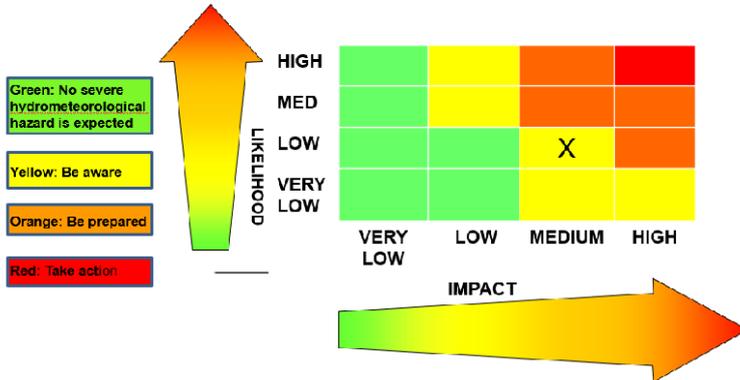
As regional cooperation for climate risk monitoring is strengthened (under Component 1) and equipment, expertise and understanding of climate-related risks and impacts are enhanced (Component 2), the NMHSs will be able to improve the range and quality of their climate-related information, products and services, based on user feedback. The dissemination of CP-CS towards vulnerable socio-economic groups will also be supported, as well as user capacity to use them as decision-making tools. Component 3 particularly aims at equipping decision-makers and communities with adequate tools to prepare for climate-related hazards and to adapt to short- to long-term climate variability and change. The update of the long term climate change adaptation plans will be limited to sections that related to the new results for the climate change projections supported under Component 2. Component 3 will also strengthen existing communication platforms for the producers and users on CP-CS (such as the UIP) and discussion forums (i.e. the SWIOCOF), which run in association with the RCC-Network. These will ensure a continuous interaction among all stakeholders, collection of user feedback on CP-CS, and production of CP-CS based on user needs. A funding strategy to maintain the UIP and SWIOCOF beyond this proposed project will be developed in association with the RCC-Network strategy and operating plan, under Activity 1.1.2. A national framework for MH-IBF-EWS for each country will be developed and harmonized at the regional level. This framework will guide the implementation of MH-IBF-EWS at the local level. This involves collaboration among NMHS, PIROI and the national DRM institutions, and other stakeholders, the development risk matrices for each hazard with agreed risk levels and colour-codes, and description of related impacts and response/actions (i.e. general impact table and general response table for each hazard). Selected vulnerability sites in each country (at least one per country in the coastal areas) will be selected to use such risk matrices and associated information for testing and validating MH-IBF-EWS, with the assistance of local government, PIROI and its national counterparts and associated NGOs. This will be followed by the development/update early warning protocols from hazard to impact-based for issuance, communication and dissemination for each hazard in the identified project sites – this will be done through a collaborative approach among the NMHSs, the National DRM agencies, the local Government, and stakeholder in the identified project sites.

Testing and validating the impact and response tables on early warning in project sites will be done in a collaborative and participatory manner. The above-mentioned impact and response tables will be then localized for the project sites by making use of the vulnerability of specific sites and tailored to the needs of those at risk (i.e. last-mile communities, including indigenous), as well as the local decision-makers, including local government, UN agencies and humanitarian actors, and local NGOs operating on the ground. Committees at the project sites will be established to ensure coordination and collaboration throughout the testing and validation, as well as for the operationalization of the MH-IBF-EWS.

The shift to impact-based forecasting and warning will imply a (re-)design of EWSs – these would need to clearly incorporate both decision-making aspects and the perceptions in terms of risk of vulnerable communities. The latter, as end-users of the last-mile of EWS, will be engaged and consulted throughout the process to ensure that the re-design of the EWS will be optimal for use and relevance. Aspects related to the content of warning messages (which needs to respond to the needs to the vulnerable communities; be effective and actionable), appropriate channels for timely delivery and dissemination of these warnings, and the provisions of end-user feedback mechanisms will be part of the design of the EWS – all using technology with which the end-users are familiar. These developments are done through meetings, workshops and capacity building/training activities.

These developments and testing at the local level will be done in the first three years of the proposed project, and then expanded and rolled out nationwide in the last two years of the project. The promotion of MH-IBF-EWS in the whole country (in the 4 countries) will be undertaken using a scenario approach. Knowledge products and information, education and communication materials will be disseminated to all local government authorities, NGOs on the ground and community leaders, in order to reach all population in the 4 countries. Dissemination and outreach activities will take advantage of regular advocacy activities of the government, UN and other agencies, NGOs, among others; use of traditional media (such as local radio programs), and social media (such as Twitter and Facebook) and other communication channels. Technical workshops to share evidence-based best practices and challenges will also be supported by the proposed project, and by working with other UN and other agencies on the ground (e.g. FAO, WFP, UNDRR). At the same time, a web-based knowledge and decision support system (DSS) that aggregate information from the four target countries, with MH-IBF and color-coded risk-based warnings (regional

“meteoalarm”<sup>98</sup> / “vigilance”<sup>99,100</sup>-type platform that would also contribute to the WMO Global Multi-hazard Alert System – GMAS<sup>101</sup>) will be jointly develop to support early warnings / early actions at regional, national and local levels. While this DSS is primarily to support DRM operations, it is intended to also address impacts to the relevant socioeconomic sectors in the country (i.e. agriculture, fisheries and tourism).



Source: WMO Guidelines on impact-based forecast and warning services.<sup>102</sup>

Under Component 3, significant investments are done in association with the GFCS Component “User Interface Platform”, to reach an “Advanced” level in the GFCS categorization in all countries by taking a regional and harmonized approach (please see Table 2 in section A.21). While noting that Mauritius and Seychelles are already at an “Essential” level, there are still a lot of activities that need to be done to ensure that users can benefit. The proposed Hydromet project takes a regional approach to facilitate sharing of expertise and experiences among the countries, so that those less advanced be able to benefit from those that have a higher level. In relation to be able to generate impact-based forecasts and risk-based warnings, including the last mile connectivity and engagement of vulnerable communities and socio-economic sectors, all 4 countries have limited experience and therefore investments will be done equality across the 4 countries.

The following Outcomes, Expected Results, Outputs and Activities (summary below and detailed description provided in section E.6.) are planned under Component 3:

Outcome 4: Enhanced preparedness and response capability with improved gender and vulnerable people inclusiveness across the EWS value chain

Expected result 4: Improved community resilience through the implementation of people-centered MH-IBF-EWS at regional, national and local levels and improved/prepared preparedness & adaptation plans

- **Output 3.1** Production, dissemination and uptake of CP-CS, including MH-IBF-EWS, improved at regional and national level

- **Activity 3.1.1** Set up/update protocols (standard operating procedures) to produce and deliver improved daily weather bulletins, multi-hazard impact-based forecasts, seasonal forecasts and agrometeorological advisories at national level

Under this activity, there will be a consultative process to improve the production and delivery of weather forecasts and agrometeorological advisories in each country. In each country, Standard Operating Procedures (SOPs) will be established for processes of co-production of products between the NMHS and relevant stakeholders, and of delivery of forecasts, advisories and warnings. Specific agrometeorological bulletins will be developed in each countries.

<sup>98</sup> <http://www.meteoalarm.eu>

<sup>99</sup> <https://vigilance.meteofrance.fr/fr>

<sup>100</sup> <http://www.meteofrance.re/vigilance-reunion>

<sup>101</sup> <https://www.wmo.int/gmas/>

<sup>102</sup> [https://library.wmo.int/doc\\_num.php?explnum\\_id=7901](https://library.wmo.int/doc_num.php?explnum_id=7901)

At the regional level, there will be coordination workshops for consolidation, harmonization and dissemination of the weather and climate bulletins at the regional User Interface Platform (UIP). PIROI and other relevant regional entities will be part of this consultative process at the regional level.

- *Activity 3.1.2 Set up protocols (standard operating procedures) to strengthen MH-IBF-EWS dissemination for and uptake by key sectors and among the general public*

Under this activity, there will be a consultative process to improve the production and delivery of MH-IBF-EWS in each country. In addition to strengthening the early warning systems for tropical cyclones in the four target countries to ensure a wider outreach, the following early warnings will be established or strengthened, to target these specific groups:

- in Comoros: EW for farmers and fishermen (using specific communication channels to reach these groups) focusing on heavy rainfalls (complementing and building on 'Ensuring climate resilient water supplies in the Comoros islands' UNDP-GCF project) and storms
- in Madagascar: EW for farmers and fishermen (using specific communication channels to reach these groups and building on PrAdA in Madagascar) focusing on heavy rainfalls and storms
- in Mauritius: EW for farmers and stakeholders in the tourism and health (using specific communication channels to reach these groups – based on methodologies and outputs from project SAWIDRA for health) focusing on heavy rainfalls, heat waves and storms
- in Seychelles: general public and stakeholders in tourism for heavy rainfalls and storms (e.g. through mobile phone app); specific warnings for fisheries for storms and algal blooms (building on IAEA 'Monitoring of Algal Bloom' initiative).

- **Output 3.2 Short- and long-term risk reduction based on a well-established MH-IBF-EWS in place, and adaptation plans improved or prepared using high quality climate-related data, MH-IBF-EWS products, risk/vulnerability assessments and climate change projections developed under Outcome 2**

- *Activity 3.2.1 Improve data sharing and coordination with emergency services for on-the-ground interventions at national and local levels*

In each country, on a national level, this activity will first review existing emergency response plans and communication processes between relevant stakeholders with a view to improve them to guide quick on-the-ground interventions to mitigate risk impacts.

Because disaster risk response happens at the local level, the national response plans will be downscaled in 2 pilot areas per country selected based on the hazard and vulnerability maps produced under Activities 2.3.3 and 2.3.4. At this level, it is not always possible for emergency services to reach the populations. Hence, key stakeholders to involve in risk prevention and response at the local level (i.e. local volunteers or trusted local stakeholders/leaders who can facilitate emergency responses at the local level) will be identified. Their capacity to understand risk warnings and advisories, to provide advises on risk prevention and to react during/after a hazardous event will be strengthened through trainings. This activity, piloted at the local level in 2 vulnerable areas in each country, will demonstrate how to downscale national emergency response plans at the local level to improve risk prevention, mitigation and recovery, in order to be replicated in other vulnerable sites.

- *Activity 3.2.2 Develop risk matrices for each hazard with agreed risk levels and colour-codes, and description of related impacts and response/actions; test and validate them in selected sites in the four countries (first 3 years of the project); expand and roll out nationwide*

Aligned with the activity 3.2.1, a national framework for MH-IBF-EWS in each country will be developed and harmonized at the regional level. This framework will guide the implementation of MH-IBF-EWS at the local level. This involves collaboration among NMHS, PIROI and the national DRM institutions, and other stakeholders, the development risk matrices for each hazard with agreed risk levels and colour-codes, and description of related impacts and response/actions. Selected vulnerability sites in each country will be selected to use such risk matrices and associated information for testing and validating MH-IBF-EWS, with the assistance of PIROI and its national counterparts and associated NGOs. These developments and testing will be done in the first three years of the proposed project, and then expanded and rolled out nationwide (in the last two years of the project) using scenarios, and through

the dissemination of knowledge products and outreach materials with the assistance of NGOs and through the community leaders, in order to reach all population in the four countries.

- *Activity 3.2.3 Develop a knowledge and decision support system to support the implementation of MH-IBF-EWS at regional, national and local levels (to be part of the UIP – Activity 3.3.3)*

A web-based knowledge and decision support system (DSS) that aggregate information from the four target countries, with MH-IBF and color-coded risk-based warnings (regional “meteoalarm”<sup>103</sup>/“vigilance”<sup>104</sup><sup>105</sup>-type platform that would also contribute to the WMO Global Multi-hazard Alert System – GMAS<sup>106</sup>) will be developed at regional level (led by IOC), with the participation of national and local authorities and stakeholders. This DSS will support early warnings / early actions at regional, national and local levels. While this DSS is primarily to support DRM operations, it is intended to also address impacts to the relevant socioeconomic sectors in the country (i.e. agriculture, fisheries and tourism). *Activity 3.2.4 Update long term climate change adaptation plans responding to the needs of each country, to be shared on the UIP (Activity 3.3.3).*

Under this activity, each country will update their NAPs with new climate projections developed under Output 2.3.

- **Output 3.3 Training for improved dissemination and preparedness involving users and end-users of CP-CS**

- *Activity 3.3.1 Train staff members of NMHS and in the RCC-Network on how to package climate-related information in a user-friendly way*

Under this activity, each country will organize workshops with NMHSs and CP-CS users in priority areas of the GFCS to ensure better packing of climate-related products prepared by the NMHSs including sector-tailored forecasts and EWS.

Similarly, at the regional level, IOC will organize workshops with the NMHSs CP-CS users in priority areas of the four countries for the development of regional climate products to be generated by the RCC-Network.

- *Activity 3.3.2 Train knowledge brokers – including NGOs, red crescent/cross, local leaders and extension officers – and representatives of sectors in the GFCS areas (public and private organisations) on how to interpret and use CP-CS for decision-making*

Under this activity, key knowledge broker institutions for risk prevention and response at the local level will be identified in each country. Their capacity to understand hazard warnings and advisories, to provide accurate advices on risk prevention and to react during/after a hazardous event will be strengthened through trainings.

At the regional level, there will be workshops with the NMHSs of the four countries, PIROI and its national counterparts (DRM institutions in the four countries) to ensure early warning / warning actions at regional, national and local levels.

- *Activity 3.3.3 Strengthen the User Interface Platform (UIP)*

The project will strengthen the existing Regional Climate Portal developed by IOC and hosted by Seychelles (SMA) since August 2019<sup>107</sup>. The Portal will be upgraded and will incorporate the new CP-CS developed under the project, as well as the above-mentioned DSS.

- *Activity 3.3.4 Support SWIOCOFs to ensure the active participation of climate services users*

SWIOCOF is a yearly event convened by IOC (in September), but with poor representation of climate services users. The project will support such users and also improvements in the content and organization of the events.

<sup>103</sup> <http://www.meteoalarm.eu>

<sup>104</sup> <https://vigilance.meteofrance.fr/fr>

<sup>105</sup> <http://www.meteofrance.re/vigilance-reunion>

<sup>106</sup> <https://www.wmo.int/gmas/>

<sup>107</sup> <http://regionalclimate-change.sc/en/>

**B.4. Implementation arrangements (max. 1500 words, approximately 3 pages plus diagrams)**

The project will be implemented through different entities whose roles and responsibilities are as follow:

<b>Entity</b>	<b>Status</b>	<b>Project responsibilities</b>
<b>AFD</b>	GCF Accredited Entity (AE)	AFD will be the Accredited Entity (AE) for the Project and will be responsible for overseeing the implementation, financial management, evaluation, reporting and closure of the activities under the project. AFD will monitor and supervise the execution of the project and ensure the proper management and application of GCF Grant Proceeds by the Executing Entity. AFD will have the overall responsibility of the Project implementation and will ensure that the Grant Proceeds are utilised in accordance with the terms of the Funded Activity (FAA) Agreement and the Accreditation Master Agreement (AMA).
<b>IOC</b>	Executing Entity (EE)	The IOC will be the Executing Entity (EE) as defined in the GCF-AFD signed AMA. Thus, the IOC (EE) will assume overall responsibility for the effective delivery of project inputs and interventions in order to achieve the expected project outputs. To fulfil its role, the EE will set up a Project Management Unit (PMU). The IOC will be the only entity mandated to engage, supervise procurements processes and to manage the funds. IOC as EE, and the regional organization mandated by the member countries to develop the Project and submitted to the GCF, will enter into a Project Agreement (PA) with the Ministries of Foreign Affairs (MoFA) of each concerned country member, which are the official representatives. The PA of each country shall (i) designate the NMHSs as the lead national lead implementing entity which shall be nominated as National Implementing Partners (NIP), (ii) designate all the beneficiaries entities; called in the project as the National Services Providers, (NSP). The PA shall details all the activities, sub-activities and objectives to achieve according to the Project at both national and regional level. The PA will be subject to AFD (AE) approval and shall considered as a precedent conditions.
<b>NHMSs</b>	<b>National Implementing Partner's (NIP) &amp; National Services providers</b>	<p>The National Meteorological and Hydrological Services (NMHSs) of each beneficiary country are expected to be designated by their respective Government as the lead implementing national entity (NIP). NMHSs, will be respectively accountable to IOC (EE) for the project execution at the national level. NMHSs, as the NIP and others NSPs, will not be mandated for the use and managements of GCF funds and all related procurement process.</p> <p>The NMHSs, as national lead implementing entity, will host the national project coordinator. The NMHSs, with the support of the EE through the PMU team and the NPCs, will be strongly involved in the project objectives achievements at the national level and will actively participate to procurement process co-design and approval for of equipment's technical specifications, national strategies, capacity building programs and training session, and equipment's installation and operation. NMHs and all beneficiaries entities of the Project will continue to involved in the project implementation in active way, as they were involved during the feasibility study of the project. The effectiveness of the project ownership by each of the four countries will be set at the project onset by adopting this approach of consultation, co-design and co-implementation and co-monitoring at national level.</p>

<b>Others National Stakeholders and beneficiary entities</b>	National Services Providers ( NSPs)	National Disaster Management Agencies (NDRM), Environmental and Climate change and sectoral ministries such us: tourism, agricultures and fishery ministries, civil society organizations, Red Cross Red Crescent National Societies and other national NGOs involved in early warning and last mile connectivity, will be the National Service providers within each beneficiary country. Each of the already identified NSPs will be actively participating on the pledged national activities and sub activities under the aegis of the NMHS (NIPs).
--	-------------------------------------	---

In order to ensure strong Project ownership, and at the country request, it has been agreed with IOC (EE), the country members and AFD (AE) that National Project Coordinators (NPCs) will be co-recruited by the EE and the each of beneficiary countries, supported by the PMU and with the involvement of NMHSs ( NIP). The NPCs will be part of the PMU and be deployed at national level and hosted by the NMHSs (NIP). Country involvement will be also ensured by the designation of a project National Focal Point (NFP), which is expected to be permanent staff member of the NMHS to coordinate and liaise with the NPC, as well as with the national DRM institutions and NGOs, which are national partners in the project.

**Implementation Arrangements**

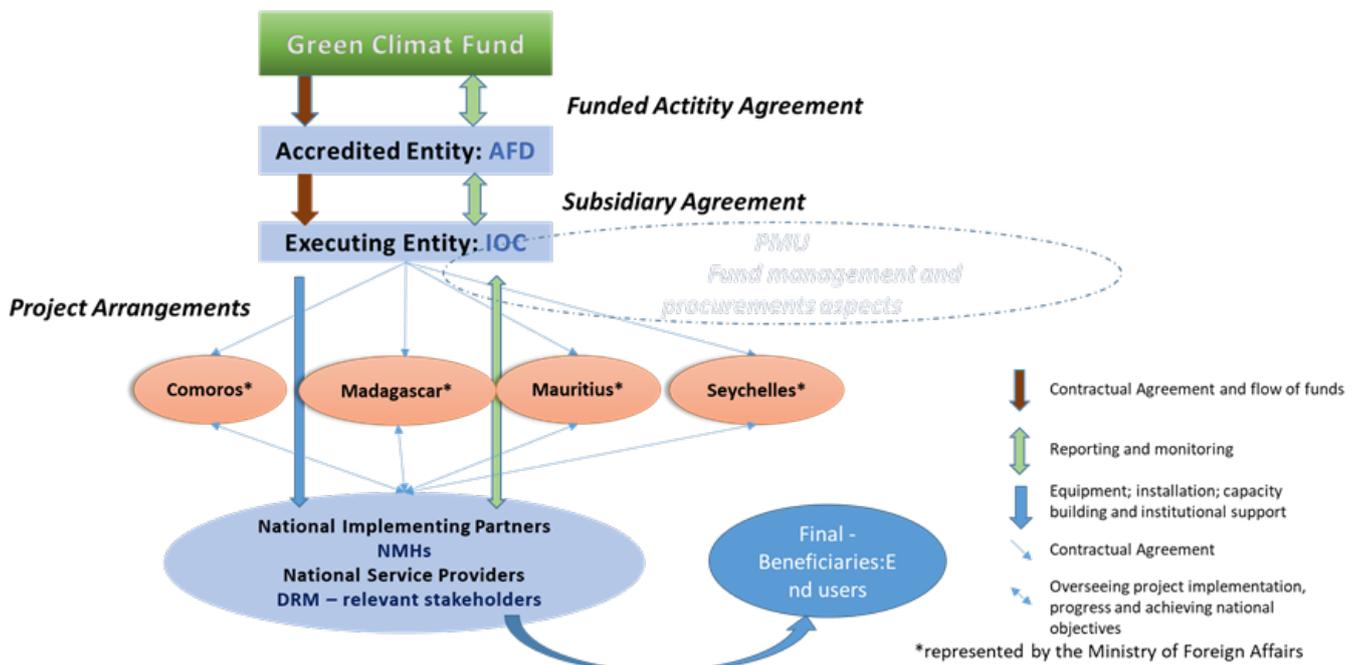


Figure 2: Project Organisational structure

Project delivery stakeholder roles, mandates, and governance structure are described and illustrated below:

**AFD:** as the AE for the proposed project, has a strong and established experience working in IOC countries. Its regional headquarters is based in La Réunion island, while three AFD offices are present in Mauritius (covering Mauritius and Seychelles), Comoros and Madagascar. Moreover, AFD has already four projects/programmes approved by GCF Board (FP021, 42, 95 and 119). As the AE, AFD will manage the funds for the implementation of the project. AFD will have a quality assurance role involving AFD staff in Paris headquarters and at the regional level, within AFD agency in Mauritius (where the IOC has its headquarters) and will involve when deemed relevant its Madagascar and Comoros offices. This quality assurance role will also be ensured through the Regional Project Steering Committee (RPSC) (see below for details) which will contribute to AFD objectives and provide independent

project oversight and monitoring functions. Together, AFD and the RPSC will ensure that appropriate project milestones are managed and completed, for example by reviewing progress against set up targets and providing recommendations to set the project back on track if needed. Project quality assurance must be independent of the Project Management function; therefore, the RPSC cannot delegate any of its quality assurance responsibilities to PMU and to the Regional Project Coordinator (RPC). As an Accredited Entity to the GCF, AFD is required to deliver GCF-specific oversight and quality assurance services including oversight of project completion and oversight on project reporting.

**IOC** will be the EE as the regional organisation under which Comoros, Madagascar, Mauritius and Seychelles are members. IOC will supervise the execution of project activities with the support of the Project Management Unit (PMU) and the national counterparts, amongst them NMHSs as NIP and NSPS. The PMU will be hosted by IOC headquarters, within its sustainable environment and climate change department. An IOC Project Manager (PM) will be assigned by the Secretary General of the IOC at the project start. The IOC already manages several projects with a portfolio of above USD 200 million relating to climate and environment amongst others. The IOC has proven experience in project management with different development partners (including the regional EU-funded ISLANDS and AFD-funded ACCLIMATE multi-year projects); and in coordinating project implementation in its member countries. IOC has also undertaken a process to become a GCF Regional Accredited Entity. As part of this endeavor, IOC has received financial support from the GCF, as well as technical punctual support from AFD's climate change division, to align its procedures with GCF accredited entity requirements e.g. for auditing and procurement. Additionally, IOC is receiving EU support under the INCA (institutional capacity building) programme, which is aimed at strengthening the institutional capacity of IOC to plan, identify, implement and evaluate projects and programmes to align with the EU 9 pillars. AFD will support IOC in the implementation of the organizational actions already identified within the INCA program.

**NMHSs (NIP)** will be the lead implementing entity within each of the beneficiary countries will be the co-executing entities and will be involved in all the project activities co – design and co-implementation at both regional and national level to insure the country ownership. NMHSs will be responsible of national activities implementation and results achievements. NSP conducted by NMHSs such as DRM institutions will be strongly involved to co-design and co-implement the activities related to EWS and last mile connectivity.

Currently, another initiative involving IOC and dealing with Hydromet and Climate Services is **Intra ACP Climate Services Project**: a large project supported by the EU and the S-ACP involving regional cooperation for the improvement of climate services and related applications. The IOC component of this initiative will be directly integrated into the regional Hydromet Project (funds delegated to AFD). International partners like WMO, JRC and, EUMESAT mobilized through the Intra- ACP CS Project, will be key in the implementation and monitoring of the Hydromet project to bring support to mainstream climate services into regional and national policies and programmes, as well to ensure ownership at the regional and national levels.

In addition others implementation partners WMO, GFDRR and UNDRR will facilitate coordination and synergies with other ongoing initiatives such as the approved IOC Project supported by CREWS<sup>108</sup>. The SWIO – EWS program structured around seven major outputs: (1) Institutional and human capacities in regional and intergovernmental organizations to provide regional climate and weather services to LDCs and SIDS increased (Regional); (2) NMHSs' service delivery improved, including the development of long-term service delivery strategies and development plans (National); (3) Risk Information to guide early warning systems and climate and weather service developed and accessible (National); (4) Information and Communication Technology, including common alerting protocol, strengthened(National); (5) Preparedness and response plans with operational procedures that outline early warning dissemination processes developed and accessible(National); (6) Knowledge products and awareness programmes on early warnings developed(National); and (7) Gender-sensitive training, capacity building programmes provided (National). These components were designed in close collaboration with the AE (AFD) in order to ensure complementarity with the proposed Hydromet project. More information about the CREWS initiative is provided in a stand-alone document, as part of this project proposal.

---

<sup>108</sup> <https://www.crews-initiative.org/en>

**Project Management Unit (PMU):** a regional PMU will be established by IOC in its headquarters and will work under the responsibility of the IOC Project Manager (PM). The PMU, which will be constituted of (i) IOC permanent member staff which will be dedicated to the Hydromet Project and by (ii) a technical assistance (TA) constituted by a skilled international company or a consortium of skilled companies. The Technical Assistance will be recruited by IOC based on an international competitive process. The PMU will be headed by a Regional Project Coordinator (RPC). The PMU will support the EE in coordinating the project Accredited Entity, beneficiary countries, and the various partners, as well as in overseeing project activity implementation. The following staff members will form the PMU:

- **Regional Project Coordinator (RPC):** will be a full-time employee of international company hired as the Technical Assistance to be part of the PMU. The RPC should have strong technical expertise and capacity in the management of large scale, multi-country projects. The RPC will be responsible for the overall project implementation and coordination at regional level. Amongst its mandate, the RPC will: i) lead and manage the PMU; ii) liaise with and report to IOC PM iii) liaise and coordinate with NPCs specific interventions in each beneficiary country and/or at the regional level, iv) provide administrative and technical expertise; v) be responsible for the day-to-day implementation and management of the project, and vi) serve as the focal point for interactions between the project stakeholders and partner organisations (e.g. government departments, NGOs, civil society groups) and vii) co-chair the RPSC. Full-time and part-time Officers will provide the administrative, logistical and financial support/expertise to the project and will work under the direct supervision of the RPC.
- **National Project Coordinators (NPCs):** will be hired directly by the EE and NMHSs with the support of the PMU/RPC. Full-time NPCs will be based in each of the four beneficiary countries and are mandated to support NMHS Focal Points in achieving project goals and objectives. The NPCs will act under the overall guidance and supervision of the RPC. NPCs will be based within National Meteorological Services, namely Comoros Meteorological Services, General Directorate of Meteorology in Madagascar, Mauritius Meteorological Services and Seychelles Meteorological Authority. The NPC should be able to deliver technical expertise. NPCs should act to facilitate daily project execution and follow-up, in close collaboration with NMHS team through a designated Focal Point (FP) or a Project Team to be nominated by each NMHS at the start of the project. NPCs' mandate will include *inter alia* i) to liaise with relevant national implementation partners, for example within sectoral ministries and disaster risk management institutions, ii) to organise workshops or meetings with regards to project activity, as relevant, iii) and to chair the National Project Steering Committee, organised by the NMHS.

Additional PMU staff members based at the IOC office will include:

- Hydro-meteorology Expert: A part-time staff member with technical expertise in hydro-meteorology will be recruited to develop ToRs and call for tenders for technical activities, review applications, and to supervise and advise the RPC on the implementation of technical project activities,
- Environmental and Social Officer: to ensure appropriate application of environmental and social safeguards during the project,
- Financial Officer: to ensure proper accountability and transparency of project expenditures
- Procurement Officer: to supervise the procurement process, manage the consultants, and tools and equipment acquisition contracts,
- Monitoring and Evaluation Officer: to report on technical and financial project implementation and prepare evaluation and monitoring reports,
- Communication Officer: to develop, disseminate and archive communication material related to the project,
- Administrative Officer: to support project implementation and conduct daily administrative tasks,
- In addition to the PMU, a pool of experts with diverse skills will be pre-identified and solicited on an *ad hoc* basis by the EE to review and assess application and candidate profiles proposed in the offers submitted in response to calls for tenders. The purpose of mobilisation of these experts will be to advise IOC on best candidate/service provider to hire for the project execution.

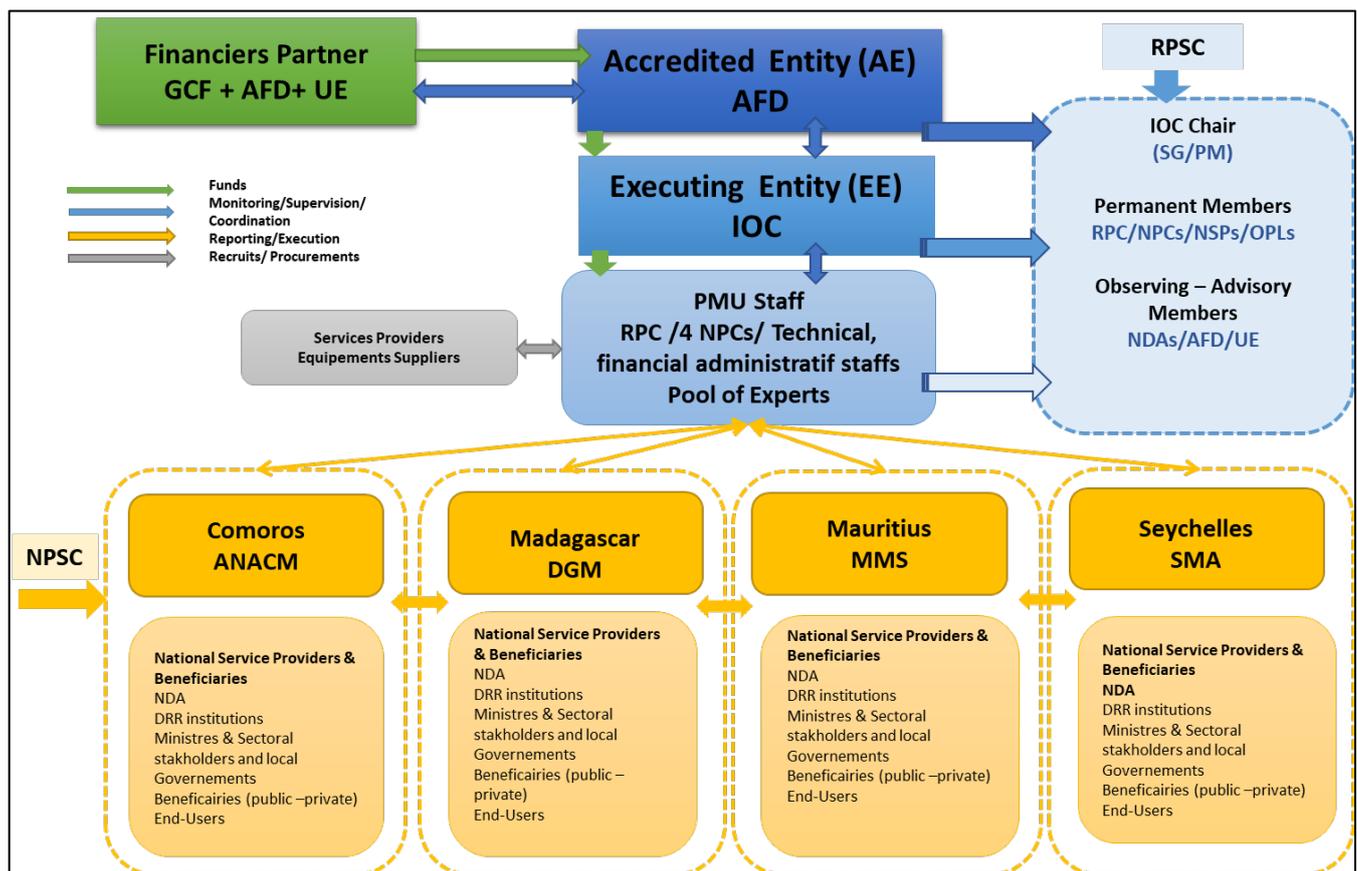
Provisional PMU staff member profiles are presented in Annex 2, FS.

**Regional project steering committee (RPSC)** will be established, coordinated and chaired by IOC. The Committee will include as permanent members: the Regional Project Coordinator (RPC); the National Focal Points (FPs), and IOC Permanent Liaison Officers (PLOs) from Comoros, Madagascar, Mauritius, Seychelles and La Réunion Island

(fifth member of IOC). The RPSC can invite additional participants as observers and advisors among whom: (i) the four National Project Coordinators; (ii) the four National Designated Authorities; (iii) a representative from AFD; as well as a representative of the EU Commission in Mauritius; and (iv) a representative from WMO and/or representatives of advanced NMHSs that could guide the implementation of the project. A gender balance should be ensured whenever possible. The mandate of the RPSC will involve providing broad strategic oversight, direction and technical advice: i) overseeing project implementation; ii) redefining or readjusting project activities, when necessary; and ii) reviewing/validating annual work-plans and project reports. The RPSC will meet at least once a year, with ad hoc meetings held as and when necessary. There will also be a platform for sharing lessons learnt and good practices among IOC member states.

**National project steering committee (NPSC)** will be convened/organised by the NPC and chaired by the National Focal Points in the NMHSs. The NPSC will be responsible for coordination and oversight of activities being delivered by national involved stakeholders. The NPSC will be held twice a year, in order to take stock of progress accomplished during project implementation, identify any issues, and, if need be, raise and address them with the PMU. All stakeholders involved in project implementation during the 6-month reporting period will be invited to attend the meeting and report progress on specific activities they are involved in. The NDA will also attend the NPSC. If deemed necessary, the RPC and the PM could be invited to participate in the NPSC at least to once year. The NPSC meeting minutes will be produced by the NPC and shared with the RPC to report lessons learnt, problems and successes at the regional level and to enable adjustments in national implementation as needed. Based on NPSC decisions, the RPC may be asked to carry out additional in-country missions to address specific requirements.

While IOC, with support from the PMU, will be responsible for the day-to-day execution of the project, overall coordination with other GCF-funded projects and climate change related initiatives will be undertaken by the countries' National Designated Authorities (NDAs) for the GCF in particular through their implication in the NPSC. For this purpose, it is proposed that the NDAs also sit on the RPSC (see below) in an advisory capacity and to foster country ownership.



*Figure 3: Project Organisational structure*

**B.5. Justification for GCF funding request (max. 1000 words, approximately 2 pages)**

The Hydromet project as proposed with its components and overall budget of **USD 71, 386, 086**, is the most appropriate investment to achieve the desired paradigm shift (see Section D). A **EUR 52, 767, 986** grant from GCF is sought by IOC and the Governments of Comoros, Madagascar, Mauritius and Seychelles to invest in climate change adaptation and enable a paradigm shift in the production and dissemination of timely, reliable and accurate climate services that respond to user needs among the most vulnerable communities and sectors. These countries are extremely vulnerable to climate change and climate-related hazards (see FS, and section B1), which are projected to increase in intensity and frequency. Neither the governments nor the vulnerable communities and sectors have the required financial and technical capacity to improve climate services and early warning systems and effectively strengthen risk prevention and mitigation at scale. Comoros and Madagascar, two LDCs, have a large portion of the population living below the poverty line. Their national budgets is in significant deficit and, given the socio-economic challenges, their governments prioritise the pressing development needs of their country. Despite being middle- and high-income countries, Mauritius and Seychelles are characterised by high debt levels and wealth inequality; moreover, their economy is highly vulnerable to climate-related shocks.

Yet, the benefits of the proposed GCF project will essentially be public goods and the financial returns e.g. for climate-sensitive sectors – will not be sufficient to service debt payments. New business models will be explored and transitional business plans will be prepared for implementation during the lifetime of the project to ensure that investments made through the project are sustained.

Traditionally, most of the revenues of the National Meteorological Services (NMSs) come from the public service funding paid by the government. According to WMO, the vast majority of NMSs (over 60% of the world's NMSs) operate as public entities and received most of their funding (about 80 %) in the form of direct government appropriations. Given existing financial challenges with government budgets in the target SWIO countries, the allocation of significant public funding towards this Project from the four IOC Member States is not sufficient to achieve the desired paradigm shift, nor can cover all the operation and maintenance costs associated with the required equipment (see Annex 4).

Nonetheless, the governments of Comoros, Madagascar, Mauritius and Seychelles are committed to support the proposed project. In Comoros, the government will provide **USD 1,267,000 in-kind**, and in Madagascar, the government will provide **USD 1,070,000 in-kind**, which corresponds to the portion of funds these services receive from their respective governments to support current O&M costs. In Mauritius, the government will provide **USD 1,742,000** in cash and kind, and in Seychelles the government will provide **USD 2,862,000** in cash and kind (refer to Annex 13 for details). These co-financing commitments will serve to finance the construction of new facilities to run and store the equipment to be set up under this project and towards O&M costs during the project lifetime.

Moreover, the AFD and EU have committed to support the proposed project through contributions in grants of respectively **USD 5,504,183** and **USD 6,172,916**. The EU is supporting most of the regional activities which are aligned with the development goals of the EU Program for Development of Cooperation in the Africa, Caribbean and Pacific countries (DEVCO-ACP). These include most of the Component 1, except the capacity building; i.e. it includes all activities related to the institutional development and regional cooperation. Under component 2, EU will support the development of hazard and vulnerability maps.

Under Component 1, AFD will complement the support from the EU in the regional cooperation; it also supports the recruitment of new staff and their training. Under Component 2, AFD will support the refurbishment of a building in Comoros, and co-finance partly the technical assistance for science-based weather and climate product generation, primarily on the organization of workshops. Under Component 3, AFD will provide very limited funds to support the participation of staff in regional workshops.

GCF financing will primarily support capacity-building activities. In this sense, under Component 1, GCF will support partly Activity 1.3.2 on retraining and education of the staff in accordance with the WMO standards. Under Component 2, GCF will support: (i) Activities 2.1.1, 2.1.2, 2.2.1 and 2.2.2 on modernization of the observation and monitoring, forecasting and ICT systems (networks and software); and (ii) partly Activities under output 2.3 on

technical assistance for science-based weather and climate product generation. Component 3 is mostly supported by GCF and relates to the implementation of the MH-IBF-EWS and last mile connectivity at national level.

Yet, based on these secured contributions, only a partial improvement of existing hydrometeorological services and capacity building would be possible, and the at-scale benefits in terms of avoided costs and in terms of development of climate services cannot be realised in the absence of GCF investments (see section D.6 and Annex 3a). After the completion of the proposed project, O&M costs will be supported by government funds, cost-recovery from the commercialized new CP-CS, leveraging funds from the new GBON/SOFF initiative, coordination with UN and other agencies on the ground that manage national funds, and the potential establishment of a ring-fenced CIEWS through an Hydromet Law. These aspects and other are elaborated in an O&M plan (see Annex 21).

Funding from other donors has been identified for climate-related projects (see section B1), however these only cover partially the overall regional and national needs. In addition, activities under the 3 components have been designed to ensure that this Hydromet funding request does not duplicate work supported by other donors and that opportunities for complementarity are identified (see Annex 2 FS).

Loan financing is also not envisaged under the proposed project. Indeed, climate data, information, forecasts, warnings and other products, supported under the proposed project are considered to be “public goods” because of their public safety value and cross-cutting socio-economic benefits; hence, it is unlikely that there will be short-term significant financial returns on investment to repay loans.

The regional CP-CS developed through the Project will not be profitable in the medium-term, so that private sector financing for the Project is not currently realistic. Commercialisation of regional CP-CS will be sought to generate revenues, but it will only partially cover total costs (to 16%, in average, of the NMHS’ budget in the four countries, ranging from 10% (Comoros and Seychelles) to 30% (Mauritius), as shown in Annex 3a). By improving service delivery to key national and sub-national stakeholders, additional demand will be created thus facilitating increased budget support in the long-term. Through the project, business plans will be developed for the transition of current business models that are not sustainable to new one following the principles and guidance in the WMO Guide to Aeronautical Meteorology Services Cost Recovery (WMO-No. 904)<sup>109</sup>. The new business models will be based on cost-recovery for the relevant sectors in the four countries, e.g. aviation for Mauritius and Seychelles (as aeronautical meteorology services in Comoros and Madagascar are provided by ASECNA<sup>110</sup>), shipping, insurance, tourism, energy, among others. In addition, successful partnerships will be sought and built up in agriculture/fisheries, tourism, water resource management sectors and other at-risk communities, and are a part of the strategy for ensuring long-term sustainability of the Project’s objectives.

Finally, the IOC, representing the beneficiary countries, will be in charge of project implementation and will be the recipient of the funds through AFD financial transfers. By the nature of its status and mandate given by its Member States, the IOC is only in capacity to raise funds through grants and cannot go into debt.

#### **B.6. Exit strategy and sustainability (max. 500 words, approximately 1 page)**

The hydro-meteorological equipment established through the project will be managed, maintained, upgraded and replaced as needed by the beneficiary governments during and after the project, or at the regional level by IOC/RCC-Network. This will be ensured in the long run by: i) transferring skills to the NMHS to ensure equipment operation, maintenance and renewal; ii) achieving cost-efficiencies through regional complementarities and synergies on monitoring, modelling, forecasting and service delivery; iii) demonstrating the value of CP-CS among users and end-users (demand-side); iv) where possible, promoting the commercialisation of these services; and v) exploring options for leveraging funds from the newly GBON Systematic Observations Financing Facility (SOFF) for the completion of the implementation of the network and O&M. This strategic approach (as described in the O&M Plan, Annex 21) will ensure that these stakeholders are able to continue co-producing and using climate services (CP-CS) once the project funding ceases; and can maintain the required O&M of the hydro-meteorological equipment. The strategic approach that underpins long-term development and use of CP-CS in the SWIO region is detailed in Annex 3a and b.

<sup>109</sup> [https://library.wmo.int/doc\\_num.php?explnum\\_id=5298](https://library.wmo.int/doc_num.php?explnum_id=5298)

<sup>110</sup> Agence pour la Sécurité de la Navigation Aérienne en Afrique (ASECNA), <https://asecnaonline.asecna.aero/index.php/fr/>

### 1- Strengthening of NMHS (including financial strategy)

Under Output 1.3, institutional capacity of the NMHS in each country will be strengthened in order to streamline roles and responsibilities, improve their working environment (to retain skilled staff) and, in particular, improve their financial efficiency and cash flows. This work will result in a robust institutional strategy for each NMHS, including a cost-recovery and business plan that enables the production and delivery of improved CP-CS. Hence, the NMHSs will be capacitated to perform strategic and budget planning, and implement effective and efficient management. A long-term business plan for the NMHSs will be prepared, to consider opportunities for commercialize CP-CS in each target country to generate new income that can be reinvested towards maintenance and update of hydro-meteorological equipment<sup>111</sup>. In addition, it is well demonstrated worldwide that an Hydromet Law, which is a national legal instrument establishing a National Meteorological and Hydrological Services (NMHS), is an important element for its successful operation, as it helps defining its mission and mandate; ensuring clarity in the definition of its responsibilities; providing legal authority for certain responsibilities; gaining recognition of its contribution to society; and facilitating allocation of adequate resources (WMO, 2017)<sup>112</sup>, eventually through a potential establishment of a ring-fenced fund to support O&M and further developments. Through proposed project, Hydromet Laws will be revised or prepared with the possibility of establishing a national fund. Collaboration with UNDP may be pursued to explore the possibility of blended finance approaches, such as those implemented in Indonesia, Bangladesh, China, Ecuador and Brazil<sup>113</sup>. The NMHSs will also be strengthened through training and capacity building interventions for their staff members including on the operational and maintenance of the hydro-meteorological equipment, and through involvement in activities to develop the capacities under Output 2.3. Together with the institutional strengthening interventions, this will contribute to bring the NMHS of the four target countries closer to WMO Category 3 'Full climate services'.

### 2- A regional approach favouring cost-effectiveness, partnerships and integration within regional hydro-meteorological initiatives

As indicated in Section B.1., item 4. integration of the region's hydromet systems provides opportunities to lower required investment while increasing accuracy of forecasts. Cost-effectiveness will be achieved through improved collaboration among Comoros, Madagascar, Mauritius and Seychelles, under the leadership of IOC. Observed data from the existing and new hydromet monitoring networks being established under the proposed project will be shared among IOC Member States following regional data exchange protocols, in order to improve monitoring of hazardous hydromet conditions, numerical modelling, and forecasting. The design of optimum regional composites for each of the subsystems (which is part of the proposed project)—hydromet observational networks, modelling, forecasting, and service delivery— would ensure robust interoperability, efficiencies, and optimization of infrastructure costs, together with a higher level of harmonization, integration, and complementarity within the SWIO region. This will result in cost savings and promote efficiency and effectiveness in the systems, while contributing to improved monitoring and increased accuracy of forecasts; over the longer term, it can increase savings and sustainability of the investments.

Collaboration will be secured through the establishment of the RCC-Network under which IOC and the four NMHSs will share roles and responsibilities. Attached to the RCC-Network, a regional calibration and maintenance laboratory and a specialized training centre will be established. The calibration and maintenance laboratory, in particular, will carry out maintenance work and calibration of existing and newly acquired hydro-meteorological equipment. This reduces current extra costs of sending sensors and other equipment (with limited lifetime and in need of regular maintenance) to overseas for maintenance (currently to Kenya and South Africa). Staff members of the NMHSs will also be trained at the regional specialized training center currently established in Mauritius, which will be refurbished with relevant equipment and software that can be shared across the region. In addition, all investments in

<sup>111</sup> See Annex 3a, Economic analysis and approach for a business plan.

<sup>112</sup> See WMO, 2017. [Guidelines on the Role, Operation and Management of National Meteorological and Hydrological Services](#), 2017 Edition, WMO-No. 1195.

<sup>113</sup> [https://www.undp.org/content/undp/en/home/librarypage/environment-energy/low\\_emission\\_climate/resilientdevelopment/blending\\_climatefinancethroughnationalclimatefunds.html](https://www.undp.org/content/undp/en/home/librarypage/environment-energy/low_emission_climate/resilientdevelopment/blending_climatefinancethroughnationalclimatefunds.html)

infrastructure, tools, and ICT will be based on the use of new technologies (such as IoT, cloud, wireless private network, etc.) in order to drive down O&M costs.

The RCC-Network, set up under the proposed project, will be established to become part of WMO Global Data-processing and Forecasting System<sup>114</sup>. Coordination among the Member States will be ensured by IOC, which plays a key role in the SWIO region. Indeed, IOC is the unique regional institution of the South West Indian Ocean States. Funded by its member states in 1984, it has been financially supported by these states since then. Finally, the project will ensure the participation of the four beneficiary countries to WMO WHYCOS initiative, by implementing the recommendations identified in HYCOS study for the Indian Ocean Region (see Annex 22 HYCOS study).

### 3- Building demand and understanding of CP-CS that are continuously improved based on user feedback

The project is designed with end users in mind, thereby placing significant resources on addressing end-user needs. The CP-CS produced under this project will be co-developed with users during workshops, consultations and joined training events with the NMHSs, DRM institutions, sectoral users and communities. Users will have a greater understanding of CP-CS. In addition user feedback on CP-CS will be systematically collected via the UIP (the online platform will include a page for users to assess the quality and usefulness of the CP-CS in their sectors, allowing the estimation of the “user satisfaction index”<sup>115</sup>) and during SWIOCOF, as users of CP-CS will be invited to share their experience and recommendations for CP-CS improvements. This will ensure the hydro-meteorological services continue to evolve as user demands change, which will contribute to long-term sustainability through keeping the relevance of hydro-meteorological services and raising demands. In the context of climate change, the demand for improved CP-CS will increase, thereby adding value to the production of such services over the long-term. Most of the CP-CS generated by the proposed project will be based on open-source tools and formats endorsed by WMO, and accessibility will be ensured through the UIP. This will build a community of practice, at the regional level, for using and improving CP-CS, coordinated under the RCC-Network and by IOC, through the organisation of the SWIOCOF.

### 4- Strategy for CP-CS commercialisation

As CP-CS improve, demand from the sectorial private sector for such services is expected to increase. Primary commercial beneficiaries / sectors are: agriculture, aviation, marine, and tourism. Preliminary discussions in the 4 countries with tourism and agribusiness representatives indicate a potential interest in paying for reliable, timely and accurate CP-CS. Shipping sector will also be approached, as well as the aviation sector in Mauritius and Seychelles where aeronautical meteorological services are provided by NMHSs (in Comoros and Madagascar, these services are provided by ASECNA). Annex 3a provides an overview of expected returns on investments through the commercialization of CP-CS. This interest will be further investigated under the proposed project. A detailed business plan, including a marketing strategy, will be developed for each NMHS to help them promote and commercialize their products, designed to respond to the specific demands of users in the private sector (including insurance sector). The potential income stream from private sector is estimated to contribute up to 16% (in average) of NMHS budgets, ranging from 10% (Comoros and Seychelles) to 30% (Mauritius); this income will be redirected towards equipment maintenance, upgrade or renewal, running costs of the RCC-Network and its associated components (including a specialized training center and the UIP), and towards the continuous production of high-quality CP-CS.

Finally, it should be noted that an estimate operation and maintenance budget has been prepared for the proposed project. The budget estimates for the five years’ implementation of the project indicate that the O&M budget following the equipment installation is about **USD 5,941,000 million** distributed to four countries. This will partly be covered by the governments of Comoros and Madagascar (in-kind) while the governments of Mauritius and Seychelles will take full care of their respective O&M budgets. The O&M budget will be updated during project implementation, based on

<sup>114</sup> <http://www.wmo.int/pages/prog/wcp/wcas/rcc/rcc.php>

<sup>115</sup> “user satisfaction index”, which considers communications, perceived accuracy and usefulness for both professional partners and vulnerable groups exposed to e.g. floods and droughts. Note that 72% is considered a good score in middle income countries and only leading developed NMHS reach > 90% (WB/GFDRR, 2019. *Weathering the Change: How to Improve Hydromet Services in Developing Countries*, <https://www.gfdr.org/en/publication/weathering-change-how-improve-hydromet-services-developing-countries>).

a more detailed examination of current human and financial resources, and fine-tuned estimates of operation and maintenance needs for each country.

As for Mauritius and Seychelles, in order to complement government funding, the strengthening and enabling of the institutional framework and policy will be essential to achieve the availability and sustainability of the O&M budget by mainstreaming Climate services commercialization and establishing cost recovery of meteorological services, as described in the O&M Plan – revenue generation (Annex 21, pages 2 to 6). Such an improvement should also be achieved by the project for Comoros and Madagascar (see in particular page 4 of the O&M plan, Annex 21). A Commitment Letter from IOC, confirming country commitment post-project implementation period to operate and maintain the equipment, is attached in the project package as Annex 0\_IOC\_Commitment\_letters).

For Comoros and Madagascar, additional agreements with ASECNA (see O&M Plan, Annex 21, page 4) are being discussed to ensure that the newly installed equipment can be considered as a new asset that can be operated and maintained under the ASECNA umbrella. It is recalled that AFD is a long-standing partner of ASECNA and has recently supported ASECNA with a non-sovereign loan of 60 M€.

At the end of the project, it is considered that the environment is enabled for the NMHSs and DRM institutions to be strong enough to allow the Mauritius and Seychelles to leverage sufficient O&M costs and to allow Madagascar and Comoros to take over GCF commitment on O&M to be mobilized during the project onset. Description of all activities that will be in place during the project to support and create an enabling environment for the sustainability of investments are described in the O&M Plan provided as part of the project proposal package (Annex 21).

#### **5- Leverage funds from GBON/SOFF**

AFD, the accredited entity for the proposed project, is supporting the Global Alliance for Hydromet Development<sup>116</sup> (GAHD), which is developing the GBON concept and related Systematic Observations Financing Facility (SOFF). The proposed Hydromet project's investments are aligned with the GBON requirements, therefore, in order to ensure the sustainability of the system, the project is considering a more secure alternative based on the mobilization of funds from the SOFF/GBON in order to support the O&M costs (see O&M Plan, Annex 21, page 9). Noting that SOFF/GBON will primarily support SIDS and LDCs, the project target countries are eligible to get such support. Thus, a request has already been submitted to the WMO, as a project technical partner, to consider these countries for the SOFF implementation, and a letter is expected to be received by the countries and IOC from WMO to be attached to the project package.

#### **6- Support from PIROI and IFRC**

The PIROI (Red Cross network in the IO region), which is already involved in the IOC project generally and EW actions during extreme events, will play a crucial role as in the implementation of the MH-IBF-EWS and last mile connectivity by ensuring that critical early warning information is delivered in a timely and efficient manner. PIROI will also assist in bridging with and bringing the support of IFRC who is very active in the region in pursuing the implementation of Forecast-based Financing (FbF), which is being currently piloted in the region in Mozambique, but expected to be expanded to other countries (not included in this project proposal as this is being supported through other mechanisms). PIROI has already expressed its support to the project, and an official letter from IFRC is expected to be also received and attached to the project package to confirm PIROI commitment.

---

<sup>116</sup> <https://public.wmo.int/en/resources/bulletin/alliance-hydromet-development>

## C. FINANCING INFORMATION

### C.1. Total financing

(a) Requested GCF funding (i + ii + iii + iv + v + vi + vii)		Total amount		Currency			
		52 767 986		million USD (\$)			
GCF financial instrument		Amount	Tenor	Grace period	Pricing		
(i)	Senior loans	Enter amount	Enter years	Enter years	Enter %		
(ii)	Subordinated loans	Enter amount	Enter years	Enter years	Enter %		
(iii)	Equity	Enter amount	Enter years		Enter % equity return		
(iv)	Guarantees	Enter amount					
(v)	Reimbursable grants	Enter amount					
(vi)	Grants	52 767 986					
(vii)	Result-based payments	Enter amount					
(b) Co-financing information		Total amount		Currency			
		18,618,099		million USD (\$)			
Name of institution		Financial instrument	Amount	Currency	Tenor & grace	Pricing	Seniority
AFD		Grant	5,405	million USD (\$)	Enter years Enter years	Enter%	Options
U.E.		Grant	6,172	million USD (\$)	Enter years Enter years	Enter%	Options
Gov of Comoros		In kind	1,267	million USD (\$)	Enter years Enter years	Enter%	Options
Gov of Madagascar		In kind	1,070	million USD (\$)	Enter years Enter years	Enter%	Options
Gov of Mauritius		In kind	1,742	million USD (\$)	Enter years Enter years	Enter%	Options
Gov of Seychelles		In kind	2,862	million USD (\$)	Enter years Enter years	Enter%	Options
(c) Total financing (c) = (a)+(b)		Amount		Currency			
		71,386,086		million USD (\$)			
(d) Other financing arrangements and contributions (max. 250 words, approximately 0.5 page)		Co-financing by the Government will support the O&M (Human Resources and Systems) budget estimate for Mauritius and Seychelles; and the O&M (Human Resources) for Comoros and Madagascar.					

### C.2. Financing by component

Component	Output	Indicative cost million USD (\$)	GCF financing		Co-financing		
			Amount million USD (\$)	Financial Instrument	Amount million USD (\$)	Financial Instrument	Name of Institutions
Capacity building, institutional development, regional cooperation, and	A Regional Climate Centre Network and frameworks for Climate Services (CP-CS)	\$846 500,00	0	Grants	\$846 500,00	Grants	AFD & EU

<b>public-private engagement</b>	established in the SWIO region						
	Institutional arrangements for NMHS operation strengthened and hydromet laws prepared with potential CIEWS funds established	\$1 298 603,20	0	Grants	\$1 298 603,20	Grants	AFD & EU
	Improved staffing capacity and capability of the RCC-Network, NMHSs and other relevant institutions	\$3 999 600,00	\$810 000,00	Grants	\$3 189 600,00	Grants	AFD & EU
	Fine tune the design to develop technical specification, system integration and tendering process of Project Activities	\$2 346 790,00	\$696 758,00	Grants	\$1 650 032,00	Grants	AFD/EU
Sub-total Component 1		<b>\$8 491 493,20</b>	<b>\$1 506 758,00</b>		<b>\$6 984 735,20</b>		
<b>High-quality climate-related data, improved multi-hazard impact-based forecasts and EWS (MH-IBF-EWS), and climate risk assessments</b>	Enhanced hydro-meteorological observation and monitoring, by making use of innovative technologies for cost-effectiveness	\$23 887 500,00	\$22 087 500,00	Grants	\$1 800 000,00	Grants	AFD; EU; & gov.
Click here to enter text.	Regional facilities for maintenance and training established	\$1 511 454,86	\$1 511 454,86	Grants		Grants	AFD & EU
Click here to enter text.	Science-based multi-hazard weather and climate risk information generated	\$6 692 893,50	\$5 336 893,80	Grants	\$1 355 999,70	Grants	AFD & EU
Sub-total Component 2		<b>\$32 091 848,36</b>	<b>\$28 935 848,66</b>		<b>\$ 3 155 999,70</b>		
<b>Enhanced accessibility and use of climate</b>	Production, dissemination and uptake of	\$4 984 000,00	\$4 853 440,00	Grants	\$130 560,00	Grants	AFD & EU

services for climate change adaptation, and improved capabilities in implementing a people-centered MH-IBF-EWS for disaster risk reduction	CP-CS, including MH-IBF-EWS, improved at regional and national level						
Click here to enter text.	Short- and long-term risk reduction, based on a well-established MH-IBF-EWS in place, and adaptation plans improved or prepared using high quality climate-related data, MH-IBF-EWS products, risk/vulnerability assessments and climate change projections (produced under Outcome 2)	\$5 240 499,90	\$ 5 009 939,90	Grants	\$230 560,00	Grants	AFD & UE
Click here to enter text.	Training for improved dissemination and preparedness involving users and end-users of CP-CS	\$7 067 999,90	\$ 6 947 999,90	Grants	\$120 000,00	Grants	AFD & UE
Sub-total Components 3		<b>\$17 292 499,80</b>	<b>\$16 811 379,80</b>		<b>\$481 120,00</b>		
Sub-total all Components	<b>\$ 57 875 841,36</b>						
Project Management	PMU	\$2 949 244,20	\$2 144 000,00	Grants	\$ 805 244,20	Grants	AFD/EU
Operation & Maintenance	O&M	\$8 061 000,00	\$2 120 000,00	Grants	\$ 5 941 000,00	Grants	Gov.
Unforeseen & Miscellaneous	U&M	\$ 1 250 000	\$ 1 250 000	Grants			
<b>Indicative total cost (USD)</b>		<b>71 386 086</b>	<b>52 767 986</b>		<b>18 618 099</b>		
<b>C.3 Capacity building and technology development/transfer (max. 250 words, approximately 0.5 page)</b>							
C.3.1 Does GCF funding finance capacity building activities?				Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>			
C.3.2. Does GCF funding finance technology development/transfer?				Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>			
Overall, the GCF will be investing USD 8,482,000 to support capacity-building interventions. These include:							

- core training on climate services, climate related risks and impacts on communities and sectors for 15 staff members of NMHS, DRM institutions and in climate-sensitive sectors, as well as training of trainers (USD 810,000);
- trainings on science-based product generation (USD 844,000),
- training will be provided as part of the development of hazard, vulnerability and risk maps (USD 1,400,000),
- In addition, people-centered multi-hazard impact-based forecasts and early warning systems will be established and training will be carried out for staff of NMHS and DRM institutions and other knowledge brokers (USD 5,428,000)

These capacity building interventions implemented under Components 1 and 2 of the project, will be critical to ensure the production of CP-CS that are timely, reliable, accurate and target to the needs of users in climate-sensitive sectors. The core trainings under Component 1 (Activity 1.3.2) will enhance understanding of how climate-related hazards and climate change can affect key sectors and communities and how CP-CS can help reduce these negative impacts; while the technical trainings to be implemented under Component 2 (Activities 2.3.1-2.3.8) will improve the capacity of NMHS' staff members to produce accurate, location-specific short- to long-range forecasts that can serve as decision-making tools to reduce climate-related vulnerabilities and risks. Finally, Activities 2.3.3 and 2.3.4 will serve to build understanding in the beneficiary countries of areas most impacted by climate-related hazards, and the vulnerability of the population to these hazards. This information will also be used by NMHSs in conjunction with weather forecasts in order to produce multi-hazard impact-based forecasts, which introduces a paradigm shift from the traditional forecasts of "what the weather will be" to modernised techniques that will allow forecasts of "what the weather will do", in accordance with the guidelines provided by WMO<sup>117</sup> (Activities 2.3.1-2.3.5; and 3.2.1-3.2.3).

It should also be noted that the regional aspects of the project that underpin collaboration, harmonization of approaches, and knowledge sharing provide an opportunity for countries to leverage each other's strengths and capitalise on successful national initiatives; the regional facilities to be set up attached to the RCC-Network, and shared responsibilities for equipment maintenance and calibration, training and R&D, or UIP management will also increase the capacity and expertise of each country in specific fields (depending on the regional component they will host).

---

<sup>117</sup> [https://library.wmo.int/index.php?lvl=notice\\_display&id=17257#.XotVly9OpBw](https://library.wmo.int/index.php?lvl=notice_display&id=17257#.XotVly9OpBw)

## D. EXPECTED PERFORMANCE AGAINST INVESTMENT CRITERIA

*This section refers to the performance of the project/programme against the investment criteria as set out in the GCF's [Initial Investment Framework](#).*

### D.1. Impact potential (max. 500 words, approximately 1 page)

The project envisions increasing climate change resilience and reduces loss of life, property, and livelihoods due to climate-induced threats in Comoros, Madagascar, Mauritius and Seychelles. The potential of the project to contribute to the achievement of the GCF's objectives and result areas is described in Section H1. The project will contribute to the GCF Adaptation Impact: **Increased sustainable, climate resilient development**, in the following ways:

#### 1. Strengthened institutional and regulatory frameworks

Institutional, financial and operational arrangements in the NMHSs will be strengthened through Component 1; moreover, regional cooperation for climate-related hazard monitoring and climate risk management will be institutionalised in the long-term by establishing an RCC-Network with operational nodes in each member country. Regulatory frameworks to produce and disseminate CP-CS will be developed (Activity 1.1.1) focusing on the end-users' requirements. Capacity building for governmental stakeholders in sectoral ministries and in the NMHSs will be provided to strengthen the capacity to produce and deliver climate-related forecasts and warnings, and enhance understanding of climate-related risks and exposure, thereby improving preparedness and response planning capacity (Activity 1.3.2).

#### 2. Increase generation and use of CP-CS in decision-making

The project will support the generation and use of specific CP-CS initially in three sectors, namely agriculture, fisheries and tourism. Additional sectors will also be considered, such as shipping, and the aviation sector in Mauritius and Seychelles where aeronautical meteorological services are provided by NMHSs (in Comoros and Madagascar, these services are provided by ASECNA). Tailored CP-CS will be developed in partnership with users in these sectors responding to user needs, whilst ensuring use of best communication channels to maximise user outreach. The number of users of CP-CS will be assessed during the baseline assessment for each country, under Activity 1.4.1. Progress in terms of number of users of CP-CS will be re-assessed through project mid-term and final evaluations. Based on the anticipated increased use of CP-CS in agriculture, fisheries and tourism, the average annual benefits of an EWS in terms of avoided costs were estimated to be about \$14 million for the SWIO region as a whole (see Annex 3a). Other products, developed under the proposed Components 2 & 3, including downscaled climate change projections, climate-related hazards and vulnerability maps, weather bulletins, impact-based forecasts and EWS, as well as the knowledge and decision support system will inform decision-making in the short-, mid- and long-term. Partnership with PIROI and its national counterparts and associated NGOs, established within the context of the proposed project, for effective MH-IBF-EWS implementation at regional, national and local levels, will significantly contribute to demonstrate increased socioeconomic and environmental benefits for the most vulnerable communities (Activities 3.2.2 and 3.2.3). The CP-CS produced under this project will be shared on the UIP to further leverage these new resources, and their use beyond targeted sectors. Beyond the project timeline, sector-specific services could be up-scaled and replicated to other priority sectors building on the methodologies, capacity building, technical support and lessons learned from the proposed project.

#### 3. Strengthened adaptive capacity and reduced risk exposure

The project will focus on end-users of the CP-CS to ensure production and dissemination of services is relevant and efficiently reaches targeted users. Most relevant communication platforms –mobile phone, radio or Internet – will be identified for each target users and CP-CS will be “packaged” based on their requirements. For example, agrometeorological advisories will be disseminated by mobile phone and radio in Comoros, Madagascar, and Mauritius (Activity 3.1.1). It is expected that farmers benefiting from these services will achieve a net profit of +10 to +15 % and an up to 10 % increase in agriculture productivity. Likewise, with access to reliable climate information, fishermen will be able to make informed decisions about when to go to the sea, and to protect their equipment and assets from climate extremes (Activity 3.1.2). Climate-related conditions also impact their ability for fish capture. At the same time, the establishment of MH-IBF-EWS, in coordination and collaboration with PIROI and its national counterparts and associated NGOs, will underpin early warning / early action, and therefore will provide significant socioeconomic and environmental benefits for the most vulnerable communities (Activities 3.2.2 and 3.2.3). The expected result is a 30% reduction in risk exposure at the end of the project (see Annex 3a).

#### 4. Strengthened awareness of climate threats and risk-reduction processes

This will be ensured as CP-CS, including MH-IBF-EWS, are designed with the stakeholders (e.g., PIROI, national DRM institutions and NGOs) and last mile end-users (pilot local communities), who will be involved in the development, testing and validation of risk matrices for each hazard based on agreed risk levels and colour-codes, and description of related impacts and response/actions (Activities 3.2.2 and 3.2.3). These developments and testing will be done in the first three years of the proposed project, and then expanded and rolled out nationwide (in the last two years of the project) using scenarios, and through the dissemination of knowledge products and outreach materials with the assistance of NGOs, humanitarian agencies and UN partners that are on the ground, and through the community leaders, in order to reach all population in the four countries. Moreover, knowledge-brokers and key community members will be trained on risk preparedness and mitigation measures (Activity 3.3.2), and all services will be shared on knowledge platforms such as the UIP. Awareness raising campaigns will also be supported by the project under Activities 2.3.4 and 3.2.1-3.2.2.

The benefits of the proposed project will span across the following areas: i) receiving direct agrometeorological advisories on cropping calendar and best varieties, droughts, heavy rainfalls and other climate-related hazards; ii) receiving 'safety at sea' alerts and warnings; iii) developing and implementing MH-IBF-EWS; iv) accessing more timely, accurate, and location-specific weather bulletins; and v) receiving adequate preparedness advice and emergency support before, during and after climate-related hazardous events. All together, these benefits will enable climate change adaptation, risk prevention and protection of lives, assets and livelihoods in the four target countries. **The expected total number of (combined direct and indirect) beneficiaries** benefitting from reduced vulnerability to climate change is estimated to be the total population of 29,241,477 across the four islands; of which more than 50% are women beneficiaries. Direct project beneficiaries were estimated at 67% of the total population (19,453,286); and indirect beneficiaries at 33% (9,788,191).

The approach used to estimate number of beneficiaries is based on the delivery of CP-CS to targeted sectors; and based on access to improved forecasts and more timely early warnings via mobile phone, radio and the Internet. See Section 5.4, Annex 2 for additional details on beneficiary calculations.

**Total population per country:** 845,477 in Comoros; 27,000,000 in Madagascar; 1,300,000 in Mauritius; and 96,000 in Seychelles.

- **Direct beneficiaries:**

Direct beneficiaries are a proportion of the population with access to communication channels, i.e. radio, mobile phone and/or Internet access (whichever is the highest)<sup>118</sup>:

Comoros: 60% in Comoros (mobile phone subscription) or 507,286 people

Madagascar: 65% in Madagascar (radio) or 17,550,000

Mauritius: in Mauritius (mobile phone) or 1,300,000 people

Seychelles: in Seychelles (mobile phone)

**Total expected direct beneficiaries = 19,453,286 which is 67% of the total population over the 4 islands; of which at least 50% are women.**

- **Indirect beneficiaries:**

Through collaboration with PIROI, the national DRM institutions, and NGOs, humanitarian agencies and UN partners on the ground for the development and implementation of MH-IBF-EWS, the indirect beneficiaries are the rest of the population, including the proportion that does not have access to radio, mobile phone and/or Internet access: 40% in Comoros or 338,191 people; 35% in Madagascar or 9,450,000; 0% in Mauritius and Seychelles. By focus on preparedness, the proposed investments will contribute to forecast-based early action; and therefore, working with partners that are supported by other initiatives and projects, 100% of the population will benefit from the project.

<sup>118</sup> The proportion was calculated using the highest percentage for people having access to one of these communication channels.

*Of which at least 50% are women.*

**Estimated indirect beneficiaries = 9,788,191, which is 33% of the total population over the 4 islands; of which at least 50% are women.**

The proposed approach for beneficiary calculation is ambitious and takes into account that climate-related hazard warnings, and preparedness and prevention advisories can be spread (i) by word of mouth, signs displayed in communities, sirens e.g. from the mosque, and trained knowledge brokers regardless of radio/mobile phone ownership; and ii) with the support of PIROI, the national DRM institutions, and NGOs, humanitarian agencies and UN partners, which are on the ground supported by other initiatives and projects.

## **D.2. Paradigm shift potential (max. 500 words, approximately 1 page)**

The project will effect a paradigm shift that results in enhanced climate-resilience in Comoros, Madagascar, Mauritius and Seychelles. It will catalyse impacts beyond the project's lifetime and economic sectors for which specific CP-CS will be developed. This will be achieved through an innovative, integrated approach that not only enhances the technical and technological capacities to monitor and forecast climate-related hazards and extremes – as is often the traditional approach in hydrometeorological projects – but will also introduce the capacity to prepare and deliver forecasts based on impacts and warnings based on risks; and by working with PIROI and its national counterparts, and NGOs, will build the capacity for their uptake so that stakeholders and local communities take informed decisions. In addition, the project will strengthen institutional settings and frameworks supporting climate-related risks reduction and adaptation at regional and national scale. As such, the proposed interventions (1) address structural needs in each of the target countries; (2) take on a “capacity development-based” approach (i.e. incorporating strategic, institutional, financial, human resources aspects as opposed to only addressing technical/equipment improvements); and (3) build on pilot people-centered MH-IBF-EWS to develop a knowledge and decision support systems rolled out nationwide, and harmonized regionally – all this contributing to revising preparedness and response plans at regional, national and local levels in collaboration and coordination with PIROI and its national counterparts, and NGOs. As the four target countries (i) are vulnerable to similar large spatial scale climate-related hazards (e.g. tropical cyclones) which are influenced by ocean currents and sea surface temperature patterns, and (ii) face identical problems, challenges and needs; the regional aspect of the project is a strength that will further enhance project outcomes. This regional approach would ensure robust interoperability, efficiencies, and optimization of infrastructure costs, together with a higher level of harmonization, integration, and complementarity within the region. This will result in cost savings and promote efficiency and effectiveness in the systems, while contributing to improved monitoring and increased accuracy of forecasts, as well as underpins successful, cost-efficient climate risk mitigation and climate change adaptation in the SWIO region; over the longer term, it can increase savings and sustainability of the investments. Regional collaboration will be facilitated by IOC, which is the unique regional institution in the SWIO region covering Comoros, Madagascar, Mauritius and Seychelles (see further details on the regional approach and IOC role in Section B.1., items 2. And 4.). Created by its Member States 36 years ago, the IOC has an established experience to implement large-scale climate-related projects and programmes in the region; moreover, the IOC has a key role of bringing together the island countries of the SWIO region, coordinating the implementation of project's activities in these countries, and protecting their interests.

The project meets the following GCF requirements:

- **Potential for scaling up and replication:** All interventions are designed based on existing international best practices and recommendations, as well as technical regulations that define the standards from the WMO and the newly GBON concept. They are also building on; complementing and upscaling other past and ongoing climate services-related projects in the four target countries (see Section B.1). The regional collaboration for risk prevention, fostered by IOC, will be institutionalised through the establishment of an RCC-Network. The RCC-Network for the SWIO region will replicate success stories like the Caribbean Institute for Meteorology and Hydrology (CIMH) which was officially designated as the World Meteorological Organization (WMO) Regional Climate Centre (RCC) for the Caribbean region in 2017 after a four-year process; and the SEARCC-Network and the Pacific RCC-Network that are currently in demonstration phase. Technical improvements for enhanced hazard monitoring and forecasting will also be supported at regional level through the design of

optimum regional composites for each of the subsystems—hydromet observational networks, modelling, forecasting, and service delivery that meet the existing and future needs of societies; and by setting up a Numerical Weather Prediction and Climate (NWP/NCP) regional team, building up on the BRIO project. The project scalability will be further enhanced by establishing a knowledge and decision support system for MH-IBF-EWS at regional, national and local levels, which will be developed based on the lessons learnt from the MH-IBF-EWS pilots in each country and rolled out nationwide based on scenarios (Activities 3.2.2 and 3.2.3); and sharing this tool and others lessons learnt and best practices through the UIP and during SWIOCOF sessions, which will both be strengthened by the project (Activities 3.3.3 and 3.3.4); the UIP, as well as the NCOFs and SWIOCOFs will also be used to share the weather and seasonal forecasts, climate change projections and other CP-CS developed under this project, in order to facilitate their use by other – non-direct beneficiary – sectors and socio-economic groups. It is expected that the CP-CS' use will reach all sectors during and after the implementation of the project, given the enhanced production of high-quality products and services. Users may include stakeholders from the private sector, which would be willing to pay for good-quality CP-CS that can inform key decisions (e.g. stakeholders from the tourism industry in Madagascar have already confirmed future possibility of buying adequate CP-CS relevant to their activity). The potential income from the private sector related to CP-CS has been estimated at up to 16% (in average) from the commercial sector, ranging from 10% (Comoros and Seychelles) to 30% (Mauritius) (see Annex 3a). Additional financial returns for the hydrometeorological services will enable further upscaling their observation networks and expanding the delivery of CP-CS to new areas and users across the country.

- **Potential for knowledge sharing and learning:** The specialised training center attached to the RCC-Network, the sessions of the SWIOCOF, as well as the UIP will be strengthened to facilitate exchange of climate-related information and risk management experience across the four countries. It will also promote collaboration for NWP/EPS developments, downscaling and calibration over the four countries through a shared platform, in order to improve the prediction of climate-related hazards such as tropical cyclones. Particular attention will be on promoting information sharing with the end-users of the climate services, i.e. the vulnerable communities. Hence, best communication means for vulnerable remote communities will be identified – including language, cultural and gender issues, communication channels, etc. Moreover, knowledge broker institutions for risk prevention will be trained to enhance risk understanding at the local level, and directly provide relevant advice and support for risk preparedness and recovery to local communities (Activity 3.3.2).
- **Contribution to the creation of an enabling environment:** Climate-related information is not disseminated on a regular basis to climate sensitive sectors in Madagascar and Comoros. In Mauritius and Seychelles, information is disseminated but is not always timely or accurate, especially for rapid-onset events such as flash floods. It is also noted that information released by the NMHS is very technical and cannot always be used for decision-makers. By modernising the NMHSs, strengthening institutional settings (Output 1.2), and improving collaboration and communication between producers and end-users (Activity 1.1.1), the project will improve the quality and usability of climate-related products. Moreover, training will be provided to producers of CP-CS on how to generate user-tailored CP-CS (Activity 3.3.1) and to users and end-users of climate services to enhance their understanding and use of climate products (Activity 3.3.2). This process will be supported through climate outlook forums (COFs) which are being hosted on a regular basis at national and regional levels, as well as through dedicated training sessions implemented during the project lifetime. Finally, the project will set the basis to foster private sector (potential customers/clients) investments into climate services by strengthening the capacities of NMHSs to develop and deliver climate products that respond to user needs, e.g. the tourism industry.
- **Contribution to the regulatory frameworks and policies:** The proposed project will strengthen the institutional set up of the NMHS in the four target countries and update existing climate change adaptation plans. Moreover, a regional framework for climate services will be developed and serve as umbrella under which national frameworks for climate services will be prepared and implemented. In addition, the proposed project will support the review or development of Hydromet Laws in the four countries, which will explore the possibility of establishing ring-fenced CIEWS funds (see Annex 2C). The climate-related products generated under the project Output 2.3 and shared on the UIP can also inform decision makers to develop policies and

strategies in climate-sensitive sectors. This will support a risk reduction culture in Comoros, Madagascar, Mauritius and Seychelles, as well as the harmonization of infrastructure, tools and processes.

### D.3. Sustainable development (max. 500 words, approximately 1 page)

The project fully supports the implementation of SDGs in the four countries, in particular SDG 2: End hunger, achieve food security and improved nutrition; SDG 3: Ensure healthy lives and promote well-being; and SDG 13: Take urgent action to combat climate change and its impacts. In addition, the project supports the operationalisation of the Sendai Framework <sup>[4]</sup> targets for Disaster Risk Reduction (SF-DRR) as well as risk-informed sustainable development.

#### 1. Environmental co-benefits

The project will reduce the vulnerability of exposed populations and assets to climate change. As people are less affected by climate-related hazards, and their economic activities become more resilient, pressure on the natural environment will decrease. For example, agrometeorological advisories and weather warnings will enable climate-smart decision making among farmers and fishermen. Farmers will be able to use adequate crop varieties based on the advisories, while farmers and fishermen will be able to protect their equipment and harvests as they receive warnings of hazardous hydrometeorological events. As a result, they will suffer less losses and damages from climate variability, change and extreme. This will, in turn, reduce pressures on the environment as, in many LDCs such as Madagascar and Comoros, unsustainable extraction of wood for charcoal production is a practice used to compensate for climate-related agricultural losses. In addition, the design and management of small dams for irrigation, for example, will also benefit from better climate-related data and dissemination services; if dams are better designed to capture water most efficiently, pressure on the ecosystems for water extraction will be reduced.

#### 2. Social co-benefits including health impacts

The project will contribute to improve well-being, health and save lives. This will be achieved through strengthening EWS and other climate services such as the production and dissemination of agrometeorological information to improve agricultural productivity supporting food security. The proposed Hydromet project will provide information with regards to risks of floods and flash floods, as well as improve the production and dissemination of early warnings towards vulnerable communities and raise awareness of risk prevention and mitigation measures. With better information at hand and access to timely warnings, communities can take proactive steps to protect their lives and assets against potential climate-related disasters. Likewise, fishermen and farmers will be able to move their assets including fishing/farming equipment to protect them against climate-related hazards such as tropical cyclones and associated storm surges. Finally, the project will update climate change adaptation plans, which will in turn improve the quality of life in the four target countries in the long-term.

#### 3. Economic co-benefits

Significant economic gains can be expected from the project; both in terms of reduced losses linked to climate-related hazards and increased financial returns/productivity in key economic sectors like agriculture and tourism. The Annual Average Benefits linked to EWS in terms of costs avoided has been assessed to be around USD 14 million for the entire SWIO region. The Annual Average Benefit from agro-climatic services have been estimated at USD 29,91 million per year for the period 2026-2030 to up to 59,82 million per year for the period 2031 to 2035 for the four countries. Finally, the Net Present Value (NPV) of the project is estimated at USD 230 million at 5% discounting rate. Sensitivity analysis shows that NPV is still positive (USD 161 million) even if the project benefits are 30% lower than expected. Moreover, in the long term, revenues from the NHMS' commercial services can be expected through the marketing of CP-CS, and will progressively complement and partly replace a portion of the public funding of NMHSs, covering from 10% (Comoros and Seychelles) to 30% (Mauritius) of their budget. At the same time, the investments alongside with the collaboration with PIROI and its national counterparts will contribute to the implementation of forecast-based action/forecast-based financing (FbA/FbF) planned for the SWIO region under the leadership of PIROI, and supported through other initiatives, based on the lessons learnt from the first experiment in the region, in Mozambique. For additional details on the economic and financial benefits of the project, please read Annex 3a, Economic Analysis.

#### 4. Gender-sensitive development impacts

The project includes a Gender Assessment and Action Plan (see Annex 8), which will operationalise gender-responsive adaptation actions through the project results framework. Hence, the gender mainstreaming approach of the Hydromet project will include: mainstreaming gender-responsive approaches for the design of CP-CS, hydro-meteorological systems, and EWS; promoting gender balance through the technical and maintenance capacity-building activities, as well as institutional development targeted for hydro-meteorological networks, tools and systems; establishing gender-aware policy frameworks to inform collaboration between key sectors and national/regional hydro-meteorological services; and pioneering gender mainstreaming analyses and praxis regarding hydro-meteorological systems, EWS and CP-CS in the Indian Ocean region and islands.

**D.4. Needs of recipient (max. 500 words, approximately 1 page)**

The SWIO region has been recognised as a ‘climate hotspot’ (see Annex 2, and section B1). The affected population and physical damages resulting from climate-related hazards are likely to rise in the coming years, in the context of climate change.

Despite different socio-economic contexts – with Comoros and Madagascar classified as LDCs, Mauritius as upper-middle income country and Seychelles as high-income country – the economy and populations of these four islands are extremely vulnerable to climate-related hazards. In Comoros and Madagascar, the population is highly reliant on agriculture and fisheries, two key economic sectors which are severely affected by increased air and sea temperature, tropical cyclones, sea level rise, and coastal inundation and erosion. In Mauritius and Seychelles, the economy is highly depending on tourism, which is also threatened by tropical cyclones, increased occurrence of floods, flash floods and landslides, and storm surges resulting in coastal inundation and erosion.

These four islands are also characterised by microclimates, which are strongly influenced by the ocean currents and sea surface temperature patterns, associated with the Indian Ocean Dipole (IOD). This makes it all the more difficult to predict climate-related hazards and therefore implement risk mitigation or planning and preparedness measures. More precisely, there is a lack of location-specific climate and weather information to inform decision-making processes, a limited production and dissemination of climate services that can help reduce risk exposure and vulnerability among communities and sectors, and limited cooperation at the regional level to monitor hazardous hydrometeorological events and share risk-related information in the SWIO countries. This is because of the limited technical capacity within NMHSs, as well as relevant expertise, training programmes and R&D activities to respond to users’ needs in terms of CP-CS (see Annex 2). Improving CP-CS to respond to user needs, reduce vulnerability to climate-related hazards and climate change, and ensure sustained economic growth also requires significant investments, which cannot be met by the NMHSs of the four target countries: while Comoros and Madagascar are considered low-income countries, all four countries are characterized by their high level of debt; their economy is threatened by climate change, with significant public spending already noted to recover from the physical damages resulting from climate-related hazards and emergency responses (see Annex 3a). Existing initiatives and investments in the four target countries supporting the improvement of CP-CS – as described in section B.1– have been assessed, and are complementary to the project; however, these interventions are limited to specific areas of a country and/or to a specific sector and cannot achieve the desired paradigm shift.

Timely, reliable weather, climate and hydrological monitoring, forecasting and service delivery, including EWS, are necessary to equip decision-makers with the adequate information for disaster risk reduction and long-term adaptation planning. To achieve this in Comoros, Madagascar, Mauritius and Seychelles, significant investments will be required not only to equip or upgrade observation networks and foster the production of climate services that respond to user needs in individual countries; but also to support the harmonisation of infrastructure, tools and processes, and enhanced communication and knowledge sharing at the regional level, through, inter alia, the establishment of an RCC-Network and frameworks for climate services. These latter interventions (i.e. with a regional scope) which underpin improvements at the national level, are new in the region. The outcomes of the proposed project will enable decision-making that will enhance livelihoods of the most vulnerable communities and support economic growth in key climate-sensitive sectors; increased economic growth can, in turn, support the production of climate services beyond the project’s lifetime.

**D.5. Country ownership (max. 500 words, approximately 1 page)**

It should also be noted that the project responds to a call to provide support at scale to NMHSs in the Indian Ocean region launched in 2010 by the African Union (AU) and the WMO. The project concept was developed by the IOC, which received repeated requests and approval from its ministerial council to develop the Hydromet project as a full-scale funding proposal for the GCF. The project will involve all technical staff of NMHSs, who will collaborate with staff from the DRM institutions at national level in the four countries and at the regional level with PIROI, while international advisors on meteorology, climate, disaster risk management, and institutional and legal aspects (one in each area) will be hired to support the implementation of the project in the four countries.

Section B1 above discusses how the proposed project contributes to the SAMOA pathway and the AU Agenda 2063. The project also supports the operationalisation of the Sendai Framework global targets for Disaster Risk Reduction (SF-DRR). In particular, the project will strengthen risk governance and management in the four target countries, by establishing a RCC-Network, as well as NFCS to enhance and harmonize disaster risk information and assessments, implement multi-hazard impact-based forecasts and early warning systems (Global Target G) in support of preparedness and recovery in the SWIO region. Moreover, the project will support staff trainings for DRM institutions and on-the-ground organisations and communities to better understand and use CP-CS and contribute to the development, testing and validation of MH-IBF-EWS. Risk preparedness will be enhanced within the four target countries, through more accurate and timely detection of climate-related risks, the development or strengthening of key CP-CS, including multi-hazard impact-based forecasts and early warnings, using best dissemination channels, the development of hazard maps and risk management plans, and capacity building interventions targeting the providers and users (including end-users) of CP-CS.

The project will support the implementation of SDGs in the four countries, as hydrometeorological and impact-based forecast and early warning services, as those to be strengthened under the proposed project, are key enablers for a broad range of adaptation decisions; the CP-CS to be developed will also improve food security and reduce disaster risks and impacts on people, economic activities and assets. Hence, the project fully supports the implementation of SDG 2: End hunger, achieve food security and improved nutrition; SDG 3: Ensure healthy lives and promote well-being; and SDG 13: Take urgent action to combat climate change and its impacts.

At the regional level, the IOC Member States have developed a joint adaptation strategy: *Document cadre pour la stratégie régionale d'adaptation au changement climatique des pays membres de la Commission de l'Océan Indien 2012-2020*.<sup>119</sup> This strategy aims at strengthening regional cooperation, fostering a shared understanding of regional issues, and improving the coordination of actions. To reach these aims, the strategy advocates strengthening forecasting and climate anticipation capabilities, to increase the capacity of all actors, and to more broadly disseminate climate-related information. The proposed Hydromet project will contribute to achieving these goals as the technical capacities of the NMHS will be enhanced and regional cooperation fostered through, *inter alia*, the establishment of a RCC-Network and a similar risk management culture. Dissemination of CP-CS will also be improved as well as the ability of people and last mile partners to interpret and use these tools.

With regards to the NDCs, the project will support their achievement in each target country:

- In Comoros, the priority actions of the NDC target the water and agriculture sectors, aim to integrate adaptation into sectoral policies, and to reduce vulnerability through poverty reduction (particularly noting the vulnerabilities of rural communities and farmers to climate change). Capacity and resilience of the agricultural sector is identified as a priority adaptation project. The Hydromet project will contribute to this priority by developing seasonal forecasts and agricultural advisories for Comoros and improving the dissemination of information and alerts among farmers and fishermen under activities 3.1.1 and 3.1.2. Another priority project of the NDC is the integration of climate change into relevant strategies, which will be supported under activity 3.2.2 as the NAP and its sectoral plans will be updated with the climate change data downscaled under this project. Finally, the NDC has a priority to strengthen the resilience of the most vulnerable to disaster risks, through the implementation of MH-IBF-EWS, which is a main objective of Hydromet project.
- Madagascar's NDC emphasize the complementarity between adaptation and mitigation. Several priority measures are identified to support adaptation and reduce GHG emission in the country, including a 'Large-scale implementation of conservation and climate-smart agriculture and agroforestry'. Hydromet project will contribute to achieve this by developing and disseminating seasonal forecasts and agricultural advisories to

<sup>119</sup> IOC Climate Change Portal. 'Document cadre pour la stratégie régionale d'adaptation au changement climatique des pays membres de la Commission de l'océan Indien 2012-2020'. Accessed 18<sup>th</sup> August 2019. Available at: [https://prodigious-lab.com/coi/wp-content/uploads/2018/01/DR-Document-cadre-pour-la-strate%CC%81gie-re%CC%81gionale-d\\_adaptation-au-changement-climatique-des-pays-membres-de-la-COI.pdf](https://prodigious-lab.com/coi/wp-content/uploads/2018/01/DR-Document-cadre-pour-la-strate%CC%81gie-re%CC%81gionale-d_adaptation-au-changement-climatique-des-pays-membres-de-la-COI.pdf)

farmers, thereby supporting climate-smart agriculture. Several priority actions of the NDC are also aligned with the objectives of Hydromet project and can be supported by the proposed interventions. For example, Hydromet will contribute to the development of multi-hazard impact-based forecasts and early warning systems. Finally, activity 1.1.1 of Hydromet will contribute to the finalisation of the “National framework for climate services” for which Madagascar has committed within the context of the Global Framework for Climate Services (GFCS), which is also an objective of the NDC.

- Mauritius’ NDC underlines several priority actions to which the Hydromet project will contribute, for example: ‘Disaster Risk Reduction Strategy: to understand disaster risk, implement disaster risk strategy, strengthen management of related governance, and invest in resilience.’ The Hydromet project will also partly contribute to the NDC’s priority ‘Water Resources Management: improve forecasting, management, protection and quality of water resources, including upgrading and building of new treatment plants and reservoirs and reducing water losses in the distribution system’. Forecasts will be improved through the technical enhancement and training of hydrological services i.e. on flood propagation models under activity 2.3.8; and risk management will be enhanced as hazard maps for floods will be developed under activity 2.3.3.
- Seychelles’ NDC recommends further research to understand the impacts of a changing climate on “cyclone patterns, ocean and air currents, and...other climate phenomena such as El Niño”. The NDC also notes the necessity to undertake “climate change modelling and risks, monitoring of climate change impacts”. The Hydromet project will contribute to this under activity 2.3.8 to downscale climate change projections for Seychelles. Within the NDC, fisheries and tourism are recognised as highly vulnerable; Hydromet project will develop hazard maps relevant for tourism under activity 2.3.3. Improved, more accurate forecasts including IBF will also be produced under activities 3.2.2 and 3.2.3, and CP-CS will be disseminated using best channels for tourism and fisheries under activity 3.1.2, along with early warnings. Finally, under activity 3.2.4, the project will support the implementation of Seychelles’ Coastal Management Plan, thereby supporting the achievement of the NDC’s goal to reduce the vulnerability of coastal areas and the tourism sector.

The Funding Proposal was prepared based on extensive in-country consultations and field visits which took place between May and November 2019, including one-on-one meetings with decision-makers in the public and private sectors, last mile partners (as organisations involved in on-the-ground disaster risk management, focused group interviews organised with vulnerable communities (especially women), and a series of workshops with relevant government and sector representatives to gather feedbacks on initial project interventions (see Annex 7). The four country NDAs have also been consulted during the project development phase. Moreover, the NDAs will follow the progress of the proposed project implementation in their country, through regular presence at National Project Steering Committees and Regional Project Steering Committee (see section B.4), in particular to ensure project alignment with their respective country’s climate change adaptation objectives, and its complementarity and synergies with other existing initiatives in this field.

The project is aligned with several international and national policies and strategies pertaining to climate change adaptation and disaster risk reduction (details on existing policies and strategies can be found in Annex 2). In a nutshell, these include:

- **Comoros:** the country has submitted its NAPA in 2006, which emphasises the need to “establishing and further developing early warning systems”<sup>120</sup>. It is currently developing its NAP and has submitted its NDC in 2016, which underlines the importance to develop an effective cross-sectoral early warning system. Comoros’ Strategic Plan 2017-2020 also notes in particular the current lack of stations, difficulties delivering services on time, and lack of capacity in the NMHS. Key partners that were consulted are: Department of Fisheries, Agriculture, Environment (acting as sector users); CERVO and COSEP (acting as governmental entities for risk management coordination and on-the-ground intervention); and Ulanga NGO and Red Cross/Crescent (civil society for preparedness/emergency relief).

<sup>120</sup> Ministry of Rural Development, Fisheries, Handicraft and Environment (2006). ‘Union of the Comoros: National Action Programme of Adaptation to climate change’. Accessed 19<sup>th</sup> August 2019. Available at: [https://www.preventionweb.net/files/8507\\_com01e.pdf](https://www.preventionweb.net/files/8507_com01e.pdf)

- **Madagascar:** the NAPA, submitted in 2006, highlights that improvements in climate services and development of agro-climatic products are critical to climate change adaptation. The NAP process was launched in 2011, and the NDC submitted in 2015. In this document, climate services, EWS, and sector-specific climate risk management plans for agriculture and water are listed as short-term priorities. Madagascar has a National Climate Change Management Policy (PNLCC, 2012), and a National Strategy for Disaster Risks Management (NSDRM, 2016-2020), which all underline the need to strengthen climate services. Key partners that were consulted are: Fisheries and Agriculture Directorates (acting as sector users); the BNGRC-CERVO (acting as governmental entities for risk management coordination and on-the-ground intervention); and Capacity Building for Community (civil society for preparedness/emergency relief).
- **Mauritius:** the country has started its NAP process and submitted its NDC in 2015; both plans support climate change adaptation and promote use of EWS to enhance climate resilience. Moreover, the country has a National Climate Change Adaptation Policy, which notes the importance of information gathering, and regional and international collaboration to implement adaptation goals<sup>121</sup>. Key partners that were consulted are: Water Resource Unit, Business Mauritius, the Fisheries and Shipping Directorates and the Ministry of Tourism (acting as sector users); the NDRRMC and Land Drainage Agency (acting as governmental entities for risk management coordination and on-the-ground intervention).
- **Seychelles:** the country has submitted its NDC in 2015, which highlights climate change impacts on fisheries, infrastructure, and tourism, among other sectors; the necessity for research and resources to “predict, prevent and respond to disasters” is emphasised. The Seychelles National Climate Change Strategy (2009) needs to be updated to support the implementation of the country’s new Climate Change Policy (currently under development). Key partners that were consulted are: Ministry of Environment, Ministry of Social Affairs, the Fishery Authority, Insurance company (acting as sector users); DRDM and the District Authority (acting as governmental entities for risk management coordination and on-the-ground intervention).

In the four countries, consultations were also organised with bilateral and international organisations including AFD, USAID, FAO, GIZ and UNDP; these are key actors involved in risk management. The discussions provided further insight on risk preparedness and management in the four countries; synergies with the current interventions of these organisations have been sought (see FS, Chapter 2 on baseline projects; and section B.1 above, Table 4).

Based on in-country consultations and the case study analysis provided in the FS, an assessment of needs to improve risk management in the four countries was conducted (see chapter 4 if the FS). Detailed case studies of risk preparedness and management were particularly relevant to design project interventions that would improve on-the-ground risk management, placing the last-mile partners (e.g. relief and disaster preparedness NGOs) and communities at the center. For example:

- Communities and last-mile partners will be part of the participatory process to develop hazards maps and vulnerability maps, which will be used to guide on-the-ground interventions for risk preparedness and recovery (activities 2.3.3 and 2.3.4)
- Last-mile partners and communities will be consulted to assess the adequacy between needs and solutions while packaging and disseminating MH-IBF-EWS and identify pathways for improvements (activities 3.1.2, and 3.2.1-3.2.3)
- Last-mile partners will be consulted with the view to strengthen and streamline the collaboration between NMHS, DRM institutions and on-the-ground organisations to enable fast response with wide outreach. In particular, the project will address the communication gaps between NMHS, DRM institutions and on-the-ground interventions services as well as identify pathways to solve difficulties of emergency services – e.g. Red Cross/Crescent – to reach local communities especially in remote location (risk identified in the FS – activities 3.2.1, and 3.2.1-3.2.3).
- In addition, local organisations, volunteers and community leaders will have the opportunity to develop and implement MH-IBF-EWS promoting people-centric risk management.

<sup>121</sup> Ibid. at page 6.

- Last-mile partners and knowledge breakers will be trained to interpret and use the CP-CS co-developed with them under this project so that they can inform and train themselves ('training-of-the-trainers approach) the vulnerable communities.

The Hydromet Project was co-designed and validated by of each the beneficiary countries during the feasibility study process. At the project onset and during its implementation period, the country engagement and ownership will be continued and enhanced. Indeed, the NMHS (NIP), as lead national implementing entities, as all concerned national entities, will be the lead implementing national partners and will be involved in the project co – design activities at both regional and national level to insure the country ownership. NMHSs will be engaged and co -responsible of national activities implementation and results achievements in relation to the IOC (EE). NSP such as DRM institutions will be strongly involved to co-design and co-implement the activities related to EWS and last mile connectivity. Moreover, the rollout of NPC in each country, at the country request, aim at spreading and ensuring the involvement of national counterparts in the implementation of the project activities at the national level and not only at IOC (EE) regional level. Finally, the country project ownership and handover process of soft and equipment's supports will start from the Project onset and will last during the entire Project. In fact, when it comes to co-design, training and capacity building the beneficiaries stakeholders will be actively engaged to participate to all steps and workshops session will be participatory. Regarding equipment's operation and maintenance, the delivery and installations in the country is planned to take place at the end of the 3<sup>rd</sup> year implementation, from that steps, the operation and maintenance of the equipment's is under the country responsibility. IOC, with PMU and WMO, and others technical partners will support the countries on the two years handover process until a complete country mastering. To the extent and when needed specifically for RADAR installation, technical support contract may be considered to support countries.

#### D.6. Efficiency and effectiveness (max. 500 words, approximately 1 page)

The Hydromet project, with its inter-linked components, is the most appropriate investment to achieve climate change adaptation objectives. In the absence of GCF funding – based on financial support from AFD and the EU only, respectively USD 5,504,183 and USD 6,172,916– it would be possible to improve meteorological services and capacity building partially but prioritizing a small sub-set of equipment in each country and focusing on pilot projects only in the most vulnerable areas instead of servicing CP-CS to key sectors nationally. Furthermore, the project would not be able to address the enabling environment and frameworks, neither fostering a regional approach, as set under Component 1. The full benefits in terms of avoided costs, long lasting gains in terms of development of climate services, for and by the private sector customers which are detailed in Annex 3a Economic Analysis and summarized below – would not be realized in the absence of GCF investments.

Without the support of the GCF, the Hydromet project will lose the major part of its activities, namely all the infrastructure allowing strengthened climate services delivery and multi-hazard impact-based forecast and early warning systems at national and regional levels. In this scenario, the major benefits from the original Hydromet project (i.e. **upgrading, refining** the warnings from general cautionary advice to a detailed, location-specific, model-based forecasts of hazard evolution, expected impacts or consequences and precautions for particular vulnerable segments of society) will no longer be possible. From the SWOT analysis and case studies described in Annex 2 (Feasibility Study), it is noted the requirement for strengthen the ability to detect, monitor, forecast, and generate and disseminate meaningful and actionable warnings, while the DRM institutions in the SWIO region will continue to be benefiting from the support of the Indian Ocean Regional Intervention Platform (PIROI) and its related initiatives and projects. However, in order to ensure a people-centered end-to-end MH-IBF-EWS, coordination and collaboration with PIROI and its national counterparts, NGOs and other agencies, will be pursued throughout the project for the implementation of MH-IBF-EWS in pilot areas and rolling out nationwide. Therefore, **all benefits of the annual average losses evaluated to approximately USD 14 million for the four countries will not be achieved**. The benefits from the potential private sector income will also be affected. The process of developing user-tailored climate services typically involving the translation of temporal and spatial information about the climate into decision-support tools to suit the needs of specific sector applications, will no longer be possible.

Following the WMO Guidelines on Emerging Data Issues (WMO-No. 1239)<sup>122</sup>, the design of the various hydromet subsystems proposed in the project (i.e. expansion of the observation network, ICT systems, downscaling and calibration of predictions over the countries/region, and implementation of MH-IBF-EWS) will explore the use of innovative technologies (such as those described in section B1, Table 5), cost sharing and, due to the limited staff in individual NMHSs, the development of a regional pool of experts that would work together towards common objectives and results, for sustainability of investments. The regional approach is key to underpin improvements in the production and dissemination of CP-CS.

The improved agricultural profits attributable to Hydromet project for the four countries have been evaluated to be around USD 29,91 million per year for the period 2026-2030 to up to 59,82 million per year for the period 2031 to 2035, with a conservative assumption (based on literature review and results in other projects) of a 10% increase in yields for 10% of the agriculture sector using agroclimatic services<sup>123</sup>. Without the Hydromet project, the absence of major infrastructure, tools and capacity building will seriously reduce the ability of NMHSs to produce tailored weather forecasts, climate predictions, and early warnings at the appropriate time and spatial scales. We reviewed the assumptions of a 1% productivity increase for 2% of the agriculture sector under a no-Hydromet project scenario.

Total incremental value of agriculture production (USD million) during 2026-2030	Madagascar	Comoros	Seychelles	Mauritius
With the Hydromet project	21.8	0.04	0.03	7.7
Without the Hydromet project	0.87	0.02	0.00	0.31

#### Impact on the economic rate of return

The NPV, with the Hydromet project, have been assessed to **USD 230 million** for a 5% discounting rate (CB ratio of 1:4,3). Without the Hydromet project, the NPV of the project becomes negative at - USD 26 million. The major share of benefits, evaluated at a total of USD **230 million at 5%** discounting rate, will be lost. With the proposed Hydromet project, the EIRR become positive after the ninth year (four years after the project completion), and reaches 14% after 15 years (lifespan of the project).

The main barrier to the development of the NMHSs in the four target countries without the Hydromet project is lack of funding. The target countries are not in a position to finance the Hydromet project alone as indicated in section B.5, without the contributions of the AFD, the EU and the GCF. The overall investment weight of the Hydromet project (**±USD 71 million**) represents 0.27 % of the combined GDP of the four countries (USD 28,343 million). In addition, the per capita burden on the four countries (29,147,444) to implement Hydromet alone would be approximately USD 2.6 per capita. This level of investment is much higher than the spending ratios of other States in the world. Most NMHSs are funded in the range of 0.010-0.050 % of Gross Domestic Product (GDP), with a total average of 0.012 %. Per capita spending on NMHS is US \$ 0.10 for at least one NMHS in every World Meteorological Organization (WMO) Regional Association, to almost US \$ 13.00. The average for developing countries is about US \$ 3.50 per capita of national population, and the average for the least developed countries is about US \$ 0.25.

<sup>122</sup> [https://library.wmo.int/doc\\_num.php?explnum\\_id=10124](https://library.wmo.int/doc_num.php?explnum_id=10124)

<sup>123</sup> In Ghana, where farmers have experienced 30 to 80% increased yield per acre, or USD 75 to USD 125 per acre in revenue after receiving climate-related information through mobile phone and adjusting their agricultural practices accordingly (see project UNEP DTU in Ghana: <https://unepdtu.org/partnerships-for-climate-action/>). In Kenya, an ex-ante modelling study conducted by Hansen et al (2009) (full reference in pag 173 of the Annex 2, FS) found that seasonal forecasts based on a general circulation model led to gross margin increases of 9–24%, averaged across years, while perfect knowledge of daily weather was worth an estimated 24–69%. Ouédraogo et al (2018) (full reference in pag 173 of the Annex 2, FS) report that Burkinabé cowpea farmers with climate information showed higher yields than those without information (an average of 847 kg/ha compared to 685 kg/ha, +23%); moreover, information recipients were shown to have made decisions that resulted in savings in seed and pesticides, resulting in gross margin gains of 66% above the control group. In East Africa, a study looked at the relationship between agricultural outcomes and the employment of “climate resilient” strategies in Ethiopia; the authors found that receiving training in the use of weather information had the greatest influence on yield (17% increase) (Anuga & Gordon, 2016) (full reference in pag 173 of the Annex 2, FS). These studies (both ex-ante and ex-post estimates of impact of agricultural climate services), including Vaughan et al (2019) (full reference in pag 173 of the Annex 2, FS), show evidence of incremental agricultural productivity gains following the uptake of climate agro-advisories, however the range varies – in all cases studied, the lowest yield enhancement was 6.9% and the highest was 24%, so the assumption of 10% used in the proposed project was based on the percentage of enhanced agricultural productivity as a result of farmers receiving agro-climatic advisories, regardless to the type of crop, farms or risks.

The financing structure of the project is essentially based on investment grant for the implementation of the project, and co-financing (from Mauritius and Seychelles) for construction work and the operating and maintenance costs. As a result, the financial model will not weight on the public debt of the targeted countries. Country ownership of operating and maintenance expenses will have limited impact on the public debt, since it will be mostly achieved by strengthening the capacity of the personnel already assigned to operate the various systems at the National Meteorological Services.

Moreover, the private sector of the four countries is not in a position to support the financing of the Hydromet project since most of the project's objectives fall under open access public services. In these four countries, the Corporate Social Responsibility is not as yet integrated in the countries private sector, except in Mauritius and Seychelles where some companies are more conscious of the impact they are having on aspects of society, including economic, social and environment; however, these are still not well established. It is not in the role of the private sector to support the production of public services. There is therefore no risk of crowding out the private sector.

The financial viability of the project is based on grant financing of investments. The absence of loan and therefore of obligation to repay capital and interest does not increase the burden of the public debt of the States. The ratios of public debts of the States are therefore not affected by the project funding.

Finally – importantly – the four countries benefiting from the Hydromet project will be able to build sustainable, long-term business models from the reliable operation of strengthened hydrometeorological systems and recover the costs of operation and maintenance (O&M) through revenue-generation / cost-recovery from commercial services, and through national budget support (see Annex 21).

The budget funding analysis (see Annex 3a) shows that the impact of the Hydromet project will be easily handled by the four countries together, as the O&M costs of the new Hydromet equipment overall, on the budgets of the four beneficiary NHMSs, will be limited; these costs will be shared adequately among the RCC-Network member countries, as per the RCC-Network multi-lateral agreement signed between these countries under Activity 1.1.2 of the proposed project. Moreover, in the long term, development of commercial revenues may complement and eventually replace part of the current public funding of NMHS, from 10% (Comoros and Seychelles) to almost 30% (Mauritius) of their budget. This indicates that the Hydromet project-related interventions may no more rely on international funding in the long term.

## E. LOGICAL FRAMEWORK

This section refers to the project/programme's logical framework in accordance with the GCF's [Performance Measurement Frameworks](#) under the [Results Management Framework](#) to which the project/programme contributes as a whole, including in respect of any co-financing.

### E.1. Paradigm shift objectives

- Shift to low-emission sustainable development pathways  
 Increased climate resilient sustainable development

### E.2. Core indicator targets

E.2.1. Expected tonnes of carbon dioxide equivalent (t CO <sub>2</sub> eq) to be reduced or avoided (mitigation and cross-cutting only)	Annual	Not applicable
	Lifetime	Not applicable
E.2.2. Estimated cost per t CO <sub>2</sub> eq, defined as total investment cost / expected lifetime emission reductions (mitigation and cross-cutting only)	(a) Total project financing	_____ Choose an item.
	(b) Requested GCF amount	_____ Choose an item.
	(c) Expected lifetime emission reductions	_____ t CO <sub>2</sub> eq
	<b>(d) Estimated cost per t CO<sub>2</sub>eq (d = a / c)</b>	_____ Choose an item. / t <b>CO<sub>2</sub>eq</b>
	<b>(e) Estimated GCF cost per t CO<sub>2</sub>eq removed (e = b / c)</b>	_____ Choose an item. / t <b>CO<sub>2</sub>eq</b>
E.2.3. Expected volume of finance to be leveraged by the proposed project/programme as a result of the Fund's financing, disaggregated by public and private sources (mitigation and cross-cutting only)	(f) Total finance leveraged	_____ Choose an item.
	(g) Public source co-financed	_____ Choose an item.
	(h) Private source finance leveraged	_____ Choose an item.
	<b>(i) Total Leverage ratio (i = f / b)</b>	_____
	(j) Public source co-financing ratio (j = g / b)	_____
	(k) Private source leverage ratio (k = h / b)	_____
E.2.4. Expected total number of direct and indirect beneficiaries, (disaggregated by sex)	Direct	19,453,286 50% female
	Indirect	<b>9,788,191</b> 50% female population is expected to be indirect beneficiaries
<i>For a multi-country proposal, indicate the aggregate amount here and provide the data per country in annex 17.</i>		
E.2.5. Number of beneficiaries relative to total population (disaggregated by sex)	Direct	67% of which 50% females
	Indirect	33% of which 50% females (rest of the population)
<i>For a multi-country proposal, leave blank and provide the data per country in annex 17.</i>		

E.3. Fund-level impacts						
Expected Results	Indicator	Means of Verification (MoV)	Baseline	Target		Assumptions
				Mid-term	Final	
A1.0 Increased resilience and enhanced livelihoods of the most vulnerable people, communities and regions	A1.1 Change in expected losses of lives and economic assets (US\$) due to the impact of extreme climate-related disasters	<p>Humanitarian reports, including but not limited to the Rapid Damage and Needs Assessment reports (RDNA) and Post-Disaster Needs Assessment reports (PDNA)</p> <p>PIROI reports</p> <p>Community surveys and government reports</p>	<p>During Tropical Cyclone Enawo in 2017, 81 lives (mostly Women and children) were lost and damage to economic assets amounted to EUR 50 million (Number of women and children lost will be collected upon project commencement from RDNA and PDNA reports from the Local Governments)</p>	<p>The introduction of MH-IBF-EWS can reduce the damage to economic assets by 3% or EUR 1,5 million and reduce loss of life to less than 40 or 50%</p>	<p>The introduction of MH-IBF-EWS can reduce the damage to economic assets by 5% or EUR 2,5 million and reduce loss of life to less than 16 or 80%</p>	<p>CP-CS are used by population in project sites and target sectors to inform decision-making processes</p> <p>The produced CP-CS leads to actual livelihood benefits for individuals, communities and sectors</p> <p>Well-established coordination and collaboration with regional and national DRM institutions and NGOs (under the leadership of PIROI)</p> <p>Occurrence of extreme weather events in project sites</p> <p>Humanitarian missions, including RDNA and/or PDNA conducted and reported</p> <p>PIROI and government reports prepared</p>
A1.0 Increased resilience and enhanced livelihoods of the most vulnerable people, communities and regions	A1.2 Number of males and females benefiting from the adoption of diversified, climate resilient livelihood options (including fisheries, agriculture, tourism, etc.)	<p>Community survey and local government reports in project selected sites (2 sites per countries to be defined upon project commencement)</p> <p>RDNA and/or PDNA reports</p>	<p>Climate-resilient fisheries (in project sites): Males: 0 Females: 0</p> <p>Climate-resilient agriculture (in project sites): Males: number of males to be collected upon project commencement (during inception) from statistics and reports of the Local Governments and FAO Females: number of females to be collected upon project commencement</p>	<p>For project sites in the 4 countries (in fisheries): Male: additional 50 Female: additional 50 (or +5% male/female of the baseline)</p>	<p>For project sites in the 4 countries (in fisheries): Male: additional 250 Female: additional 250 (or +10% male/female of the baseline)</p>	<p>Occurrence of extreme weather events in project sites</p> <p>RDNA and/or PDNA conducted and reported</p> <p>Communities and target beneficiaries in project sites wanting to engage in the MH-IBF-EWS</p>

			(during inception) from statistics and reports of the Local Governments and FAO			
A2.0 Increased resilience of health and well-being, and food and water security	A2.2 Number of food secure households (in areas/periods at risk of climate change impacts)	Household surveys  Statistics and reports of the Local Governments and FAO that would demonstrate more productive and year around production of food	Total number of food-secure households <sup>124,125</sup> (for the 4 countries) to be collected upon project commencement (during inception) from statistics and reports of the Local Governments and FAO  Male-headed householders: number of male food-secured households to be collected upon project commencement (during inception) from statistics and reports of the Local Governments and FAO  Female-headed householders: number of female food-secured households to be collected upon	Total number of food-secure householders (for the project sites in the 4 countries): Additional 100 (or +5% of the baseline) Male-headed householders: additional 50 Female-headed householders: additional 250	Total number of food-secure householders (for the project sites in the 4 countries): Additional 500 (or +10% of the baseline) Male-headed householders: additional 250 Female-headed householders: additional 250	Hydromet information is disseminated to end-users using appropriate channels and used to inform decision-making  The produced CP-CS bring actual benefits to communities and sectors, through the establishment of MH-IBF-EWS at regional, national and local levels  The FAO definition for food security is applied in defining food-security households. <sup>126</sup> Food security will be monitored by working with the FAO, which is also implementing project in target countries, and gathering statistics from its surveys.

<sup>124</sup> For Comoros, data extracted from : Rapport ACCLIMATE (2011). 'Etude de vulnérabilité aux changements climatiques: évaluation qualitative'. For Madagascar, data extracted from : <http://www.foodsecurityportal.org/madagascar/resources>. For Mauritius and Seychelles, data extracted from : <https://www.who.int/nutrition/publications/foodsecurity/state-food-security-nutrition-2019-en.pdf?ua=1>

<sup>125</sup> Households of Comoros, Madagascar and Seychelles: [https://www.un.org/en/development/desa/population/publications/pdf/ageing/household\\_size\\_and\\_composition\\_around\\_the\\_world\\_2017\\_data\\_booklet.pdf](https://www.un.org/en/development/desa/population/publications/pdf/ageing/household_size_and_composition_around_the_world_2017_data_booklet.pdf); Households of Mauritius: <https://www.africageportal.com/datasets/02c0feecd29d4f219f4da2a4308e720c>

<sup>126</sup> Households are food secure when they have year-round access to the amount and variety of safe foods their members need to lead active and healthy lives. At the household level, food security refers to the ability of the household to secure, either from its own production or through purchases, adequate food for meeting the dietary needs of all members of the household. See: [http://www.fao.org/ag/agn/nutrition/household\\_en.stm](http://www.fao.org/ag/agn/nutrition/household_en.stm)

			<i>project commencement (during inception) from statistics and reports of the Local Governments and FAO</i>			
<i>A2.0 Increased resilience of health and well-being, and food and water security</i>	<i>A2.3 Number of males and females with yearround access to reliable and safe water supply despite climate shocks and stresses</i>	<i>Household surveys  Statistics and reports of the Local Governments and FAO that would demonstrate year around access to reliable and safe water supply in agriculture with more production of food  Household surveys</i>	<i>Total number of males and females with access to reliable and safe water supply for the project sites in the 4 countries (in agriculture) to be collected upon project commencement from statistics and reports of the Local Governments and FAO</i>	<i>For project sites in the 4 countries (in agriculture): Male: additional 50 Female: additional 50 (+5% of the baseline)</i>	<i>For the project sites in the 4 countries (in agriculture): Male: additional 250 Female: additional 250 (+10% of the baseline)</i>	<i>Hydromet information is disseminated to end-users using appropriate channels and used to inform decision-making  The produced CP-CS bring actual benefits to communities and sectors, through the establishment of MH-IBF-EWS at regional, national and local levels  Sufficient rainfall, groundwater and surface water can be mobilized to help achieve water security  Water safety and reliability in agriculture is defined as water availability for at least 2 hours per day to be used for irrigation, throughout a calendar year</i>

E.4. Fund-level outcomes						
Expected Outcomes	Indicator	Means of Verification (MoV)	Baseline	Target		Assumptions
				Mid-term)	Final	
	<i>Number of technologies and innovative solutions transferred or licensed to support low-emission development as a result of GCF support</i>	<i>Technology: Audit reports of the on-site inspections Reports of the Factory Acceptance Tests (FAT), Site Inspections Tests (SAT), and Operational Tests (OT)  Measure:</i>	<i>Technology: Number of technologies (networks and systems) to be determined based on the assessments done under Activity 1.4.1 (at the inception phase of the project)</i>	<i>Technology: At least 2 new technologies in place across the four countries in the SWIO region  Measure: 4 NFCS revised or established</i>	<i>Technology: At least 4 new technologies in place across the four countries in the SWIO region  Measure: A RFCS established 4 NFCS revised or established</i>	<i>Government has a political will, institutional capacity and necessary resources to support O&amp;M of the new technologies (networks and systems)  NMHS are willing to participate in the development and adoption of RFCS and NFCS  Sector specific stakeholders are</i>

		<i>A Regional Framework for Climate Services (RFCS) established</i> <i>National Frameworks for Climate Services revised or established</i>	<i>Measure: No RFCS 1 NFCS Madagascar</i>			<i>willing to participate in the development and adoption of RFCS and NFCS</i>
<i>A5.0 Strengthened institutional and regulatory systems for climate-responsive planning and development</i>	<i>A5.1 Institutional and regulatory systems that improve incentives for climate resilience and their effective implementation</i>	<i>Approved national hydromet laws</i>  <i>Approved national and local policies, guidelines and frameworks on climate services and MH-IBF-EWS</i>	<i>Existing hydromet laws do not have a sustainable mechanism for supporting O&amp;M of NMHSs</i>  <i>Existing plans currently do not have MH-IBF-EWS (such as the national DRM plans; the SOP on EWS)</i>	<i>Drafted National Hydromet Laws with a sustainable mechanism for supporting O&amp;M of NMHSs</i>  <i>Risk matrix with impact and response tables adopted by the local DRM authorities at the project sites</i>  <i>Drafted guidelines on mainstreaming MH-IBF-EWS in national and local disaster preparedness and response plans that is gender- and sector-sensitive</i>  <i>National DRM Committee that is gender- and sector-sensitive (re-)established</i>	<i>Adopted National Hydromet Laws with a sustainable mechanism for supporting O&amp;M of NMHSs</i>  <i>Risk matrix with impact and response tables adopted by the local (at project sites) and national DRM authorities</i>  <i>Final guidelines on mainstreaming MH-IBF-EWS in local resilience planning and national SOPs of collaborating members of National DRM Committee that is gender- and sector-sensitive</i>	<i>NMHS are willing to participate in the development and adoption of institutional and regulatory frameworks and CP-CS</i>  <i>Sector specific stakeholders are willing to participate in the development and adoption of SOPs</i> <i>National disaster response plans, EWS and SOPs are using hazard-based forecasting and warning information</i>
<i>A5.0 Strengthened institutional and regulatory systems for climate-responsive planning and development</i>	<i>A5.2 Number and level of effective coordination mechanisms</i>	<i>National and local directives activating the Emergency Operation Center(s)</i>	<i>Existing EWS coordinating bodies and mechanisms to be assessed at the project commencement</i>	<i>One inter-agency national committee for MH-IBF-EWS established</i>  <i>One task force/committee established</i>	<i>One inter-agency national committee for MH-IBF-EWS established</i>  <i>One task force/committee established and led by the local government</i>	<i>Stakeholders at national level and project sites are willing to participate in the Committees/Task Forces</i>  <i>Committees and mechanisms established at the</i>

		<i>Situation reports</i>	<i>(inception phase)</i>	<i>tee established and led by the local government authority in the project sites</i>	<i>authority in the project sites</i>	<i>national level and difference project sites are effective</i>
				<i>Coordination mechanisms improved to Level of Effectiveness 3</i>	<i>Coordination mechanisms improved to Level of Effectiveness 3</i>	<i>The scale of measure the Level of Effectiveness is: 0 – no coordination mechanism 1 – coordination mechanism in place; 2 – coordination mechanism in place, meeting regularly with appropriate representation (gender, sector and decision-making authorities) 3 – coordination mechanism in place, meeting regularly with appropriate representation (gender, sector and decision-making authorities), with appropriate information flows and monitoring of action items/issues raised</i>
<i>A6.0 Increased generation and use of climate information in decision-making</i>	<i>A6.1 Use of climate information products/services in decision-making in climate sensitive sectors</i>	<i>Surveys among sectors and end-users</i>  <i>National climate change and DRM/DRR policies, plans and situation reports</i>	<i>Current climate information products /services in DRM decision-making in climate-sensitive sectors are hazard-based</i>  <i>CP-CS are not used in decision-making in agriculture sector</i>  <i>Absence of MH-IBF-EWS across the four target countries in the SWIO region</i>	<i>The DRM sector uses improved CP-CS in each country, leading to at least 20% (5'848'295) of the total beneficiaries / population</i>  <i>MH-IBF-EWS piloted in selected vulnerable communities in the four countries, leading to the reduction of the damage to economic assets by 10% or USD 5 million and reduce loss of life to less than 40</i>	<i>Annual agriculture sector plans in each country are updated using hydromet data and MH-IBF-EWS, and relevant sectoral and extension workers are trained in the application of the plans, leading to reduction of losses in the agriculture production amounting to USD 400.000/year (total for the four target countries)</i>  <i>MH-IBF-EWS implemented at regional, national and local levels, , leading to the reduction of the damage to economic assets by 30% or USD 15 million and reduce loss of life to less than 16</i>	<i>NMHSs, DRM institutions and sectors work together to co-produce improved user-friendly CP-CS, and to implement MH-IBF-EWS at regional, national and local levels</i>  <i>Sector authorities are willing to use the CP-CS developed</i>
<i>A7.0 Strengthened adaptive capacity and reduced exposure to climate risks</i>	<i>A7.1 Use by vulnerable households, communities, businesses and public-sector services of Fund-supported tools instruments, strategies and activities to respond to climate change and variability</i>	<i>Surveys among selected communities , sectors and local governments on early warning/risk</i>	<i>0 – No use of fund-supported tools</i>  <i>0 – No formal use of MH-IBF-EWS &amp; other</i>	<i>Local governments (municipalities/urban councils – to be defined upon commencement of the</i>	<i>Local governments (municipalities/urban councils and rural authorities/district councils – to be defined upon commencement of the project with the selection of the project sites) at the</i>	<i>The CP-CS developed during the project are still being used/maintained beyond the project's lifetime</i>  <i>There is continued commitment and uptake of the</i>

		<p>perception survey</p> <p>Situational reports</p> <p>Local government s' annual reports</p>	<p>climate-related information by local governments (municipalities/urban councils and rural authorities/district councils)</p> <p>0 – No households in the project sites have formally introduction of CP-CS in their agriculture plans</p>	<p>project with the selection of the project sites) at the project sites have access and use MH-IBF-EWS knowledge information and decision support system</p> <p>100 households in the project sites who have introduced CP-CS in their agriculture plans have an average increase of annual income of 3%</p>	<p>project sites in the 4 countries have access and use MH-IBF-EWS knowledge information and decision support system</p> <p>500 households in the project sites who have introduced CP-CS in their agriculture plans have an average increase of annual income of 5%</p>	<p>information by target communities in the project sites</p>
<p>A7.0 Strengthened adaptive capacity and reduced exposure to climate risks</p>	<p>A7.2 Number of males and females reached by [or total geographic coverage of] climate-related early warning systems and other risk reduction measures established/strengthened</p>	<p>Baseline and endline surveys among selected communities, sectors and local governments on early warning/risk perception survey</p> <p>Situation reports</p>	<p>0 - A baseline study of CP-CS use in each target country will be undertaken under Activity 1.4.</p>	<p>10% of the target population, i.e. 2'924'147 (total in the 4 countries' project sites) (50% male and 50% female) with access to CP-CS, including MH-IBF-EWS for tropical cyclones</p>	<p>67% of the target population, i.e. 19'453'286 (total in the 4 countries nationwide) (50% male and 50% female) with access to CP-CS, including MH-IBF-EWS for tropical cyclones</p>	<p>MH-IBF-EWS reach relevant population using adequate dissemination channels</p> <p>There is continued commitment and uptake of the information by target communities in the project sites</p> <p>Project sites will be defined at the project commencement (inception phase)</p>
<p>A8.0 Strengthened awareness of climate threats and risk-reduction processes</p>	<p>M8.1 Number of additional female and male passengers using low-carbon transport as a result of Fund support</p>	<p>Public Surveys</p>	<p>0 - A baseline study of CP-CS use in project sites in the four target countries will be undertaken under Activity 1.4.1</p>	<p>For project sites in the 4 countries: Male: additional 250 Female: additional 250 (or +10% male/ female of the baseline) with access to CP-CS</p>	<p>For project sites in the 4 countries: Male: additional 750 Female: additional 750 (or +25% male/ female of the baseline) with access to CP-CS</p>	<p>Interactions between CP-CS providers and end-users is effective, through the UIP, NCOF, SWIOCOF and other means</p> <p>Awareness of climate threats and risk-reduction responses is defined as the number of males and females who have attended the project workshops and meetings, and have received knowledge products and outreach materials</p>

<b>E.5. Project/programme performance indicators</b>						
<i>The performance indicators for progress reporting during implementation should seek to measure pre-existing conditions, progress and results at the most relevant level for ease of GCF monitoring and AE reporting. Add rows as needed.</i>						
Expected Results	Indicator	Means of Verification (MoV)	Baseline	Target		Assumptions
				Mid-term	Final	
1. Generation, dissemination and uptake of climate-related information supported by effective organizational and institutional capacities, regional cooperation, and enabling environment	1.1 Established RCC-Network for generating reliable regional CP-CS	Report of the pilot phase of the RCC-Network RCC-Network endorsed by WMO	No RCC or RCC-Network in the SWIO region	1 RCC-Network (pilot phase)	1 RCC-Network (designated by WMO)	Partner countries agree on a strategy and operating plan to set up the structure and functions of the RCC-Network, and to maintain the RCC-Network functions beyond project's lifetime
	1.2 Adopted national hydromet laws with mechanisms for supporting O&M of NMHSs	Reports of workshops of public consultations Hydromet Laws drafted and adopted	No National Hydromet Laws revised or prepared with mechanisms for supporting O&M of NMHSs	Drafted national Hydromet Laws revised or prepared with mechanisms for supporting O&M of NMHSs	Adopted national Hydromet Laws revised or prepared with mechanisms for supporting O&M of NMHSs	Stronger institutions provide an adequate environment to generate profit and retain staff  Hydromet Laws support the functioning of NMHSs & CIEWS fund supports O&M and further investments required
2. Upgraded obs. & monitoring, and information systems capacities secure reliable capacity to monitor climate-related hazards & assess trends	2.1 Percentage of networks set up (i.e. procured, installed and operating) to improve the monitoring capabilities	Audit reports of the on-site inspections Reports of the Factory Acceptance Tests (FAT), Site Inspections Tests (SAT), and Operational Tests (OT)	Hydromet observation networks outdated and inadequate  Number of networks to be determined/fine-tuned based on the assessments done under Activity 1.4.1	At least 20% of the Hydromet observation network expanded (total for the 4 countries)	At least 80% of Hydromet observation network upgraded and expanded (total for the 4 countries)	The upgrade and expansion of the hydromet observation network will be upgraded and expanded using innovative technologies for cost-effectiveness  Government commitment to secure adequate O&M for the monitoring equipment are fulfilled on a continuous basis both during the project implementation and afterwards
	2.2 A centralized platform in place to secure reliable capacity to monitor and forecast climate-related hazards systems integration in place to improve the process of generating forecasts	Audit reports of the on-site inspections Reports of the Factory Acceptance Tests (FAT), Site Inspections Tests (SAT), and Operational Tests (OT)	No Systems integration	N/A	Full Systems integration through a centralized platform in place to secure reliable capacity to monitor and forecast climate-related hazards a	The existing systems will be upgraded or new will be set-up using innovative technologies for cost-effectiveness, to facilitate their integration  Government commitment to secure adequate O&M for the data management and other information systems are fulfilled on a continuous basis both during the project implementation and afterwards

<p>3. Generation of science-based multi-hazard weather, climate and water risk info improve the quality of forecasts and warning, and impact-based decision-making</p>	<p>3.1 Number of farmers with access to CP-CS target for agriculture (gender-sensitive)</p>	<p>Reports of Training sessions and lists of participants; training materials/content</p>	<p>Absence of target CP-CS for agriculture</p>	<p>Weather and climate advisories integrating the needs of farmers (both men and women), and tailored delivery and communication methods designed</p>	<p>1'000'000 farmers (of which 50% are women) with access to CP-CS target for agriculture</p>	<p>Trained staff members are retained in the NMHSs</p> <p>Staff members of NMHSs collaborate with stakeholders and CP-CS users to develop target CP-CS products for agriculture</p> <p>Capacities built through the project are maintained and periodically updated</p>
	<p>3.2 Number of site-specific forecasts/warnings generated and issued daily by NMHSs</p>	<p>Reports of Training sessions and lists of participants; training materials/content</p>	<p>Lack of site-specific forecasts</p>	<p>Site-specific forecasts/warnings generated and issued daily by NMHSs for the capital city of each country</p>	<p>Site-specific forecasts/warnings generated and issued daily by NMHSs to the municipality level in each country</p>	<p>Trained staff members are retained in the NMHSs</p> <p>Capacities built through the project are maintained and periodically updated</p>
<p>4. Improved community resilience through the implementation of people-centered MH-IBF-EWS at regional, national and local levels and improved/prepared preparedness &amp; adaptation plans</p>	<p>4.1 Implemented nation-wide MH-IBF-EWS covering tropical cyclones, heavy rainfalls/floods, storm surges and droughts in the four target countries</p>	<p>Regulatory framework for MH-IBF-EWS, SOPs, communication protocols; preparedness &amp; adaptation plans</p>	<p>Level 2 – nation-wide EWS for Tropical Cyclones, not impact based</p> <p>No institutional responsibilities and communication protocols</p>	<p>National framework for MH-IBF-EWS for the individual countries, which will guide the implementation at the local level</p> <p>Developed/ updated early warning protocols from hazard to impact-based for issuance, communication and dissemination for each hazard in the project sites</p> <p>MH-IBF-EWS piloted in the project sites (Level of Implementation 7)</p>	<p>Operationalized national framework for MH-IBF-EWS for the individual countries</p> <p>MH-IBF-EWS rolled-out nationwide (Level of Implementation 8)</p>	<p>Governments have political will to implement relevant legal-regulatory reforms for effective and efficient MH-IBF-EWS</p> <p>Levels of implementation of the MH-IBF-EWS are defined as:</p> <p>Level 0 – No MH-IBF-EWS</p> <p>Level 1 – EWS for Tropical Cyclones in project sites, not impact based</p> <p>Level 2 – nation-wide EWS for Tropical Cyclones, not impact based</p> <p>Level 3 – EWS for multi-hazards (e.g. Tropical Cyclones and floods) in project sites, not impact based</p> <p>Level 4 – nation-wide EWS for multi-hazards (e.g. Tropical Cyclones and floods), not impact based</p> <p>Level 5 – IBF-EWS for Tropical Cyclones in project sites</p> <p>Level 6 – nation-wide IBF-EWS for Tropical Cyclones</p> <p>Level 7 – MH-IBF-EWS in project sites</p> <p>Level 8 – nation-wide MH-IBF-EWS</p>
	<p>4.2 A centralized/dedicated User Interface Platform (UIP), including a “meteoalarm”-type</p>	<p>Progress reports for the UIP development</p>	<p>No dedicated UIP; only very limited climate</p>	<p>Dedicated UIP established for</p>	<p>UIP upgraded to include the DSS for the MH-IBF-EWS</p>	

	<i>for dissemination of warning established and operating [yes/no]</i>	<i>Reports of training sessions; lists of participants; and training materials/content</i>	<i>information at the IOC website</i>	<i>dissemination CP-CS</i>		
	<i>4.3 Improved NMHSs weather and climate services</i>	<i>Surveys among users and communities in project sites</i>	<i>User satisfaction index to be determined at the first SWIOCOF session supported by the project; and baseline survey in the project sites</i>	<i>User satisfaction with the UIP and SWIOCOF &gt; 40%</i>	<i>User satisfaction index with the UIP &gt; 72%</i>	<i>The “user satisfaction index” is defined in the World Bank/ GFDRR (2019): Weathering the Change: how to improve hydromet services in developing countries (<a href="https://www.gfdr.org/en/publication/weathering-change-how-improve-hydromet-services-developing-countries">https://www.gfdr.org/en/publication/weathering-change-how-improve-hydromet-services-developing-countries</a>), and considers communications, perceived accuracy and usefulness of NMHSs’ products and services for both professional partners and vulnerable groups exposed to natural disasters</i>

E.6. Activities			
Activity	Description	Sub-activities	Deliverables
1.1.1 Develop regional and national frameworks for climate services (RFCS & NFCS)	<p>The RFCS will be developed based on the GFCS led by WMO and serve as an umbrella under which each partner country will develop its own national framework for climate services. The RFCS will include the following elements:</p> <ul style="list-style-type: none"> <li>- a common regional methodology and rule book (based on international WMO standards) for weather monitoring and forecasting and climate monitoring for long term prediction at regional and downscaled level, relevant to the nature of hazards and resilient responses.</li> <li>- regional protocols to disseminate weather forecasts and climate predictions to relevant users and provide decision makers with the information they need for long-term planning.</li> <li>- a protocol for member countries to ensure a systematic collection and integration of user feedback to co-produce and improve climate services.</li> <li>- A draft profile of the RCC-Network that will be established under Activity 1.1.2, which will feed the SWIOCOF with the required products.</li> </ul> <p>The RFCS will also promote the role of the UIP and SWIOCOF (to be strengthened under Activities 3.3.3 &amp; 3.3.4) as communication platforms to disseminate regional climate products developed by the RCC-Network, national climate products and hydromet warnings prepared by the NMHSs, and to facilitate communication and knowledge exchange among the RCC-Network member countries.</p>	<p>Under this activity each country will develop a National Framework for Climate Services (NFCS) to coordinate, facilitate and strengthen collaboration among national institutions for enhanced use of CP-CS and to facilitate a long-term sustainable business model for national climate services.<sup>127</sup></p> <p>At a same time, under the leadership of IOC, a Regional Framework for Climate Services (RFCS) will be developed to coordinate, facilitate and strengthen collaboration among regional institutions (e.g. PIROI) for enhanced use of CP-CS; and at the same time to introduce an harmonized approach across the region and input to the NFCS.</p> <p>1.1.1.1 Organise consultations with stakeholders in IOC, NMHSs, DRM institutions, climate sensitive sectors to develop the RFCS. 1.1.1.2 Organise a regional workshop to validate the RFCS. 1.1.1.3 Once the RFCS is validated, design the NFCS following the guidelines of the RFCS. 1.1.1.4 Organise 4 national workshops to present and validate the NFCS in Comoros, Madagascar, Mauritius and Seychelles.</p> <p>Responsible parties:</p> <ul style="list-style-type: none"> <li>- Leader: IOC with the Support of PMU expertise to recruit an expert (meteorologist/climate services expert)</li> <li>- Beneficiary supervision and validation: RCC and NMHSs</li> </ul>	RFCS and 4 NFCSs

<sup>127</sup> WMO, 2018. Step-by-step Guidelines for Establishing a National Framework for Climate Services

	<p>Based on the RFCS, NFCS in the four target countries will be developed or improved, if already exists. These frameworks will also promote NCOFs as complementary forums to SWIOCOF/SARCOF in terms of calendar and content/activities. National frameworks will follow the broad guidelines from the RFCS – especially to harmonize processes and equipment for climate data monitoring among countries – but be country-specific. Ultimately, the RFCS and the NFCSs will contribute to develop a common risk culture in the IOC region that reinforces weather data and information sharing in order to better understand and monitor main hazards for the region (i.e. tropical cyclones, storms with strong winds and heavy rainfall).</p>	<ul style="list-style-type: none"> <li>- Stakeholders to be involved and consulted: DRM institutions, climate sensitive sectors</li> </ul>	
<p>1.1.2 Establish the legal, institutional, financial and organisational strategy to establish the RCC within IOC</p>	<p>RCCs and RCC-Networks<sup>128</sup>, established according to WMO technical regulations<sup>129</sup> / standards, are centers of excellence, holding regional responsibilities (not duplicating or replacing the responsibilities of NMHSs). RCCs and RCC-Networks' mandatory functions include the development of regional climate products, as well as support training and capacity building interventions at the regional scale. The climate products include long-range forecasts, which can be used as decision-making tools for climate change adaptation and disaster risk reduction. With these products and tools provided by the 'climate data services' function, countries in the SWIO region will be able to produce and deliver better climate services to national users. Additional functions, not mandatory but highly recommended by WMO, for RCCs/RCC-Network will also be implemented for the benefit of the all IOC member countries. The RCCs/RCC-Networks constitute integral components of WMO's <u>Global Data Processing and Forecasting System (GDPFS)</u> underpinning the generation of climate information products by the NMHSs.</p> <p>The RCC-Network will be established under the aegis of IOC and will be submitted to WMO for endorsement through its concerned Regional Association; guidance throughout its implementation and 'pilot phase'; and ultimately formal designation as part of the WMO/GDPFS. Based on the RCC-Network profile prepared under Activity 1.1.1, a complete plan for establishing the RCC-Network for the SWIO region will be developed, based on WMO guidelines to establish RCC<sup>130</sup>; and based on an analysis of strategies and operating plans for establishing the other existing WMO RCCs/RCC-Networks.</p>	<p>This activity includes the development of a legal, institutional, financial and organizational model for the establishment of the RCC-Network. This will be done through regional meetings and workshops led by IOC, with the participation of the four countries.</p> <p>As each country will have a particular function(s) in the RCC-Network, these need to be discussed and agreed at the national level with the relevant authorities, and therefore, NMHSs of the four countries will be responsible for coordinating the inputs and organize the relevant consultative meetings and workshops at the national level.</p> <p>1.1.2.1 Establish a strategy and develop an operating plan for the RCC-Network, based on WMO technical regulations / standards, including the criteria for designating Regional for Climate Centers, in collaboration with IOC its future member states. The plan will include type and number of staff members needed; roles, responsibilities and functions of the RCC-Network and of its nodes, etc.</p> <p>1.1.2.2 Organise a validation workshop with IOC and the proposed member states of the RCC-Network, with the</p>	<p>1 WMO RCC- Network</p>

<sup>128</sup> WMO RCC-Network is a group of centres performing climate-related activities that collectively fulfil all the required mandatory functions of a Regional Climate Centre (RCC). Each centre in a designated WMO RCC-Network will be referred to as a 'Node'. A Node will perform, for the region or sub-region, one or several of the mandatory RCC activities (e.g. long-range forecasting (LRF), climate monitoring, climate data services, training). Only centres or groups of centres designated by WMO will carry the title 'WMO RCC' or 'WMO RCC-Network' respectively. See <http://www.wmo.int/pages/prog/wcp/wcasp/rcc/rcc.php>

<sup>129</sup> WMO-No. 49, WMO Technical Regulations, <https://public.wmo.int/en/resources/standards-technical-regulations#standards>

<sup>130</sup> [http://www.wmo.int/pages/prog/wcp/wcasp/rcc/documents/WCASP80\\_TD1534.pdf](http://www.wmo.int/pages/prog/wcp/wcasp/rcc/documents/WCASP80_TD1534.pdf)

	<p>This plan must identify legal, institutional, financial and organizational model settings that would better suit the targeted region. The RCC-Network strategy will define the purpose, goals and scope, while the operating plan will confirm and define the details, <i>inter alia</i>, of the following regional elements :</p> <ul style="list-style-type: none"> <li>- Which country will have the administrative and logistic responsibilities for the RCC-Network, under the aegis of IOC, and as a formal designated center by WMO;</li> <li>- IOC's role (i) in the organisation of the SWIOCOF every year will be strengthened, and (ii) in the additional non-operational RCC-Network activities will be defined;</li> <li>- technical expertise and responsibilities for functions of the RCC-Network will be shared between IOC member countries. For regional products, a 'regional expert team' will be set up, composed of selected hydro-meteorologists from the concerned IOC member states.</li> </ul> <p>The RCC-Network established under this activity will have the mandatory functions of WMO RCCs/RCC-Networks, including (i) operational activities for long-range forecasting (LRF) (see Activity 2.3.7); (ii) operational activities for climate monitoring; (iii) operational climate data services; and (iv) training in the use of operational RCC products and services (see Activity 2.2.1). Additional functions, not mandatory but highly recommended by WMO, for RCCs/RCC-Network will also be implemented. These include: (a) climate prediction and climate projection (beyond 2 years timeframe); (b) research and development; (c) non-operational data services; and (d) coordination functions – IOC would have a clear role in the implementation of the last two. Attached to the RCC-Network, there will be the establishment of a WMO Regional Instrument Centre, for the calibration and maintenance services for the hydro-meteorological equipment, and of a regional center for specialized training and capacity building, to complement the existing training in the region (see Activity 2.2.2); and the development of a UIP for the dissemination of the RCC-Network products and tools within the SWIO member states (see Activity 3.3.3). This platform will also be used for experience and knowledge sharing for adaptation and disaster risk reduction (complementing the SWIOCOF – see Activity 3.3.4), and for dissemination of the SWIO climate outlooks. Key sectors in the beneficiary countries members of the RCC-Network will be able to use the climate products, prepared by the RCC-Network, as decision-making tools to develop climate-resilient strategies, implement climate-adaptation measures, and guide investments. This will be done by ensuring that the climate products and services developed by the RCC-Network are used to co-produce climate services with users in climate-sensitive sector and national sectoral experts (e.g. agronomist to develop agro-meteorological bulletins) – see Output 2.3. The RCC-Network strategy and operating plan will also identify if new staff members should be recruited to run the RCC-Network nodes; and, if so, how</p>	<p>participation of WMO, to validate the proposed strategy and operating plan, and institutional organization, as well as regional products and services to be delivered by the RCC-Network. At the end of the workshop, a multi-lateral agreement will be reached between IOC and its member states on all aspects of the RCC-Network.</p> <p>1.1.2.3 Develop a business model/cost-recovery plan that underlines how the regional products and services (agreed upon under sub-activity 1.1.2.2) will be financed from national contributions and other potential sources.</p> <p>1.1.2.4 Present and validate the 'regional business model/plan' for the RCC-Network during a participative workshop.</p> <p>1.1.2.5 Implement the RCC-Network 'pilot phase' (i.e. operationalize it) and submit the results to WMO for assessment and formal designation as part of the WMO/GDPFS.</p> <p>Responsible parties:</p> <ul style="list-style-type: none"> <li>- Leader: IOC with the Support of PMU expertise to recruit an institutional/legal expert; an economist; and a meteorologist</li> <li>- Beneficiary supervision and validation: IOC and NMHSs of the RCC-Network member countries</li> <li>- Stakeholders to be involved and consulted: NMHSs of the RCC-Network member countries</li> </ul>	
--	--	---	--

	<p>they will be paid in the long term (see below). RCC-Network staff members will receive basic trainings on CP-CS under Activity 1.3.2. Once the RCC-Network strategy and operating plan is approved by all member states and IOC, through multi-lateral agreement. They will also agree on how each member state will financially contribute to the running costs of the RCC-Network beyond the project's lifetime – e.g. finance for the maintenance laboratory, and the specialized training center (see Activity 1.1.3), and sharing O&amp;M costs of the UIP (see Activity 3.3.3) and SWIOCOF (see Activity 3.3.4). A regional business model/plan will also be developed to explore possible business models and identify additional sources of funding for the RCC-Network from public and private sectors through e.g. cost-recovery of regional CP-CS (see Annex 3a).</p>		
<p>1.1.3 Define strategies and operating plans for the establishment of (i) a regional laboratory for maintenance and annual calibration of equipment as a WMO Regional Instrument Centre;, and (ii) regional center for specialized training</p>	<p>A strategy and operating plan to set up a calibration and maintenance laboratory will be developed, especially to determine where the laboratory should be established, how it will be run and funded (by consulting with all IOC member countries), and what equipment will be needed to maintain and calibrate the hydromet equipment of the region, including those provided under Output 2.1. The establishment of this lab will follow WMO standard procedures for a formal designation as a WMO Regional Instrument Centre<sup>131</sup>. Moreover, a strategy and operating plan to strengthen and improve operationalization of a specialized training center (currently based in Mauritius) will be developed, ensuring that training performed by this center is complementary to training already performed in. This specialized training will be design and implemented to contribute to the WMO Global Campus<sup>132</sup>, by making available training materials developed by the center to WMO for wider use by all WMO Members.</p>	<p>At the regional level, led by IOC, there will be regional workshops with the participation of the four countries to refine the requirements and develop strategies for the establishment of a regional laboratory in Seychelles and a regional training for specialized training in Mauritius.</p> <p>At the national level, there will be initial meetings for development of the operating plans, and follow up meetings/field visits to assess progress in the establishment of a regional laboratory in Seychelles (led by the NMHS of Seychelles) and a regional training for specialized training in Mauritius (led by the NMHS of Mauritius).</p> <p>1.1.3.1 Review existing training center capabilities in Mauritius and other training facilities in the region; identify weaknesses, gaps and specialized areas for implementation; and specify and provide the equipment and tools, as required.</p> <p>1.1.3.2 Work with IOC and the staff members of the NMHSs in the four countries to define strategies and develop operating plans for the design/strengthen the maintenance lab and the specialized training center.</p> <p>1.1.3.3 Implement the specialized training center, and the maintenance and calibration lab (i.e. operationalize them) and submit documentation for formal designation by WMO.</p> <p>Responsible parties:</p>	<p>1 WMO Regional Instrument Centre, and 1 specialized training center</p>

<sup>131</sup> <https://www.wmo.int/pages/prog/www/IMOP/instrument-reg-centres.html>

<sup>132</sup> For WMO Global Campus, see <https://public.wmo.int/en/resources/meteoworld/wmo-global-campus>.

		<ul style="list-style-type: none"> <li>- Leader: IOC with the Support of PMU expertise to recruit 2 experts specialised in maintenance &amp; operation of observing networks; and hydro-meteorology training working with IOC and NMHSs</li> <li>- Beneficiary supervision and validation: NMHSs</li> </ul> <p>Stakeholders to be involved and consulted: NMHSs and staff members of other training providers in the region</p>	
<p>1.1.4 Prepare a strategy to improve Regional Numerical Weather (NWP) and Climate Prediction (NCP)</p>	<p>This strategy aims to ensure the harmonization of weather forecasts and climate products across countries, based on international WMO technical regulations / standards. This strategy will be done at the regional level to define a vision and ways to achieve it for the NWP/NCP. The output of the regional NWP/NCP will be used at national level in the countries to improve the hydromet and climate services they produce and disseminate within their territories. This strategy must consider forecast verification and feedback, model post-processing/downscaling and calibration using modern techniques, and model output interpretation, and address requirements related to the use of deterministic and probabilistic forecasts. The strategy also needs to consider the NWP/NCP developments required and a sustainable mechanism to engage staff from the NMHSs of the 4 countries in these developments, to ensure joint ownership, aligned with the international good practice.</p>	<p>The development of the Regional Numerical Weather and Climate Prediction strategy will be done at the regional level. Led by IOC, there will be consultative workshops with the participation of the four countries and partners, including the relevant WMO global and regional centers.</p> <p>1.1.4.1 Prepare a regional strategy and action plan to improve Numerical Weather and Climate Prediction, in collaboration with representatives of the NMHSs of each country and external expertise as needed (e.g. Météo-France, Copernicus partners).</p> <p>1.1.4.2 Design the downscaling and calibration approach for each country including the computing resources, using modern techniques (e.g. artificial intelligence) and technologies (e.g. cloud).</p> <p>1.1.4.3 Organise a regional workshop with the representatives of the NMHSs of each country and relevant external partners to validate the strategy and action plan (implementation will be done under Output 2.3).</p> <p>Responsible parties:</p> <ul style="list-style-type: none"> <li>- Leader: IOC with the Support of PMU expertise to recruit a consultant (meteorologist)</li> <li>- Beneficiary supervision and validation: IOC and NMHSs in each country</li> </ul> <p>Stakeholders to be involved and consulted: IOC and NMHSs, and relevant external partners</p>	<p>1 Strategy and action plan document</p>
<p>1.2.1 Strengthen the institutional, operating and financial strategy of NMHSs for each target country</p>	<p>The purpose of the strategy is to improve efficiency within NMHSs with particular attention given to retaining skilled staff (including those hired and/or trained under this project). For this, institutional settings will be improved in order to streamline the role and responsibilities of staff members (existing and newly hired under Activity 1.3.1).</p> <p>The strategy will also strengthen the operationalisation of NMHS to meet WMO's requirements for category 3 NMHS. For example, FS, Chapter 3 indicates the following needs to be addressed:</p>	<p>Under this activity, each country will review existing arrangements and will develop institutional, operating and financial strategies of their NMHSs.</p> <p>1.2.1.1 Update the capacity assessment conducted in Annex 2 (FS, Chapter 3)</p> <p>1.2.1.2 Investigate through consultations with relevant stakeholders the collaboration between met, hydro, and DRM</p>	<p>Robust institutional strategies, including detailed business plans for each NMHS</p>

	<ul style="list-style-type: none"> <li>- establish a formal written governance structure for DGM (Madagascar) and ANACM (Comoros);</li> <li>- ensure participation of the NMHSs in research projects (4 countries – to be done under Output 2.3);</li> <li>- established procedures to collect users’ feedback on CP-CS (4 countries – to be done through the NFCS and UIP); and</li> <li>- improve dissemination of forecasts and national observations on website (4 countries – to be done under Component 3).</li> </ul> <p>All these elements will be included in the NMHS strategy and implemented under Components 1, 2 and 3 of the proposed project. Other recommendations from the FS point to the need for capacity building and staffing - which will be addressed under Activity 1.3.1 and 1.3.2.</p> <p>The institutional strategy will also strengthen the collaboration between meteorological, hydrological, DRM services and sectoral ministries and provide guidelines for NMHS’ contribution to the production of climate-related policies and strategies.</p> <p>As part of this strategy, an in-depth analysis of cash flow will be performed to explore new business models with cost-recovery plan. A business plan will then be developed for each NMHS. The business model/plan is key to ensure the long-term maintenance and operation of the NMHS, the sustainability of new equipment and software (e.g. maintenance and operation costs, license renew), and yearly organisation of the NCOF (which are promoted in the NFCS, developed under Activity 1.1.1). The business model/plan will take into account economic growth/avoided costs expected through the project in climate-sensitive sectors (see Economic Analysis Annex 3a); it will also identify sources of funding for the NMHS through public budget and commercial services of CP-CS.</p>	<p>services and identify pathways to increase collaboration and improve communication</p> <p>1.2.1.3 Analyse cash-flows within NMHS and national markets to identify potential customers of CP-CS and willingness to pay, price elasticity (in public and private sector), as well as other sources of finance to support the production of CP-CS in the long-term.</p> <p>1.2.1.4 Develop, present and validate the recommendations for institutional and financial strengthening, as detailed in the business plans that are aligned with each country’s reality/context – e.g. from centralised to decentralised models – during 4 national workshops.</p> <p>Responsible parties:</p> <ul style="list-style-type: none"> <li>- Leader: IOC with the Support of PMU expertise to recruit 1 institutional expert and 1 economist</li> <li>- Beneficiary supervision and validation: the NMHS of each country</li> </ul> <p>Stakeholders to be involved and consulted: NMHS, stakeholders from the public and private sectors</p>	
<p>1.2.2 Develop a transition support plan required for each NMHS, DRM institutions and relevant sectoral ministries (Capacity Development Plans)</p>	<p>The transition support plans are developed to prepare, support, and help individuals, teams, and organizations (NMHSs and main stakeholders) in the implementation phase of the proposed project; these plans will enable organizational change based on the needs required by the project. For the purpose of Hydromet project, the plans will be developed for the NMHSs, DRM institutions and sectoral ministries in GFCS priority areas, in all 4 target countries.</p> <p>This is required to support the implementation of project interventions, and the ‘organizational change’ required in these institutions to adapt to the changes introduced by new technologies and tools. It is important that the project implementation entities implement the activities accordingly with the NMHS on a joint co-built plan to ensure a proper appropriation of these activities and better project outcome sustainability. This is based on lessons learned with</p>	<p>Under this activity, each country will develop capacity development plans based on their respective assessment of the current capacity.</p> <p>1.2.2.1 Define measurable stakeholder gains (inside and outside the NMHSs) through consultations with these stakeholders, and create a roadmap for their achievement</p> <p>1.2.2.2 Track assumptions, risks, dependencies, costs, returns on investment, dis-benefits and cultural issues</p> <p>1.2.2.3 Organise workshops to inform various stakeholders of the reasons for the organizational change, the benefits of successful implementation, as well as a detailed plan of what the changes will entail and their key role in the process.</p>	<p>Capacity Development Plans</p>

	<p>other projects and international developments/guidance<sup>133</sup>. At the same time, throughout the process of developing the Capacity Development Plan, activities will be carried out to contribute to retaining the skilled, trained and talent staff, including:</p> <ul style="list-style-type: none"> <li>• Job descriptions either developed or revised, as appropriate.</li> <li>• a career path defined and established, including the related grades and salary scales, for meteorologists, meteorological technicians, hydrologists, and hydrological technicians, following the WMO guidelines. This also includes the process for progression in the career, as well as salary scales upgrade/update, based on the business cases that will be prepared and presented to the respective Ministries of Finance in each country.</li> <li>• Incentives for promotion of the staff in place. This would include a “learning-by-doing” process, which includes training, experience and exposure; as well as staff rotation (primarily at a national level, but when feasible within the SWIO region).</li> <li>• Hand over protocols in place to ensure continuity, in case of a staff member leaves the Service.</li> <li>• Traing of Trainers in place to ensure continuity.</li> </ul>	<p>1.2.2.4 Define an effective education, training and/or skills upgrading scheme for the organisation (<i>Capacity Development plans</i>)</p> <p>Responsible parties:</p> <ul style="list-style-type: none"> <li>- Leader: IOC with the Support of PMU expertise to recruit 1 expert in production and sale of CP-CS (e.g. from MF, UKmet, etc.)</li> <li>- Beneficiary supervision and validation: NMHS in each country</li> </ul> <p>Stakeholders to be involved and consulted: NMHS and DRM institutions in each country</p>	
<p>1.2.3 Review and/or strengthen legal and regulatory materials, including the potential establishment of a CIEWS fund</p>	<p>The national legal instrument establishing a National Meteorological and Hydrological Service (NMHS) is an important element for its successful operation. It helps to define its mission and mandate; ensure clarity in the definition of its responsibilities; provide legal authority for certain responsibilities; gain recognition of its contribution to society; and facilitate allocation of adequate resources (WMO, 2017)<sup>134</sup>.</p> <p>The legal instrument is also a means of demonstrating how governments will meet their obligations under various international agreements, including the WMO Convention (WMO, 2015)<sup>135</sup>.</p> <p>Rogers et al (2019)<sup>136</sup> explains that:</p> <p>(1) Policy, legal, and institutional frameworks should be established to clearly define the roles and responsibilities of the NMHS and other organizations within the central and local governments, and to enhance collaboration with stakeholders;</p>	<p>Under this activity, each country will review their legal and regulatory materials; and review and evaluate all possible mechanisms to establish a CIEWS fund. Based on this analysis, each country will revise / strengthen their respective legal and regulatory materials.</p> <p>1.2.3.1 Review the current institutional and legal arrangement sin each country</p> <p>1.2.3.2 Analyse relevant international best practices and customize examples for the national contexts in each country</p> <p>1.2.3.3 Draft new or revise existing Hydromet Laws to include the possibility of establishing and operating CIEWS funds</p> <p>1.2.3.4 Conduct public consultations to get feedback for finalization of the draft Laws</p>	<p>Hydromet laws revised or prepared with the possibility of establishing CIEWS funds</p>

<sup>133</sup> ‘Road Mapping and Capacity Development Planning for NMHSs – A Guidebook’ (WB/GFDRR, 2020) -

<http://documents1.worldbank.org/curated/en/570671605083362138/pdf/Road-Mapping-and-Capacity-Development-Planning-for-National-Meteorological-and-Hydrological-Services-A-Guidebook.pdf>

<sup>134</sup> See WMO, 2017. [Guidelines on the Role, Operation and Management of National Meteorological and Hydrological Services](#), 2017 Edition, WMO-No. 1195.

<sup>135</sup> See WMO, 2015. [Basic Documents](#), 2015 Edition, WMO-No. 15.

<sup>136</sup> See Rogers et al, 2019. [Weathering the Change : How to Improve Hydromet Services in Developing Countries?](#). World Bank, Washington, DC. © World Bank. License: CC BY 3.0 IGO.

	<p>(2) To facilitate effective early warning services, it is important to establish a legal framework that makes NMHS the single authoritative voice for warning services, along with the efficient communication and dissemination mechanisms for end-users; and,</p> <p>(3) Policy, legal, and institutional frameworks help building government (ministries of finance, economy, and planning) understanding of the importance of NMHSs, with the hope of leading to a legally binding commitment fixed in credit or a grant agreement to increase budget support and allocations for O&amp;M costs.</p> <p>It is expected that the developed or revised Laws in each country would also facilitate allocation of adequate resources, including for O&amp;M costs, through the establishment of a ring-fenced CIEWS fund; and would provide a legal and regulatory framework for working with other public and private sectors. The establishment of a CIEWS draws upon the experience and information from the UNDP work on the establishment of National Climate Funds (NCFs) to support countries to collect, coordinate, blend and account for climate finance<sup>137</sup>; as well as on the WMO and WB activities to strengthen the Hydrometeorological Laws and policies in the countries by defining the roles of NMHSs in the climate area, and supporting and securing sustainable budgetary resources for their operations. The latter relies on well-documented business cases and revised Hydromet reglementary and policy documents to be put in place by the respective governments throughout the project implementation. The steps toward the establishment of the CIEWS include:</p> <p>(i) review and revise the Hydromet Law of each target country to allow commercial services, revenue generation, public-private engagement, and the establishment of a Trust Fund (the CIEWS) with clear indication of its goals; and,</p> <p>(ii) the development of the regulations (and their implementation) that define the CIEWS components and structure, including: (a) defining the programmatic and management objectives; (b) identifying capitalization, i.e. potential sources of funds linking with the objectives – this would require discussions with stakeholders, national and international partners and others; (c) defining effective governance – typically a Steering Committee is established with clear Terms of Reference, chaired by the Minister in charge for the NMHSs, the Director-General of the NMHS (who usually acts as the Secretariat), and with the participation of stakeholders / user sectors and partners; (d) defining fiduciary and implementing arrangements; and (e) describing monitoring, reporting and verification processes.</p>	<p>Responsible parties:</p> <ul style="list-style-type: none"> <li>- Leader: IOC with the Support of PMU expertise to recruit 1 expert in legal and institutional aspects</li> <li>- Beneficiary supervision and validation: NMHS in each country</li> </ul> <p>Stakeholders to be involved and consulted: Government Ministries and Institutions, National Committees, public and private sectors, NGOs, UN Agencies and development partners involved in each country</p>	
--	---	---	--

<sup>137</sup> [https://www.undp.org/content/undp/en/home/librarypage/environment-energy/low\\_emission\\_climate-resilient-development/blending\\_climate-finance-through-national-climate-funds.html](https://www.undp.org/content/undp/en/home/librarypage/environment-energy/low_emission_climate-resilient-development/blending_climate-finance-through-national-climate-funds.html)

	<p>This activity relates to procuring the technical assistance for the review of the possible mechanisms and preparation of the required documentation for the establishment of the CIEWS.</p>		
<p>1.3.1 Recruit new staff members for the RCC-Network and NMHSs</p>	<p>Staffing needs will be identified for each NMHS, and has been identified for the RCC under Activity 1.2.1. For example, the FS identified the need for meteorological services to hire more staff with MSC's and PhD's to meet the requirements of WMO NMHS Category 3. If new staff is to be recruited – which will be decided by each NMHS at project onset –, it would require commitment and investment from the national government to sustain the positions beyond project completion.</p>	<p>Under this activity, each country will access its NMHS needs in terms of human resources to carry out both its national responsibilities and its functions as part of its RCC-Network node. Based on the result of the assessments, there will be recruitment of staff in each country.</p> <p>1.3.1.1 Assess staffing needs for the RCC-Network and in each NMHS to contribute to the production of improved and new weather and seasonal forecasts and climate projections. 1.3.1.2 NMHS recruit new staff members (if needed) with required expertise.</p> <p>Responsible parties:</p> <ul style="list-style-type: none"> <li>- Leader : IOC with the Support of PMU expertise to recruit a consultant (hydromet expert)</li> <li>- Beneficiary supervision and validation : IOC, RCC-Network and NMHSs to be nominated for each country</li> </ul> <p>Stakeholders to be involved and consulted: IOC and NMHSs to nominate for each country for need assessment</p>	<p>Staff recruited</p>
<p>1.3.2 Train new and retrain existing staff</p>	<p>The training will be aligned with the WMO competency frameworks, especially the once for climate services personnel. It will cover, <i>inter alia</i>, basics on climate services, risk prediction models, and risk exposure of population and sectors; with regards to risk exposure, the training will use the hazard maps and vulnerability assessments prepared under Activities 2.3.5 and 2.3.6. The training will not only target staff members of the National Meteorological Services and RCC-Network, but also staff in National Hydrology Services, in DRR and climate-sensitive sectors of the GFCS. It will be implemented by national/regional universities, research institutions and academics with a priority given to those located within or nearby the SWIO region (e.g. Indian Ocean-based consultants working on RIMES). Twinning arrangements with advanced NMHSs (within the context of the WMO Global Campus) may also be considered. This training program will be aligned with the WMO Standards for Education and Training in Meteorology and Hydrology<sup>138</sup> (Basic Instruction Packages for meteorologists and meteorological technicians; and for hydrologists and hydrological technicians).</p>	<p>Under this activity, in each country, new and existing staff will be trained/retrained at national/regional universities and research institutions. Twinning arrangements with WMO global and regional centers will also be considered.</p> <p>1.3.2.1 Identify relevant training programmes in national/regional institutions, as well as within the context of the WMO Global Campus, and aligned with the WMO Standards for Education and Training in Meteorology and Hydrology 1.3.2.2 Train new and retrain existing staff within these programmes.</p> <p>Responsible parties:</p> <ul style="list-style-type: none"> <li>- Leader : IOC with the Support of PMU expertise to recruit a consultant (hydromet expert); national or regional universities/research center/academics etc. to conduct basic trainings</li> </ul>	<p>Trained staff</p>

<sup>138</sup> [https://www.wmo.int/pages/prog/dra/etrp/documents/1083\\_Manual\\_on\\_ETS\\_en\\_rev.pdf](https://www.wmo.int/pages/prog/dra/etrp/documents/1083_Manual_on_ETS_en_rev.pdf)

		<ul style="list-style-type: none"> <li>- Beneficiary supervision and validation : RCC-Network, NMHSs, DRM institutions and climate-sensitive sectors of the GFCS</li> </ul> <p>Stakeholders to be involved and consulted: RCC-Network, NMHSs, DRM institutions and climate-sensitive sectors of the GFCS for training need assessment</p>	
<p>1.4.1. Conduct baseline studies on how CP-CS and MH-IBF-EWS for hydro-meteorological hazards are used in each beneficiary country, and on user requirements for improving such services</p>	<p>The studies will be conducted to assess access to, and use of CP-CS at baseline in the following sectors: agriculture and fisheries (Comoros and Madagascar); agriculture and tourism (Mauritius); fisheries and tourism (Seychelles); as well as access to early warnings for tropical cyclones and other hydro-meteorological hazards in all countries. This will build understanding of current CP-CS outreach in each target countries, how these are used, and any user requirements to address the weaknesses/gaps, in order to inform the development of the detailed system (Activity 1.4.2) as well as to identify pathway to increase CP-CS outreach through the proposed project. An initial assessment of the access to CS-CP and user needs was conducted per key sector and presented in the FS. This assessment identifies needs for improvements. This state of affairs of the 'needs' will be reconfirmed and fine-tuned at the project onset to make sure we consider any new conditions (such as those implied by the COVID-19 pandemic) and adjustments made since the FS preparation. In order to measure progress in terms of uptake, efficiency and effectiveness of project investments by the user sectors, these will need to replicate such surveys during the project implementation.</p>	<p>Under this activity, each country will conduct studies to assess the access to, and use, of CP-CS, as well as the status of the EWS at the baseline level; these will be re-assessed at project mid- and end-term to demonstrate achievements throughout project implementation.</p> <p>1.4.1 Conduct surveys in each country to assess the access and use of CP-CS and EWS for hydro-meteorological hazards, as well as any user requirements to address the weaknesses/gaps</p> <p>Responsible parties:</p> <ul style="list-style-type: none"> <li>- Leader : IOC with the Support of PMU expertise to recruit a consultant (hydromet expert);</li> <li>- Beneficiary supervision and validation : NMHSs</li> </ul> <p>Stakeholders to be involved and consulted: NMHSs, DRM institutions, climate-sensitive sectors of the GFCS and targeted communities, public and private sector stakeholders receiving/using CP-CS</p>	<p>Baseline assessments done in each country</p>
<p>1.4.2. Fine tune the design of the hydromet observational networks, modelling, forecasting, and service delivery systems for each NMHS, taking a regional harmonized approach</p>	<p>This activity will include the development of the detailed/fine-tuned system integration specifications, including all project activities and taking into account the existing sub-systems. It will also include the preparation of technical specifications and tender documents for equipment and services. This will be developed taking a regional approach to ensure harmonization of the various systems across the SWIO region. Technical specifications could be developed with the support of the IOC for a regional harmonized approach. This greater degree of harmonization will result in cost saving and will increase systems' efficiency and effectiveness, while also contributing to improved monitoring and more accurate forecasts. E.g. by using common technical specifications for observing systems, it would facilitate the maintenance and calibration of sensors at the WMO Regional Instrument Centre being established under Activity 1.1.3.</p> <p>The systems integration will help to develop new information products and services, and operationalizing their production.</p> <p>Implementation support will be provided to each NMHS team for effective functioning of the overall system.</p>	<p>Under this activity, each country will develop the detailed/fine-tuned systems technical specifications, while the tender process will be carried out by IOC. The detailed list of equipment and information systems per country is provided under Activities 2.1.1 and 2.1.2, respectively.</p> <p>1.4.2.1 Detail/Fine tune the design of each sub-system of the overall system including, <i>inter alia</i>, global, regional and national observations, ICT, modelling, forecasting and service delivery systems</p> <p>1.4.2.3 Prepare technical specifications for the different various equipment, tools, services and systems to be procured, taking into account innovative techniques and technologies</p> <p>Responsible parties:</p> <ul style="list-style-type: none"> <li>- Leader : IOC with the Support of PMU expertise to recruit a firm (specialised in provision of hydro-meteorological equipment) which will be responsible for Activity 1.4.1; 1.4.2; 2.1.1; and 2.1.2)</li> </ul>	<p>Technical specifications and tender documents</p>

	<p>As indicated above, the system integration will ensure functional compatibility of the modernized meteorological and hydrological systems with the global and regional systems as recommended by WMO and with the existing systems installed at each NMHS.</p> <p>The refinement of the design of an optimum composite surface observation network and associated ICT systems for the SWIO region will be aligned with the Global Basic Observing Network (GBON) concept, with a minimum set of stations in target countries, in terms of type, number and location of the stations, as well as the exchange of their data internationally for improved NWP and climate analysis.</p> <p>This Activity will support the technical assistance required to fine-tune the specifications of the networks and technology systems, oversight their installations and testing, as well as to promote enhanced practices.</p>	<ul style="list-style-type: none"> <li>- Beneficiary supervision and validation : NMHS in each country</li> </ul> <p>Stakeholders to be involved and consulted: IOC and NMHS in each country</p>	
<p>1.4.3 Ensure full system integration from observation stations to delivery of CP-CS to end-user</p>	<p>This activity includes the development of step-by-step practices and procedures for system integration and coordination of project activities.</p> <p>The observation and monitoring network and remote sensing equipment will be modernised/ completed with harmonized equipment for all NMHSs to facilitate information exchange (Activity 2.1.1).</p> <p>In addition, ICT systems will be upgraded following the with WMO technical regulations / standards (Activity 2.1.2). Various networks, and even the same type of network but from different manufacturers use different datalogger software which collect data in different formats. Their associated data management systems only allow the display of the data coming from the same network and same manufacturer. This activity will therefore support the development of a data integration "architecture" where the all data from the various networks and within the same network from different manufacturer be transmitted to a centralized Datacenter (to be established under the proposed project) and converted in the WMO standard formats. All these standardized data will then be integrated and displayed in a single data management system (rather than those individual systems provided by the different manufacturers/suppliers) – the standardized WMO Climate Data Management System (please see <a href="https://www.wmo.int/pages/prog/wcp/wcdmp/CDM_3.php">https://www.wmo.int/pages/prog/wcp/wcdmp/CDM_3.php</a>). As part of this activity, a detailed study of the various networks and types of equipment, data formats and transmission will be study with the intend to develop the data integration "architecture" and implement/develop the various scripts required to ensure the transmission, conversion, standardization, as well as automation of the data management.</p> <p>It is expected that this activity will include the active participation of experts from developed NMHSs (e.g. through twinning arrangements), which are</p>	<p>This activity includes the development of step-by-step practices and procedures for system integration and coordination of project activities in each country.</p> <p>1.4.3.1 Conduct capacity gap analysis of ICT system in each country</p> <p>1.4.3.2 Design the proper technical integration of the different systems (ICT design/data integration "architecture") from previous activity to make the overall system as efficient as to disseminate services including, <i>inter alia</i>: data, products and services flow and exchange, and protocols and standard operating procedures between the NMHSs and beneficiary institutions; taking into account innovative techniques and technologies</p> <p>1.4.3.3 implement the data integration "architecture" through the develop the various scripts required to ensure the transmission, conversion, standardization, as well as automation of the data management</p> <p>Responsible parties:</p> <ul style="list-style-type: none"> <li>- Leader : IOC with the Support of PMU expertise to recruit a firm (specialised in provision of hydro-meteorological equipment) which will be responsible for Activity 1.4.1; 1.4.2; 2.1.1; and 2.1.2)</li> <li>- Beneficiary supervision and validation: NMHS in each country</li> </ul>	<p>ICT design</p>

	<p>directly involved or well familiar with operational aspects of production and service delivery of meteorological and hydrological products and actively involved in the development of WMO programs.</p> <p>As per the previous activity, the design of the ICT systems will also be designed according to the GBON concept.</p>	<p>Stakeholders to be involved and consulted: NMHS in each country</p>	
<p>2.1.1 Modernise/upgrade climate-related observation and monitoring network</p>	<p>The observation and monitoring network and remote sensing equipment in each NMHS will be modernised/ upgraded with harmonized equipment for all NMHSs to facilitate information exchange. The reinforcement will follow WMO technical regulations / standards; equipment linked to hydrology – in particular to monitor rainfall in water catchments – have been identified through the HYCOS study (see Annex 22) and, for Mauritius, also through the ER2C project.</p> <p>In Madagascar, the hydrological equipment will be established to complement what has been set up under Project PACARC and the future UNDP-GCF ‘Hydromet Madagascar’ project.</p> <p>Options will be explored for leveraging funds from the newly GBON Systematic Observations Financing Facility (SOFF) for the completion of the implementation of the optimum composite surface observation network (refined under Activity 1.4.2). This Activity relates to procuring new equipment (full or parts of the equipment) to modernize or upgrade/update the networks, as these are either inexistent or outdated.</p>	<p>In each country, modernise/upgrade the networks based on the detailed plan and specifications produced under output 1.4</p> <p>2.1.1.1 In Comoros: Rehabilitation/extension of the building where the National Meteorological Service is based, upgrade the national synoptic networks (meteorological stations following the Feasibility Study recommendations – Annex 2; and hydrologic stations following HYCOS recommendation), sub-synoptic rainfall network in flood-prone areas, agrometeorological observing network, AWOS and ASOS, meteo-oceanographic buoys, Upper air radiosounding system, Doppler radar, Tower for radar</p> <p>2.1.1.2 In Madagascar: Upgrade national synoptic networks (meteorological stations following the Feasibility Study recommendations – Annex 2; and hydrological stations following HYCOS recommendations), sub-synoptic rainfall network in flood-prone areas, agrometeorological observing network, Upper air radiosounding system, Doppler radar, Tower for radar</p> <p>2.1.1.3 In Mauritius: Upgrade national synoptic networks (AWS and hydrological stations following HYCOS recommendation), sub-synoptic rain network in flood-prone areas (Port-Louis), Wave radar for North Mauritius, Rodrigues and Agalega, Maregraph for North Mauritius, Rodrigues and Agalega and Brandon, Lightning detection network station at Rodrigues, Upper air radiosounding system for Agalega, Saint Brandon and Rodrigues, Doppler radar for Rodrigues, Tower for radar</p> <p>2.1.1.4 In Seychelles: Upgrade national synoptic networks (AWS and hydrological stations following HYCOS recommendations), sub-synoptic rainfall network in flood-prone areas (Mahé, Praslin and La Digue), Wave radar for Mahé, Praslin and La Digue, Tide gauge for Mahé, Praslin and La Digue, Lightning detection network stations for Mahé, Praslin and La Digue, Doppler radar for Mahé, Tower for radar</p>	<p>New/upgrade d hydro-meteorologic al equipment in the four target countries</p>

		<p>Responsible parties:</p> <ul style="list-style-type: none"> <li>- Leader : IOC with the Support of PMU expertise to recruit a firm (specialised in developing technical specifications for the provision of hydro-meteorological equipment) which will be responsible for Activity 1.4.1; 1.4.2; 2.1.1; and 2.1.2)</li> <li>- Beneficiary supervision and validation : NMHS in each country</li> </ul> <p>Stakeholders to be involved and consulted: NMHS in each country</p>	
<p>2.1.2 Modernise/upgrade the information and communication technology systems</p>	<p>Based on a capacity gap analysis, modernize/upgrade the ICT systems following the WMO technical regulations / standards. This includes equipment and tools in support of data acquisition, retrieve, storage, archiving, management, visualization and production.</p> <p>This Activity relates to procuring new equipment (full or parts of the equipment) to modernize or upgrade/update the technology systems, as these are either inexistent or outdated.</p>	<p>In each of the four countries the following systems will be upgraded and/or set-up by the firm hired under Activity 1.4.1 working with the NMHSs:</p> <ul style="list-style-type: none"> <li>2.1.2.1 Data collecting system</li> <li>2.1.2.2 Automatic Meteorological Switching System</li> <li>2.1.2.3 Data center</li> <li>2.1.2.4 Storage and archive of national data</li> <li>2.1.2.5 Forecaster workstation</li> <li>2.1.2.6 Climatological Database Management System</li> <li>2.1.2.7 Service delivery platform (i.e. end user production system)</li> </ul> <p>Responsible parties,</p> <p>2.1.2.8 In order to ensure systems integration, data centers will be established at regional and national levels, accordingly. This will be done by exploring and assessing physical versus cloud-service approaches.</p> <p>2.1.2.9 Develop standard operating procedures for all data processes, following the WMO Guidelines on Quality Management in Climate Services<sup>139</sup>.</p> <ul style="list-style-type: none"> <li>- Leader : IOC with the Support of PMU expertise to recruit a firm (specialised in provision of hydro-meteorological equipment) which will be responsible for Activity 1.4.1; 1.4.2; 2.1.1; and 2.1.2)</li> <li>- Beneficiary supervision and validation : NMHS in each country</li> </ul> <p>Stakeholders to be involved and consulted: NMHS in each country</p>	<p>New/upgraded information systems</p>

<sup>139</sup> [https://library.wmo.int/doc\\_num.php?explnum\\_id=5174](https://library.wmo.int/doc_num.php?explnum_id=5174)

<p>2.2.1 Establish a maintenance and calibration laboratory (WMO Regional Instrument Centre)</p>	<p>A regional maintenance laboratory (WMO Regional Instrument Centre) will be built and equipped to do support maintenance work and calibration of the existing and new acquired hydromet equipment, following the strategy developed under Activity 1.1.3. This will serve to avoid current extra cost sending the sensors or other equipment with a limited lifetime and in need of regular maintenance overseas for maintenance (typically to Kenya or South Africa at present). This will result in skills available in the SWIO region, efficiency and effectiveness, and cost saving and sustainability of the investments.</p>	<p>A regional maintenance laboratory (WMO Regional Instrument Centre) will be built and equipped in Seychelles to do support maintenance work and calibration of the existing and new acquired hydromet equipment for the four countries in the region, following the strategy developed under Activity 1.1.3.</p> <p>2.2.1.1 Build the laboratory based on the defined strategy and operating plan developed under Activity 1.1.3</p> <p>2.2.1.2 Provide all equipment and tools that are required based on the laboratory strategy and operating plan, and gap analysis developed under Activity 1.1.3</p> <p>Responsible parties:</p> <ul style="list-style-type: none"> <li>- Leader : IOC with the Support of PMU expertise to recruit a firm (specialised in provision of hydro-meteorological equipment) which will be responsible for Activity 1.4.1; 1.4.2; 2.1.1; and 2.1.2) ; and a firm for building the building</li> <li>- Beneficiary supervision and validation: NMHS in each country</li> </ul> <p>Stakeholders to be involved and consulted: NMHS in each country</p>	<p>1 regional calibration center (WMO Regional Instrument Centre)</p>
<p>2.2.2 Equip the specialized training center for the region, hosted by Mauritius NMHS (which will contribute to the WMO Global Campus)</p>	<p>The specialized training center will be complementary to the existing facilities in the region. It will be upgraded following the defined strategy and operating plan developed under Activity 1.1.3.</p>	<p>A specialized training center for the region will be equipped in Mauritius to support training in the region, for the four countries and also contribute to the WMO Global Campus by making available the training materials developed by this training center, following the strategy developed under Activity 1.1.3.</p> <p>2.2.2.1 Buy and install relevant equipment and tools to support specialized training (as determined in the laboratory defined strategy and operating plan developed under Activity 1.1.3)</p> <p>Responsible parties:</p> <ul style="list-style-type: none"> <li>- Leader : IOC with the Support of PMU expertise to recruit a firm (specialised in provision of hydro-meteorological equipment) which will be responsible for Activity 1.4.1; 1.4.2; 2.1.1; and 2.1.2)</li> <li>- Beneficiary supervision and validation : NMHS in each country</li> </ul>	<p>1 equipped / modernized training center (contributing to the WMO Global Campus)</p>

		Stakeholders to be involved and consulted: NMHS in each country	
<p>2.3.1 Downscale and calibrate meteorological forecasts by making use of numerical weather prediction/ensemble prediction systems (NWP/EPS) and applying modern techniques such as artificial intelligence</p>	<p>This activity will serve to improve the production of short-range ‘day-to-day’ forecasts and warnings in each target country (see Activity 3.1.1). Moreover, staff members of NMHSs, with the support of DRM institutions, will be trained in probabilistic forecasts and on its use to produce multi-hazard impact-based forecasts (MH-IBF) to translate hydromet hazards into sector and location-specific impacts. This is key to enable mitigation response from the government. Both daily forecasts and MH-IBF will benefit from high-quality data which are produced and collected with the equipment established under Activity 2.1.1 and 2.1.2. This activity is aligned with the strategy to improve Regional Numerical Weather and Climate Prediction developed under Activity 1.1.4.</p>	<p>Aligned with the strategy to improve Regional Numerical Weather and Climate Prediction developed under Activity 1.1.4, staff from the four NMHSs will be trained at the regional center in Mauritius. This activity will be coordinated by IOC, and includes the participation of international experts as lecturers.</p> <p>2.3.1.1 Conduct objective forecast verification and develop a calibration/post-processing system over individual countries in the SWIO region, using modern techniques</p> <p>2.3.1.2 Conduct NWP/EPS aligned with the strategy to improve Regional Numerical Weather and Climate Prediction developed under Activity 1.1.4</p> <p>2.3.1.3 Conduct downscaling using e.g. Artificial Intelligence techniques (deep learning) to adapt the numerical weather prediction/ensemble prediction systems combining them with observing data with IoT data analytic capability</p> <p>2.3.1.4 Conduct training in probabilistic forecasts and ensemble prediction systems for use in MH-IBF to address “what the weather will do rather than only what the weather will be”</p> <p>Responsible parties:</p> <ul style="list-style-type: none"> <li>- Leader : IOC with the Support of PMU expertise to work with relevant experts (e.g. existing staff of the specialized training center in Mauritius; and other training facilities in the region</li> <li>- Beneficiary supervision and validation : National Meteorological Services in each country</li> </ul> <p>Stakeholders to be involved and consulted: National Meteorological Services and DRM institutions (for IBF) in each country</p>	<p>Trained staff 4 downscaled and calibrated NWP/EPS systems</p>
<p>2.3.2 Establish threshold values for issuing warnings based on extreme value analysis and review of historical</p>	<p>Technical analysis (using Extreme analysis tools and climate data) and review of the historical hydrometeorological events that caused flooding and other hazardous events will be undertaken to determine the threshold values for each hazard for each country. This would need to be harmonized at the national level for effective MH-IBF-EWS at regional, national and local levels.</p>	<p>This is an activity carried out at the national level in each country, with workshops with NMHSs and DRM institutions and other stakeholders (including NGOs) to agree on national threshold values for issuing warnings based on extreme value</p>	<p>National thresholds for issuing warnings harmonized at regional level</p>

<p>hydrometeorological events</p>		<p>analysis and review of historical hydrometeorological events in each country.</p> <p>There will be also regional workshops led by IOC, with the participation of the four NMHSs and of PIROI, for harmonization of threshold warnings across the region to facilitate integration of warning information into the regional “meteo-alarm” type dissemination.</p> <p>2.3.2.1 Carry out extreme analysis with the climate data in each country</p> <p>2.3.2.2 Workshops with NMHSs and DRM institutions and other stakeholders (including NGOs) at national and local levels to discuss and agree on the national thresholds for issuing warnings in each country</p> <p>2.3.2.3 Workshops with NMHSs and PIROI and its national counterparts for regional harmonization of the warning criteria (including analysis of current situation, climatological analysis of the severe events, harmonization proposal, discussions and formal agreements among countries, definition of common dissemination approaches, capacity building, etc.)</p> <p>Responsible parties:</p> <ul style="list-style-type: none"> <li>- Leader : IOC with the Support of PMU to recruit a hydro-meteorologist/climate change experts (1 consultant per country) and organize workshops</li> <li>- Beneficiary supervision and validation : NMHSs, DRM institutions</li> </ul> <p>Stakeholders to be involved and consulted: NMHSs and DRM institutions and other stakeholders (including NGOs) in each country, PIROI</p>	
<p>2.3.3 Develop hazards maps</p>	<p>As a base to improve climate risk understanding among staff members of NMHSs, DRM institutions (with technical support from institutions in charge of hydrology and hazard maps) and CP-CS users, and to serve as decision-making tools for disaster risk reduction and climate change adaptation (see Component 3), hazard maps, which take into account climate change impacts on return period/intensity of selected hazards, will be produced in selected areas of the four target countries. The production of the maps will rely on enhanced climate and weather monitoring (Activity 2.1.1) and improved, downscaled climate change projections (Activity 2.3.7).</p> <p>As rainfall induced floods are significant throughout the SWIO region (related to tropical cyclones or not), flood risk maps will be prepared for the four countries,</p>	<p>This is an activity carried out at the national and local levels in each country, with workshops with NMHSs and DRM institutions and other stakeholders (including NGOs) to understand the frequency and intensity of selected hazards, and develop or update the hazard maps using the monitoring equipment established under Activity 2.1.1 and based on return period of the hazards.</p> <p>2.3.3.1 Integrate or review existing hazard maps (if existing)</p>	<p>2 hazard maps per country</p>

	<p>focusing on selected vulnerable areas. In Mauritius, this process will build on ER2C and the Land Master Plan initiatives (see Baseline projects) and complement the flood maps developed by LDA and Audit of Rivers (Ministry of Environment) under these 2 initiatives.</p> <p>In addition to floods, the following maps will be produced:</p> <ul style="list-style-type: none"> <li>- droughts for Comoros (relevant to agriculture in Anjouan) and Madagascar (also relevant to agriculture); and</li> <li>- coastal erosion for Mauritius and Seychelles (relevant to tourism and urban development planning).</li> </ul> <p>The hazard maps will serve to indicate the location, frequency (probability of occurrence taking into account climate change) and intensity of hazards. These maps will be useful to develop risk prevention plans (see Component 3). The maps will be produced by the NMHSs with technical support from institutions in charge of hydrology, and shared regionally on the UIP (see Activity 3.3.3).</p>	<p>2.3.3.2 Identify areas most affected by the selected hazard in each country based on existing maps (if any), consultations with relevant stakeholders, scientific sources, etc.</p> <p>2.3.3.3 Conduct consultations with stakeholders and community members in these areas to understand frequency and intensity of selected hazards</p> <p>2.3.3.4 Develop or update hazard maps using the monitoring equipment established under Activity 2.1.1, and based on return period of the hazards taking into account climate change projections and impacts, and based on stakeholder consultations conducted under 2.3.3.3</p> <p>2.3.3.5 Present and validate the maps during national workshop</p> <p>2.3.3.6 Share maps on the UIP established under activity 3.3.3.</p> <p>Responsible parties:</p> <ul style="list-style-type: none"> <li>- Leader : IOC with the Support of PMU expertise to recruit a hydro-meteorologist/climate change/DRM experts (1 consultant per country)</li> <li>- Beneficiary supervision and validation : NMHS and DRM institutions in each country</li> </ul> <p>Stakeholders to be involved and consulted: NMHS and DRM institutions and sectors in each country</p>	
<p>2.3.4 Develop climate vulnerability maps</p>	<p>Based on the hazard maps produced under Activity 2.3.3, a mapping exercise for climate-risk vulnerability – of people and assets – will be conducted in a participative way with the NMHS, local authorities of hazardous-prone areas, public and private sectors representing agriculture/fisheries, tourism, health, water sectors and at-risk communities. The purpose will be to identify main assets and most vulnerable people affected by the selected hazards (selected under Activity 2.3.3) from a local point of view and based on how people/assets were affected during past events. This all-inclusive process will draw on local experiences and perspectives in order to capture current risks; such process will also contribute to awareness-raising among diverse stakeholders and encourage their involvement in DRM processes (including through the provision of feedback on climate products). Once the vulnerability assessments and maps are finalized and validated, training will be implemented for NMHSs, stakeholders from climate-sensitive sectors and local authorities in the selected vulnerable areas for which the maps were developed to raise understanding of risk exposure at the local level, and future risks taking into account climate change projections (downscaled under Activity 2.3.7). The hazard maps will be useful to inform the NAP development process in the four countries, or their update (see Activity 3.2.4).</p>	<p>This is an activity carried out at the national and local levels in each country. Based on the hazard maps produced under Activity 2.3.3, a mapping exercise for climate-risk vulnerability – of people and assets – will be conducted in a participative way with the NMHS, local authorities of hazardous-prone areas, public and private sectors representing agriculture/fisheries, tourism, health, water sectors and at-risk communities. There will also be workshops at national and local levels to raise awareness of climate-related vulnerability and shifts in the context of climate change.</p> <p>2.3.4.1 Conduct vulnerability assessments in areas most affected by selected hazards (at least 2 areas per country)</p> <p>2.3.4.2 Develop vulnerability maps</p> <p>2.3.4.3. Organise workshops to raise awareness of climate-related vulnerability and shifts in the context of climate change</p> <p>2.3.4.4 Share maps on the UIP established under activity 3.3.3.</p> <p>Responsible parties:</p>	<p>1 vulnerability map per country</p>

		<ul style="list-style-type: none"> <li>- Leader: IOC with the Support of PMU expertise to recruit a DRM expert</li> <li>- Beneficiary supervision and validation: NMHS, DRM institutions and sectors in each country</li> <li>- Stakeholders to be involved and consulted: NMHS, DRM institutions, sectors and vulnerable communities in each country</li> </ul>	
<p>2.3.5 Undertake risk analysis incorporating hazard, exposure and vulnerability to identify potential impacts from extreme events</p>	<p>This activity will involve compilation of various datasets available for characterizing hazard, vulnerability and exposure to develop a tool in quantifying risks, i.e. potential impacts. This tool will therefore be used to analyze exposure and determine potential physical, environment, social and economic impacts in the four countries due to their respective hazards. This risk analysis tool or methodology will be used in generating multi-hazard impact-based forecasts and early warnings and visualization maps through the knowledge and decision support system that will be developed in Output 3.2.</p>	<p>This is an activity carried out at the national and local levels in each country. This activity will involve compilation of various datasets available for characterizing hazard, vulnerability and exposure to develop a tool in quantifying risks, i.e. potential impacts. This tool will therefore be used to analyse exposure and determine potential physical, environment, social and economic impacts in the four countries due to their respective hazards. This risk analysis tool or methodology will be used in generating multi-hazard impact-based forecasts and early warnings and visualization maps through the knowledge and decision support system that will be developed in Output 3.2.</p> <p>2.3.5.1 Conduct training in the combined use of weather forecasts, vulnerability and exposure data (using GIS) to understand hazards' impacts on sectors and locations</p> <p>2.3.5.2 Develop risk maps</p> <p>2.3.5.3. Organise workshops to raise awareness of climate-related risks</p> <p>2.3.5.4 Share maps on the knowledge and decision support system established under activity 3.2.3.</p> <p>Responsible parties:</p> <ul style="list-style-type: none"> <li>- Leader: IOC with the Support of PMU expertise to recruit a DRM expert</li> <li>- Beneficiary supervision and validation: NMHS, DRM institutions and sectors in each country</li> </ul> <p>Stakeholders to be involved and consulted: NMHS, DRM institutions, sectors and vulnerable communities in each country</p>	<p>Trained staff</p>
<p>2.3.6 Carry out downscaling of global and regional seasonal forecasts to national level, and use them to produce</p>	<p>Annex 2, the FS, Chapter 3 has identified gaps in producing seasonal agrometeorological forecast at local level especially for Comoros, Madagascar and Mauritius, where agriculture is a key economic sector. This activity will serve to downscale the production of seasonal forecast by:</p> <ul style="list-style-type: none"> <li>- training experts of the target countries to develop skills in downscaling of global seasonal forecasts.</li> </ul>	<p>Aligned with the strategy to improve Regional Numerical Weather and Climate Prediction developed under Activity 1.1.4, staff from the four NMHSs will be on hands-on training at the regional center in Mauritius. This activity will be coordinated by IOC, and includes the participation of international experts as lecturers, for the common training sessions for the four</p>	<p>Trained staff</p> <p>4 agrometeorological</p>

<p>agrometeorological products</p>	<ul style="list-style-type: none"> <li>- defining and generating (by countries' experts) climate products or services from datasets created (in line with the needs of national users).</li> <li>- providing countries in the region with high-resolution regional seasonal forecasts, downscaling them to national level, and use them to produce agrometeorological products.</li> </ul> <p>In Madagascar, the training will use the methodologies and complement the PrAdA project (see baseline projects). The forecasts will be packaged according to users' needs and disseminated under Activity 3.1.1.</p>	<p>countries. This activity also includes individual tasks such as downscaling of global and regional seasonal forecasts to national level and production of agrometeorological products for each of the four countries.</p> <p>2.3.6.1 Develop specific training for agrometeorologists and implement it 2.3.6.2 Develop <a href="#">agrometeorological advisories</a></p> <p>Responsible parties:</p> <ul style="list-style-type: none"> <li>- Leader : IOC with the Support of PMU expertise to work with relevant experts (e.g. existing staff of the specialized training center in Mauritius; and other training facilities in the region)</li> <li>- Beneficiary supervision and validation : National Meteorological Services and agriculture sector in the target countries</li> </ul> <p>Stakeholders to be involved and consulted: agriculture services in each country</p>	<p>advisory bulletins</p>
<p>2.3.7 Build the capacity do downscale climate models for national purposes</p>	<p>Regional downscaling and national calibration of the different climate models will be performed at regional level with representatives of each country's National Meteorological Services. The production of downscaled climate change projections will use BRIO outputs and be based on BRIO methodologies. Based on the downscaled climate change projections, impact assessments to various sectors will be prepared in each country. The climate change models and projections as well as the sectoral models and impact assessments will be shared on the UIP.</p> <p>The implementation of these downscaled and sectoral models will be done at national level under component 3.</p>	<p>Aligned with the strategy to improve Regional Numerical Weather and Climate Prediction developed under Activity 1.1.4, staff from the four NMHSs will be on hands-on training at the regional center in Mauritius. This activity will be coordinated by IOC, and includes the participation of international experts as lecturers, for the common training sessions for the four countries. This activity also includes individual tasks such as downscaling of climate models to national purposes in each of the four countries.</p> <p>2.3.7.1 Produce downscaled climatic change projections at country level based on the regional models developed under BRIO 2.3.7.2 Share downscaled forecasts and CC projections on the online platform 2.3.7.3 Produce sectoral models and impact assessments to anticipate the climate impacts in each country (e.g. urban hydrology, pollution, agrometeorology, sea state, coastal erosion)</p> <p>Responsible parties:</p> <ul style="list-style-type: none"> <li>- Leader : IOC with the Support of PMU expertise to work with relevant experts (e.g. staff of the specialized</li> </ul>	<p>Trained staff</p>

		<p>training center in Mauritius); and other training facilities in the region</p> <ul style="list-style-type: none"> <li>- Beneficiary supervision and validation : National Meteorological Services in each country</li> </ul> <p>Stakeholders to be involved and consulted: National Meteorological Services and relevant sector stakeholders in each country</p>	
<p>2.3.8 Build the capacity for hydrological modelling for flood forecasting (i.e. flood propagation model)</p>	<p>Annex 2, the FS, Chapter 3 has identified gaps in monitoring hydrology data, hydrology expertise and forecasting floods in the four target countries. This is also underlined in the HYCOS study (Annex 22). Hence, the training will target the staff members of the National Hydrological Services in the four target countries. The purpose of the training is to: i) improve knowledge of hydrological processes in water catchments; ii) improve knowledge of different types of floods that can occur on different types of water catchments; iii) monitor flood risk on key water catchments using the hydrological equipment established under Activity 2.1.1; iv) understand how to set up a flood risk alert system for one/several specific water catchments (which will be set up under Activity 3.1.2); v) understand urban flood risks based on IDF curves; and vi) learn how to produce flood hazard maps and flood vulnerability assessments (see Activity 2.3.3 and 2.3.4).</p> <p>The following activity will build on the existing data and hydrological and Hydraulic modelling software and other related tools. As such, countries like Mauritius, through the Land Drainage Authority “LDA” is already developing a Land Drainage Master Plan. Madagascar have also developed a national strategy to mitigate floods.</p>	<p>Under this activity, staff from the four NMHSs will be on hands-on training at the regional center in Mauritius. This activity will be coordinated by IOC, and includes the participation of international experts as lecturers, for the common training sessions for the four countries. This activity also includes individual tasks such as hydrological modelling for flood forecasting in each of the four countries.</p> <p>2.3.8.1 Design and implement relevant training in one of the regional center or at national level</p> <p>Responsible parties:</p> <ul style="list-style-type: none"> <li>- Leader : IOC with the Support of PMU to recruit hydrologist</li> <li>- Beneficiary supervision and validation : National Hydrological Services in each country</li> </ul> <p>Stakeholders to be involved and consulted: National Hydrological Services in each country</p>	<p>Trained staff</p>
<p>3.1.1 Set up/update protocols (standard operating procedures) to produce and deliver improved daily weather bulletin, multi-hazard impact-based forecasts, seasonal forecasts, and agrometeorological advisories</p>	<p>The FS (Annex 2, Chapter 3) has identified needs to improve the production and delivery of the daily weather bulletin, IBF, seasonal forecasts, and other weather products among the population of the four target countries.</p> <p>This activity will improve the production and delivery of weather forecasts, which are used by all for ‘everyday life’ in the four target countries, and IBF which support risk prevention. The accuracy of these forecasts will be enhanced, thanks to a production of high-quality climate-related data, under Outcome 2. Under this activity, staff members of the National Meteorological Services – which has been trained under activity 2.3.1 for the downscaling of meteorological forecasts and production of IBF – will receive support from a communication expert to prepare, package and disseminate their forecasts using relevant communication channels – including television, radio, and the website of the meteorological services - to ensure user-friendly format and wide outreach.</p> <p>In addition, in Comoros (Anjouan), Madagascar and Mauritius (where agriculture is a key activity – see Annex 2, FS, Chapter 1, and Annex 3a,</p>	<p>Under this activity, there will be a consultative process to improve the production and delivery of weather forecasts and agrometeorological advisories in each country. In each country, Standard Operating Procedures (SOPs) will be established for processes of co-production of products between the NMHS and relevant stakeholders, and of delivery of forecasts, advisories and warnings. Specific agrometeorological bulletins will be developed in each countries.</p> <p>At the regional level, there will be coordination workshops for consolidation, harmonization and dissemination of the weather and climate bulletins at the regional User Interface Platform (UIP). PIROI and other relevant regional entities will be part of this consultative process at the regional level.</p>	<p>Agricultural advisories Improved weather bulletins</p>

	<p>Economic Analysis), agricultural advisories will be prepared by staff members of the National Meteorological Services – trained under Activity 2.3.6 – in coordination with the Ministry of Agriculture, and representatives of farming communities to provide feedback on the format of the advisories and best communication channels. Where possible, the project will build on existing initiatives like PrAdA in Madagascar, by diversifying the type of crops for which agricultural calendars are produced, by upscaling success and by diversifying communication means used to disseminate agricultural advisories.</p>	<p>3.1.1.1 Conduct surveys among population to assess user satisfaction and to identify best ways to package/prepare the forecasts to be disseminated among the public in each country .</p> <p>3.1.1.2 Identify best packaging format and communication channels in each country – including TV, radio, newspaper – through surveys among population in particular farmers in Comoros, Madagascar and Mauritius, fishermen in Comoros and Seychelles, and the tourism industry in Seychelles and Mauritius.</p> <p>3.1.1.3 Support the National Meteorological Services to format their forecasts adequately for each communication channel – using local languages as appropriate.</p> <p>3.1.1.4 Prepare agricultural advisories through a participative process</p> <p>3.1.1.5 Identify best communication channels and language/ format for farmers in Comoros, Madagascar and Mauritius</p> <p>3.1.1.6 Disseminate the advisories using best communication channels</p> <p>3.1.1.7 Disseminate all weather bulletins and advisories on the UIP to collect users' feedback</p> <p>3.1.1.8 Develop standard operating procedures for all processes, following the WMO Guidelines on Quality Management in Climate Services<sup>140</sup> and the WMO Guidelines on Multi-hazard Impact-based Forecast and Warning Services<sup>141</sup>.</p> <p>Responsible parties:</p> <ul style="list-style-type: none"> <li>- Leader: IOC with the Support of PMU expertise to recruit a communication consultant</li> <li>- Beneficiary supervision and validation: National Meteorological Services and Ministry of Agriculture in each country</li> </ul> <p>Stakeholders to be involved and consulted: National Meteorological Services and population including farmers (for surveys on packaging information and best dissemination channels) in each country</p>	
--	---	--	--

<sup>140</sup> [https://library.wmo.int/doc\\_num.php?explnum\\_id=5174](https://library.wmo.int/doc_num.php?explnum_id=5174)

<sup>141</sup> [https://www.wmo.int/pages/prog/www/DPFS/Meetings/ET-OWFPS\\_Montreal2016/documents/WMOGuidelinesonMulti-hazardImpact-basedForecastandWarningServices.pdf](https://www.wmo.int/pages/prog/www/DPFS/Meetings/ET-OWFPS_Montreal2016/documents/WMOGuidelinesonMulti-hazardImpact-basedForecastandWarningServices.pdf)

<p>3.1.2 Set up protocols (standard operating procedures) to strengthen MH-IBF-EWS dissemination for and uptake by key sectors and among the general public</p>	<p>Thanks to the equipment installed under Component 2, NMHS will be able to forecast climate-related hazards earlier and more accurately. This activity will focus on improving warnings for climate-related risks in the four target countries. A presentation and assessment of how warnings are currently disseminated to vulnerable sectors (of the GFCS areas) and to the general public has been conducted in Annex 2, the FS, Chapter 2 and 3. The assessment underlines problems to issue timely warnings, that have a wide outreach in the four target countries (see Case Studies in Chapter 3 for concrete examples).</p> <p>To address this problem, end user's in-depth analysis will be performed at national scale in each country to ensure the perfect adequacy between needs and solutions while packaging EW. In particular, consultations will be organised with vulnerable socio-economic groups in each country to identify best communication means to disseminate warnings – including mobile cellphone, radio and trusted local stakeholders/leaders. Once channels have been identified, stakeholders e.g. at radio or national TV, or even community leads will be trained to disseminate user-friendly warnings in local languages.</p> <p>In addition to strengthening the early warning systems for tropical cyclones in the four target countries to ensure a wider outreach, the following early warnings will be established or strengthened, to target these specific groups:</p> <ul style="list-style-type: none"> <li>- in Comoros: EW for farmers and fishermen (using specific communication channels to reach these groups) focusing on heavy rainfalls (complementing and building on 'Ensuring climate resilient water supplies in the Comoros islands' UNDP-GCF project) and storms</li> <li>- in Madagascar: EW for farmers and fishermen (using specific communication channels to reach these groups and building on PrAdA in Madagascar) focusing on heavy rainfalls and storms</li> <li>- in Mauritius: EW for farmers and stakeholders in the tourism and health (using specific communication channels to reach these groups – based on methodologies and outputs from project SAWIDRA for health) focusing on heavy rainfalls, heat waves and storms</li> <li>- in Seychelles: general public and stakeholders in tourism for heavy rainfalls and storms (e.g. through mobile phone app); specific warnings for fisheries for storms and algal blooms (building on IAEA 'Monitoring of Algal Bloom' initiative).</li> </ul>	<p>Under this activity, there will be a consultative process to improve the production and delivery of MH-IBF-EWS in each country.</p> <p>3.1.2.1 Identify how to best package MH-IBF-EW information in user-friendly format through surveys with the general public, and with specific targeted vulnerable groups/sectors in each country.</p> <p>3.1.2.2 Train stakeholders in identified best dissemination channels for the general public and for the targeted groups (e.g. radio/TV presentations/community leaders) will be trained to disseminate warnings</p> <p>3.1.2.3 Work with PIROI and its national counterparts and NGOs to strengthen SOPs for MH-IBF-EWS at regional and national levels based on the results of the pilots in each country (carried out under Activity 3.2.2)</p> <p>Responsible parties: communication consultant hired under 3.1.1</p> <ul style="list-style-type: none"> <li>- Leader : IOC with the Support of PMU expertise to recruit a communication consultant</li> <li>- Beneficiary supervision and validation : NMHS, DRM and targeted sectoral institutions in each country</li> <li>- Stakeholders to be involved and consulted: IOC, NMHS, DRM institutions and population (for surveys) in each country</li> </ul>	<p>Strengthened MH-IBF-EWS in each country and at regional level</p>
<p>3.2.1 Improve data sharing and coordination with emergency services</p>	<p>Strengthening the collaboration between NMHSs and DRM institutions was a recommendation identified in Annex 2, the FS, Chapter 4. Such collaboration will be fostered in the four countries under this project's (see Activity 1.2.1). Through case studies, the FS has also underlined problems linked to disaster</p>	<p>In each country, on a national level, this activity will first review existing emergency response plans and communication processes between relevant stakeholders with a view to improve</p>	<p>National and local emergency</p>

<p>for on-the-ground interventions at national and local levels</p>	<p>risk management in the four countries (see SWOT analysis, Annex 2, the FS, Chapter 3); it underlines communication gaps between NMHS, DRM institutions and on-the-ground interventions services as well as highlights difficulties of emergency services – e.g. Red Cross/Crescent – to reach local communities especially in remote location.</p> <p>On a national level, this activity will first review existing emergency response plans and communication processes between relevant stakeholders with a view to improve them to guide quick on-the-ground interventions to mitigate risk impacts.</p> <p>Because disaster risk response happens at the local level, the national response plans will be downscaled in 2 pilot areas per country selected based on the hazard and vulnerability maps produced under Activities 2.3.3 and 2.3.4. At this level, it is not always possible for emergency services to reach the populations. Hence, key stakeholders to involve in risk prevention and response at the local level (i.e. local volunteers or trusted local stakeholders/leaders who can facilitate emergency responses at the local level) will be identified. Their capacity to understand risk warnings and advisories, to provide advises on risk prevention and to react during/after a hazardous event will be strengthened through trainings.</p> <p>This activity, piloted at the local level in in 2 vulnerable areas, will demonstrate how to downscale national emergency response plans at the local level to improve risk prevention, mitigation and recovery, in order to be replicated in other vulnerable sites.</p>	<p>them to guide quick on-the-ground interventions to mitigate risk impacts.</p> <p>Because disaster risk response happens at the local level, the national response plans will be downscaled in 2 pilot areas per country selected based on the hazard and vulnerability maps produced under Activities 2.3.3 and 2.3.4. At this level, it is not always possible for emergency services to reach the populations. Hence, key stakeholders to involve in risk prevention and response at the local level (i.e. local volunteers or trusted local stakeholders/leaders who can facilitate emergency responses at the local level) will be identified. Their capacity to understand risk warnings and advisories, to provide advises on risk prevention and to react during/after a hazardous event will be strengthened through trainings. This activity, piloted at the local level in in 2 vulnerable areas in each country, will demonstrate how to downscale national emergency response plans at the local level to improve risk prevention, mitigation and recovery, in order to be replicated in other vulnerable sites.</p> <p>3.2.1.1 Working with NMHS, DRR institutions and emergency services, identify pathways to improve communication and coordinate interventions among these services</p> <p>3.2.1.2. Conduct local assessment of on-the-ground intervention organisations including local community leaders, red cross/crescent, NGOs in 2 pilot sites per country</p> <p>3.2.2.3 Update national and develop local emergency response plans working in partnership with DRM institutions, emergency response services and local stakeholders</p> <p>3.2.2.4 Train local stakeholders in the selected pilot sites on risk prevention, mitigation and recovery</p> <p>3.2.2.5 Develop disaster risk reduction products – e.g. flyers in local languages, signs displayed and pictures – to place in strategic public spaces of the selected pilot sites to inform communities of DRR measures</p> <p>Responsible parties:</p> <ul style="list-style-type: none"> <li>- Leader : IOC with the Support of PMU expertise to recruit a DRM consultant</li> <li>- Beneficiary supervision and validation : DRMR institutions and emergency services</li> </ul>	<p>response plans</p>
---	--	---	-----------------------

		<ul style="list-style-type: none"> <li>- Stakeholders to be involved and consulted: DRM institutions, emergency services and population (for surveys) in each country</li> </ul>	
<p>3.2.2 Develop risk matrices for each hazard with agreed risk levels and colour-coded, and description of related impacts and response /actions; test and validate in selected sites in the four countries; expand and roll out nationwide</p>	<p>Aligned with the activity 3.2.1, a national framework for MH-IBF-EWS for each country will be developed and harmonized at the regional level. This framework will guide the implementation of MH-IBF-EWS at the local level. This involves collaboration among NMHS, PIROI and the national DRM institutions, and other stakeholders, the development risk matrices for each hazard with agreed risk levels and colour-codes, and description of related impacts and response/actions. Selected vulnerability sites in each country will be selected to use such risk matrices and associated information for testing and validating MH-IBF-EWS, with the assistance of PIROI and its national counterparts and associated NGOs. These developments and testing will be done in the first three years of the proposed project, and then expanded and rolled out nationwide (in the last two years of the project) using scenarios, and through the dissemination of knowledge products and outreach materials with the assistance of NGOs and through the community leaders, in order to reach all population in the four countries.</p>	<p>Aligned with the activity 3.2.1, a national framework for MH-IBF-EWS in each country will be developed and harmonized at the regional level. This framework will guide the implementation of MH-IBF-EWS at the local level. This involves collaboration among NMHS, PIROI and the national DRM institutions, and other stakeholders, the development risk matrices for each hazard with agreed risk levels and colour-codes, and description of related impacts and response/actions. Selected vulnerability sites in each country will be selected to use such risk matrices and associated information for testing and validating MH-IBF-EWS, with the assistance of PIROI and its national counterparts and associated NGOs. These developments and testing will be done in the first three years of the proposed project, and then expanded and rolled out nationwide (in the last two years of the project) using scenarios, and through the dissemination of knowledge products and outreach materials with the assistance of NGOs and through the community leaders, in order to reach all population in the four countries.</p> <p>3.2.2.1 Organize workshops with NMHS, PIROI and the national DRM institutions, and other stakeholders, NGOs and local communities at pilot areas to develop risk matrices for each hazard with agreed risk levels and colour-codes, and description of related impacts and response/actions</p> <p>3.2.2.2 Carry out exercises in the pilot areas to test and validate the risk matrices and associated information</p> <p>3.2.2.3 Develop scenarios to roll out nationwide</p> <p>3.2.2.4 Harmonize approaches at regional level</p> <p>Responsible parties:</p> <ul style="list-style-type: none"> <li>- Leader : IOC with the Support of PMU expertise to recruit a DRM consultant</li> <li>- Beneficiary supervision and validation : NMHSs, PIROI and national DRM institutions and emergency services</li> </ul> <p>Stakeholders to be involved and consulted: DRM institutions, emergency services and population, NGOs in each country</p>	<p>8 MH-IBF-EWS at local areas</p> <p>1 national MH-IBF-EWS</p> <p>1 regional MH-IBF-EWS</p>

<p>3.2.3 Develop a knowledge and decision support system to support the implementation of MH-IBF-EWS at regional, national and local levels</p>	<p>At the same time, a web-based knowledge and decision support system (DSS) that aggregate information from the four target countries, with MH-IBF and color-coded risk-based warnings (regional “meteoalarm”<sup>142</sup> / “vigilance”<sup>143</sup> / “type platform that would also contribute to the WMO Global Multi-hazard Alert System – GMAS”<sup>145</sup>) will be jointly develop to support early warnings / early actions at regional, national and local levels. While this DSS is primarily to support DRM operations, it is intended to also address impacts to the relevant socioeconomic sectors in the country (i.e. agriculture, fisheries and tourism).</p>	<p>3.2.3.1 At the regional level, develop a web-based knowledge and decision support system (DSS) that aggregate MH-IBF-EWS information from the four target countries</p> <p>3.2.3.2 Implement the Common Alert Protocol (CAP) in each country and associate in the DSS</p> <p>Responsible parties:</p> <ul style="list-style-type: none"> <li>- Leader : IOC with the Support of PMU expertise to recruit a DRM consultant</li> <li>- Beneficiary supervision and validation : NMHSs, PIROI and national DRM institutions and emergency services</li> </ul> <p>Stakeholders to be involved and consulted: NMHSs, PIROI, national DRM institutions, emergency services and population, NGOs in each country</p>	<p>1 knowledge and decision support system</p> <p>4 CAPs</p>
<p>3.2.4 Update long term climate change adaptation plans responding to the needs of each country</p>	<p>Comoros, Madagascar and Mauritius are in the process of developing their NAP, which will be finalised in 2020. Based on the high-quality climate data and projections produced under Component 2 (in particular Output 2.3), the NAPs will be updated.</p> <p>In Seychelles, where no NAP is being developed, the project will support the implementation of the R&amp;D component of the existing Coastal Management Plan (based on hazard maps developed under Activity 2.3.3) and update the national climate change strategy (in support to the new climate change policy to be validated in 2019).</p> <p>The plans will be shared on the UIP (Activity 3.3.3).</p>	<p>3.2.2.1 Update NAPs in Comoros, Madagascar and Mauritius</p> <p>3.2.2.2 In Seychelles, work with the Climate Change Department to implement the CMP and update the national climate change strategy</p> <p>Responsible parties:</p> <ul style="list-style-type: none"> <li>- Leader : IOC with the Support of PMU expertise to recruit a climate change adaptation consultant</li> <li>- Beneficiary supervision and validation : Ministry of Environment/ climate change units; relevant sectoral ministries (e.g. agriculture)</li> </ul> <p>Stakeholders to be involved and consulted: Ministry of Environment/ climate change units; relevant sectoral ministries (e.g. agriculture)</p>	<p>Updated NAPs and climate change strategies</p>

<sup>142</sup> <http://www.meteoalarm.eu>

<sup>143</sup> <https://vigilance.meteofrance.fr/fr>

<sup>144</sup> <http://www.meteofrance.re/vigilance-reunion>

<sup>145</sup> <https://www.wmo.int/gmas/>

<p>3.3.1 Train staff members of NMHS and in the RCC on how to package climate-related information in a user-friendly way</p>	<p>Workshops with NMHSs and CP-CS users in priority areas of the GFCS will be organised to ensure better packing of climate-related products prepared by the NMHSs including sector-tailored forecasts and EWS. At least 15 members of each NMHS will be trained.</p>	<p>Under this activity, each country will organize workshops with NMHSs and CP-CS users in priority areas of the GFCS to ensure better packing of climate-related products prepared by the NMHSs including sector-tailored forecasts and EWS. Similarly, at the regional level, IOC will organize workshops with the NMHSs CP-CS users in priority areas of the four countries for the development of regional climate products to be generated by the RCC-Network.</p> <p>3.3.1.1 Develop training programme on packaging and communicating climate-related information</p> <p>3.3.1.2. Identify stakeholders within key institutions of provider and user of CP-CS to invite at workshop</p> <p>3.3.1.3 Organise workshops to facilitate discussions between producer and users of CP-CS and identify ways of packaging CP-CS so that they are understandable and useful.</p> <p>Responsible parties:</p> <ul style="list-style-type: none"> <li>- Leader : IOC with the Support of PMU expertise and communication consultant hired under Activity 3.1.1</li> <li>- Beneficiary supervision and validation : NMHSs and CP-CS users</li> </ul> <p>Stakeholders to be involved and consulted: NMHSs, DRM institutions and relevant sectoral organisations</p>	<p>Trained staff</p>
<p>3.3.2 Train knowledge brokers – including NGOs, red crescent/cross, local leaders and extension officers – and representatives of sectors in the GFCS areas (public and private organisations) on how to interpret and use CP-CS for decision-making</p>	<p>Key knowledge broker institutions for risk prevention and response at the local level will be identified in each country. Their capacity to understand hazard warnings and advisories, to provide accurate advices on risk prevention and to react during/after a hazardous event will be strengthened through trainings.</p>	<p>Under this activity, key knowledge broker institutions for risk prevention and response at the local level will be identified in each country. Their capacity to understand hazard warnings and advisories, to provide accurate advices on risk prevention and to react during/after a hazardous event will be strengthened through trainings.</p> <p>At the regional level, there will be workshops with the NMHSs of the four countries, PIROI and its national counterparts (DRM institutions in the four countries) to ensure early warning / warning actions at regional, national and local levels.</p> <p>3.3.2.1 Identify local 'knowledge brokers' in risk prevention</p> <p>3.3.2.2 Develop a training programme for knowledge brokers on how to interpret and use CP-CS for decision-making</p> <p>3.3.2.3 Organise a workshop to train knowledge brokers</p> <p>3.3.2.4 Prepare and disseminate knowledge material (also on the UIP)</p>	

		<p>Responsible parties:</p> <ul style="list-style-type: none"> <li>- Leader : IOC with the Support of PMU expertise and communication consultant hired under Activity 3.1.1</li> <li>- Beneficiary supervision and validation : DRM institutions</li> </ul> <p>Stakeholders to be involved and consulted: DRM institutions and knowledge brokers</p>	
<p>3.3.3 Strengthen the User Interface Platform (UIP)</p>	<p>The project will strengthen the existing Regional Climate Portal developed by IOC and hosted by Seychelles (SMA) since August 2019<sup>146</sup>. The platform, which is regional and will be a key communication tool for the RCC-Network (see Activity 1.1.2), is already used by MF and IOC to disseminate climate-related information following the SWIOCOFs. Through Hydromet project, the platform will serve to facilitate access to CP-CS (weather bulletin, seasonal forecasts, warnings, climate change projections and vulnerability assessments), including those produced during the SWIOCOFs and NCOFs, within and between countries. The products developed under Output 2.3 – the climate-related hazards maps and vulnerability maps – will also be shared on the platform, as well as the updated, downscaled climate change projections produced under the same Output. The platform will target stakeholders working in the GFCP-CS priority areas (from public and private sectors, e.g. ministries, business, researcher, etc.) to provide them with decision-making support tools or with climate-related information that can be used to produce targeted CP-CS. For this purpose, the information will be packaged according to their needs.</p> <p>In addition, in line with the development of regional capacity for disaster risk management in SWIO, there is a need to harmonize the warning criteria for hydro-meteorological hazards within the region. It is important for individual countries to share and display the warnings for at least 48 hours, in a manner understandable for professionals and the public, using a dedicated regional web platform<sup>147</sup> as part of the UIP. IOC will have a critical role in this harmonization process.</p> <p>The platform will be designed to include a page where users of CP-CS can provide feedback on the services they receive (Annex 2, the FS, Chapter 3 has identified a lack of feedback mechanism between NMHS and users of climate services).</p>	<p>The project will strengthen the existing Regional Climate Portal developed by IOC and hosted by Seychelles (SMA) since August 2019<sup>148</sup>. The Portal will be upgraded and will incorporate the new CP-CS developed under the project, as well as the above-mentioned DSS.</p> <p>3.3.3.1 Identify gaps/weaknesses in the design/operationalisation of the existing Regional Climate Portal.</p> <p>3.3.3.2 Conduct interviews with users of the platform to identify gaps/weaknesses in information provided (packaging, content, 'usability')</p> <p>3.3.3.3 Develop and implement a communication strategy to improve the platform which include tool to collect users' feedback on CP-CS.</p> <p>3.3.3.4 Associate the DSS (developed under Output 3.2) to the UIP</p> <p>Responsible parties:</p> <ul style="list-style-type: none"> <li>- Leader : IOC with the Support of PMU expertise and communication/IT consultant hired under Activity 3.1.1</li> <li>- Beneficiary supervision and validation : RCC-Network, NMHSs, CP-CS users, the public</li> <li>- Stakeholders to be involved and consulted: IOC, National Meteorological Services and platform users</li> </ul>	<p>1 strengthened regional UIP</p>

<sup>146</sup> <http://regionalclimate-change.sc/en/>

<sup>147</sup> An example of such a platform is Meteoalarm, which was developed under the framework of the European Meteorological Services Network (EUMETNET) (and which recently incorporated hydrological warnings).

<sup>148</sup> <http://regionalclimate-change.sc/en/>

<p>3.3.4 Support SWIOCOFs to ensure the active participation of climate services users</p>	<p>SWIOCOF is a yearly event convened by IOC (in September). Its efficiency will be assessed by a meteorologist expert and recommendations will be made to improve its impact, in particular to enhance its complementarity with NCOF/SARCOF. This assessment will seek to assess SWIOCOF so it can provide CP-CS users with relevant and action-oriented seasonal information; and offer a platform for users to provide feedback on CP-CS including early warning systems (improvement to be made based on assessment of existing process in SWIOCOF). The lessons learned collected from users will be shared on the online platform (strengthen under Activity 3.3.3). To note that a funding strategy to maintain SWIOCOF beyond the proposed project's lifetime will be developed under Activity 1.2.1.</p>	<p>SWIOCOF is a yearly event convened by IOC (in September), but with poor representation of climate services users. The project will support such users and also improvements in the content and organization of the events.</p> <p>3.3.4.1 Conduct capacity gap analysis on SWIOCOF to identify pathways for improvements  3.3.4.2. Identify how to best complement SARCOFs and NCOFs  3.3.4.3 Design a strategy for IOC to improve SWIOCOF with a view to enhance users' implication in the forum.</p> <p>Responsible parties:</p> <ul style="list-style-type: none"> <li>- Leader : IOC with the Support of PMU expertise to recruit a meteorologist expert</li> <li>- Beneficiary supervision and validation : IOC, RCC-Network, CP-CS users</li> </ul> <p>Stakeholders to be involved and consulted: SWIOCOF participants</p>	<p>Strengthened SWIOCOF</p>
--	---	---	-----------------------------

### **E.7. Monitoring, reporting and evaluation arrangements (max. 500 words, approximately 1 page)**

Monitoring, reporting and evaluation arrangements will comply with the relevant GCF policies.

#### **Reporting to the PMU**

The EE, through its PMU, will ensure the day-to-day monitoring and overseeing project implementation, ensuring coordination with relevant partners including NPCs, NFPs, NMHSs and NDAs, exchanging with local government, etc.

Every semester, the PMU will review project performance and assess any potential risks. This task will be performed by the Monitoring and Evaluation (M&E) Officer member of the PMU, with the assistance of the four national Project Focal Points (NFP) and (NPCs). The RPC will visit project sites at least once a year; and more if deemed necessary. NPCs will liaise continuously with the RPC. At the national level project implementation report will be prepared by the NPCs on a biannually basis; the RPCs will monitor the implementation progress and adjust the annual work plan and objectives. At the end of the disbursement period, the EE will prepare a project completion report summarising the main events of the implementation phase, the results achieved, and the lessons learned. This report will also provide recommendations for future improvements.

#### **Reporting to the AE**

During the disbursement period, AFD will receive reports from the EE, i.e. the IOC, to track progress and identify potential issues as well as improvement opportunities. In this document, the EE will report on a semi-annual or annual basis on performance indicators; these indicators will be detailed in a result monitoring framework developed to assess progress towards the Project Development Objective (PDO); while intermediate indicators will monitor the progress of each component over the lifetime of the Project.

Accounting and financial audits will also be conducted every year by an independent third party. AFD will tender and contract independent consultancy services for the mid-term review (MTR) and for the ex-post evaluation of the project after its full completion for a terminal evaluation (TE). The MTR and TE aim to improve future project implementation as well as other projects/programmes by deriving lessons from experience and to find ways to make aid more effective.

#### **Reporting to the GCF**

Annual Performance Reports (APR) will be duly prepared by AFD and shared in a manner compliant with the provisions of the Accreditation Master Agreement (AMA), the Funded Activity Agreement (FAA) and the Monitoring and Accountability Framework (MAF) of GCF. In particular, the APR may include a narrative report on the implementation progress based on the logical framework, considerations on the ongoing performance of the proposed project, updates on the indicators, and a report on environmental and social safeguards (ESS) as well as gender issues.

**F. RISK ASSESSMENT AND MANAGEMENT**

**F.1. Risk factors and mitigations measures (max. 3 pages)**

**Selected Risk Factor 1**

Category	Probability	Impact
Technical and operational Technical and operational	Medium Medium	High

Description

Project implementation could be affected by the limited capacity of NMHSs to operationalise the new/upgraded hydro-meteorological equipment and tools, and to implement project. This could happen if: i) NMHSs do not appoint appropriate experts to operationalise the equipment and tools, or do not provide adequate training to their staff members; ii) Staff members of the NMHSs are not involved in project implementation; or iii) Operation and maintenance costs during and after project cannot be met by the NMHSs.

Mitigation Measure(s)

These risks will be mitigated through the following project interventions: i) the signature of a Memorandum of Understanding between the EE and each national counterpart of beneficiary country to confirm their involvement and commitment, ii) institutional and technical capacity of beneficiary NMHSs will be strengthened to improve their operationalisation and retain skilled staff; staff will also be trained to operationalise equipment and tools, and new staff will be hired (as needed) to enable effective project implementation and coordination; iii) the project has been designed in consultation with the NMHSs of each beneficiary country, which will be involved in project implementation at the national level; indeed, a National Focal Point (NFP) will be appointed within the NMHS to ensure collaboration and involvement of these services during project implementation; the NMHSs will also be represented during bi-annual national project steering committees and annual regional steering committee to ensure their commitment and engagement; and iv) modernization of key equipment and tools, and training on their operation and maintenance will support increased capacity for project implementation among the beneficiary NMHSs during and after the project; moreover, a calibration and maintenance center (WMO Regional Instrument Centre) will be established for the SWIO region to facilitate the maintenance and calibration of hydro-meteorological equipment; finally, as indicated in the Economic Analysis (Annex 3a), financial capacity of the NMHSs would increase through the production and commercialisation of high-quality CP-CS, hence additional financial resources will be reinvested into operation and maintenance after project implementation.

**Selected Risk Factor 2**

Category	Probability	Impact
Governance	Medium	High

Description

The proposed project could be affected by limited commitment of the government towards project implementation; for example, new appointments in the government – ministries or NMHS management – could affect project implementation in the country.

Mitigation Measure(s)

The risk is more significant in politically-unstable countries, prone to government re-shuffle. To ensure strong involvement of the beneficiary countries, extensive in-country consultations – with representatives of the NMHSs, relevant line ministries, and NDAs – were conducted during the project development phase. Two series of workshops were held (at national and regional levels) to provide opportunities for countries to comment and adjust requirements. As such, expectations from NMHSs and CP-CS users have been incorporated where relevant to ensure greater buy-in. NPC will also be appointed within the NMHS to coordinate project implementation in their country. In addition, the IOC will sign bilateral agreements with each Ministry of Foreign Affairs, which, in turn, will sign agreements with the

line ministry of the NMHSs in the four target countries. This will serve to ensure that NMHSs remain in charge of national project implementation (through their NPC), even if changes occur at the head of the parent ministry.		
<b>Selected Risk Factor 3</b>		
Category	Probability	Impact
Technical and operational	Low	Low
Description		
Security issues and vandalism put hydro-meteorological equipment at risk of damage or loss. Tensions with the population located where the new hydro-meteorological equipment will be installed could rise especially if population relocation is necessary; this could result in damages caused by the impacted population to the equipment.		
Mitigation Measure(s)		
<p>Several actions will be undertaken to avoid relocating population, engage with the population located nearby hydro-meteorological equipment and ensure the equipment is not damaged during and after project implementation:</p> <ul style="list-style-type: none"> <li>- No relocation is foreseen within this project: most equipment will be set up or upgraded in sites already used by such equipment and building extension/construction (for the NMHSs in Comoros and Seychelles) will take place on land already acquired by the NMHSs;</li> <li>- Communities surrounding the newly established/upgraded equipment will be informed beforehand of the purpose of the project and type of equipment to be installed;</li> <li>- The equipment will be equipped with argos tracking tags, whenever possible;</li> <li>- Fences will be set up around the equipment;</li> <li>- Awareness-raising of the benefits of CP-CS will be conducted so that the communities appreciate the value of the hydromet equipment installed nearby; and</li> <li>- Agreements will be signed with the NMHSs or their line ministry of the 4 countries to protect the equipment during their lifetime (e.g. equipment insurance where possible).</li> </ul>		
<b>Selected Risk Factor 4</b>		
Category	Probability	Impact
Technical and operational	Low	Low
Description		
There is a risk that climate-related hazards will damage the hydro-meteorological equipment during and after the project lifetime. For example, tropical cyclones and storms could destroy automatic weather stations and communication infrastructure if those are not carefully placed using resilient materials.		
Mitigation Measure(s)		
The four beneficiary countries are affected by climate-related hazards which could cause damages to the newly established equipment. Particular attention will be given to site selection to install new equipment in 'risk-free' areas – e.g. avoiding low-land areas affected by floods. This will, for example, be ensured by installing the new equipment in similar location of previously set equipment if this location is known for not being affected by climate-related hazards and extremes. In addition, all infrastructure and equipment will be built with adequate construction materials and efficient design to be resilient to severe and frequent tropical cyclone events, floods, high winds etc (future-proof). Finally, enhanced climate-related forecasts and risk assessments will enable the NMHSs to protect or remove movable equipment when a warning is issued.		
<b>Selected Risk Factor 5</b>		
Category	Probability	Impact
Technical and operational	Medium	Medium

Description		
There is a risk that innovative technology and techniques compromise the end result in terms of quality of observations and forecasts, as well as operations and maintenance, due to limited expertise.		
Mitigation Measure(s)		
While the project will promote the use of innovative solutions both in terms of observation systems and downscaling of forecasts, only well established and proven technology and techniques will be used, and therefore particular attention will be given to the development of the technical specifications and terms of reference to ensure, as well as to the evaluation process, to ensure that they meet this requirement.		
Selected Risk Factor 6		
Category	Probability	Impact
Governance	Medium	High
Description		
The proposed project could be affected by limited commitment of the government towards supporting continuously the required financial and human resources required for O&M.		
Mitigation Measure(s)		
<p>As described in the O&amp;M Plan (see Annex 21), efforts will be made throughout the project implementation to ensure that sustainable funding and human resources are in place for the implementation of the project and beyond project implementation, by applying the following mechanisms to support O&amp;M in the four countries:</p> <ul style="list-style-type: none"> <li>(a) Introducing value-added services through cost recovery of meteorological services and commercial services;</li> <li>(b) Promoting Public-Private Engagement (PPE);</li> <li>(c) Engaging with the UN and other international partners working in the four countries;</li> <li>(d) Establishing business plans and revising the Hydromet Laws in each of the four countries for revenue generation and license fees;</li> <li>(e) Leveraging funds from the SOFF/GBON.</li> </ul> <p>In summary, as for Mauritius and Seychelles, in order to complement government funding, the strengthening and enabling of the institutional framework and policy will be essential to achieve the availability and sustainability of the O&amp;M budget by mainstreaming Climate services commercialization and establishing cost recovery of meteorological services, as described in the O&amp;M Plan – revenue generation (Annex 21, pages 2 to 6). Such an improvement should also be achieved by the project for Comoros and Madagascar (see in particular page 4 of the O&amp;M plan, Annex 21). A Commitment Letter from IOC, confirming country commitment post-project implementation period to operate and maintain the equipment, is attached in the project package as Annex 0_IOC_commitment_Letters.</p> <p>In addition, and particularly for Comoros and Madagascar, in order to ensure the sustainability of the system, the project is considering a more secure alternative based on the mobilization of funds from the SOFF/GBON in order to support the O&amp;M costs (see O&amp;M Plan, Annex 21, page 9). Noting that SOFF/GBON will primarily support SIDS and LDCs, Comoros and Madagascar are eligible to get such support. Thus, a request has already been submitted to the WMO, as a project technical partner, to consider these countries for the SOFF implementation, and a letter is expected to be received by countries and IOC from WMO to be attached to the project package. For Comoros and Madagascar, additional agreements with ASECNA (see O&amp;M Plan, Annex 21, page 4) are being negotiated to ensure that the newly installed equipment can be considered as a new asset that can be operated and maintained under the ASECNA umbrella. It is recalled that AFD is a long-standing partner of ASECNA and has recently supported ASECNA with a non-sovereign loan of 60 M€. Additionally, the PIROI (Red Cross network in the IO region), which is already involved in the IOC project generally and EW actions during extreme events, will play a crucial role as in the implementation of the MH-IBF-EWS and last mile connectivity by ensuring that critical early warning information is delivered in a timely and efficient manner.</p>		

PIROI will also assist in bridging with and bringing the support of IFRC who is very active in the region in pursuing the implementation of Forecast-based Financing (FbF), which is being currently piloted in the region in Mozambique, but expected to be expanded to other countries (not included in this project proposal as this is being supported through other mechanisms). PIROI has already expressed its support to the project, and an official letter from IFRC is expected to be received and attached to the project package to confirm PIROI commitment.

At the end of the project, it is considered that the environment is enabled for the NMHSs and DRM institutions to be strong enough to allow the Mauritius and Seychelles to leverage sufficient O&M costs and to allow Madagascar and Comoros to take over GCF commitment on O&M to be mobilized during the project onset. Description of all activities that will be in place during the project to support and create an enabling environment for the sustainability of investments are described in the O&M Plan provided as part of the project proposal package (Annex 21).

## G. GCF POLICIES AND STANDARDS

### G.1. Environmental and social risk assessment (max. 750 words, approximately 1.5 pages)

The proposal for Hydromet project is predominantly for capacity building and institutional strengthening to deliver improved climate services. There will be an associated provision of new hydrometeorological equipment and tools for monitoring, data storage, data processing, modelling, forecasting and service delivery systems. These are specified in relation to both the needs of each country and requirements for coordinated IOC regional climate services provision. This component of the project encompasses the refurbishment and re-equipping of existing weather stations and installation of strategically-placed weather monitoring equipment facilities and river gauges, etc. Such state of the art technology will record meteorological and hydrological data to be analysed and disseminated to government services and end users, including the general public.

#### ***Environmental and social risks***

As evaluated in the assessment, the project is expected to have minimal environmental and social impacts and is more likely to generate beneficial impacts. The project has been classified overall as Category B. The safeguards risks are primarily associated with the installation of new meteorological equipment mounted on masts (e.g. new or rehabilitated automatic weather stations, AWS), in the case of the Doppler Radar units on small tower structures (also supplied will be work stations, computers, wiring, etc.), and installation of hydrological stations.

AWSs are typically installed within local government owned properties. A very limited area is required for each weather station (some 100m<sup>2</sup>) at sites of modified and semi-natural habitat, such as airfields or government research institutes. With the exception of river gauges, the equipment will be installed almost exclusively at existing stations where they can be protected from damage, being on secure premises and/or through secure fencing. Many stations have fallen into disuse and project meteorological equipment will be established on existing sites on government-owned land; therefore, the project will not result in land acquisition and/or resettlement of local population. It is anticipated that there will be minimal planning requirements but following the environmental planning procedure of the ESMF all local permitting requirements will be adhered to and the PMU will facilitate and assure such regulations are respected and ESMF plan reporting requirements will enable monitoring and accountability.

In each of the countries it is anticipated that one Doppler Radar unit will be installed and these will be mounted on a base of a tower (up to some 8 meters in height). There will also be a small number of wave-monitoring buoys and tidal gauges. Modification and extension of existing buildings associated with offices and weather station facilities is also envisaged. The Seychelles government are relocating their main offices at their own expense and these will receive certain project supplied computers and data processing equipment.

Negative environmental and social impacts which would potentially occur from the installation works of AWSs include noise pollution from machinery and equipment, increase in generation of solid wastes, and increase in dust emissions as a result of excavation and civil works during the installation of the AWSs especially in new sites. These impacts will affect, albeit temporarily, occupational health and safety of workers to be involved during construction works and surrounding localities in close proximity to the selected local government owned properties.

The ESMF (E&S framework) has examined all such potential impacts and suggests negligible potential impacts if basic codes of good health and safety practice are followed by contractors, including national and international regulations applicable in the countries including ILO conventions. The nature of the project is such that its potential physical impact and safeguards risk factor is necessarily limited. The new physical infrastructure element at any location will be very modest in size and dispersed in siting so cumulative issues are not a relevant consideration.

#### ***Environmental Management***

The process of optimal site selection for facilities is addressed together with health and safety guidance for construction. Planning requirements for Doppler Radar installations and the wave height monitoring buoys will respect national planning compliance expectations. The construction safeguards are not only relevant to installation works but also any protection fencing to guard against third party damage. A "fit-for-purpose" approach is adopted in line with the GCF risk-based policy to the project proponent and guide management and monitoring of sub-

contractors. The project will ensure that all equipment to be purchased meets international environmental, safety and technical standards.

Where there are alternative options in siting the proponent will seek the optimal location subject to approval of the national environmental authorities. An E&S safeguard monitoring and reporting component will constantly review and audit the implementation of the programme including setting up of new and rehabilitated hydrometeorological stations to verify that safeguards are implemented.

In conclusion, very limited negative risks are predicted to arise from the project and, when effectively implemented, the project will provide reliable climate-related data of importance for climate risk adaptation and enhancing the management of natural resources, mitigating vulnerability of exposed populations and assets to climate change. Some sites will benefit positively as buildings and station sites in poor condition are renovated resulting in positive direct and indirect impacts. The accompanying training in use of new project-supplied equipment will include health and safety in equipment and facility use.

The ESMF (see Annex 6) presents actions to assure sound safeguards implementation to manage risks and achieve compliance with national and IFC requirements, and therefore realise the significant benefits of the project while avoiding or mitigating any adverse effects.

## G.2. Gender assessment and action plan (max. 500 words, approximately 1 page)

The proposed GCF project includes a Gender Assessment and Action Plan (Annex 8).

The analytical prerogatives of the Gender Assessment and Action Plan are informed by both GCF and AFD gender policies: the 2018 Gender Policy and Action Plan passed by the GCF (building upon the 2014 edition)<sup>149</sup>; and, the AFD Strategy on Gender and the Reduction of Gender Inequalities (2014), as well as its AFD Group Strategy 2018 – 2022.<sup>150</sup> There is no gender strategy available currently at the IOC level<sup>151</sup>. However, national gender plans are available in each of the four countries.<sup>152</sup> These plans were reviewed along with other gender-related legislations such as on economic empowerment and prevention of gender-based violence, and with gender-related protocols like the CEDAW and Maputo protocols. These serve to point out the national legal and institutional frameworks and the gender priorities of each country, which can be used to support gender equality through the proposed project.

The proposed Gender Assessment provides an overview of the gender baseline in each beneficiary country (alongside a regional appraisal). The assessment is based on rapid in-country missions as well as desk-review of available secondary literature and data. Particularly, the assessment identifies key gender-related factors that determine climate resilience, access to EWS and CS, potential inequality aspects and trickle-down effect of project benefits towards end-users of CP-CS (most particularly within vulnerable communities).

Semi-structured interviews (with focus groups, and institutional representatives) were conducted during short in-country missions. A comprehensive desk-review was conducted based on existing literature on gender, climate change adaptation, climate services and hydro-meteorological services. The triangulated assessment was synthesised to cover the four project countries, taking into consideration their unique contexts and performances and across social indicators.

**Gender-differentiated climate impacts and natural disasters:** The World Economic Forum (WEF)'s report The Global Risks Report 2020 finds that the top five among the primary ten risk factors facing the world population are

<sup>149</sup> GCF – Green Climate Fund (2018). *Updated Gender Policy and Action Plan*. Policy Document. Accessed 22 April 2019. Available at: [https://www.greenclimate.fund/documents/20182/1087995/GCF\\_B.20\\_07\\_-\\_Updated\\_Gender\\_Policy\\_and\\_Action\\_Plan\\_2018\\_2020.pdf/9bd48527-6e35-a72a-2f52-fd401d16d358](https://www.greenclimate.fund/documents/20182/1087995/GCF_B.20_07_-_Updated_Gender_Policy_and_Action_Plan_2018_2020.pdf/9bd48527-6e35-a72a-2f52-fd401d16d358)

<sup>150</sup> AFD – Agence Française de Développement (2019). Official Website. Accessed 2 August 2019. Available at: <https://www.afd.fr/en/page-thematique-axe/gender-equality>

<sup>151</sup> However, it should be noted that Seychelles has put a GCF Readiness proposal together, which request the development of a regional IOC strategy for equal woman involvement in environmental projects. See GCF (2017). Readiness Proposal with the Indian Ocean Commission (IOC) for Republic of Seychelles. Project Document.

<sup>152</sup> Comoros : National Policy on Gender Equality and Equity (2008)  
Madagascar : National Policy for the Promotion of Women (2000 – 2015)  
Mauritius : National Gender Policy Framework (2008)  
Seychelles : National Gender Policy (2016)

environmental in nature: (in order of risk) extreme weather, climate action failure, natural disasters, biodiversity loss, human-made environmental disasters.<sup>153</sup> Gender determinants (such as consumption patterns and incidence of poverty, access to and control of resources and power, time use patterns and economic activities) when juxtaposed with environmental risks, can uniquely compound and overlap to create progressive vulnerabilities in each of the project countries. High burden of adverse impacts of climate change, especially with the lack of EWS, CS, and hydromet services, will limit not only adaptation capacities in real time, but also have intergenerational effects and undo progress made towards gender equality in the island nations (with increased consequences especially in LDC contexts of Madagascar and Comoros).

**Gendered access to adaptation solutions:** Site visits undertaken in the Comoros (Moroni) and Seychelles (La Digue, Praslin and Victoria) and engagement with government officials in all four countries, revealed that adaptation solutions, ranging from DRR training to climate-resilient agricultural inputs, face gendered barriers. For the operationalisation of the Hydromet project, it is important to consider that women are often not allowed to access public spaces (where EW may be announced – such as mosques in Comoros) or have limited to no radio access (in Madagascar), and generally, the dissemination of information are restricted to channels primarily accessed and controlled by men.

**Gendered limitations in decision-making institutions and representation:** Decision-making institutions, power-sharing mechanisms and overall representation tend to be skewed towards men in all four IOC member countries, excepting Seychelles. Yet, at the same time, women make important household decisions daily, in these countries, that pertain to domestic food security, water provision, and other essentials – which contribute towards DRM response, resilience during hazardous hydrometeorological events, and adaptation capacities. An adequate integration of these complex and gendered phenomena in the project approach will, thus, be necessary to respond to particular needs and interests of vulnerable groups at decentralised and grassroots locales. Bottom-up, tailored approach, will ensure project ownership, and sustainability at the community context.

**Side-lining local adaptation measures and information channels:** Communities of the SWIO possess experience, history and knowledge in the management and use of natural resources as sustainable livelihood sources. Thus, self-help adaptation methods, particularly those discrete and reactive in nature – information channels, sharing of resources and communal control of wastage during crises, building strategies – can be traced among these communities. The project, especially due to its focus on building resilience of communities, as well as ecosystems, thus has to ensure the incorporation of these techniques into broader, pre-emptive EWS, CS and hydromet services. Such a process will require vetting as well as emphasis on cross-community dialogue to tailor these provisions, consider inclusions and exclusions, manage expectations, etc.

Additionally, Annex 8 gives consideration to gender-based violence and time poverty<sup>154</sup> experienced by women and men (in some contexts), and how these phenomena can also constrain the adoption of adaptation solutions, particularly in *ex post* disaster and other vulnerable contexts.

In order to address the above-mentioned gendered limitations, particularly women’s participation in adaptation solutions, and to build on the potential opportunities of increased gender equality through the objectives and outputs of the Hydromet project, a Gender Action Plan has been developed.

Key actions included in the plan are presented in the table below per project component:

Project Component	Gender Action Point
1. Capacity Building, Institutional, Development and Regional Cooperation	- Include gender-responsive policy inputs in regional and national frameworks developed for climate services (with reference to WMO Gender Strategy)

<sup>153</sup> World Economic Forum – WEF (2020). Official Website. Accessed 17 January 2020. Available at: [http://www3.weforum.org/docs/WEF\\_Global\\_Risk\\_Report\\_2020.pdf](http://www3.weforum.org/docs/WEF_Global_Risk_Report_2020.pdf)

<sup>154</sup> An individual is **time poor** if he/she is working long hours and is also monetary **poor**, or would fall into monetary **poverty** if he/she were to reduce his/her working hours below a given **time poverty** line. Thus being **time poor** results from the combination of two conditions (source: World Bank elibrary)

	<ul style="list-style-type: none"> <li>- Ensure gender capacity building through the design of training modules to assist transition and capacity development plans of NMHSs, DRM institutions and relevant sectoral ministries</li> <li>- Increase gender parity in new staff and trainees hired for EWS, CS, and hydromet services</li> </ul>
2. High Quality Climate – related data, and improved EWSs and climate risk assessments	<ul style="list-style-type: none"> <li>- Ensure gender-engagement training of observers and forecasters, particularly those involved in impact-based forecasting and nowcasting, to increase gender-responsiveness to EWS and CS products</li> <li>- Research and Development activities to include community and social vulnerabilities, particularly gendered impacts and gender-differentiated capacities of resilience, in the hazard maps and climate vulnerability maps developed for each country</li> </ul>
3. Enhanced use of climate services for climate change adaptation and disaster risk reduction at national and regional levels	<ul style="list-style-type: none"> <li>- Conduct needs assessments to ensure gender-responsiveness to daily weather bulletins, seasonal forecasts and agrometeorological advisories</li> <li>- Ensure gender-responsiveness in EW dissemination, particularly the limited access women have to public spaces (mosques in Comoros), or information channels (radio in Madagascar), and the incidence of gendered time poverty</li> </ul>

### G.3. Financial management and procurement (max. 500 words, approximately 1 page)

#### Contracting Authority

In line with the Accreditation Master Agreement that sets forth, among others, the general terms and condition between the Parties in connection with Funded Activity, AFD (AE) will enter into Funded Activity Agreement with the Green Climate Fund. Furthermore, the Accredited Entity will carry out the project through signing a Subsidiary Agreement (SA) with the IOC as the Executing Entity, representing the beneficiary countries. This SA and its related documents will specify the mandates, duties and engagements related to IOC and related to national counterparts beneficiaries of the project, specifically, National Service Providers of each beneficiary countries.

For the implementation of the Project, the IOC (EE) will enter into contractual agreements with each of the Ministry of Foreign Affairs (MoFA) of Beneficiary countries which. The Contractual arrangements can take the shape of a “Project Agreement (PA)”.

The contractual agreements to be established between the EE (IOC) and each of the four countries shall designate the NMHSs, as lead implementing entities, in each of the four target countries, wherein all the activities and funds allocated will be described, as well as their functions and responsibilities throughout the project implementation.

At National level, each MoFA will also sign an agreement with line ministries of the National Meteorological and Hydrological Services or with the concerned Agencies directly such as for Seychelles and Comoros, and with Disaster Risk Management Institutions, and each entity considered as national services providers in the project context. These agreements aim at clarifying the mandates, roles and commitments of each party.

#### Procurement

AFD's Procurement rules are in line with international standards provided by the World Bank Group. The AFD Procurement guidelines will apply to the EE, in charge of implementing the Hydromet project. For a detailed presentation of AFD Procurement rules, see the Procurement Guidelines for AFD Financed Contracts in Foreign Countries available on AFD's website.

<https://www.afd.fr/sites/afd/files/2017-09/directives-passation-marches-etats-etranagers-english-version.pdf>.

All procurement undertaken will be done by the EE (IOC) and based on AFD procurement guidelines. On the procurement process the EE (IOC), will be supported by the Project Management Unit. PMU will be mandated to (i) monitor the procurement plan implementation and its updates, (ii) to draft the tender dossiers internally and or by the mobilization of qualified experts, procure, and assess the bids under the bids under EE supervision (iii) to supervise the implementation. The EE will be the unique signatory of services and equipment's contracts.

#### AFD supervision of the project

AFD will provide no-objections :

- 1) Prior to the signing of the Contractual agreement between EE and MoFA and contractual agreement between MoFA and National line ministries or beneficiary entities,
- 2) On semi-annual national reporting Progress Reports, and on annual technical and financial work plan prepared by the PMU,
- 3) On every step of a tendering process according to its own procedures.

Bi annual supervision missions will take place; including mobilization of headquarters expertise. Environmental, social and gender AFD expert staff could be assigned to the monitoring of the ESMP and Gender Action Plan.

### **Financial Management**

The detailed provisions regarding financial management of the GCF resources by AFD will be described in the Funded Activity Agreement (FAA) signed between GCF and AFD. Reporting will be provided by AFD to the GCF specifying among others: 1) the amounts already committed and disbursed by AFD to the EE; 2) the remaining amount; and iii) a provisional disbursement schedule on a one-year rolling horizon. Annual Performance Reports (APR) will be submitted to GCF following the reporting requirements detailed in the FAA. These reports will include a narrative on the implementation progress based on the logical framework, considerations on the ongoing performance of the project, updates on the indicators, and on ESS as well as gender. The APR will be submitted to the Secretariat on an annual basis for the period ending on 31 December within 60 days after the end of the relevant annual period. The first APR will be submitted following the end of the calendar year after the Parties have entered into the relevant FAA and the last APR will be submitted within six months of the end of the relevant reporting period. The implementation reporting period of the Project will start from the date of effectiveness of the FAAs until the project implementation end date. Mid-term and final independent evaluation of the project will be organised.

### **Accounting and disbursements**

The subsidy agreement to be signed between AFD and IOC will establish the terms and conditions of the cooperation, and define clear roles and responsibilities for both parties. The projects AFD, EU and GCF funds will be directly and exclusively managed by the EE (IOC), through a dedicated project account to be open and managed by IOC, and by AFD (AE). Disbursements will take the form of advance payment to the EE (IOC) or direct payment by the AE (AFD) to firms contracted for works, supply of goods or services. There will be no direct management of the funds or any disbursements to the national Entities or NHMS.

Payments in the form of advances, except for the first advance, will be made under the following conditions:

- The result of the audit carried out on the previous advance is satisfactory to the AFD;
- These audits are carried out by an independent audit firm selected by IOC, after the AFD has given notice of no objection to the terms of reference of the audit assignment and to the audit firm selected.

As the AE, AFD will disburse funding received from the GCF and the EU, EE must open a separate bank account for the project; this ensures transparency regarding financial transactions and renders audits more efficiently. The EE, with the support of the PMU; will be the manager of the revolving advance project account. Revolving Advance payments will be made by AFD at the request of IOC, based on the issuance of activity reports and according to the disbursement schedule of the convention. The advance payments tranches will be used for :

- i) signed services contacts with a maximum amount of thousand dollars (100,000 EUR),
- ii) payment of PMU staff members, and PMU set-up and running costs.

Each request to be introduced by the EE for a new advance payment drawdown should be accompanied by the necessary proof of consumption of funds from the previous advance tranches (70% of the previous (N-1) and 100% of the advance (N-2) and all other relevant documents and services contracts.

For all contract providers of goods and services with an amount superior to thousands euros (100,000 EUR), direct payments will be covered by AFD.

As IOC is in the process of acquiring GCF accreditation, it will benefit from capacity development in the project from acting as EE.

During the disbursement period, AFD will receive semi-annual reports from IOC on implementation to track progress and identify potential issues as well as improvement opportunities. The RPC will liaise with AFD every quarter to report on project implementation. AFD will also be represented at the Project Regional Steering Committee organised every year. Controls will be performed before every disbursement by the PMU Financial Officer so as to continuously oversee the correct implementation of the project. Accounting and financial audits will be conducted by an independent third party. At the end of the disbursement period, AFD will prepare a project completion report summarising the main events of the implementation phase, the results achieved, and the lessons learned. This report will also provide recommendations for future improvement.

### Cash Flow

The figure below depicts the flow of funds between IFIs, the AE, the EE and the providers of services, goods and equipment.

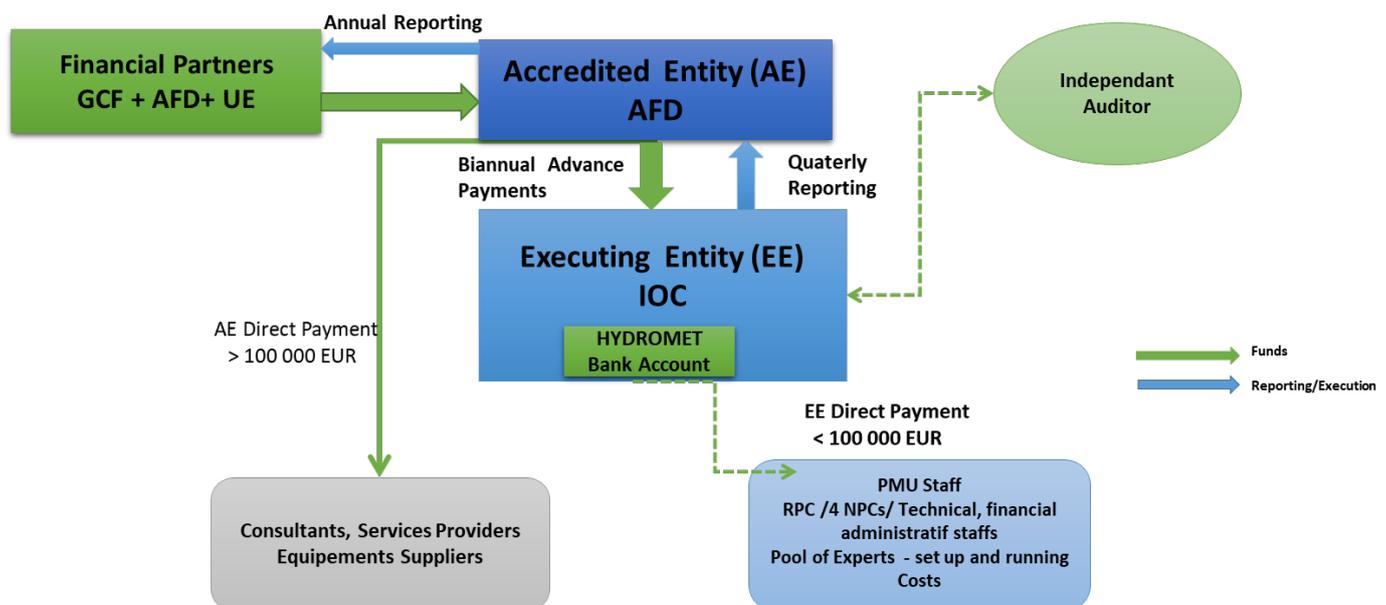


Figure 4: Flow of Funds

### G.4. Disclosure of funding proposal

**No confidential information:** The accredited entity confirms that the funding proposal, including its annexes, may be disclosed in full by the GCF, as no information is being provided in confidence.

**With confidential information:** The accredited entity declares that the funding proposal, including its annexes, may not be disclosed in full by the GCF, as certain information is being provided in confidence. Accordingly, the accredited entity is providing to the Secretariat the following two copies of the funding proposal, including all annexes:

- full copy for internal use of the GCF in which the confidential portions are marked accordingly, together with an explanatory note regarding the said portions and the corresponding reason for confidentiality under the accredited entity's disclosure policy, and
- redacted copy for disclosure on the GCF website.

The funding proposal can only be processed upon receipt of the two copies above, if containing confidential information.

## H. ANNEXES

### H.1. Mandatory annexes

- Annex 1 NDA no-objection letter(s) [\(template provided\)](#)
- Annex 2 Feasibility study - and a market study, if applicable
- Annex 3 Economic and/or financial analyses in spreadsheet format
- Annex 4 Detailed budget plan [\(template provided\)](#)
- Annex 5 Implementation timetable including key project/programme milestones [\(template provided\)](#)
- Annex 6 E&S document corresponding to the E&S category (A, B or C; or I1, I2 or I3):  
[\(ESS disclosure form provided\)](#)
  - Environmental and Social Impact Assessment (ESIA) or
  - Environmental and Social Management Plan (ESMP) or
  - Environmental and Social Management System (ESMS)
  - Others (please specify – e.g. Resettlement Action Plan, Resettlement Policy Framework, Indigenous People’s Plan, Land Acquisition Plan, etc.)
- Annex 7 Summary of consultations and stakeholder engagement plan
- Annex 8 Gender assessment and project/programme-level action plan [\(template provided\)](#)
- Annex 9 Legal due diligence (regulation, taxation and insurance)
- Annex 10 Procurement plan [\(template provided\)](#)
- Annex 11 Monitoring and evaluation plan [\(template provided\)](#)
- Annex 12 AE fee request [\(template provided\)](#)
- Annex 13 Co-financing commitment letter, if applicable [\(template provided\)](#)
- Annex 14 Term sheet including a detailed disbursement schedule and, if applicable, repayment schedule

### H.2. Other annexes as applicable

- Annex 15 Evidence of internal approval [\(template provided\)](#)
- Annex 16 Map(s) indicating the location of proposed interventions
- Annex 17 Multi-country project/programme information [\(template provided\)](#)
- Annex 18 Appraisal, due diligence or evaluation report for proposals based on up-scaling or replicating a pilot project
- Annex 19 Procedures for controlling procurement by third parties or executing entities undertaking projects financed by the entity
- Annex 20 First level AML/CFT (KYC) assessment
- Annex 21 Operations manual (Operations and maintenance)
- Annex 22 HYCOS Feasibility Study 2019

*\* Please note that a funding proposal will be considered complete only upon receipt of all the applicable supporting documents.*

No-objection letter issued by the national designated authority(ies) or focal point(s)

UNION DES COMORES

Unité - Solidarité - Développement

Ministère de l'Agriculture,  
de la Pêche, et de l'Environnement,

Direction Générale  
de l'Environnement et des Forêts



جمهورية القمر المتحدة

الوحدة - التضامن - التنمية

والزراعة والصيد والبيئة

إدارة العام للبيئة والغابات

Moroni, on 23 April 2020

Réf. N°20 - 06 /MAPE/NDA

To  
The Green Climate Fund (GCF)  
Korea

**Subject:** Funding proposal for the GCF by **Agence Française de Development (AFD)** regarding Building Regional Resilience through Strengthened Meteorological, Hydrological and Climate Services in the Indian Ocean Commission Member Countries (**Hydromet Project**)

Dear Madam, Sir,

We refer to the project **Hydromet** as in Union of Comoros included in the funding proposal submitted by **AFD** to us on 27 April 2020.

The undersigned is the duly authorized representative of youssouf **HAMADI**, the National focal point of Union of Comoros.

Pursuant to GCF decision B.08/10, the content of which we acknowledge to have reviewed, we hereby communicate our no-objection to the project as included in the funding proposal.

By communicating our no-objection, it is implied that:

- The government of Union of Comoros has no-objection to the project as included in the funding proposal;
- The project as included in the funding proposal is in conformity with Comoros's national priorities, strategies and plans;
- In accordance with the GCF's environmental and social safeguards, the project as included in the funding proposal is in conformity with relevant national laws and regulations.

We also confirm that our national process for ascertaining no-objection to the project as included in the funding proposal has been duly followed.

[We also confirm that our no-objection applies to all projects or activities to be implemented within the scope of the project

We acknowledge that this letter will be made publicly available on the GCF website.

Kind regards,

youssouf **HAMADI**  
GCF focal point of Union of Comoros





Antananarivo, 28 JAN 2020

To: The Green Climate Fund ("GCF")

Re: Funding proposal for the GCF by Agence Française de Développement (AFD) regarding Building Regional Resilience through Strengthened Meteorological, Hydrological and Climate Services in the Indian Ocean Commission Member Countries (Hydromet Project)

Dear Madam, Sir,

We refer to the project Building Regional Resilience through Strengthened Meteorological, Hydrological and Climate Services in the Indian Ocean Commission Member Countries (Hydromet Project) in Madagascar as included in the funding proposal submitted by Agence Française de Développement (AFD) to us on December 20<sup>th</sup>, 2019.

The undersigned is the duly authorized representative of the Ministry of Environment and Sustainable Development, the National Designated Authority/focal point of Madagascar.

Pursuant to GCF decision B.08/10, the content of which we acknowledge to have reviewed, we hereby communicate our no-objection to the **Building Regional Resilience through Strengthened Meteorological, Hydrological and Climate Services in the Indian Ocean Commission Member Countries (HydrometProject)** as included in the funding proposal.

By communicating our no-objection, it is implied that:

- (a) The government of Madagascar has no-objection to the project as included in the funding proposal;
- (b) The project as included in the funding proposal is in conformity with Madagascar's national priorities, strategies and plans;
- (c) In accordance with the GCF's environmental and social safeguards, the project as included in the funding proposal is in conformity with relevant national laws and regulations.

We also confirm that our national process for ascertaining no-objection to the project as included in the funding proposal has been duly followed.

We also confirm that our no-objection applies to all projects or activities to be implemented within the scope of the programme.

We acknowledge that this letter will be made publicly available on the GCF website.

Kind regards,

\_\_\_\_\_  
Name: Lovakanto RAVELOMANANA

Title: National Designated Authority/Focal Point of Madagascar





## MINISTRY OF FINANCE, ECONOMIC PLANNING AND DEVELOPMENT

Government Centre, Port Louis, Mauritius

In reply please quote: CF/50/70/85 V6

24 April 2020

**Mr Yannick Glemarec**  
**Executive Director, Green Climate Fund**  
**G-Tower, Songdo Business District**  
**175 Art Centre-Daero**  
**Yeonsu-gu, Incheon 22004**  
**Republic of Korea**

**Re: regarding “Building Regional Resilience through Strengthened Meteorological, Hydrological and Climate Services in the Indian Ocean Commission (IOC) Member Countries”**

Dear Sir,

We refer to the project “Building Regional Resilience through Strengthened Meteorological, Hydrological and Climate Services in the Indian Ocean Commission (IOC) Member Countries” as included in the funding proposal submitted by Agence Française de Développement (AFD) on 30 March 2020.

The undersigned is the duly authorized representative of the Ministry of Finance, Economic Planning and Development, the National Designated Authority of Mauritius.

Pursuant to GCF decision B.08/10, the content of which we acknowledge to have reviewed, we hereby communicate our no-objection to the project as included in the funding proposal. By communicating our no-objection, it is implied that:

- (a) The government of the Republic of Mauritius has no-objection to the project as included in the funding proposal;
- (b) The project as included in the funding proposal is in conformity with the Republic of Mauritius’s national priorities, strategies and plans;
- (c) In accordance with the GCF’s environmental and social safeguards, the project as included in the funding proposal is in conformity with relevant national laws and regulations.

We also confirm that our national process for ascertaining no-objection to the project as included in the funding proposal has been duly followed.

We acknowledge that this letter will be made publicly available on the GCF website.

Yours faithfully,

**G. Bussier**  
**Deputy Financial Secretary**

MINISTRY OF ENVIRONMENT, ENERGY & CLIMATE CHANGE  
ENERGY AND CLIMATE CHANGE DEPARTMENT

Office of the Principal Secretary

Botanical Gardens, Mont Fleuri, P.O. Box 445, Victoria, Mahe, Republic of Seychelles

Tel. No. (+248) 4670568

Email: [w.agricole@env.gov.sc](mailto:w.agricole@env.gov.sc) / [w.agricole@meteo.gov.sc](mailto:w.agricole@meteo.gov.sc)



*Please address all correspondence to the Principal Secretary – Mr Wills Agricole*

**DATE:** 5<sup>th</sup> February, 2020

**Yannick Glemarec**  
**Executive Director**  
**Green Climate Fund**

Songdo Business District  
175 Art Center-daero  
Yeonsu-gu, Incheon 22004

**REPUBLIC OF KOREA**

**Re: Funding proposal for the GCF by Indian Ocean Commission regarding “Building Regional Resilience through strengthening Meteorological, hydrological and climate service in the Indian Ocean Commission member states (Hydromet)”**

Dear Sir,

We refer to the **“Building Regional Resilience through strengthening Meteorological, hydrological and climate service in the Indian Ocean Commission member states (Hydromet)”** project in Seychelles as included in the funding proposal submitted by Indian Ocean Commission to us on 31<sup>st</sup> January, 2020.

The undersigned is the duly authorized representative of the Green Climate Fund (GCF) NDA of SEYCHELLES. Pursuant to GCF decision B.08/10, the content of which we acknowledge to have reviewed, we hereby communicate our no-objection to the project as included in the funding proposal.

By communicating our no-objection, it is implied that:

- a) The government of Seychelles has no-objection to the project as included in the funding proposal;
- b) The project as included in the funding proposal is in conformity with Seychelles’ national priorities, strategies and plans;

- c) In accordance with the GCF's environmental and social safeguards, the project as included in the funding proposal is in conformity with relevant national laws and regulations.

We also confirm that our national process for ascertaining no-objection to the project as included in the funding proposal has been duly followed.

We also confirm that our no-objection applies to all projects or activities to be implemented within the scope of the project. We acknowledge that this letter will be made publicly available on the GCF website.

Kind regards,

A handwritten signature in blue ink, appearing to read 'Wills Agricole', with a horizontal line underneath.

Wills Agricole (Mr.)

**GCF NDA OF SEYCHELLES AND**  
**PRINCIPAL SECRETARY/ENERGY & CLIMATE CHANGE**

## Environmental and social safeguards report form pursuant to para. 17 of the IDP

<b>Basic project or programme information</b>	
<b>Project or programme title</b>	Building Regional Resilience through Strengthened Meteorological, Hydrological and Climate Services in the Indian Ocean Commission (IOC) Member Countries (Hydromet Project)
<b>Existence of subproject(s) to be identified after GCF Board approval</b>	No
<b>Sector (public or private)</b>	Public
<b>Accredited entity</b>	Agence Française de Développement (AFD)
<b>Environmental and social safeguards (ESS) category</b>	Category B
<b>Location – specific location(s) of project or target country or location(s) of programme</b>	Comoros, Madagascar, Mauritius, and Seychelles
<b>Environmental and Social Impact Assessment (ESIA) (if applicable)</b>	
Date of disclosure on accredited entity's website	Wednesday, February 3, 2021
Language(s) of disclosure	English and French
Explanation on language	French is an official language of Comoros, Madagascar, and Seychelles.  English is the official language of Mauritius and an official language of Seychelles.
Link to disclosure	English: <a href="https://www.afd.fr/en/ressources/hydromet-project-annex-6-environmental-and-social-management-framework">https://www.afd.fr/en/ressources/hydromet-project-annex-6-environmental-and-social-management-framework</a>  French: <a href="https://www.afd.fr/fr/ressources/projet-hydromet-annexe-6-cadre-de-gestion-environnementale-et-sociale">https://www.afd.fr/fr/ressources/projet-hydromet-annexe-6-cadre-de-gestion-environnementale-et-sociale</a>
Other link(s)	<a href="https://www.afd.fr/en/e-s-complaints-mechanism">https://www.afd.fr/en/e-s-complaints-mechanism</a>
Remarks	An ESIA consistent with the requirements for a Category B project is contained in the “Environmental and Social Management Framework”.
<b>Environmental and Social Management Plan (ESMP) (if applicable)</b>	
Date of disclosure on accredited entity's website	Wednesday, February 3, 2021
Language(s) of disclosure	English and French
Explanation on language	French is an official language of Comoros, Madagascar, and Seychelles.  English is the official language of Mauritius and an official language of Seychelles.

Link to disclosure	<p>English:  <a href="https://www.afd.fr/en/ressources/hydromet-project-annex-6-environmental-and-social-management-framework">https://www.afd.fr/en/ressources/hydromet-project-annex-6-environmental-and-social-management-framework</a></p> <p>French:  <a href="https://www.afd.fr/fr/ressources/projet-hydromet-annexe-6-cadre-de-gestion-environnementale-et-sociale">https://www.afd.fr/fr/ressources/projet-hydromet-annexe-6-cadre-de-gestion-environnementale-et-sociale</a></p>
Other link(s)	<a href="https://www.afd.fr/en/e-s-complaints-mechanism">https://www.afd.fr/en/e-s-complaints-mechanism</a>
Remarks	An ESMP consistent with the requirements for a Category B project is contained in the “Environmental and Social Management Framework”.
<b>Environmental and Social Management (ESMS) (if applicable)</b>	
Date of disclosure on accredited entity’s website	N/A
Language(s) of disclosure	N/A
Explanation on language	N/A
Link to disclosure	N/A
Other link(s)	N/A
Remarks	N/A
<b>Any other relevant ESS reports, e.g. Resettlement Action Plan (RAP), Resettlement Policy Framework (RPF), Indigenous Peoples Plan (IPP), IPP Framework (if applicable)</b>	
Description of report/disclosure on accredited entity’s website	N/A
Language(s) of disclosure	N/A
Explanation on language	N/A
Link to disclosure	N/A
Other link(s)	N/A
Remarks	N/A
<b>Disclosure in locations convenient to affected peoples (stakeholders)</b>	
Date	Wednesday, February 3, 2021
Place	<p>In the vicinity of the four National Meteorological and Hydrological Services sites, where some of the national consultations were conducted with stakeholders (e.g. local NGOs). National Meteorological and Hydrological Services addresses are:</p> <p>Comoros: Agence Nationale de l’Aviation Civile et de la Météorologie (ANACM), BP 72, Moroni</p> <p>Madagascar: Direction Générale de la Météorologie (DGM), Rue FARAFATY. BP 1254 Ampandrianomby, Antananarivo (101)</p> <p>Mauritius: Mauritius Meteorology Services (MMS), Saint Paul Road, Vacoas</p> <p>Seychelles: Seychelles Meteorological Authority (SMA), PO Box :1604 International Airport, Mahe</p>

	Disclosure has also been made on the Commission de l'Océan Indien website: <a href="https://www.commissionoceanindien.org/portfolio-items/hydromet/">https://www.commissionoceanindien.org/portfolio-items/hydromet/</a>
<b>Date of Board meeting in which the FP is intended to be considered</b>	
Date of accredited entity's Board meeting	Thursday, June 18, 2020
Date of GCF's Board meeting	Tuesday, March 16, 2021

**Note: This form was prepared by the accredited entity stated above.**

## Secretariat's assessment of FP161

Proposal name:	Building Regional Resilience through Strengthened Meteorological, Hydrological and Climate Services in the Indian Ocean Commission (IOC) Member Countries
Accredited entity:	Agence Française de Développement (AFD)
Country/(ies):	Comoros, Madagascar, Mauritius, and Seychelles
Project/programme size:	Medium

### I. Overall assessment of the Secretariat

1. The funding proposal is presented to the Board for consideration with the following remarks:

Strengths	Points of caution
Four South-West Indian Ocean countries will benefit from substantially strengthened ability to generate and effectively use climate data	The financial sustainability of operations and maintenance will be critical to the proposal's success after the project implementation period
Reaches total population of the project countries: improvements to early warning and early action, impact-based forecasting, forecast-based financing	

2. The Board may wish to consider approving this funding proposal with the terms and conditions listed in the term sheet and addendum XVII, titled "List of proposed conditions and recommendations", respectively.

### II. Summary of the Secretariat's assessment

#### 2.1 Project background

3. Comoros, Madagascar, Mauritius and Seychelles are all highly vulnerable to natural hazards amplified by climate change factors. The four countries, all located in the South-West Indian Ocean region, must deal with tropical cyclones and heavy rainfalls, which in turn cause floods, flash floods, landslides and drought. Rising sea levels also increase coastal vulnerability. Tropical cyclones represent a frequent and substantial threat and have been responsible for significant historical economic losses and casualties. In order to better manage and prepare for these threats to the lives and livelihoods of these four countries, the proposed project will support investments to produce high-quality impact-based climate-related products and services, including early warning systems (EWS), at the regional and national levels. These products and services will be more accurate, location-specific, and user-tailored, and they will increase lead time to prepare for climate-related hazards.

4. Currently, Comoros and Madagascar have low capacity to deliver weather, climate, and hydrological services, often referred to as "hydromet services." These countries require support to achieve the "Basic" level of hydromet services as defined by World Meteorological

Organization (WMO) standards. Mauritius and Seychelles are at the “Basic” level. This project proposal will raise the capacity of the respective National Meteorological and Hydrological Services (NMHSs) of Comoros, Madagascar, Mauritius and Seychelles to the “Essential” level, meaning that all four countries can develop and provide climate predictions including seasonal climate outlooks, work with users in various sectors to identify their weather and climate data requirements, and provide advice on climate information and products.

5. The proposed project takes a regional approach, which the accredited entity (AE) argues is key as the four target countries are vulnerable to similar climate-related hazards and face identical problems, challenges and needs. Project design focuses on sharing expertise and tools between regional and national levels to reach a similar level of operational capacity in each country, ensuring robust interoperability, efficiencies and optimization of infrastructure costs.

6. The project cost totals USD 71.4 million. The total figure is comprised of USD 52.8 million applied from the GCF, USD 5.4 million in co-financing contributions by French Development Agency (AFD) and USD 6.2 million from the European Union’s Intra-ACP Climate Services Program. Project countries will contribute USD 6.9 million in a mix of cash and in-kind contributions.

7. The Secretariat team has assessed the proposal’s environmental and social safeguards (ESS) and concurs with the AFD Category B rating.

## 2.2 Component-by-component analysis

### Component 1: Capacity-building, institutional development, regional cooperation and public-private engagement (total cost: USD 8.5 million; GCF cost: USD 1.5 million)

8. Component 1 aims to strengthen regional cooperation through targeted investments in capacity building and institutional development. Through the component a regional climate centre network (RCC-Network) will be established among the Indian Ocean Commission (IOC) member countries. Regional and national frameworks for climate services to be developed through the project should enable the development and delivery of climate services at the respective levels. Institutional strengthening, including the business models/plans for the respective NMHS, will also be implemented to achieve financial returns and retain skilled staff. Hydromet regulatory material will be reviewed to explore opportunities to establish or strengthen existing national funds for climate information and early warning services.

9. Key strengths of Component 1 include the exploration of new business models with a cost-recovery plan for each NMHS (Activity 1.2.1). Each business model/plan is key to ensure the long-term maintenance and operation of the NMHSs, the sustainability of new equipment and software, and yearly funding for the National Climate Outlook Forums. While the RCC-Network will also include business plans to engage the private sector in the region, its cost effectiveness and usefulness is somewhat difficult to assess.

### Component 2: High-quality climate-related data, improved multi-hazard impact-based forecasts and EWS (MH-IBF-EWS), and climate risk assessments (total cost: USD 32.1 million; GCF cost: USD 28.9 million)

10. Component 2 represents the project’s core hydromet infrastructure and systems investments as well as the capacity-building needed to successfully operate that infrastructure. It also represents the majority of GCF funding requested. Under Component 2, observation and monitoring network equipment and information systems will be modernised in line with WMO technical standards. A regional maintenance and calibration laboratory (WMO Regional Instrument Centre) will be established to optimize the maintenance and calibration of this equipment. In addition, the technical capacities and expertise of NMHS staff members will be

improved through specialized training. Data centres will also be established at regional and national levels and a quality management system will be put in place.

11. While the proposed project has put in place arrangements for the operation and maintenance (O&M) of the equipment and systems, this has been an issue for previous investments and therefore remains a concern and risk factor. The long-term viability and usefulness of these investments will hinge on the ability of the NHMS and the IOC to successfully operate and maintain investments in this component in particular, and project investments more broadly.

*Component 3: Enhanced accessibility and use of climate services for climate change adaptation, and improved capabilities in implementing a people-centred MH-IBF-EWS for disaster risk reduction (total cost: USD 17.3 million; GCF cost: USD 16.8 million)*

12. Through Component 3, climate products and services will be used to reduce vulnerability and increase resilience of vulnerable socioeconomic groups. NMHSs will also be able to consult with end users to improve the quality and usefulness of their climate-related information, products and services. Component 3 particularly aims at equipping decision-makers and communities with the tools they need to prepare for climate-related hazards and to adapt to short- and long-term climate variability and change. Long-term climate change adaptation plans will be updated in line with new results from the climate change projections supported under Component 2.

13. Component 3 is critical to ensure that the climate information and data generated reaches the end users most vulnerable to climate change hazards. In addition, improved daily weather bulletins, seasonal forecasts, and agrometeorological advisories will add value and build resilience among key climate-vulnerable sectors.

*Operations and maintenance and contingency costs (total cost: USD 9.3 million; GCF cost: USD 3.4 million)*

14. During the project implementation period, Madagascar and Seychelles will fully finance their respective O&M costs, while a combination of GCF grant funding and government in-kind contributions will pay for the O&M costs of Comoros and Mauritius.

15. After completion of the proposed project, O&M costs will be supported by government funds. Alternatively, the project country governments will seek prospective O&M funding from the new Global Basic Observing Network/Systematic Observations Financing Facility (GBON/SOFF) initiative and/or cost-recovery from the commercialized new climate products and services. There is also the potential establishment of a ring-fenced Climate Information and Early Warning System (CIEWS) through a Hydromet Law. Supporting details of post-implementation O&M are elaborated in the Operations and Management Plan annex.

*Project management (total cost: USD 2.9 million; GCF cost: USD 2.1 million)*

16. GCF is the primary funder of project management costs and the expected share is within GCF policy limits.

### **III. Assessment of performance against investment criteria**

17. This is a large, ambitious project with many expected outcomes and beneficiaries. The principal investment will be in the meteorological and hydrological observation networks, for which significant infrastructure is proposed. However, this is necessary to improve the services being delivered by the NHMS of the four countries as they address the issues and complexities of a new climate paradigm.

18. One of the key issues likely to emerge from the project in the longer term will be capacity development and subsequently the project's sustainability if that capacity development

is not achieved. The establishment of a regional training centre to address the need for capacity development will be a key factor for the long-term success of the project and some additional detail on this would be useful.

19. However, the project appears to be transformative and innovative and has the scope to significantly improve the lives and livelihoods of many of the residents of Comoros, Madagascar, Mauritius and Seychelles.

### 3.1 Impact potential

*Scale: High*

20. The South-West Indian Ocean African small island developing States of Comoros, Madagascar, Mauritius and Seychelles are extremely vulnerable to natural hazards and climate change, especially tropical cyclones and heavy rainfalls, leading to floods, flash floods and landslides, drought, increased temperatures and sea level rise. Scientific observations confirm shifts in the climate patterns observed in the South-West Indian Ocean region, including more floods (both directly and indirectly associated with tropical cyclones) and drought, based on a comparison of the periods 1961–1990 and 1991–2020, as well as increased temperatures. Climate-related disasters in Comoros, Madagascar, Mauritius and Seychelles have affected about 14.4 million people in the period 1964–2014, with physical damage estimated at USD 13.1 billion, and are expected to further increase in the context of climate change.

21. Improvements in services warning of high-impact climate and weather events are imperative in order to increase the resilience and safety of nations in the future. Without this proposed intervention, it is likely that, minimally, Comoros and Madagascar will be locked in a vicious cycle of extreme poverty among the most vulnerable communities as they struggle to recover from a cascade of seasonal and annual hurricanes and related climate disasters. The urgency and benefits of building resilience through anticipatory action to improve their critical services, infrastructure and living standards through this project cannot be overemphasized.

22. The total number of beneficiaries (combined direct and indirect) of these interventions is estimated to be 29,241,477 across the four countries, of which at least 50 per cent will be women beneficiaries. The direct project beneficiaries are estimated to amount to 19,453,286 people representing 67 per cent of the total population, with indirect beneficiaries amounting to 9,788,191 people.

### 3.2 Paradigm shift potential

*Scale: Medium–High*

23. The proposed hydromet project is designed to strengthen the resilience of the most vulnerable communities by modernizing hydromet and disaster management services; strengthening national and regional institutional frameworks; fostering regional cooperation; and expanding climate knowledge and awareness. The regional approach is key to underpinning improvements in the production and dissemination of climate services through economy of scale, as the four target countries are vulnerable to similar climate-related hazards and socioeconomic conditions. It would ensure robust interoperability, efficiencies and optimization of infrastructure costs, together with a higher level of harmonization, integration and complementarity within the region.

24. The proposed project seeks to introduce innovative approaches to impact-based forecasting and forecast-based financing to ensure that last-mile delivery is based on the best available science and practices that target the most vulnerable with actionable risk information. It will provide observation networks to detect and monitor changes in the oceans, land and atmosphere through radar, cloud, Internet of Things and big data analytics technologies that are compliant with the WMO Global Basic Observing Network standards. It is envisaged that this will significantly improve forecast accuracy and lead times, thereby enabling better anticipatory

planning and action. Collectively, these actions will reduce the cost of both the production and delivery of climate information and early warning services.

25. The proposal also seeks to establish a regional training centre for capacity development as an important initiative that requires significant investment in order to attract and sustain appropriately qualified staff. The proposal does not provide clear information on where these staff will be recruited or trained. The regional training centre will help to build the capacity of national institutions in the production of robust meteorological, hydrological, climatological and engineering solutions to build resilience in the region.

26. The proposal directly addresses several GCF outcomes for adaptation, namely: (i) A5.0: strengthened institutional and regulatory systems for climate-responsive planning and development; (ii) A6.0: increased generation and use of climate information in decision-making; (iii) A7.0: strengthened adaptive capacity and reduced exposure to climate risks; and (iv) A8.0: strengthened awareness of climate threats and risk-reduction processes.

### 3.3 Sustainable development potential *Scale: Medium–High*

27. Each year, Comoros, Madagascar, Mauritius and Seychelles collectively face up to USD 251.45 million in losses due to natural hazards. Related threats to livelihoods and economic growth in these island countries are increasing, exacerbating the baseline situation.

28. The proposal states that improvements in forecast accuracy and lead times for location-specific weather forecasts will enable better agricultural planning and decision-making, such as accurate scheduling of calendars for the agriculture sector. The impact-based forecasts will also facilitate risk-prevention measures, and timely early warnings will enable the protection of lives, buildings, fisheries, tourism, agricultural equipment and harvests, among other assets.

29. The proposal will provide significant environmental, economic and social co-benefits. It will directly contribute to the following Sustainable Development Goals (SDGs): (i) SDG 1: End poverty in all its forms everywhere; (ii) SDG 2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture; (iii) SDG 3: Ensure healthy lives and promote well-being for all at all ages; (iv) SDG 11: Make cities and human settlements inclusive, safe, resilient and sustainable; (v) SDG 13: Take urgent action to combat climate change and its impacts; and (vi) SDG 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development.

### 3.4 Needs of the recipient *Scale: High*

30. Comoros and Madagascar are classified as least developed countries, while Mauritius is classified as an upper-middle-income country and Seychelles as an upper-income country.

31. The four countries must deal with tropical cyclones and heavy rainfalls, which in turn cause floods, flash floods, landslides and drought. Rising sea levels also increase coastal vulnerability. Tropical cyclones represent a frequent and substantial threat and have been responsible for significant historical economic losses and casualties. There is clear evidence that all four nations are vulnerable to climate change and that this will have a significant impact on their gross domestic product.

32. All four countries are developing substantial legislative responses to climate change, as well as climate change policies. They have all adopted nationally determined contributions, and Comoros and Madagascar have submitted their national adaptation programmes of action. All countries, except Seychelles, are in the process of developing their national adaptation plan. Other relevant domestic policies include Comoros' National Strategic Plan 2017–2020, Madagascar's National Climate Change Management Policy (2012), Mauritius' National Climate

Change Adaptation Policy Framework (2012), and Seychelles' National Climate Change Strategy (2009) and Climate Change Policy.

### 3.5 Country ownership

*Scale: Medium*

33. The project was endorsed at the political level by the IOC Council of Ministers. It is well aligned with and supports several policies and strategies currently implemented both at the IOC level and in the four countries, in particular their nationally determined contributions, the SDGs, the African Union's Agenda 2063, and the Sendai Framework for Disaster Risk Reduction 2015–2030. However, the proposal will benefit from additional evidence in the form of a high-level commitment towards contributions to the operation and maintenance of the investments in each of the target countries.

34. Strong community engagement will be necessary to enable the advances made by the NMHS to be translated into more effective and inclusive early warning services. Some references in the funding proposal indicate that national emergency management services are involved (e.g.: "The government of these four countries, as well as users and end-users of Climate Products and Climate Services (CP-CS) such as sectoral ministries, private sector and local communities, have been consulted during the process of preparing this proposal"); however, there appear to be insufficient details on addressing the "last mile" and communicating the messages to the most vulnerable populations. The Secretariat highly recommends that the AE take the necessary steps to enhance coherence and complementarity among the institutions involved in disaster management, both at the national and regional levels. Also, since the project focuses on resilience-building, equal attention should be placed on disaster management agencies and hydromet services.

### 3.6 Efficiency and effectiveness

*Scale: Medium–High*

35. The proposal indicates that the project will build on, scale up and complement past and ongoing regional and national initiatives and projects. To ensure complementarity and identify synergies with existing and planned projects, meetings have been conducted in the four countries with multilateral and bilateral development partners that are strongly involved in the region, specifically in developing hydromet projects.

36. It is estimated that the benefits resulting from the intervention will lead to improved agricultural revenues in the four countries amounting to around USD 29.9 million per year for the period 2026–2030 and up to USD 59.8 million per year for the period 2031–2035, with a conservative assumption of a 10 per cent increase in yields for 10 per cent of the agriculture sector using agroclimatic services. The net present value (NPV) of the project is estimated at USD 230 million at a 5 per cent discount rate. Moreover, in the long term, revenues from the commercial services of the NHMS can be expected through the marketing of climate information and early warning services and will progressively complement and partly replace a portion of the public funding of NMHS, covering from 10 per cent (Comoros and Seychelles) to almost 30 per cent (Mauritius) of the budget for those services. The grant investments could lay the groundwork for potential future cost recovery through tailored information products.

37. The proposal explains that the four countries will be able to develop sustainable long-term business models for the reliable operation of the investments and recover the costs of O&M through revenue generation/cost recovery from commercial revenues, and through national budgetary support. The regional costs will be shared among the RCC-Network member countries, in accordance with the RCC-Network multilateral agreement signed between those countries under activity 1.1.2 of the proposed project. Moreover, in the long term, the development of commercial revenues may complement and eventually replace part of the

current public funding of NMHS. This indicates that the hydromet project-related interventions may no longer need to rely on international funding in the long term.

38. The executing entity (EE) will be the IOC, which will manage the project in close collaboration with AFD, which is the AE. The IOC will support four national project coordinators based within the NMHS of Comoros, Madagascar, Mauritius and Seychelles.

## **IV. Assessment of consistency with GCF safeguards and policies**

### **4.1 Environmental and social safeguards**

39. The proposed project is predominantly geared towards providing capacity-building and institutional strengthening interventions in the four target countries to provide improved climate services. The project will also provide new hydrometeorological equipment and tools for monitoring, data storage, data-processing, modelling, forecasting and service-delivery systems. One component of the project includes refurbishing and re-equipping existing weather stations and installing facilities for weather monitoring equipment. The AE assessed the project as potentially having environmental and social risks and impacts that are expected to be mostly minimal, with a few activities potentially having limited risks and impacts, particularly with respect to construction-related activities. The accredited entity (AE) has classified the project overall as category B under the GCF risk categorization system. The Secretariat agrees with the categorization and confirms that it is within the risk level to which the AE has been accredited. The AE has developed an environmental and social management framework to provide guidance on the actions to be applied during project implementation to manage the identified risks and impacts of the project.

40. The project's environmental co-benefits include reduced pressure on the extraction of wood for charcoal production that occurs when farmers look for other sources of income to compensate for climate-related losses in agricultural outputs. There will also be reduced pressure on water extraction because the improved climate-related data will result in the establishment of irrigation facilities, such as small dams, that are able to capture water more efficiently. Social co-benefits include better health and nutrition among the countries' populations as a result of a more secure food supply due to improved agricultural productivity. The exposure of communities to the risk of flooding will also be minimized as a result of the enhanced early warning systems in place.

41. The environmental and social risks and impacts of the project are primarily associated with the installation of new meteorological equipment such as the mounting on masts of new or rehabilitated automatic weather stations, the construction of Doppler radar units on small tower structures, and the installation of hydrological stations. Limited negative environmental and social impacts could potentially occur from construction-related installation works for the automatic weather stations, including the creation of temporary nuisance noise from operating the machinery and equipment, an increase in generation of solid wastes, and an increase in dust emissions due to excavation and civil works. Workers are also expected to be exposed to various occupational health and safety hazards. These issues will also be applicable to the installation of the Doppler radar units in each country. Occupational health and safety issues will be mitigated by following basic codes of good health and safety practices that will need to be followed by the contractors.

42. The modification and extension of existing buildings that house offices and weather station facilities are also expected to result in the generation of solid wastes. Some electronic-related wastes will also be generated and will need to be properly disposed of during the installation of computers and data-processing equipment. The use of solar panels as a source of electricity may also generate potentially hazardous wastes, which will need to be disposed of

through the competent authorities. The adverse impact of installing a number of wave-monitoring buoys and tidal gauges will be avoided by selecting appropriate sites where no impacts are expected on the marine flora and fauna.

43. The project is not expected to result in additional land acquisition or the relocation of households since most of the equipment that will be established or replaced will be in existing sites where local governments own the properties (e.g. airfields or government research institutes). Further, only a small parcel of land is required for each weather station (approximately 100 m<sup>2</sup>). To prevent the facilities from being vandalized, the communities surrounding the newly established or upgraded equipment will be informed of the project, and fences will be erected around the equipment.

44. The AE will have responsibility for overall oversight of implementation and monitoring of the safeguards policy during project implementation. The secretariat of the Indian Ocean Commission, as the executing entity, will be in charge of obtaining environmental, health and safety permitting requirements with the relevant national authorities. At the project level, a project management unit will be established, which will be staffed by technical experts, including an environmental and social officer who will ensure adequate implementation of project management and monitoring measures.

45. The project has conducted consultations with various stakeholders during the project development phase, including representatives from government departments of agriculture, fisheries and tourism. This included engaging with government officials, members of non-governmental organizations and potential beneficiary coastal villages and fishing communities. The consultation process is inclusive of all socioeconomic, ethnic and age groups. Further consultations and engagement with stakeholders and end-users will also be conducted during project implementation through implementation of the stakeholder engagement strategy. The AE has provided screening for indigenous peoples and states that the relevant standard will not be triggered owing to the historically mixed and multicultural societies in the project areas.

46. The project will establish a grievance redress mechanism; the related material will be translated into the local language and disseminated at all national project coordinator offices to provide stakeholders and potentially or likely to be affected communities and households with a means of providing feedback or expressing grievances and receiving responses with regard to the implementation of project activities. This will be set up at the project management unit, where a grievance and redress committee will be established to set out the necessary steps for disseminating information on the grievance redress mechanism regarding contact information and appropriate modes of lodging grievances. Aggrieved communities or individuals shall have access to grievance redress mechanisms at all three levels: the GCF Independent Redress Mechanism, the grievance redress mechanism of the AE, and the grievance redress mechanism at the project activity level.

## 4.2 Gender policy

47. The accredited entity (AE) provided a gender assessment and gender action plan and therefore complies with the requirements of the GCF Gender Policy.

48. In the gender assessment, the AE provided country-wide details on international policies, conventions, frameworks, and legal instruments ratified or signed by targeted countries, and highlighted national laws and governance mechanisms which help the targeted countries advance gender equality using enabling policy environments. The gender assessment undertaken by the AE was informed by a desk review as well as through stakeholder consultations which involved the participation of a significant number of women in all four targeted countries. The key indicators demonstrate a high degree of vulnerability of women and girls to interdependent social, economic and environmental factors. In spite of this, Seychelles,

per World Bank estimates, had the highest gross domestic product per capita in Africa in 2016, and consumption patterns increased substantially despite high poverty levels in Comoros.

49. The assessment highlights that women and men are affected differently by climate-induced disasters and respond disproportionately to climate services and early warning systems (EWS). It illustrates that women are more time-poor than men, whether employed or not, in targeted countries, irrespective of their employment status. Another dimension of time-poverty is the lack of opportunities to change current time-use patterns within households and explore other economic activities. Therefore, implementing gender-responsive measures involving the full participation of women might prove challenging at first, but is not impossible in the long run. In the targeted countries, women's engagement in entrepreneurial activities is highly restricted. Women also have a limited presence in the science, technology, engineering and mathematics (STEM) stream and normally do not earn equal wages as their male counterparts. Where women are employed, they occupy low-ranked positions and/or temporary or unskilled jobs. Despite having constitutional rights, women's land tenure and property rights are precarious. Ownership of property is in the name of the head of household (usually men). Men are dominant decision-makers within the household and the wider community. Men control most economic and productive resources and have easier access to capital, savings and investment opportunities than women, all of which are conditions considered crucial to achieving resilience, boosting adaptive capacities, responding to climate-induced disasters in a timely manner, and gaining access to relevant information and the ability to capitalize on adaptation opportunities.

50. The gender assessment identified gender-based violence (GBV) and intimate partner violence (IPV) as socially 'accepted' and deeply entrenched cultural norms across the countries. GBV persists as a shadow pandemic in the Indian Ocean region, including in the four targeted countries. The International Federation of Red Cross and Red Crescent Societies found that GBV is a constant theme in post-disaster contexts. In the Indian Ocean region, greater incidences of GBV and IPV usually result from negative shocks; loss of family members, livelihoods and homes; domestic conflicts; existence of patriarchal attitudes; high and regular unemployment rates among men; wife's economic dependence on her husband; and tolerance of violence. With increasing frequency and intensity of climate-related hazards and risks in the Indian Ocean region, GBV is expected to increase exponentially, reiterating the importance of resilience mechanisms and adaptation opportunities through gender-sensitive climate services and EWS interventions in targeted countries. GBV, including its causes and impacts, are fleshed out well in the gender assessment. The AE, through its focus on hydromet, climate services and EWS, will reduce gender-related vulnerabilities and mobilize partners to implement awareness-building campaigns and capacity development measures on GBV prevention for relevant ministries and existing or new staff/trainees, including women.

51. The AE has provided a gender action plan that contains relevant outcomes, outputs, activities, indicators and targets to ensure improved access by marginalized women to user-friendly technologies which would provide information on hydromet services, climate services and EWS. Keeping in mind the time-use patterns and time poverty faced by women, the AE will work with relevant stakeholders to optimize women's and girls' active participation in activities without fully disrupting their daily routines, advocate for reducing their unpaid work and/or redistribute their workloads. Additionally, separate consultations with women and girls will be held to help them express their opinions freely and without coercion. The gender action plan also contains means of verification and responsible units/persons, including gender experts. Costs for gender experts have been included in the plan. A gender expert will be recruited at the regional level and will be supported by a gender expert for each targeted country.

52. Activities identified in the gender action plan across the targeted countries are: (a) promote gender-informed capacity development through the design of training modules to support transition and development plans of the national ministry for hydromet services,

disaster risk reduction institutions and relevant sectorial ministries; (b) increase gender parity in new staff and trainees hired for hydromet services, climate services and EWS, which will allow women to not only be involved in STEM-related expertise but also increasingly allow them to participate in decision-making on climate-resilient technology innovation and implementation; (c) build capacities of observers and forecasters, particularly those involved in impact forecasting and nowcasting, to increase the gender-responsiveness of climate services and EWS products; (d) research community/social vulnerabilities, particularly gendered impacts and gender-differentiated capacities for resilience, and include them in hazard and climate vulnerability maps developed for each targeted country; (e) conduct needs assessments to ensure the gender-responsiveness of daily weather bulletins, seasonal forecasts and agricultural advisories; (f) ensure gender-responsiveness in EWS dissemination, particularly with regard to the limited access women have in public spaces (e.g. mosques in Comoros) or to information channels (e.g. radios in Madagascar); and (g) incorporate time-use analyses to ensure effective and meaningful participation of women and other vulnerable groups in trainings and information campaigns on climate services and EWS. The AE articulated a comprehensive and overarching assessment for all targeted countries, with further commitments to conduct country-level assessments to tease out more context-specific gender issues. Such assessments will help address critical gender considerations like time-poverty and GBV through “localized” solutions. The AE is also committed to ensuring its initial gender diagnosis is accurate and monitoring gendered outcomes with the support of the executing agency and last-mile partners. The AE will, through country-specific assessments, ensure the integration of GBV as a key measurement variable while studying time-use analyses to ensure that this theme is adequately covered, particularly in the context of how it influences or affects gendered dimensions of time poverty.

## 4.3 Risks

### 4.3.1. Overall programme assessment (medium risk)

53. The funding proposal request USD 52 million as part of a USD 71 million project for building resilience through strengthened meteorological, hydrological and climate services in the Indian Ocean Commission (IOC) Member Countries. This will be achieved by (1) institutional strengthening and reforms, capacity-building and public-private engagement; (2) improvement and modernisation of hydro-meteorological systems and services; and (3) enhancing the use of climate services. Co-financing in the form of grants will be provided by AFD (USD 5.4 million) and the EU (6.1 million). In-kind co-financing will be provided by the governments of Comoros (USD 1.3 million), Madagascar (USD 1 million), Mauritius (USD 1.7 million) and Seychelles (USD 2.8 million).

### 4.3.2. Accredited entity/executing entity capability to execute the current programme (medium risk)

54. The accredited entity AFD is a public international financial institution. AFD is rated as AA by Fitch and Standard and Poor's and has a strong track record of support by the French government.

55. The IOC will be the EE. The IOC has experience in project management with different development partners including the regional EU-funded ISLANDS and AFD-funded ACCLIMATE multi-year projects. Total projects under management currently exceed USD 200 million and include climate and environment related projects. The EE will set up a Project Management Unit (PMU) and will be the only entity mandated to engage personnel, supervise procurements processes and to manage the funds. The National Meteorological and Hydrological Services (NMHSs) of each beneficiary country are expected to be designated by their respective

governments as the lead implementing national entity. NMHSs, will be accountable to IOC (EE) for project execution at the national level.

#### 4.3.3. Programme-specific execution risks (medium risk)

56. Continued government support: Project success could be affected by limited commitment by any of the governments in supporting the project with the needed financial and human resources for O&M over the lifetime of the project (15 years). This risk is partially mitigated by activities undertaken during project implementation to obtain sustainable funding and human resources. However, it is advised that full commitment to cover any potential O&M funding and human resources gaps for the lifetime of the project shall be provided before funded activity agreement effectiveness.

57. Security risks: Security issues could put hydro-meteorological equipment at risk of damage or loss. Tensions with the population where the new hydro-meteorological equipment will be installed could rise in case of need for relocation to accommodate equipment (although no relocation is foreseen at this stage by the AE). Risk is mitigated by community engagement, tagging and fencing of equipment and agreements with the NMHSs to protect equipment during its lifetime.

58. Project sourcing and selection: The impact of the project will depend on effective procurement of new equipment and the capacity of the NMHSs to operationalise new or upgrade existing equipment and tools. Lack of allocation of human resources or continued retention of knowledge could reduce benefits of the project over time. Comfort can be derived from the Memorandum of Understanding between the EE and the beneficiary country, capacity development at the NMHSs and possible increase of financial capacity of the NMHS as result commercialization envisioned.

59. The economic internal rate of return of the project is estimated at 14 per cent, with the economic internal rate of return becoming positive in the ninth year of operations. The AE concludes that the private sector of the four countries is not in a position to support financing the hydromet project since most of its objectives fall under open access public services. Nevertheless, during the project the AE envisions developing business models to recover the costs for O&M.

#### 4.3.4. Compliance risk (medium risk)

60. The Agence Française de Développement (AFD), as the AE, confirm that no project activities will be undertaken in any jurisdiction which is subject to or affected by United Nations Security Council resolutions.

61. AFD confirm that, in accordance with their internal processes and pre-approval due diligence procedures, individuals and entities are screened against the UN sanction list. AFD have re-assigned these obligations to its executing entity, the Indian Ocean Commission, to ensure no individual or entity that is listed on any United Nations Security Council sanctions list will be involved with the project in any manner.

62. AFD advise that due diligence conducted is limited to the EE. Members states (i.e. the project countries) cannot be subject to due diligence according to AFD's procedures. The National Meteorological and Hydrological Services (NMHS) will be committed into the project on the aegis of their line ministries.

63. AFD confirm that there are no intentions to distribute or disburse to beneficiaries, either directly or indirectly, cash, vouchers, commodities or other items of value.

64. AFD advise that they conducted a risk assessment and due diligence on this project regarding money laundering and financing of terrorism (ML/FT) and prohibited practices (PP),

according to its internal procedures (which were reviewed by GCF at the time of AFD's accreditation with GCF). The process concluded that the project presented a limited level of risk. Despite this, appropriate mitigation measures have been taken, including:

- (a) The implementation scheme, which limits the mandate of the EE to one entity (i.e. the IOC), to monitor the flow of funds and procurement process, rather than having five EEs according to the AMA agreement (with as many bank accounts), to be audited;
- (b) Inclusion of a Financial Officer and a Monitoring and Evaluation Officer in the Project Management Unit;
- (c) AFD provision of a Non-Objection state at all levels of technical and financial reporting; and
- (d) Audits reports.

65. AFD confirm that anti-money laundering and counter-financing of terrorism (AML/CFT) due diligence has been duly conducted during the instruction process and that risk mitigation will be monitored during project implementation.

66. AFD advise that they will carry out internal controls to prevent, mitigate, identify, report and remedy any risks, indications, or allegations of ML/FT, sanctions violations, or prohibited practices in accordance with its internal procedures, which have been recognized by the GCF for accreditation of AFD.

67. AFD inform that the above-mentioned control measures will be re-assigned to the EE, with an obligation to provide information without delay if the EE becomes aware of information which leads to any ML/FT, sanctions violations, or prohibited practices.

68. AFD advise that an annual audit by an independent and reputable auditing firm will be conducted to check that all drawdowns/advances paid into the EE's programme account have been used in accordance with the terms of this Agreement.

69. AFD advise that the AFD grievance management mechanism will be included in subsidiary agreements signed between AFD and IOC.<sup>1</sup>

70. **Recommended risk rating:** The Office of Risk Management and Compliance's Compliance Team ("ORMC/Compliance") has conducted a review of the project in accordance with relevant GCF Board approved policies and does not find any material issue or deviation with respect to compliance issues. Based on available information for this funding proposal, the ORMC/Compliance Team have determined a risk rating of 'medium' and have no objection to this request proceeding to the next steps for processing.

71. ORMC/Compliance would like to remind AFD, as the AE, of its continuing obligations and responsibilities with regard to monitoring and reporting any risks for ML/FT and PP among the intended counterparties, executing entities, beneficiaries, persons involved, or any of the proposed activities.

#### 4.3.5. GCF portfolio concentration risk (low risk)

72. In case of approval, the impact of this proposal on the GCF portfolio concentration in terms of result area and single proposal is not material.

#### 4.3.6. Recommendation

73. It is recommended that the Board consider the above factors in its decision.

---

<sup>1</sup> <https://www.afd.fr/en/e-s-complaints-mechanism>  
<https://www.afd.fr/en/combating-corruption>

Summary risk assessment		Rationale
Overall programme	Medium	Success of the project depends on successful procurement and continued operation of equipment and retention of knowledge. Project equipment is exposed to security risks. Continued government support for O&M is advised.
Accredited entity (AE)/executing entity (EE) capability	Medium	
Project-specific execution	Medium	
GCF portfolio concentration	Low	
Compliance	Medium	

## 4.4 Fiduciary

74. AFD will be the Accredited Entity (AE) for the project and be responsible for overseeing the implementation, financial management, evaluation, reporting and closure of the project's activities. AFD will have the overall responsibility of the Project implementation and ensure that the Grant Proceeds are utilised according to the terms of the Funded Activity (FAA) Agreement and the Accreditation Master Agreement (AMA).

75. The IOC will be the project's Executing Entity (EE). Thus, will assume the overall responsibility for the effective delivery of project inputs and interventions to achieve the expected project outputs. To fulfil its role, the EE will set up a Project Management Unit (PMU). The IOC will be the only entity mandated to engage, supervise procurements processes, and manage the funds. IOC as EE, and the regional organisation mandated by the member countries to develop the project and submitted to the GCF, will enter into a Project Agreement (PA) with the Ministries of Foreign Affairs (MoFA) of each concerned country member, which are the official representatives.

76. The National Meteorological and Hydrological Services (NMHSs) of each beneficiary country are expected to be designated by their respective Government as the lead implementing national entity (NIP). NMHSs will be respectively accountable to IOC (EE) for the project execution at the national level. NMHSs, as the NIP and other NSPs, will not be mandated for the use and management of GCF funds and all related procurement process.

77. The IOC and AFD will directly and exclusively manage the project's funds. Disbursements will take the form of advance payment to the EE (IOC) or direct payment by the AE (AFD) to firms contracted for works and the supply of goods or services. There will be no direct management of the funds or any disbursements to the national Entities or NHMS.

78. The accounting and financial audits will be conducted by an independent third party. At the end of the disbursement period, AFD will prepare a project completion report summarising the implementation phase's main events, the results achieved, and the lessons learned. This report will also provide recommendations for future improvement.

## 4.5 Results monitoring and reporting

79. The theory of change (TOC) clearly defines the ultimate project goal and explicitly states the causal logic which informs the project's design. The TOC's stated outcomes are defined in a manner that is clearly supportive of meeting the ultimate project goal. The 'if, then, because' logic is clearly shown in the diagram as provided in the funding proposal.

### 4.5.1 Logical framework

80. At the core indicator level, the logical framework has been designed with relevant details, as per the GCF results management framework (RMF) and performance measurement frameworks (PMFs). This includes reporting on the appropriate core indicator for adaptation (number of direct and indirect beneficiaries disaggregated by sex). Additionally, the respective impact, outcome and project performance indicators for the targeted results areas of ‘Increased resilience and enhanced livelihoods of the most vulnerable people, communities and regions’ (A1.0) and ‘Increased resilience of health and well-being, and food and water security’ (A2.0) are properly articulated.

81. At the GCF Outcome level, the AE has properly included the indicator for technologies and innovative solutions transferred as a result of GCF support with relevant mid-term and final targets. However, we note that indicator A5.1 is a qualitative indicator, and we suggest to the AE that the baseline be determined based on careful analysis of the country-specific circumstances. It is good practice for formulation of the target to correspond to the major requirements for this indicator, such as defining the type of incentives and mechanisms, integration of the mechanisms in the planning process and the measurement of effectiveness.

82. Indicator A5.2, refers to both the number and the level of effective coordination mechanisms, and as such it is both a quantitative and qualitative indicator. The AE has articulated the recommended scorecard approach and has defined the different levels of effectiveness. The main assumptions made as part of the scorecard development should be reported in the assumptions section. Good practice for this indicator includes:

- (a) The targets specify the actual mechanisms to which they are related;
- (b) The targets examine the level of effective coordination by applying a scorecard approach; and
- (c) It is clearly specified how the targets are related to the planning process.

#### 4.5.2. **Implementation timetable**

83. The implementation timetable for the funding proposal has been completed appropriately. It shows all activities and key milestones associated with each phase of the project and they are consistent with the logical framework.

#### 4.5.3. **Monitoring, reporting and evaluation arrangements**

84. The arrangements for monitoring, evaluation, and reporting (section E.7 of the funding proposal) are adequate.

## 4.6 Legal assessment

85. The Accreditation Master Agreement (the “AMA”), was signed with the Accredited Entity on 11 November 2017 and it became effective on 16 January 2018.

86. The Accredited Entity has provided a legal opinion/certificate confirming that it has obtained all internal approvals and it has the capacity and authority to implement the project.

87. The proposed project will be implemented in the Union of the Comoros, the Republic of Madagascar, the Republic of Mauritius and the Republic of Seychelles, countries in which GCF is not provided with privileges and immunities. This means that, amongst other things, GCF is not protected against litigation or expropriation in these countries, which risks need to be further assessed. The Secretariat has engaged with these countries as follows:

- (a) With respect to the Union of the Comoros, the Secretariat submitted a draft privileges and immunities agreement to the Government of the Union of the Comoros on 7 April

- 2016 and a bilingual version was submitted to the Government of the Union of the Comoros on 10 December 2018. The agreement is currently under the Government's review;
- (b) With respect to the Republic of Madagascar, the Secretariat submitted a draft privileges and immunities agreement to the Government of the Republic of Madagascar on 26 January 2016 and a bilingual version was submitted to the Government of the Republic of Madagascar on 13 May 2019. The agreement is currently under the Government's review;
  - (c) With respect to the Republic of Mauritius, the Secretariat submitted a draft privileges and immunities agreement to the Government of the Republic of Mauritius on 12 April 2016. The Government of the Republic of Mauritius has indicated that it would not be possible to grant privileges and immunities to GCF through a bilateral privileges and immunities agreement; and
  - (d) With respect to the Republic of Seychelles, the Secretariat submitted a draft privileges and immunities agreement to the Government of the Republic of Seychelles on 7 April 2016. The agreement is currently under the Government's review.
88. The Heads of the Independent Redress Mechanism (IRM) and Independent Integrity Unit (IIU) have both expressed that it would not be legally feasible to undertake their redress activities and/or investigations, as appropriate, in countries where GCF is not provided with relevant privileges and immunities. Therefore, it is recommended that disbursements by GCF are made only after GCF has obtained satisfactory protection against litigation and expropriation in the countries, or has been provided with appropriate privileges and immunities.
89. In order to mitigate risk, it is recommended that any approval by the Board is made subject to the following conditions:
- (a) Signature of the funded activity agreement in a form and substance satisfactory to the GCF Secretariat within 180 days from the date of Board approval; and
  - (b) Completion of the legal due diligence to the satisfaction of the GCF Secretariat.

## Independent Technical Advisory Panel's assessment of FP161

Proposal name:	Building regional resilience through strengthened hydrometeorological-climate information services in Indian Ocean Member Countries
Accredited entity:	Agence Française de Développement (AFD)
Country/(ies):	Comoros, Madagascar, Mauritius, and Seychelles
Project/programme size:	Medium

### I. Assessment of the independent Technical Advisory Panel

#### 1.1 Impact potential

*Scale: Medium to low*

1. The South-West Indian Ocean (SWIO) region is represented by four small island developing states (SIDS) namely the Comoros, Madagascar, Mauritius and Seychelles. The location of the SWIO States is close to the southern part of the continent of Africa. The islands are subject to frequently occurring tropical cyclones (TC), which often devastate the islands due to high intensity wind speed and subsequent storm surges. The islands are also subject to heavy rainfall and occasional droughts. On a global scale, the region is known as a climate hotspot, considering its exposure to climate-induced hazards that not only threaten lives but also adversely affect the livelihoods of the islanders.

2. According to recent studies, the four countries have faced over 100 disastrous climatic events over the past 50 years. The adverse impacts were faced by 14.4 million people, while the cumulative economic toll was estimated at USD 13.1 billion. Rapid onset cyclones appear as nightmares to seagoing fishermen due to the absence of any reliable forecasting mechanism, even though there have been tremendous advancements in both model-based forecasting and communication systems globally. As a result, lives have been lost, particularly those of seagoing fishermen in the four countries. In addition to the loss of lives, physical infrastructure have been severely damaged in all four countries. Many such infrastructures belong to the tourism sector, which is the main economic activity. Due to repeated damages to tourism infrastructure, small operators found it difficult to maintain their businesses. There are agricultural activities in the larger islands such as Madagascar and the Comoros<sup>1</sup>, where heavy rainfall and seasonal droughts often trigger crop loss and subsequent food insecurity within farming households.

3. TCs are the most frequently occurring hazard in the SWIO region. The Southwest Indian basin is one of the most active areas for cyclonic activities in the world. In terms of cyclonic intensity, the TCs are found to be more intense than those occurring in other parts of the world. On average, as many as 13 TCs with a threshold intensity of 63 kilometres per hour are formed each year in the region. The SWIO cyclones generally occur between mid-November and the end of April of the following calendar year. Available historical records suggest that a total of 847 TC events have occurred in the SWIO region between 1950 and 2014. Fortunately, not all TCs have made landfall in the islands. However, the high intensity wind and rough seas cause significant loss and damage, especially in the fisheries and agricultural sectors.

---

<sup>1</sup> These two islands are also least developed countries (LDC).

4. In addition to TCs, there are non-tropical cyclone (NTC) induced rainfall, which is significant throughout the SWIO region. Such events generally cause heavy rainfall, which triggers flooding and, often, landslides. Sometimes NTC events occur with very high intensity rainfall that also causes flash floods. Between 1970 and 2015, Mauritius and Seychelles had the highest number of NTC-related flooding events at 20 and 22, respectively, of which 9 in Mauritius and 1 in Seychelles were considered catastrophic events. During this same period, Madagascar and the Comoros experienced nine and two catastrophic events, respectively.
5. Unfortunately, the land-based as well as oceanic temperatures in the SWIO region are found to be increasing. The rise in sea surface temperature is of great importance due to the fact that its seasonal change beyond a threshold triggers TCs to occur during cyclone season and NTCs to occur during rainy season. An effort has been made to understand the rainfall variability in the SWIO region. Comparing the two periods 1961–1990 and 1991–2016, an increase in precipitation during the rainy season and a decrease in precipitation during the dry season were noted, which implies a historical increase of flood and drought events, respectively. Based on the available science, it is generally understood that both TC and NTC events will increase in the coming decades, further threatening lives and livelihoods of people in the four countries.
6. It is proven that timely and precise climate information, through an effective early warning system (EWS), can significantly reduce loss and damage burden. Many countries across the world experiencing multiple hazards (MH), such as the countries in the SWIO region, have successfully enhanced disaster risk reduction (DRR) efforts by means of both meteorological and hydrological forecasting. Impact-based forecasting (IBF) demands a complete understanding of the two scientific disciplines including the understanding of causes and subsequent effects in physical terms so that computational models can be customized through calibration and employed to project future. Unfortunately, not all regions with such an array of hydro-meteorological hazards have the prerequisites to develop MH-IBF-EWS. While the need for stakeholder-tailored forecast messages is paramount for the SWIO, and the change in climate system demands a strengthened forecasting system, the existing national meteorological and hydrological services (NMHS) in each of the four target countries have little infrastructure as well as human capacity to deliver an MH-IBF-EWS. Climate change warrants immediate mobilization of resources to acquire data handling and processing capacity as well as modelling capacity, as per global standards prescribed by the World Meteorological Organization (WMO) and various centres of excellence on other issues including hydrology. Not only financial support is needed; substantial technical assistance and hand-holding is also required so that human and institutional capacities are built and retained with the help of such global centres of excellence.
7. The funding proposal claims to be part of the development of NMHS. However, the proposal hardly has any activity on the hydrology aspect and is biased in its approach towards observations and delivering EWS. Without adequate investment and development of capacities on hydrological modelling (which is needed to bring down to the micro-watershed levels information regarding water run off following a forecast rainfall), several of the claimed benefits will not materialize.
8. The four SWIO SIDS have come forward to develop projects aiming at building capacities at the nodal points involving NMHS as well as developing regional capacity to better understand the physical relationships among ocean, land and atmosphere at regional scale by forming a regional centre of excellence on their own by means of extended cooperation and coordination. However, the financial resources needed to start the process are perhaps too much for the region, especially when the larger two of the four islands belong to Africa's least developed countries (LDC), which is why they requested GCF to contribute financial support for their collective effort. WMO is expected to provide support for the development of regional capacity.
9. The proposed project consists of three components, which are as follows:

- (a) Component 1: Capacity-building, institutional development, regional cooperation and public-private engagement;
- (b) Component 2: Generation of high quality climate-related data, improvement of MH-IBF and EWS, climate risk assessments and climate change projections; and
- (c) Component 3: Enhancement of accessibility and use of climate services for climate change adaptation, and improvement of capabilities in implementation of a people-centred MH-IBF-EWS for DRR at national/regional levels.

10. Component 1 will focus on institutional development, a key pillar in delivering IBF and early warning services in a sustained fashion. Institutional development will be achieved by building the capacity of personnel so that they develop expertise in collating and processing data, and generate and disseminate hazard-specific forecasts following internationally acceptable standards. To achieve this objective, courses will be developed and training imparted in cooperation with WMO. Equal effort will have to be ensured for hydrological data generation and handling. Basic level training sessions will not be helpful in expertise development. It is recommended that customized training sessions be designed under the aegis of WMO and a globally recognized centre of excellence on hydrology and hydraulics so that professional courses are administered to achieve the objective of developing human capacity on data handling, modelling and generation of climate bulletin/forecasting.

11. Under the same component, additional efforts for institutional development will be considered, such as the procurement and setting up of equipment; data archival systems; measures to calibrate models as necessary; ground truthing (particularly for hydrological model calibration); implementation of operation and maintenance (O&M) plan; and enhancement of capacity to cater to the need for the delivery of legal mandate. Two other important functions under component 1 include fostering regional cooperation and promoting public-private engagement so that the private sector can receive tailored climate information to protect their businesses. The latter will in turn enable the NMHS to earn revenue that will partially cover their recurrent O&M costs.

12. Following the capacity building efforts under component 1, the application of advanced modelling skills will be organized under component 2. The focus of this component will be to deliver MH-IBF-EWS. At the national level, it is expected that climate hazard maps will be generated and vulnerability assessments will be conducted through consultations with various stakeholders. Under component 2, the WMO regional instrumentation centre will be established wherein the regional laboratory will be hosted in a bid to foster regional cooperation.

13. Component 3 is primarily designed to reach “last mile” users of climate information with bulletins and forecasts so that needs-responsive information tailored for specific purposes will be generated and disseminated. The approach here is people-centric, which will determine how and under which condition the climate information and forecasts will be delivered to achieve maximum attention of the various users at the grassroots. The information will eventually be designed and delivered in a form and substance understandable by the stakeholder groups.

14. The project is expected to deliver the much-needed country-specific and region-wide capacities to deliver MH-IBF-EWS within its five-year implementation period. Much needed is the training of NMHS staff working in observations (including quality control and assurance), data management and application of information and communication technologies, as included in the proposal. However, such trainings are not sufficient. The funding proposal does not include other aspects that are very much needed on the hydrological aspects, namely the acquisition of hydrological models (which are expensive) and the initial set-up of these hydrological models (which is even more expensive, since it requires micro-catchment level

calibration<sup>2</sup> and subsequent validation using observational data). Without these fundamental enabling steps, the operational use of hydrological models and the development of specialized hydrological information needed for addressing floods (feeding into possible design of protective infrastructure) and allocating water to address droughts are not possible. Moreover, the guidance of a centre of excellence on hydrology is needed. Reliance on NMHS-built capacities on meteorology will not be sufficient to deliver flood forecasting, flood risk assessment and other hydrological services.

15. Assuming that the project will deliver its objectives as envisaged in the theory of change, the project will benefit 19.45 million people, which represents some 67 per cent of the total population of the four target countries. Following the issuance of early warnings with adequate lead time, it is expected that people will be able to save their lives, particularly those who are required to go to open sea for fishing. The tourism sector in all four countries and the agriculture sector in the Comoros and Madagascar will benefit the most. In terms of its impact potential, the proportion of the population that will benefit appears impressive. It is expected that about 50 per cent of the large number of beneficiaries will be women, although in reality an effective forecast actually reduces the post-hazard burden of women significantly.

16. The independent Technical Advisory Panel (TAP) understands that the aspects related to hydrology in the proposal are given lesser priority compared to that of meteorology and that there has not been any involvement of globally acclaimed centres of excellence on hydrology to provide guidance on calibration and modelling of hydrology and flood hydraulics. Considering this shortcoming, the independent TAP finds the impact potential as medium to low. However, if the accredited entity (AE) considers corrective measures, engages a centre of excellence on hydrology to guide the latter processes (as WMO is engaged upfront for a similar role for meteorology), and finds other sources of funding to develop adequate NMHS capacity, particularly in the Comoros, Madagascar and Mauritius (where no hydrological models are available), the impact potential can be higher.

## 1.2 Paradigm shift potential

*Scale: Medium high*

17. Advanced technology-based probabilistic modelling and forecasting techniques are not new anymore; therefore, one may not find innovation in the approach of the project. However, building modelling capacities to generate precise and useful forecasts through the application of modelling techniques can be quite challenging. For the four SIDS in question, acquiring such capacities means taking a huge leap, given the rudimentary state of affairs involving IBF. Once the existing institutions have appropriate instrumentation and human resources to deliver advanced climate information, the outputs will automatically find clientele in the private sector. This will open up new opportunities for developing a business model for the generation of model-driven hazard forecasts and their uptake within the private sector.

18. The project will introduce a much enhanced capacity to prepare and deliver forecasts on the basis of perceived impacts and warnings in view of the understanding of hazard risks. This will enable institutions to stay away from traditional methods of hazard advisories, which generally leave virtually no lead time for communities to react and safeguard their lives and livelihoods. In technical terms, the project will make efforts to use advanced science-based and technology-driven climate information so that, instead of deterministic forecasts, reliable probabilistic forecasts may be disseminated towards avoiding loss and damage of lives and properties of affected communities in the participating SIDS. The above indicates a significant paradigm shift in both approach and delivery of EWS in each of the participatory countries in the SWIO region.

---

<sup>2</sup> Calibration at micro-catchment level is also time consuming.

19. The absence of hydro-meteorological data in the desired level of resolution and time-steps is the first and foremost deficiency being faced by most developing countries. The situation is even worse in SIDS. In the absence of observational data, computer-driven models cannot be validated and their outputs cannot be used for generating reliable forecasts. Since a doplar radar can capture and transmit on time meteorological data within a 200 km radius, such data can be a great boon towards calibration of available models for the generation of forecasts. Once the physical relationships of various climatological parameters are understood and calibrated for the SWIO region, strengthening of modelling exercises and replication will become possible, at least at the technical level. The effort towards building up technical as well as human capacity will enable the replication processes, provided that the trained human capacities are retained within the NMHS system.

20. The project aims at knowledge sharing and learning in a number of modalities: (i) specialized training by hydro-meteorological specialists will be engaged in the proposed Regional Climate Change Network, (ii) training sessions of the SWIO Climate Outlook Forum, and (iii) UIP will be strengthened to facilitate information and risk management experience across the participating countries. There will be opportunities for sharing of learnings regarding model calibration and downscaling techniques and development of numerical weather prediction/ensemble prediction systems. The regional laboratory will be a centre for NMHS experts to cross-check their modelling-related learning and subsequent sharing under the guidance of professionals representing WMO. The institutions that manage hazard and disaster-related information will be trained so that they reach the “last mile” information recipients in the most effective manner in each of the four countries.

21. The assistance to set up technologies such as doplar radar and upper air observation network in the SWIO region will continue to generate data that are critical to calibrating the models and generating reliable forecasts with a certain degree of precision. Since the countries will retain both the instrumentation and human resources, and the O&M costs are committed including the salaries of personnel to be engaged and trained, it is expected that the regional meteorological and hydrological services (RMHS) and NMHS will continue to deliver results beyond completion of the project intervention.

22. The project will contribute significantly to the creation of an enabling environment across almost all aspects of MH-IBF-EWS involving key institutions in all four countries. Strengthening institutions with data acquisition and processing equipment, trained human resources and other capacities to deliver user-tailored climate products and climate services will enhance the enabling capacities of NMHS institutions. The guidance of WMO will contribute significantly to human and institutional enabling capacity, especially on meteorological aspects of MH-IBF-EWS. Moreover, policy harmonization and the standardization of output data and risk information with respect to global best practices and potential in-country regulatory reforms will greatly contribute to an enabling environment that will pave the way to meaningful forecasting.

23. However, efforts on capacity in hydrological and hydraulic aspects of a multi-hazard forecasting and EWS appear neglected in the proposal. The involvement of potential centres of excellence on such aspects has not been found in the proposal, which may limit progress towards the coveted goal of MH-IBF-EWS.

24. In view of the above-mentioned discussion, the independent TAP finds paradigm shift potential to be medium high.

### 1.3 Sustainable development potential

*Scale: Medium to high*

25. Since the overarching goal of the project is to build hydro-meteorological technical and institutional capacities to advance MH-IBF-EWS, the project may not have immediate direct

contribution to achieving sustainable development goals (SDG) as such, perhaps with the exception of SDG 13 (enhanced climate action). However, once the RMHS and NMHS are fully operational, it may be expected that the project outcome will contribute either directly or indirectly to SDG 2 (zero hunger, by preventing hazard-related food production losses), SDG 3 (good health and well-being, by means of protecting lives and household-level well-being through the issuance of hazard warnings), SDG 5 (gender equity and women's empowerment, by means of reducing disproportionate gender-related burden in the wake of hydro-meteorological disasters), and SDG 6 (ensure access to water and sanitation for all, in particular targets 6.5 integrated water resources management and 6.6 protect and restore water-related ecosystems).

26. **Economic co-benefits:** Provided that hydrological and hydraulic modelling (which is not part of this project) is developed and integrated into MH-IBF, the project is expected to help end users plan early and safeguard their lives, vulnerable assets and livelihoods in the wake of every extreme event including cyclonic storm surges and flash floods. Costs avoided through reducing risks of loss and damage could be quite substantial, as has been seen in many hazard-prone climate hotspots. It is not only at household level that such avoided costs will be substantial, it is also expected to drastically reduce the burden on government spending in post-hazard emergency relief operations and social rehabilitation of impacted populations.

27. Moreover, governments in impacted states are also required to invest in refurbishing damaged infrastructure following a disastrous hydro-meteorological extreme event, the cost of which may be reduced considerably if proper early warnings are provided with increased lead time so that institutions can take adequate precautionary measures. All such possibilities are expected to contribute to the economic co-benefits that are likely to be accrued from the project outcomes.

28. In the SWIO States, significant economic potential lies with the tourism sector, and seamless airport operations are crucial for realizing tourism-related opportunities in island states. However, the latter can only materialize if airport operations are adequately guided through the timely issuance of advanced early warnings in relation to inclement weather conditions, especially in SIDS. The importance of advanced early warnings in tourism development cannot be overemphasized in SIDS. This project will likely serve the regional airport hub and therefore regional tourism-related economic growth potential. In turn, the post-project long-term O&M of the hydro-meteorological capacities will benefit profusely from the proceeds of sales of advanced EWS and information to the airport authorities. The latter will not only help materialize healthy economic co-benefits, it will also foster a public-private co-benefitting relationship in the region.

29. **Social co-benefits:** One of the outcomes of the project will be increased lead time for people to take precautionary measures against sudden onset hazards, ensuring greater household and community-level well-being and health care. Bringing disaster-related mortality rate down to zero, especially among seagoing fisherfolk, will be a great outcome. All these social co-benefits are achievable in the long run if the project triggers the enabling conditions and continues efforts with the help of global centres of excellence such as WMO.

30. Agro-meteorological information and advisories can be generated, which then provide for extension services to interplay with farmers and eventually ensure maintenance of agricultural productivity, despite impinging agro-climatic hazards. There have been many instances across the world where timely agricultural advisories and early warnings have led to effective measures at farmers' levels that culminated into avoidance of food insecurity and/or market price hike of agricultural products. Furthermore, timely and precise agricultural advisories can trigger index-based insurance products for relevant private sector entities, which in turn open up new opportunities for agricultural insurance. However, availability of both meteorological and hydrological inputs into adequately calibrated and customized models underpins the development of climate information that generally contribute to the latter

possibilities in the long run. All these may not be achieved within the timeline of the project implementation.

31. **Environmental co-benefits:** As such, there is no direct co-benefit that may be accrued from the project. However, prevention and/or reduction of loss burden and damage might influence poor people to not practice maladaptive measures such as destruction of vegetation, terrestrial and marine ecosystems and, particularly, biodiversity.

32. The project talks about potential environmental co-benefits with small dam operations following issuance of warnings/advisories. However, given the weak integration of hydrological aspects of modelling, including calibration and validation of hydrological models, such potential benefits may not be realized under the project. The low-level ambition in modelling and the short time frame for project implementation could also put limits on fully integrating critical hydrological models and their outputs within the project implementation timeline. The independent TAP also found that the importance of hydrological aspects with respect to meteorological aspects is kept relatively low especially in seeking peer guidance on successful integration of hydrological models, which might slow down the likelihood of achieving MH-IBF on hydrological aspects.

33. **Gender-related co-benefits:** Issuance of early warnings can potentially save lives during extreme weather events. It has been found in many countries that morbidity rates due to cyclonic storm surge are particularly higher for women and children. In this context, the strengthening of EWS in a hazard-prone climate hot spot is always gender-friendly.

34. Since the project will integrate societal response towards early warnings and advisories, the processes create avenues to integrate gender concerns in designing messages for climate information and advisories. The policy and regulatory measures, as proposed, might re-examine the gender friendliness of available provisions and recommend inclusive policy and regulatory measures. The gender assessment and action plan (annex 8 of the funding proposal package) elaborate on such possibilities of gender mainstreaming throughout project implementation.

35. Based on the above discussion, it appears to the independent TAP that the sustainable development potential of the proposed project is medium to high.

#### 1.4 Needs of the recipient

*Scale: High*

36. In recent years, a number of cyclones have hit the SWIO countries, causing devastation due to high intensity winds, storm surge and wide-spread flash floods. While physical immobile infrastructure have been damaged in all these countries, damages have also been recorded in agricultural productivity, particularly in the islands of the Comoros and Madagascar. The future outlook of these islands in the wake of climate change is also very bleak, since higher level of climate forcing with subsequent rise in sea surface temperature will tend to increase the frequency of occurrence of high intensity cyclonic events in the SWIO region. According to globally available literature, the SWIO region has been recognized as a climate hotspot.

37. The four target countries are not homogenous in terms of economy and economic structure of their inhabitants. While the key drivers of advanced economies such as Mauritius and Seychelles include tourism, it suffers due to frequent occurrence of high intensity cyclonic storm surge and flash floods, leaving uncomfortable conditions for tourism to thrive. Moreover, the inability of regional airports to operate during such high intensity cyclonic events adversely affects tourism, limiting income opportunities from tourism and offshore recreational activities.

38. The situations in relatively larger islands such as the Comoros and Madagascar are even worse when the said cyclonic events restrict income opportunities for farmers and fisherfolk. Since these two LDCs have high poverty (on the basis of per capita income) and the poor are dependent on agricultural productions and sea-bound fisheries, climate-induced extreme events

hit the poor segment of their populations hard. Therefore, the general need for EWS is rather high. Such needs cannot be met by keeping the forecasting capacities in their current forms in the four countries.

39. In addition to people, communities and economic sectors need financial as well as technical support to overcome existing barriers. NMHS institutions, including those providing DRR services, need adequate support towards upgrading and modernizing their respective services to achieve MH-IBF-EWS. There is also a need for enhanced cooperation and coordination at regional level so that regional-scale land-ocean-atmospheric climatological systems can be understood and the knowledge shared among the participating countries. Furthermore, the nodal point for fostering regional cooperation needs active collaboration and technical guidance from centres of excellence such as WMO.

40. However, for the latter need, one may find weakness in the funding proposal not having adequate planning to rope in hydrological centres of excellence for much-needed hydrological research and IBF. While it is heartening to see that the project pays due attention to strengthening the capacities of relevant institutions for both meteorological and hydrological aspects, the absence of global peer bodies on hydrology in the advisory capacity weakens the realization of the intent of the project.

41. As indicated earlier, the target countries belong to SIDS, of which two are LDCs. Although per capita income in Mauritius and Seychelles are higher, the size of these economies is very small. As a result, none of these countries individually or even collectively could arrange finance to develop robust data collection and subsequent modelling facilities. The overall investment weight of the project represents 0.27 per cent of the combined GDP of the four countries. The demand for forecasting data/information for the private sector is currently low, which does not provide the incentive to finance a project through public financing windows. Under such circumstances, viable alternate financing is virtually absent, despite the utmost needs of the recipient countries to deliver MH-IBF-EWS.

42. The independent TAP rates the needs of the recipient as high.

## 1.5 Country ownership

*Scale: High*

43. The African Union (AU), in collaboration with WMO, made a call in 2010 to provide support at scale to NMHS in the wider Indian Ocean region. This project can be considered a response to the call of AU. The Indian Ocean Commission (IOC) has been instrumental in developing the concept, responding to repeated requests and approval from IOC's Ministerial Council. The outcome of the project fits into the regional vision titled AU Agenda 2063. At a global scale, the project contributes to the operationalization of the Sendai Framework, with an aim to reduce disaster risks in the participating countries.

44. The IOC member States have jointly developed an adaptation strategy for 2012–2020. The strategy aims at strengthening regional scale cooperation through coordinated actions, emphasizing climate forecasting and anticipation capabilities so that all actors can participate in disseminating climate information. The proposed regional project therefore resonates well with regional and global policies and strategies on relevant issues.

45. Although it is a regional project, its central focus is also grounded well in each of the participating country's policies and strategies. In all four countries, the respective nationally determined contributions (NDCs) highlight the needs for much strengthened hydro-meteorological forecasting capacities to reduce climate-related loss and damages. The NDC of the Comoros prioritizes the implementation of MH-IBF-EWS, while that of Madagascar commits to the finalization of the "national framework for climate services" within the Global Framework of Climate Services. The NDC of Mauritius attaches priority to implementing its DRR strategy and its water resources management strategies, where emphasis is placed on improved

forecasting capabilities. The NDC of Seychelles highlights the necessity to undertake “climate change modelling, ..... monitoring of climate change impacts”, recognizing the high vulnerability of its fisheries and tourism sectors, where the importance of early warning is paramount. The policy environment for the proposed project, in view of global, regional and country contexts, is found to be fully aligned.

46. The design of the project was aided by stakeholder consultations in the participating countries. The international development partners active in the region took part in organizing such consultations. The process integrated and/or appraised past and ongoing projects in the region and tried to build synergies with such initiatives. The design process took cognizance of the various needs of stakeholders, including those of “last mile” grassroots people, partners and relevant institutions. All of the needs have been reflected in the feasibility study report (i.e., annex 2).

47. The project was co-designed and validated by the respective NMHS institutions in each of the SWIO countries. As a result, the respective NMHS institutions are proposed as lead national implementing entities. The NMHS will be responsible for managing instrumental and human capacities likely to be built, coordinating with respective national and regional organizations for standardization of processes and fine-tuning of products, and eventually disseminating such climate information products as per the needs of the “last mile” beneficiaries. They will be responsible for maintaining the trained human resource pool and arranging O&M for equipment according to the O&M plan provided in the funding proposal package.

48. The above discussions lead the independent TAP to infer that the country ownership for the project is high.

## 1.6 Efficiency and effectiveness

*Scale: Medium to low*

49. The hydro-meteorological project proposes a budget of USD 71 million of which about USD 54 million (i.e. 74.23 per cent of the total) is requested from GCF as grants. The AE and the European Union are providing USD 5.5 million and USD 5.85 million, respectively, as co-financing. The total co-financing amount is USD 16.75, which gives a ratio of 1:0.347.

50. In absence of the requested GCF financing, the available financing will enable the project to pay for a small sub-set of equipment needed and piloting the dissemination of climate information products in small pockets in the four target countries. However, such disjointed efforts and partial enhancement of instrumentation capacities will not do justice to the holistic needs of overall capacity-building, including modern equipment, computational requirements and automation, trained and expert human capital for running the models, and development of tailored forecasting messages and their dissemination. A piecemeal approach will simply not work in this case, and therefore the co-financing will be largely wasted if GCF financing is not committed upfront.

51. The entire objective is to generate accurate climate forecasting with adequate lead time, which is commonly done by involving public sector institutions across the world. Unfortunately, the private sector has not been seen as the lead actor in such an endeavour anywhere in the world, which is why the financing falls on the shoulders of individual states. In this case, without the participation and active support of GCF, the financial requirements cannot be met by the SWIO countries. This is why the public sector driven activities need financing from GCF.

52. There is no denying the fact that two of the four target countries (Mauritius and Seychelles) have healthy per capita income. However, the two other countries (the Comoros and Madagascar) do not only have much lower per capita income, but also a significant proportion of poor people who are climate vulnerable. Since all four countries belong to SIDS, the proposal

for grant financing (highest concessionality) is justified as per the GCF criteria of giving preferential treatment towards assessing funding requests from SIDS.

53. In an attempt to improve the existing forecasting capabilities to deliver MH-IBF-EWS, a significant technological upgrade is proposed, at least on meteorological aspects of forecasting. Global best practices will be emulated under the guidance of a global centre of excellence, WMO. However, equal thrust has not been observed on hydrological aspects, which will limit the overall effectiveness of advanced forecasting on water related matters. To be effective, both meteorological and hydrological excellence will have to be attained simultaneously through the project interventions. The current bias on meteorological aspects will reduce effective application of global best practices.

54. The funding proposal identifies four streams of potential benefits from the project, which include the following: (i) damage avoided through DRR, (ii) loss avoided through sustained agricultural production and subsequent food security, (iii) health costs avoided by restricting spread of infectious diseases, and (iv) gains from improved water resources management. The delivery of the last item will not be realized within the project implementation period of five years. Also, damage related to flooding will not be adequately forecasted without the full application of hydrological models. The cost estimates have removed the last two benefit streams, while comparing benefits with costs.

55. The benefit to cost estimation considered a time horizon of 15 years for the project, while it also considers 5 per cent discount rate. The economic efficiency estimates reveal a positive net present value of USD 230 million, with a cost-benefit ratio of 1:3.6. The economic internal rate of return becomes positive after the ninth year (four years after project completion), and reaches 14 per cent by the project completion. This indicates that the project's economic efficiency is high.

56. The same analysis involving a 30 per cent decline in benefits provided a sensitivity analysis, which also yields a net positive net present value of USD 161 million and a still healthy cost-benefit ratio of 1:1.8. The major decline in benefits dampens the economic internal rate of return, however it still appears attractive. Therefore, the economic efficiency of the project is found to be high, even without the potential benefits added from water resources management.

57. Despite such economic considerations, the use value (considering the social and gender related needs) of the forecasts will greatly decline due to the inherent weakness of the inadequate integration of hydrological modelling and subsequent forecasting. The time frame for the project and its budget will not be sufficient for the project proponents to procure, develop and calibrate globally-acclaimed hydrological and hydraulic models so that accurate forecasts may be made possible. Moreover, such models are not only expensive, the proponents will also have to expand the idea of building institutional capacities for the inclusion of hydrological modelling and forecasting by committing to additional costs, which are not seen in the budget spread of the project. This therefore appears as a missed opportunity, which is why the overall implementation of MH-IBF-EWS may not be effectively accomplished within the project budget and stipulated timeline.

58. In view of the above considerations, the effectiveness and efficiency of the project is rated as medium to low.

## **II. Overall remarks from the independent Technical Advisory Panel**

59. Without equal emphasis on hydrology, the project is not considered as among the best. However, the independent TAP recognizes the need for much improved forecasting capacities in the four SIDS and recommends that the Board approve the project.



60. The independent TAP recommends for the AE to actively engage with a global centre of excellence on hydrology and give adequate emphasis on the inclusion of hydrological data collection, monitoring and subsequent modelling in each of the four target countries, so that effective forecasting for multiple hazards becomes a reality within the lifetime of the project.

## **Response from the accredited entity to the independent Technical Advisory Panel's assessment (FP 161)**

Proposal name:	Building regional resilience through strengthened hydrometeorological-climate information services in Indian Ocean Member Countries
Accredited entity:	Agence Française de Développement (AFD)
Country/(ies):	Comoros, Madagascar, Mauritius, and Seychelles
Project/programme size:	Medium

### **Impact potential**

AFD, as the AE, thanks ITAP for the Funding Proposal (FP) review and assessment regarding the Impact Potential. We note the ITAP's conclusion that the Hydromet Project will have Medium to Low impact potential.

Indeed, AFD agree on the importance and the strong benefit of the engagement with WMO centre of excellence on hydrology, and agree on the necessity to lever additional sources of funding to support hydrological and Hydraulic activities modelling activities.

Noting that AFD acknowledges the equal importance of addressing meteorological and hydrological needs in the four target countries at national level to bring down the understating and impacted based forecast to the watershed level, AFD is pleased to confirm to ITAP that following the ITAP/AE meeting, the Funding Proposal has been already strengthened and completed to highlight the importance of the hydrological aspects as per the constructive ITAP questioning. AFD inform ITAP that a specific annex on hydrological and hydraulic existing tools –Annex 22-B) have been developed to confirm the completeness of the FP assessment.

AFD, would like to bring to ITAP attention, that the Hydromet Project supports activities on hydrological data generation and handling under Activities 2.1.1 (observation systems), 2.1.2 (information systems), and 2.2.1 (calibration laboratory), as these activities cover both meteorological and hydrological aspects. These activities will be supported by a strong capacity building and training program (Activity 1.3.2) on which engaging a WMO Centre(s) of Excellence on Hydrology will support meeting ITAP recommendations.

As a first approach, AFD, have already identified the following centres that may be considered as partner for the Project Implementation: the UK Centre of Ecology and Hydrology (CEH), and the Indian Institute of Technology Roorke/Department of Hydrology), the WMO Global Hydrological Data Centres (in Germany, Russian Federation and the Netherlands), and others (such as ECMWF, JRC and RIMES).

In addition to these activities, AFD recalls its support to ongoing others projects related to hydrological and Hydraulic capacity development specifically in Mauritius and Madagascar and Seychelles (Annex 22b). For efficiency and to avoid any financial effort duplication, AFD did not considered the necessity to provide countries like Mauritius with new licences.

Moreover, based on its large experience in LDCs, the AE recommends the use of open source models, alongside with global and regional datasets – e.g. from the EC/Copernicus GloFAS

(<https://www.globalfloods.eu>), and RIMES Flood Forecasting System (<https://www.rimes.int>) – that could be calibrated over the four countries.

AFD emphasizes that WMO is a technical implementing partner for the Hydromet Project and is considered as a member of the Project Regional Steering Committee – this has also been highlighted in the FP. Finally, AFD would like to recall that the HYCOS assessment of the IOC countries has been developed by WMO and endorsed by the AE, to be financed under the Hydromet project. In addition, through the partnership with WMO, the beneficiary countries will also benefit from the newly developed WMO Global Hydrometry Support Facility (HydroHub)<sup>1</sup>. These facts should secure the ITAP on the already existing strong dialogue and collaboration with WMO on hydrological, which dialogue will be maintained during the implementation of the project.

Based on what is develop above, AFD understand that the impact potential assessment of the Hydromet Project can be considered by ITAP as “High”.

### **Paradigm shift potential**

AFD thanks ITAP for the Funding Proposal review and assessment regarding the Paradigm Shift Potential. We note the ITAP’s conclusion that the Hydromet Project will have Medium High sustainable development potential, since ITAP considered that capacity development regarding hydrological and hydraulic aspects of the multi-hazard forecasting and EWS described in the Hydromet project may not be sufficient to achieve the coveted goal of MH-IBF-EWS.

AFD concurs on the equal importance of od addressing meteorological and hydrological aspects in MH-IBF-EWS. Based on the ITAP /AE meeting relevant discussions on the Funding Proposal on this specific issue, AFD took the opportunity to enhance and clarify theses aspects, following the constructive recommendation from ITAP.

In particular, AFD would like to confirm to ITAP that the FP activities cover the development of flood hazard maps for each of the four target countries under Activity 2.3.3 of the Hydromet Project. Vulnerability maps and flood risk analysis will be carried out for 2 pilot areas in each country under Activities 2.3.4 and 2.3.5, respectively. Flood forecasting capabilities will be introduced under Activity 2.3.8 (please refer to the previous response (above) on Impact Potential related to the hydrological and hydraulic tools, and to Annex 22b-Hydrological capacity development), including the use of ECMWF probabilistic data as an input to the flood forecasting model to generate probabilistic flood forecasts. For Impact Based Flood Forecasting, AFD agree on the necessity of linking warning to flood hazard mapping and modelling, exposure and vulnerability data to estimate the likely impact using concepts and approaches that are consistent with WMO Guidelines on Multi-Hazard Impact-based Forecast and Warning Services.

### **Sustainable development potential**

AFD thanks ITAP for the Funding Proposal review and assessment regarding the Sustainable Development Potential. AFD appreciates ITAP’s positive assessment of the economic, social environmental and gender-related co-benefits; however, it notes the ITAP’s conclusion that the Project will have Medium to High sustainable development potential since ITAP considered that capacity development regarding hydrological and hydraulic aspects in the Hydromet project may not be sufficient to fully achieve the environmental benefits of MH-IBF-EWS, and the social benefits accrued from agromet advisories.

<sup>1</sup> <https://public.wmo.int/en/our-mandate/water/High-quality-data-supports-science>

In this sense, AFD would like to confirm that the FP have been already modified after ITAP meeting to highlight the hydrological aspects, as described in previous responses to reflect the equal importance of addressing meteorological and hydrological aspects in MH-IBF-EWS and agromet services. Engagement with WMO Centres of Excellence on Hydrology will be pursued.

**Needs of the recipient**

The description of the Project’s “needs of the recipient” reflects the information provided in the Funding Proposal package. The AE thanks ITAP for the Funding Proposal review and assessment as “High” regarding the Needs of the Recipient.

**Country ownership**

The description of the Project’s “country ownership” reflects the information provided in the Funding Proposal package. AFD thanks ITAP for the Funding Proposal review and assessment as “High” regarding the Country Ownership.

**Efficiency and effectiveness**

AFD thanks ITAP for the thorough Funding Proposal (FP) review and assessment regarding the Efficiency and effectiveness.

AFD, as the AE, appreciates ITAP’s positive assessment of the results on the avoided damages and losses that the project will allow as well as on the gains, *inter alia*, in productivity impacts in the agricultural and tourism sectors. However, the AE considers that the evaluation of the criteria of efficiency and effectiveness “Medium to Low” mainly due to hydrological and hydraulic aspects could be revisit noting that the project (i) have dedicated activities related to hydrological aspects, and those will be strengthened with the additions included in the FP, based on ITAP’s recommendation (and described in previous responses); and (ii) strengthen synergies with ongoing projects on resilience and flood risk management especially those being implemented in beneficiary countries with the support of the AFD.

**Overall remarks from the independent Technical Advisory Panel:**

AFD thanks sincerely ITAP for the overall Funding Proposal (FP) review and assessment. The assessment document provides a good summary of the Project as it relates to the GCF’s six assessment criteria. We welcome the recommendation that the Project be funded without conditions.

AFD also welcome the recommendation from ITAP related to hydrological aspects, and together with the EE, is very keen to consider engaging with a Global Centre(s) of Excellence on Hydrology, as developed above in the Impact Potential part.

AFD, as the AE, will continue working closely with WMO, and will explore the newly developed WMO Global Hydrometry Support Facility (HydroHub) (<https://public.wmo.int/en/our-mandate/water/High-quality-data-supports-science>), to complement existing initiatives and further support the hydrological aspects in the Hydromet project.

With previous clarifications and additions to the FP on the hydrological aspects (as described/detailed in previous responses), AFD would appreciate that ITAP considers the Hydromet Project among the best, specifically when we consider its regional approach, which will lead to strong SIDS’ integration and levelling up.



**AFD will be very thankful for a strong endorsement of the Hydromet Project by ITAP.**



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

**Annex 7: Gender Assessment & Action Plan**

January 2021



AFD/DOE/CLI-DCP-2017-060  
Contract #: CZ22152-MS-2019-03





*This technical assistance operation is financed by Agence Française de Développement (AFD) under the Adapt'Action Facility. This Facility, which started in May 2017, supports African countries, LDCs*

*and SIDS in the implementation of their commitments under the Paris Climate Agreement, by financing studies, capacity building and technical assistance activities, particularly in the adaptation sector. The authors take full responsibility for the content of this document. The opinions expressed do not necessarily reflect those of AFD or its partners.*

## TABLE OF CONTENTS

<b>ABBREVIATIONS AND ACRONYMS</b> .....	<b>2</b>
<b>1 INTRODUCTION</b> .....	<b>1</b>
<b>2 METHODOLOGY</b> .....	<b>4</b>
2.1 APPRAISAL OF GENDER MAINSTREAMING PRIORITIES OF GCF AND AFD .....	4
2.2 CONCURRENT TRIANGULATION AND IN-COUNTRY MISSIONS .....	5
2.3 LITERATURE REVIEW AND STRUCTURE OF THE ANALYSIS .....	7
<b>3 GENDER MAINSTREAMING, SECTORAL ISSUES &amp; HYDRO-METEOROLOGICAL INFORMATION SERVICES</b> .....	<b>9</b>
3.1 THE GENDER-CLIMATE CHANGE-EWS/CS NEXUS .....	10
3.2 MAINSTREAMING GENDER WITHIN CLIMATE INFORMATION SERVICES IN THE IOC COUNTRIES .....	12
3.3 TAILORING PRODUCTS TOWARDS END USERS IN CLIMATE-VULNERABLE SECTORS.....	13
3.4 UTILISING COMMUNITY INFORMATION CHANNELS AND LOCAL KNOWLEDGE .....	14
3.5 CREATING OPPORTUNITIES TO OVERCOME GENDERED BARRIERS .....	15
<b>4 SOCIOECONOMIC AND GENDER BASELINE IN THE IOC COUNTRIES</b> .....	<b>17</b>
4.1 NATIONAL AGGREGATE STATISTICS AND DATA .....	17
4.2 POLICY ENVIRONMENT .....	28
4.3 COMPOSITE INDICES – HDI, GDI, GGI, GGCI, AND MPI .....	31
<b>5 CONCLUSION: REGIONAL POTENTIAL &amp; WAY FORWARD</b> .....	<b>35</b>
<b>6 GENDER ACTION PLAN</b> .....	<b>36</b>
<b>7 BIBLIOGRAPHY</b> .....	<b>58</b>

# Abbreviations and Acronyms

AFD	Agence Française du Développement
AU	African Union
AUC	African Union Commission
CEDAW	Convention on the Elimination of All Forms of Violence Against Women
COI/IOC	Commission de l’Océan Indien / Indian Ocean Commission
CS	Climate Information Services
CVI	Climate Vulnerability Index
DIE	Deutsches Institute für Entwicklungspolitik
DRR	Disaster Risk Reduction
EWS	Early Warning System/s
FHH	Female-headed Households
GBV	Gender-based Violence
GCF	Green Climate Fund
GDI	Gender Development Index
GFDRR	Global Facility for Disaster Risk Reduction and Recovery
GGGI	Global Gender Gap Index
GII	Global Inequality Index
GNI	Gross National Income
HDI	Human Development Index
ICT	Information Communication Technology
IFRC	International Federation of Red Cross and Red Crescent Societies
IPV	Intimate Partner Violence
IUCN	International Union for the Conservation of Nature
LDC	Least Developed Country/ies
MHH	Male-headed Households
MPI	Multidimensional Poverty Index
NMHS	National Meteorological and Hydrological Services
RCCC	Regional Climate Change Centre
RCSS	Regional Climate Services Strategy
OECD	Organization for Economic Cooperation and Development
OPHI	Oxford Poverty and Human Development Initiative
SADC	Southern African Development Community
SDG	Sustainable Development Goals
SIDS	Small Island Developing States
SIGI	Social Institutions and Gender Index
SMS	Short Messaging Services
SWIO RAFI	Southwest Indian Ocean Island Risk Assessment and Financing Initiative
UIP	Regional User Interface Platform
UNDESA	United Nations Department of Economics and Social Affairs
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention Climate Change
UNODC	United Nations Office on Drugs and Crime
UN-OHRLLS	Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries, and Small Island Developing States
VAW	Violence Against Women
WEF	World Economic Forum
WHO	World Health Organization
WMO	World Meteorological Organization

# 1 Introduction

This **Gender Assessment and Action Plan** has been prepared to assist the design of a Green Climate Fund (GCF) funding proposal by Agence Française de Développement (AFD) and Indian Ocean Commission (IOC), titled: ***Building Regional Resilience through Strengthened Meteorological, Hydrological and Climate Services in the Indian Ocean Commission (IOC) Member Countries (Hydromet)***.

This project aims to bolster climate resilience and adaptive capacities among communities by developing national hydro-meteorological services, strengthening regional cooperation and climate knowledge sharing, and with an overall focus on improving and scaling up climate information services (CS) delivery and early warning systems (EWS) in the IOC countries. These countries have been identified as 'climate hotspots' - vulnerable to climate risks and impacts due to greater exposure to coastal erosion, natural hazards, sea-level rise and saline intrusion, temperature variability, to cite a few factors. This is compounded by the following<sup>1</sup>: remoteness and deprivation from the benefits of scale, low income and assets, small domestic markets and heavy dependence on a few external markets, high volatility of economic growth, fragile natural environments, and socioeconomic as well as gendered vulnerabilities.

With **three components** (1: capacity building, institutional development, regional cooperation, public-private engagement); 2: high-quality climate-related data, improved multi-hazard impact-based forecasts and EWSs, and climate risk assessments; and, 3: enhanced use of climate services for climate change adaptation, and improved capabilities in implementation a people-centred MH-IBF-EWS for DRR), **the proposed project can reduce**, towards greater gender time poverty in the four countries by:

- Mainstreaming gender-responsive approaches for the design of CS products, hydro-meteorological systems, and EWS;
- Promoting gender balance through the technical and maintenance capacity-building activities as well as institutional development targeted for hydro-meteorological networks, equipment and systems;
- Establishing gender-aware policy frameworks to inform collaboration between key sectors and national/regional hydro-meteorological services; and
- Pioneering gender mainstreaming analyses and praxis regarding hydro-meteorological systems, EWS and CS in the Indian Ocean region.

**A kaleidoscope of overlapping cultural, economic, social and political roles form gender relations in the Comoros, Madagascar, Mauritius and Seychelles.** Given the expanse of the region and the unique markers of Comorian, Malagasy, Mauritian and Seychellois societies, these roles have multiple facets, broadly reflecting the:

---

<sup>1</sup> UN-OHRLS – Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries, and Small Island Developing States (2015). *Small Island Developing States in Numbers: Climate Change Edition 2015*. Report. Accessed 16 July 2019. Available at: [https://sustainabledevelopment.un.org/content/documents/2189SIDS-IN-NUMBERS-CLIMATE-CHANGE-EDITION\\_2015.pdf](https://sustainabledevelopment.un.org/content/documents/2189SIDS-IN-NUMBERS-CLIMATE-CHANGE-EDITION_2015.pdf)

- **Geographical and geopolitical specificity of the region:** Comoros<sup>2</sup> and Madagascar<sup>3</sup> are identified as Least Developed Countries or LDCs – UN designated countries for aid, preferential market access, and special technical assistance due to low income (calculated by a three-year average of Gross National Income or GNI), human assets and, economic vulnerability. Further, Mauritius and Seychelles along with Comoros are also classified as Small Islands Developing States or SIDS, which are a distinct group of developing island countries facing specific social, economic and environmental vulnerabilities. SIDS were recognized as having special status both for their environment and development at the Earth Summit, held in Rio de Janeiro, Brazil in 1992.
- **Traditional and faith-based norms within intraregional societies of the four countries:** the IOC covers a vast oceanic and land area, which despite a shared climatic and environmental system in the region reflect diversity among cultures, communities and customs. Seychelles, among the four island nations, has been distinctively a matrilineal society with greater access to both public and household expenditure and decision-making for women. On the other hand, Comoros, Madagascar and Mauritius have been traditionally patrilineal societies with varying amounts of decision-making accorded to women in the public and private sphere.
- **Gender gaps in economic roles and political representation:** the data collated from the four countries, explored in detail – see Section 3, reveal the different baselines in the IOC countries.

**At the outset, the project recognises that the lack of a gender-responsive approach** to address the above baseline (see Section 3 for details), particularly stemming from:

- Supposed ‘common sense’ notions that climate services are gender-neutral<sup>4</sup>;
- Side-lining of gender needs or ethnic vulnerabilities in adaptation design, resilience capacity-building and mitigation services<sup>5</sup>; and
- Lack or scant allocation of financial means, gender budgets and dedicated resources towards mainstreaming gender action

**will limit the potential, inclusiveness and success of the project goals in the Indian Ocean islands.**

**Without gender analysis and mainstreaming in IOC Hydromet,** the benefits of increased support and access to climate services, in tandem with awareness-raising and capacity-building, may accrue to better-off households or more mainstream groups that are able to capitalise on new

---

<sup>2</sup> UNDESA – United Nations Department of Economics and Social Affairs (2018). *LDC Country Profile: Comoros*. Brief Report. Accessed 1 August 2019. Available at: [https://www.un.org/development/desa/dpad/wpcontent/uploads/sites/45/LDC\\_Profile\\_Comoros.pdf](https://www.un.org/development/desa/dpad/wpcontent/uploads/sites/45/LDC_Profile_Comoros.pdf)

<sup>3</sup> UNDESA (2018). *LDC Country Profile: Comoros*. Brief Report. Accessed 1 August 2019. Available at: [https://www.un.org/development/desa/dpad/wpcontent/uploads/sites/45/LDC\\_Profile\\_Madagascar.pdf](https://www.un.org/development/desa/dpad/wpcontent/uploads/sites/45/LDC_Profile_Madagascar.pdf)

<sup>4</sup> Current literature on climate change, and its effects and emergent risks, are predominantly produced in scientific circles. Yet, there is increasing evidence that adopting social science methods, and situating resilience and adaptation practice within a broader science-policy interface and rights-based perspectives, can gear projects towards environmental and socioeconomic co-benefits. Particularly, this could better prepare communities to avoid resource strife and respond to the complexity of social arrangements, reducing far-reaching impacts of climate risks. See Butterfield, R. (2018) ‘Bringing rights into resilience: revealing complexities of climate risks and social conflict’ in *Disasters*. Journal Article.

<sup>5</sup> Poor or missing gender analysis, or the lack of gender-responsive action, may lead to planners or personnel depending on women to assume a central role in their coping strategies, which may not be the practical reality for many vulnerable communities. Further, this also glosses over the existing burdens on women among such groups. See Nelson, V., Meadows, K., Cannon, T., Morton, J., & Martin, A. (2002) ‘Uncertain predictions, invisible impacts and the need to mainstream gender in climate change adaptations’ in *Gender and Development*. Journal Article.

opportunities and respond better to changes implemented through the project.

**A 'gender lens', thus, is both necessary and relevant** for the project to maximise its outcomes, particularly creating hydro-meteorological, EWS and CS capacities for observation of weather phenomena and climate change impacts for vulnerable sectors; and, ensuring preparedness against natural and climate-induced hazards, disasters and weather variations that cannot be avoided. This gender-responsive approach is also crucial for establishing institutional structures and broad-based political and socioeconomic frameworks to mobilise medium- and long-term climate change adaptation action as well as regional cooperation.

## 2 METHODOLOGY

### 2.1 Appraisal of Gender Mainstreaming Priorities of GCF and AFD

The analytical prerogatives of this Gender Assessment and Action Plan are informed by both GCF's and AFD's respective gender policies.

The **GCF** adopted a revised version of its 2014 Gender Policy and Action Plan on June 2018 in Korea.<sup>6</sup> The revised Policy addresses pertinent issues on gender and climate change: the expansion of gender mainstreaming beyond the preserve of 'women's issues'; and the identification of synergies with the in-house Indigenous People (IP) Policy as well as the United Nations Framework Convention on Climate Change (UNFCCC)'s Gender Action Plan (GAP), Sustainable Development Goals (SDGs) and Convention on the Elimination of All Forms of Discrimination Against Women (CEDAW). Overall, the Policy and Action Plan reinforce the responsiveness of GCF to the multiple, heterogeneous, culturally diverse context of gender inequality to better address and account for the links between gender issues and climate change – a perspective that has been mainstreamed in the development of the funding proposal for IOC Hydromet.

The **AFD** recognises the important contributions made by increased gender equality to development. In 2013, the French Government made the promotion of gender equality a priority through the adoption of the French Gender and Development Strategy 2013 – 2017.<sup>7</sup> In 2014, AFD defined its Strategy on Gender and the Reduction of Gender Inequalities. It is based on three priorities: prevent gender inequalities in the operations financed by AFD; promote gender as one of the objectives of AFD's operations; and support progress in societies on these issues.<sup>8</sup>

Further, the AFD defines itself as a '100% Social Link' agency in its Strategy 2018-2022<sup>9</sup>: "All AFD Group actions will aim to bolster social link – or at least not weaken social link – by reducing inequalities and improving access to essential goods and services such as education, health, nutrition, water, energy, judicial protection, and culture. The Group will also close gaps in economic participation by facilitating access to property ownership, employment, and credit, and by connecting isolated areas to the rest of the world. This multidimensional commitment will help attain SDG 1 (eradicate poverty), SDG 10 (reduce inequalities), and SDG 5 (gender equality). It also includes all AFD actions that contribute to SDG 2 (zero hunger), SDG 3 (good health and well-being), SDG 4 (quality education), and SDG 8 (decent work and economic growth); and, the SDGs that address access and territorial challenges: SDG 6 (water and sanitation), SDG 7 (clean and affordable energy), and SDG 11 (sustainable cities and communities)."

---

<sup>6</sup> GCF – Green Climate Fund (2018). *Updated Gender Policy and Action Plan*. Policy Document. Accessed 22 April 2019. Available at: [https://www.greenclimate.fund/documents/20182/1087995/GCF\\_B.20\\_07\\_-\\_Updated\\_Gender\\_Policy\\_and\\_Action\\_Plan\\_2018\\_2020.pdf/9bd48527-6e35-a72a-2f52-fd401d16d358](https://www.greenclimate.fund/documents/20182/1087995/GCF_B.20_07_-_Updated_Gender_Policy_and_Action_Plan_2018_2020.pdf/9bd48527-6e35-a72a-2f52-fd401d16d358)

<sup>7</sup> AFD – Agence Française de Développement (2019). 'Gender Equality'. Official Website. Accessed 2 August 2019. Available at: <https://www.afd.fr/en/page-thematique-axe/gender-equality>

<sup>8</sup> AFD (2019). *Ibid.*

<sup>9</sup> AFD (2018). *Towards a World in Common: AFD Group 2018 – 2022 Strategy*. Policy Document. Accessed 2 August 2019. Available at: <https://www.afd.fr/sites/afd/files/2018-09-04-05-09/afd-group-strategy-2018-2022.pdf>

The **IOC**, as of January 2020, does not have a regional gender policy in place. However, a GCF accreditation and readiness proposal put together for the IOC by Seychelles stipulates the identification and development of regional needs for equal representation of women in environmental projects.<sup>10</sup>

## 2.2 Concurrent Triangulation and In-country Missions

This Gender Assessment is informed by a **concurrent triangulation research design**: firstly, semi-structured interviews (with community focus groups, key informants within governments and technical organizations, and institutional representatives of met and related departments) were conducted during the rapid in-country missions (five working days in each IOC country in the months of June and July 2019).

Secondly, the **focus of these interviews** was ensured to reflect upon and build on the information and secondary data gathered from the desk-review of existing literature (see bibliography under chapter 6). Participants and stakeholders were identified using a combination of purposive and snowball sampling during the mission, and classified according to their levels of knowledge, exposure and access on climate change, early warning systems, and gender baseline and inequality issues to prioritise and vet information and data received.

The **concurrent triangulation research design** was deemed suited to the IOC Hydromet gender assessment, given: the flexibility to convert secondary quantitative and qualitative findings into narrative data for the comprehension of the studied phenomenon, and the accuracy it can provide to samples of intermediate or small size (which were the primary sources). The research undertaken in the four countries, was also formative in nature and rapid in mandate, necessitating the prompt methodology to establish an inventory of information related to gendered aspects of EWS, CS and hydromet services, relevant for the delivery of outputs identified in the results framework. The methodology, thus, informed the in-country missions for gender data and information scoping, described in chronological order below:

### **Madagascar (24 – 28 June 2019)**

The week-long in-country mission in Madagascar, based out of Antananarivo, primarily focused on identifying and interviewing key informants (particularly government stakeholders such as representatives from the Ministries of Agriculture, Livestock and Fisheries; Tourism; Social Protection and the Advancement of Women) and experts (international organizations and NGOs) to understand the country context the country context and gender baseline, especially gauging the availability of gender-related secondary data and information on climate-vulnerable sectors (such as, participation of women in agriculture).

Multi-stakeholder meetings with different government wings (key climate-vulnerable sectors such as the Ministry of Agriculture, Livestock and Fisheries; and the Ministry of Environment, Ecology and Forests) provided an overview of gendered labour force participation and potential beneficiaries in these sectors. A report on women and environment for the National Adaptation Planning process, finalised in February 2019, was also obtained to inform this analysis.

Additionally, meetings were held with and reports were received from:

<sup>10</sup>

---

GCF (2017). Readiness Proposal with the Indian Ocean Commission (IOC) for Republic of Seychelles. Project Document. Accessed 15 January 2020. Available at: [https://www.greenclimate.fund/documents/20182/466992/Readiness\\_proposals\\_-\\_Seychelles\\_Indian\\_Ocean\\_Commission\\_Entity\\_Support.pdf/7a649544-1b41-430e-b735-c53a840d62ba](https://www.greenclimate.fund/documents/20182/466992/Readiness_proposals_-_Seychelles_Indian_Ocean_Commission_Entity_Support.pdf/7a649544-1b41-430e-b735-c53a840d62ba)

- A local non-governmental organisation (NGO) – Capacity-Building for Communities (C for C) – that focuses on women’s economic empowerment and gender-based violence (GBV) activism in rural Malagasy communities under the EU-funded SAHALA programme; and
- USAID Madagascar for technical information on gender baselines that have informed their agenda and programming in the country, particularly the Fararano Food Security project.

### ***Comoros (01 – 05 July 2019)***

The week-long in-country mission in the Comoros archipelago was trifurcated to cover all three islands: Anjouan, Grande Comore, and Mohéli. Gender-related data scoping and information collection were undertaken primarily by the consultant in Moroni, Grande Comore. This involved:

- Engagement with key government stakeholders such as Ministry of Civil Aviation and Meteorology, Ministry of Civil Protection, Ministry of Fisheries, etc;
- Consultation with NGOs and volunteer associations such as International Red Cross and Red Crescent Societies; and
- Key-informant interviews with UN organisations active in the islands – Food and Agriculture Organization (FAO) and United Nations Development Programme (UNDP).

Additionally, site visits (organized through the project focal point in the meteorological department) in Grande Comore to areas hit by Cyclone Kenneth were undertaken along with the core and complementary studies team. Focus group discussions in coastal communities of north Ngazidja were held with women’s representatives and village elders. These were conducted in a semi-structured interview format, using both open-ended and closed questions to gather information regarding:

- Current and past livelihoods in the communities, particularly fishing practices (dominated by men), ylang ylang plucking (dominated by women);
- Gendered access to government and NGO aid, resources and capital in the selected sites;
- Information dissemination channels among different groups within the communities (particularly, public spaces such as mosques and women’s limited access to these); and
- Importantly, the ex-ante (the EW was received mostly by men, and women were uninformed / underinformed about the cyclone), during (it was revealed that due to lack of information dissemination, many communities in Ngazidja lost their housing and managed to take part in last-minute evacuations) and ex-post coping mechanisms taken by men and women, in response to the cyclone (such as community mobilization and sharing of resources – many families were depending on familial and neighbour networks as their houses were yet to be repaired, losses of agricultural land were yet to be reversed).

### ***Seychelles (22 – 26 July 2019)***

The week-long in-country mission in Seychelles was based out of Mahé Island, the largest island and governance centre of the archipelago. At the outset, a multi-stakeholder meeting organised through the Seychelles Meteorological Authority brought different governmental departments such as Ministry of Tourism, Civil Aviation, Ports and Marine, Ministry of Fisheries and Agriculture, Seychelles Fisheries Authority, etc. This helped identify the key stakeholders and existing CS, EWS and hydro-meteorological services, and understand the gender requirements in terms of sectoral users and beneficiaries. Field visits, organised through the meteorological services, to Praslin and La Digue islands, facilitated rapid assessments of coastal erosion sites and engagement with private enterprises (potential users of climate services) that have experienced sea intrusion-related losses.

A gender-focused meeting was organised with the Gender Secretariat housed within Seychelles' Ministry of Social Affairs, Community Development and Sports. Key-informant interviews with the Principal Secretary and other operatives of the Secretariat highlighted gender- and youth-related issues, that inform the climate- and disaster-readiness of the country: primarily market segmentation in the labour force, drug epidemic and gender-based violence (GBV) among certain communities.

### *Mauritius (29 July – 02 August 2019)*

The week-long in-country mission in Mauritius was centred around Port Louis, the capital city and administrative hub, and focused on pinpointing sectoral stakeholders, cost-estimation of climate-related losses, and institutional collaborations for climate and hydro-meteorological services in the administrative structure. This began with bringing key sectors for a joint stakeholder meeting, including the Mauritius Meteorological Services, Ministry of Agro Industry and Food Security, and Ministry of Ocean Economy, Marine Resources, Fisheries and Shipping. Following the identification of potential beneficiaries of improved climate services, a targeted gender meeting with key informants (Gender Coordinators) in the Ministry of Gender Equality, Child Development and Family Welfare was organised.

This meeting was crucial in mapping the current gender baseline in Mauritius, and understanding gender issues in context with cross-cutting factors such as socioeconomic performance and caste determinants. Further, it shed light on gender roles in Mauritian societies and how these relate to climate change preparedness, and potential adaptation options through hydro-meteorological services and products. The key-informant interviews with Gender Coordinators in the Ministry were combined with secondary data collection and policy appraisal through the existing knowledge products of the department, as well as collation of existing gender assessments done for environment- and climate change-related funding proposals on solar energy, land management, etc.

## 2.3 Literature Review and Structure of the Analysis

A comprehensive **desk-review** of existing literature was conducted on gender, climate change adaptation, climate services and hydro-meteorological services. Literature was drawn from: in-house documents and similar projects of both GCF and AFD; research reports from international organisations or knowledge platforms (UNDP, World Meteorological Organisation – WMO, Sustainable Development Knowledge Platform); multilateral development banks and international financial institutions (primarily the World Bank and the African Development Bank – AfDB); journals (*Gender and Development*, *Disasters*, *Society and Natural Resources*); and grey literature (for example, Beijing 25+ country report for Comoros<sup>11</sup>, SAHALA-EU activity report for Madagascar<sup>12</sup>,

---

<sup>11</sup> UN Women & Union Des Comores, Commissariat National à la Solidarite, à la Protection, er à la Promotion du Genre (2014). *Rapport Pays sur les Progres Realises dans la Mise en Œuvre de la Plateforme D'Action de Beijing+25*. Government Report. Accessed 2 August 2019. Available at: <https://www.unwomen.org/-/media/headquarters/attachments/sections/csw/64/national-reviews/comoros.pdf?la=en&vs=2402>

<sup>12</sup> EU & C for C (2018). *Rapport Final des Activites du Project – Couvrant la Periode du 01er Avril 2016 au 31 Mars 2018*. Project Evaluation Report.

CEDAW shadow report for Mauritius<sup>13</sup>, and National Comprehensive Review report for Seychelles<sup>14</sup>).

The next section (Section 2) presents **gender-responsive elements related to sectoral issues** to be incorporated within project outcomes to reduce climate vulnerability, particularly of at-risk households and ethnic minority groups; gender considerations and actions for stakeholders; and presents normative information to gear the overall proposal towards better socioeconomic, gender and environmental co-benefits.

The literature review revealed useful data and research, which were informed by varied methodologies and perspectives. Thus, a **derivative baseline** (Section 3) with additional data points from composite indices and national aggregates has been inferred to identify the gender barriers and dynamics in the IOC countries, and to substantiate Section 2. Subsequently the section also explores the **policy environments** in Comoros, Madagascar, Mauritius and Seychelles, and presents a potential list of gender collaborators relevant for project activities and stakeholder consultations during project implementation.

---

<sup>13</sup> Gender Links, Young Queer Alliance, Media Watch Organization, and SOS Femmes (2018). *Report to CEDAW from Mauritius*. Shadow Report. Accessed 2 August 2019. Available at: [https://tbinternet.ohchr.org/Treaties/CEDAW/Shared%20Documents/MUS/INT\\_CEDAW\\_CSS\\_MUS\\_32569\\_E.pdf](https://tbinternet.ohchr.org/Treaties/CEDAW/Shared%20Documents/MUS/INT_CEDAW_CSS_MUS_32569_E.pdf)

<sup>14</sup> UN Women & Government of Seychelles, Ministry of Family Affairs (2019). *Seychelles: National Comprehensive Review*. Report. Accessed 2 August 2019. Available at: <https://www.unwomen.org/-/media/headquarters/attachments/sections/csw/64/national-reviews/seychelles.pdf?la=en&vs=4554>

### 3 GENDER MAINSTREAMING, SECTORAL ISSUES & HYDRO-METEOROLOGICAL INFORMATION SERVICES

The World Economic Forum (WEF)'s report *The Global Risks Report 2020* finds that the top five among the primary ten risk factors facing the world population are environmental in nature: (in order of risk) extreme weather, climate action failure, natural disasters, biodiversity loss, human-made environmental disasters.<sup>15</sup> These risk factors are often compounded by 'threat multipliers' such as precarious economic status and lack of political access (including, decision-making bodies); performance on health, education and livelihood indicators (which are often worsened by extreme weather events and natural disasters); limited access to productive assets, information networks, skills (which work as buffers during ex-post disaster situations); among others.

Employing a gender mainstreaming perspective will highlight these complex social development phenomena and interconnected nature of risks and threats in the western Indian Ocean nations. Once identified, this will form the gender and social development context in which the IOC Hydromet has to be operationalized. In doing so, the project's change narrative can also amend some of these persistent inequalities and unequal access, which often result in specific and entrenched vulnerabilities in the IOC countries.

Vulnerabilities, thus, can be defined a set of general characteristics that impair the ability of a social group to cope with, respond effectively to, and adapt to external shocks, including those emerging from climate change, natural hazards, and disasters.<sup>16</sup> This perspective is an important point of departure for the IOC Hydromet project, as vulnerabilities (in the background of risks and threat multipliers) need addressing through a range of climate adaptation activities, as they act as impediments for coping capacities against climate risks and impacts.

Further, these vulnerabilities, whether compounded or individual, can reverse the progress achieved in securing household economic stability (with spillover effects on food, energy and water security) and managing community, resource and social strife. They can also reverse advances made on developmental goals and social change, particularly in the precarious contexts of both LDCs and SIDS. On the other hand, gender mainstreaming through the Gender and Development (GAD) approach<sup>17</sup> (as adopted by the project) will also recognise the role marginalised and vulnerable groups can play, and not simply stylise them *a priori* as 'victims'. With an inclusive project design, they are often able to contribute traditional and artisanal knowledge of coping and improvising strategies, which can either be strengthened and mainstreamed as well as used as a basis for further capacity development.

This section presents a synthesis of gender, environment and climate change issues, as these pertain to EWS and CS, as a broad background informing the gender-responsive perspective of IOC Hydromet. Then, it identifies sectoral recommendations in relation to gender-responsive planning for CS that have been identified for the project's design and operationalisation.

---

<sup>15</sup> World Economic Forum – WEF (2020). Official Website. Accessed 17 January 2020. Available at: [http://www3.weforum.org/docs/WEF\\_Global\\_Risk\\_Report\\_2020.pdf](http://www3.weforum.org/docs/WEF_Global_Risk_Report_2020.pdf)

<sup>16</sup> DIE – Deutsches Institute für Entwicklungspolitik (2009). "Climate Change Adaptation from a Gender Perspective". Discussion Paper.

<sup>17</sup> The GAD approach seeks to correct systems and mechanisms that produce gender inequality by focusing not only on women, but also by assessing the social status of both women and men. Moreover, it emphasises the role of men in resolving gender inequality, and places importance on the empowerment of women, who are placed in a socially and economically weaker position than men.

### 3.1 The Gender-Climate Change-EWS/CS Nexus

In December 2019, the 25<sup>th</sup> Conference of the Parties (COP) was held in Madrid, Spain and organized by the Government of Chile, bringing together all the signatories to the United Nations Framework Convention on Climate Change (UNFCCC). Renewed demands and efforts for gender mainstreaming and gender-responsive climate change adaptation were highlighted by the Women and Gender Constituency – particularly the inadequacy of transformative action (and policy gaps) on gender-climate issues towards the Lima Work Programme and its Gender Action Plan.

COP 25 and other high-level policy engagements, between states and international organizations, reveal that gender and climate change issues have been recognized in adaptation and mitigation policy design and action. Yet, despite having currency as a concept and perspective, the operationalization of gender-responsive measures in adaptation and mitigation action remains scarce.

Further, resource mobilization and commitments by national governments, in tandem with local actors, do not exhibit the percolation of these issues – especially at grassroots level where gender-responsive climate action is crucial in determining overall resilience and adaptive capacities of communities.

As elaborated in the funding proposal, this Gender Annex concurs that climate impacts in the IOC countries will be on demographic groups that are (primarily) reliant on natural resource-based livelihoods and agriculture, as well as tourism. The stakeholders in these sectors, in each IOC country, require capacity-building to manage changed climate phenomenon, natural disasters and hazards, as well as increasing and intensifying weather events. It has been generally observed, that female-headed households and women commonly face higher risks and greater burdens from these impacts, particularly compounded by incidence of poverty, unequal participation in decision-making processes, disparities in labour markets, health risks, etc.

The following table identifies the main risks and challenges relevant for gender mainstreaming in a multi-country EWS and CS adaptation project like IOC Hydromet.

<b>MAIN GENDER RISKS AND CHALLENGES FOR IOC HYDROMET</b>	
<b>GENDER-DIFFERENTIATED IMPACTS OF CLIMATE EFFECTS AND NATURAL DISASTERS</b>	<p>The first and foremost hurdle for the project is the gender-specific differences (in consumption patterns and incidence of poverty, access to and control of resources and power, time use patterns and economic activities, etc.) that uniquely compound and overlap to create gendered vulnerability to climate change in each IOC country.</p> <p>This high burden of adverse impacts of climate change, especially with the lack of EWS, CS, and hydromet services, limit not only adaptation capacities in real time, but also have intergenerational effects and undo progress made towards gender equality in the island nations (particularly in SIDS and LDC contexts).</p>
<b>GENDERED ACCESS TO ADAPTATION SOLUTIONS IMPLEMENTED BY THE PROJECT</b>	<p>Field visits and engagement with government officials revealed that adaptation solutions, ranging from climate-smart agriculture to DRR training, face gendered impediments in percolation (when these are rarely mobilized). Women are often not allowed to access public spaces (where EW may be announced), for example mosques in Comoros. They may have limited access to radios or other information channels, such as in Madagascar. As a trend in the region, dissemination of information are limited to channels primarily accessed by men. Additionally, time poverty (explored below) experienced by women and men (in some contexts) can also constrain the adoption of adaptation solutions, particularly in post-disaster and other vulnerable contexts.</p>
<b>SIDELINING LOCAL ADAPTATION MEASURES AND INFORMATION CHANNELS</b>	<p>Communities have long histories and praxis of engagement with and management of natural resources. Consequently, local adaptation methods, information channels, and disaster strategies (albeit discrete and reactive) have also existed. Resilience of communities, as well as ecosystems, can be ensured through the incorporation of these primarily reactive techniques into broader, pre-emptive EWS, CS and hydromet services with an emphasis on cross-community dialogue to tailor these provisions.</p>
<b>GENDER-BASED VIOLENCE (GBV)</b>	<p>Despite mounting evidence for interlinkages between GBV and environmental factors, academic enquiry and practical integration of this perspective remains limited in adaptation practice. Physical, sexual and psychological harm are usually exacerbated during <i>ex-post</i> situations of climate impacts and losses, disasters and extreme weather events.</p> <p>In the Indian Ocean island nations, GBV rates are high (when reported), and often go underreported (with, in fact, Madagascar lacking a recent nation-wide survey). In the Seychelles archipelago, men also experience high levels of violence (uncharacteristic to the region, where women are usually targeted) alongside a persistent drug addiction epidemic, creating further barriers in the face of frequent and severe climate impacts.</p>
<b>GENDERED LIMITATIONS IN DECISION-MAKING INSTITUTIONS (RELATED TO EWS, CS &amp; HYDROMET) &amp; REPRESENTATION</b>	<p>Decision-making institutions, power-sharing mechanisms and overall representation tend to be skewed towards men in all four IOC countries, barring Seychelles. Yet, at the same time, women make important household decisions daily, in these countries, that pertain to domestic food security, water provision and other essentials. Without the adequate integration of these complex and gendered phenomena, it will be difficult to respond to particular needs and interests of vulnerable groups at the local level. In such a context, interventions become restricted to implementing scenario-based adaptation solutions, which are essentially top-down, that lead to limited successes and lack of ownership at the community level.</p>

## 3.2 Mainstreaming Gender within Climate Information Services in the IOC Countries

The countries identified by the project are uniquely vulnerable to aggregate shocks from both economic and environmental stressors due to their small size, isolation, and other geographic, economic and socio-political features. The climate impacts on household well-being and the effectiveness of prevailing risk management mechanisms are not well understood, despite the use of different types of risk assessments, household income and expenditure surveys, and poverty analysis having been conducted in the region, and the macroeconomic impacts of negative shocks having been well studied in generic contexts.

Given this lack of understanding regarding the effects of climate-related risks, natural hazards and disasters, along with inadequate CS, cannot be empirically quantified but can be hypothesised to produce unevenly distributed impacts within a population. The impacts and exposure compound with current incidence of impoverishment, gender inequality and lack of access to social safety networks and disproportionately affect the poorer and more vulnerable demographics – determined by the needs, opportunities and perils facing men and women. In this context, gender-responsive CS will play a unique and positive role in increasing adaptability and resilience of communities towards climate-related risks and hazards; bolstering national meteorological and hydrological institutions (NMHS) and weather variation as well as observation, data collection, analysis, and interpretation; and strengthening EWS.

At the outset, mainstreaming gender in CS through the project will involve the consideration of the following factors in activity design:

- Division of labour (activity/place);
- Visibility of labour (formal/informal sector);
- Poverty levels (incidence/severity);
- Human development factors, including:
  - nutrition pattern (current levels of health/morbidity and mortality rates),
  - literacy levels (access to information/ability to act on information and knowledge),
  - recourse to legal protection (inheritance/land rights);
- Access to and supply of information;
- Access to critical resources (emergency aid/loans/insurance); and
- Influence over decision-making processes (authority/power over domestic, community and local management).
- Household responsibilities and time-use (domestic and unpaid care as well as reproductive work, fuel and water provisioning)
- Incidence of physical, social and psychological violence in the household (especially how gender-based violence and intimate partner violence trends are affected in *ex post* disaster contexts)

### 3.3 Tailoring Products towards End Users in Climate-Vulnerable Sectors

The IOC countries have faced consequences of disasters (including climate-induced disasters), extreme weather events and the pitfalls of limited meteorological capacities in recent years. For example:

- Comoros is estimated to have lost between 60 – 80% of staple crops, water facilities and housing due to Cyclone Kenneth.<sup>18</sup>
- The Climate Vulnerability Index (CVI)<sup>19</sup> calculated by Germanwatch e.V. identifies Madagascar as the 7th most affected by climate event and related losses in 2017.
- The Southwest Indian Ocean Risk Assessment (SWIO RAFI), conducted by the Global Facility for Disaster Risk Reduction and Recovery (GFDRR) and World Bank, finds that Mauritius experiences a combined US\$ 110 million in combined direct losses from earthquake, floods and tropical cyclone each year.<sup>20</sup>
- In 2013, a Damage, Loss, and Needs Assessment report<sup>21</sup> by the Government of Seychelles (supported by the European Union or EU and the World Bank) found that Cyclone Felleng caused an estimated loss of US\$ 8.4 million, equivalent to 0.77% of the country's GDP.

The above predicament of the IOC countries can be contextualised by a CGIAR report<sup>22</sup> that highlights how the extent of exposure to the impacts and losses of climate events is determined mainly by three factors:

- *Ex ante* and *ex post* coping mechanisms;
- The resources and information available to a community; and
- The frequency and intensity of shocks/impacts that determines income shortages and asset loss, and cause failures of local recovery techniques built up over time.

The reports reiterate the importance of hydromet and CS as well as a robust EWS in the Indian Ocean island countries, and how these cannot simply be limited to technical capacities and tools, particularly because expected and unavoidable variations in climatic patterns, climate-induced disasters and hazards, and unpredicted climate change risks will create different exposure patterns among communities.

To address these differential exposure patterns, CS products, such as impact forecasting (analysing and disseminating implications of the forecast and specific uses of the forecast information) and nowcasting (short range weather forecasting, particularly from ground-based remote sensing

---

<sup>18</sup> ReliefWeb (2019). 'Comoros Humanitarian Situation Report – Cyclone Kenneth'. Online Report. Accessed 09 September 2019. Available at: <https://reliefweb.int/report/comoros/comoros-humanitarian-situation-report-no-2-cyclone-kenneth>

<sup>19</sup> GermanWatch (2019). *Climate Vulnerability Index 2019*. Report. Accessed 09 September 2019. Available at: [https://germanwatch.org/sites/germanwatch.org/files/Global%20Climate%20Risk%20Index%202019\\_2.pdf](https://germanwatch.org/sites/germanwatch.org/files/Global%20Climate%20Risk%20Index%202019_2.pdf)

<sup>20</sup> The World Bank & Global Facility for Disaster Reduction and Recovery – GFDRR (2016). *Disaster Risk Profile: Mauritius*. Accessed 09 September 2019. Available at: <https://reliefweb.int/sites/reliefweb.int/files/resources/mauritius.pdf>

<sup>21</sup> Government of Seychelles (2013). *Seychelles Damage Loss and Needs Assessment Report 2013*. Report. Accessed 09 September 2019. Available at: [https://www.gfdr.org/sites/default/files/publication/Seychelles\\_DaLA\\_2013\\_Floods.pdf](https://www.gfdr.org/sites/default/files/publication/Seychelles_DaLA_2013_Floods.pdf)

<sup>22</sup> CGIAR CCAFS – Research Program on Climate Change, Agriculture and Food Security (2013). 'Investigating Climate Information Services through a Gendered Lens'. Working Paper no. 42.

systems, radars, wind profilers) etc., have to be geared towards end users, particularly those with low access in vulnerable sectors such as agriculture, fishing, and pearl farming.

Gearing CS products for greater end-to-end value and effectiveness thus functions in tandem with gender-responsive mapping of users and stakeholders. The project will address this through the Regional Climate Services Strategy (RCSS), which will allow for user feedback mechanisms to evaluate the effectiveness and pitfalls of CS – recalibrating and configuring these products to optimise value and information, where necessary.

### 3.4 Utilising Community Information Channels and Local Knowledge

A complementary approach to creating user-friendly and gender-responsive climate service products is sourcing local knowledge, artisanal practices and traditional know-how to inform EWS and CS products as well as other hydromet technical and maintenance capacity building activities. Conducting mapping exercises, informed by participant observation and a consultative approach, will be key to: understand how local information and warning systems work; identify community engagement and decision-making groups; and invest in gender-relevant or women’s groups.

Further, the consideration of gendered access to technology in the different countries is an important factor in the delivery and efficiency of CS products. The importance of understanding differences in access to information and communication technologies (ICTs) between women and men, as well as variations in usage patterns and desired value-added services have been highlighted in recent research, particularly for climate-smart agriculture.<sup>23</sup> The data reveals that often women are falsely presumed to have similar levels of access and usage as men to ICTs<sup>24</sup>, creating a significant gender gap that can determine the effectiveness and percolation of CS products and EWS. Additionally, gender-disaggregated data is often available for the national level – concealing large variations in access and use by geographical region and rural versus urban communities.<sup>25</sup>

Addressing these factors will assist in empowering women in their roles as key actors in climate-vulnerable sectors, encourage active participation and involve them as information producers, and draw out valuable inputs for climate information product design.

A CGIAR<sup>26</sup> report finds that inclusion of traditional methods and gender-responsive design in community engagement could substitute for where modern innovations are lacking in gender awareness or accessibility, as these utilise strong social networks that have historical continuity within the community and provide a familiar means of communication. Adaptation to technological changes is not linear, hence these traditional methods can be easily hybridised with modern technology such as (where available) radio, television and short messaging service (SMS) through telecom networks to ensure impact forecasting products and other relevant climate content are disseminated effectively. The GAP report shows that in some contexts it is important to build on the existing socio-political networks that form the basis of information sharing, EWS, DRR. Since the

---

<sup>23</sup> USAID (n.a.). *Gender and Information Communication Technology (ICTs)*. Survey Toolkit.

Accessed 01 October 2019. Available at:  
[https://www.usaid.gov/sites/default/files/documents/15396/Gender\\_and\\_ICT\\_Toolkit.pdf](https://www.usaid.gov/sites/default/files/documents/15396/Gender_and_ICT_Toolkit.pdf)

<sup>24</sup> USAID (n.a.). *Gender and Information Communication Technology (ICTs)*. *Ibid*.

This was particularly true for Comoros – where women (in focus group discussions) revealed the lack of access to technology within the household (for example, mobile phones). Further research can identify the sociocultural norms informing this, which remains beyond the scope of this assessment.

<sup>25</sup> *Ibid*.

<sup>26</sup> CGIAR CCAFS – Research Program on Climate Change, Agriculture and Food Security (2013). *Ibid*.

project is expected to introduce newer technologies, to encourage uptake, it will be important to build on the existing, traditional systems - such as public announcements in mosques in Comoros and radio usage in Madagascar. At the project onset and during implementation period, the reassessment of the baseline will be tackled for each country with the support of the last mile partner such as IFRC/PIROI. This will allow identifying carefully if there are traditional networks that can be built on, how these serve different gender interest groups, and then to figure how improved hydromet and early warning services can build on this to improve outcomes. The consultation process have shown that sometimes-traditional networks may exclude women, as it was observed in Comoros.

Feedback loops, by which community members, specifically women in vulnerable groups such as subsistence agriculture-dependent smallholders, can reflect upon which methods work best for their particular context, are also necessary.<sup>27</sup> By introducing new technologies into traditional networks and means of communication, climate information providers, such as field workers from met services, may be able to extend the reach of their climate information services and help more vulnerable communities to adapt to environmental and climate changes.

### 3.5 Creating Opportunities to Overcome Gendered Barriers

Section 3 below presents detailed statistics related to poverty and hardship, labour and education, and health and social indicators to demonstrate the gendered realities of the Indian Ocean islands under the purview of this project. To further the analyses, it is important to consider the intra-household dynamics between men and women pertaining to culture- and faith-based socioeconomic practices. Regionally, it is commonplace for women to participate in the bulk of domestic, care and reproductive work – which is further exacerbated<sup>28</sup> with productive labour due to high levels of male out-migration for seasonal work. Thus, it can be surmised that gendered time poverty in the project countries is high.

Bardasi and Wodon define<sup>29</sup> an individual as ‘time poor’ if he/she is working long hours, while being simultaneously monetary poor, or facing the risk of monetary poverty if he/she were to reduce his/her working hours below a given time poverty line. Thus, time poverty results from the combination of two conditions<sup>30</sup>:

- Firstly, the individual does not have enough time for rest and leisure once all working hours (whether spent in the labour market or doing household chores such as cooking and fetching water and wood) are accounted for; and
- Secondly, the individual cannot reduce his/her working time without either: increasing the level of poverty of his/her household (if the household is already poor); or leading his/her household to fall into monetary poverty due to the loss in income or consumption associated with the reduction in working time (if the household is not originally poor).

---

<sup>27</sup> *Ibid.*

<sup>28</sup> Wodon, Q. & Bardasi, E. (2006). “Measuring Time Poverty and Analyzing its Determinants: Concepts and Applications to Guinea” in *Economics Bulletin* (Vol. 10, No. 12). Journal Article.

<sup>29</sup> *Ibid.*

<sup>30</sup> *Ibid.*

An additional implication of time poverty is the lack of flexibility/opportunity to change the current time usage pattern within the household to explore other economic activities or, as in the case of this project, to explore autonomous or technical adaptation options against climate-induced weather variation, natural disasters and hazards such tropical cyclones, and other climate risks.

In addition to facing the time poverty-related risks, GBV persists as a serious epidemic in the Indian Ocean region, as explored further in Section 3. The International Federation of Red Cross and Red Crescent Societies (IFRC), upon conducting in-depth research<sup>31</sup> on its designated regional zones and national societies, found that GBV is a constant theme in post-disaster contexts. Given the negative shocks, loss of family members, livelihoods and homes, domestic conflict levels tend to rise, leading to greater incidence of GBV and IPV, among other effects on gender relations. With the increasing frequency and intensity of climate-related hazards and risks, GBV can be expected to witness an upward trend, reiterating the importance of resilience mechanisms and adaptation opportunities through CS in the beneficiary countries. Further, recent research<sup>32</sup> undertaken by the International Union for the Conservation of Nature (IUCN) with USAID has revealed potential risks of and connections between environment- and climate-related stressors and increased GBV, which are both detrimental to the well-being of survivors as well as impediments for inclusive climate change adaptation and resilience.

---

<sup>31</sup> IFRC – International Federation of Red Cross and Red Crescent Societies (2015). *Unseen, Unheard: GBV in Disasters*. Report.

<sup>32</sup> Research connecting environmental and climate-related stressors to GBV is nascent. AGENT – Advancing Gender in the Environment (USAID-IUCN partnership) is at the forefront of collating, analysing and identifying these stressors in different contexts.

## 4 SOCIOECONOMIC AND GENDER BASELINE IN THE IOC COUNTRIES

The previous section underscored the important nexus issues of gender, environment, climate risks, and threat multipliers, which are relevant towards the successful implementation of the project. Gender mainstreaming, in line with GCF and AFD standards, requires taking stock of the complex phenomena that inform the existing gender inequalities in any society. In the context of climate change and environment, the under usage of gender and social indicators has led to a lacuna in the available data, necessitating the use of indirect (but related) points of entry, such as: poverty and hardship; labour and education; and, health and social indicators. AFD's in-house gender profiles<sup>33</sup> for Comoros, Madagascar and Mauritius (not available for Seychelles), similarly, establishes the gender landscape by analysis the health, access to water and sanitation, education and professional training, etc.

### 4.1 National aggregate statistics and data

The national-level data points (divided into three categories: **poverty and hardship**; **labour and education**; and **health and social indicators**) presented below are *not* comparable across countries, given the different methodologies of each statistical bureau or equivalent national counterpart. These broadly speak to issues<sup>34</sup> identified by the GCF as crucial in the project design stage (such as: poverty levels; participation of men/women in formal/informal labour markets; gender-disaggregated education and literacy indicators; gender-disaggregated health, morbidity and mortality statistics; etc.) to map and mainstream existing vulnerabilities.

#### 4.1.1 Poverty and Hardship

POVERTY & HARDSHIP INDICATORS	COMOROS	MADAGASCAR	MAURITIUS	SEYCHELLES
% of Population Below International Poverty Line	17.9 <sup>a</sup>	77.6 <sup>b</sup>	7.90 <sup>c</sup>	1.10 <sup>d</sup>
% of Population Below National Poverty Line	42.4 <sup>a</sup>	70.7 <sup>b</sup>	0.50 <sup>c</sup>	39.3 <sup>d</sup>
% of Population in Severe Multidimensional Poverty	16.1 <sup>e</sup>	57.1 <sup>e</sup>	-	-
% of Population Vulnerable to Multidimensional Poverty	22.3 <sup>e</sup>	11.8 <sup>e</sup>	-	-
% of Female-Headed Households (FHHs)	27.7 <sup>f</sup>	19.3 <sup>f</sup>	17.0 <sup>g</sup>	51.0 <sup>h</sup>
% of Male-Headed Households (MHHs)	72.3 <sup>f</sup>	80.7 <sup>f</sup>	83.0 <sup>g</sup>	49.0 <sup>h</sup>
<b>NOTE:</b> NATIONAL AND INTERNATIONAL POVERTY LINE: National poverty lines are defined according to each country's specific economic and social circumstances. The national poverty lines are typically lower in poorer countries and higher in				

<sup>33</sup> AFD (n.a.). Profil Genre: Afrique (three of the four countries available under the continent tab) Accessed 20 January 2020. Available at:

[https://www.afd.fr/fr/ressources/profil-genre-afrique?fbclid=IwAR104PGZ\\_TlhVqDdO2ie3V6KeACfxzckkYjaiNAUWBCp93m5\\_4T0UqqKn-M](https://www.afd.fr/fr/ressources/profil-genre-afrique?fbclid=IwAR104PGZ_TlhVqDdO2ie3V6KeACfxzckkYjaiNAUWBCp93m5_4T0UqqKn-M)

<sup>34</sup> GCF and UN Women (2017). "Mainstreaming Gender in Green Climate Fund Projects". Policy Document. Accessed 07 August 2019. Available at: [https://www.greenclimate.fund/documents/20182/194568/Guidelines\\_GCF\\_Toolkit\\_Mainstreaming\\_Gender.pdf/860d1d03-877d-4c64-9a49-c0160c794ca7](https://www.greenclimate.fund/documents/20182/194568/Guidelines_GCF_Toolkit_Mainstreaming_Gender.pdf/860d1d03-877d-4c64-9a49-c0160c794ca7)

richer countries. International poverty lines attempt to hold the real value of the poverty lines consistent across countries by accounting for differences in purchasing power across countries.<sup>35</sup>

For Comoros, the international poverty line is 432.2 in Comorian franc (2013) or US\$ 1.90 (2011 PPP).<sup>a</sup>

For Madagascar, the international poverty line is 1415.9 in Malagasy ariary (2012) or US\$ 1.90 (2011 PPP).<sup>b</sup>

For Mauritius, the international poverty line is 36.1 in Mauritius rupees (2012) or US\$ 1.90 (2011 PPP).<sup>c</sup>

For Seychelles, the international poverty line is 16.8 in Seychelles rupees (2013) or US\$ 1.90 (2011 PPP).<sup>d</sup>

**MULTIDIMENSIONAL POVERTY:** In the post-2015 SDG and Agenda 2030 framework, SDG 1 targets poverty elimination – in all forms and dimensions. This mandate requires tools to enumerate (quantitatively) and assess (qualitatively) poverty levels in different countries – here the MPI can be a useful tool. It compares acute multidimensional poverty for more than 100 countries and 5.7 billion people, and monitors changes over time.<sup>36</sup> The global MPI scrutinises a person's deprivations across 10 indicators in health, education and standard of living and offers a high-resolution lens to identify both who is poor and how they are poor. It complements the international \$1.90 a day poverty rate by showing the nature and extent of overlapping deprivations for each person. The 2019 update uses data from 50 Demographic and Health Surveys (DHS), 42 Multiple Indicator Cluster Surveys (MICS), one DHSMICS and eight national surveys that provide comparable information to DHS and MICS.

**GENDER-DISAGGREGATION OF HOUSEHOLDS:** Micro data analyses (conducted by the World Bank Development Research Group), with consideration for macro, population and demographic factors, reveals the importance of introducing heterogeneity in household poverty figures as well as contextualising how FHHs and MHHs function, conditional upon location, age, number of members, marital status, economic access, etc.<sup>37</sup> 'Feminisation of poverty' is a concept that gained currency in the development and aid sector since the 1990s – but more recent analysis and data collection reveals that such concepts may border on generalisations rather than being based on realities. Instead the data reveals more complex trends: firstly, it can be more conclusively ascertained that certain types of FHHs are frequently found to head disadvantaged households; and, secondly, in Africa FHHs have better rates of poverty reduction than MHHs. Gender-disaggregation of households, with consideration in tandem of other conditions, is therefore an important method to understand the specificities of poverty incidence in a certain context.

Sources of data/information for this table:

<sup>a</sup> The World Bank, Poverty and Equity Data Portal (2019). 'Poverty and Equity Brief: Comoros'. Technical Note (online). Accessed 07 August 2019. Available at: [https://databank.worldbank.org/data/download/poverty/33EF03BB-9722-4AE2-ABC7-AA2972D68AFE/Global\\_POVEQ\\_COM.pdf](https://databank.worldbank.org/data/download/poverty/33EF03BB-9722-4AE2-ABC7-AA2972D68AFE/Global_POVEQ_COM.pdf)

<sup>b</sup> The World Bank, Poverty and Equity Data Portal (2019). 'Poverty and Equity Brief: Madagascar'. Technical Note (online). Accessed 07 August 2019. Available at: [https://databank.worldbank.org/data/download/poverty/33EF03BB-9722-4AE2-ABC7-AA2972D68AFE/Global\\_POVEQ\\_MDG.pdf](https://databank.worldbank.org/data/download/poverty/33EF03BB-9722-4AE2-ABC7-AA2972D68AFE/Global_POVEQ_MDG.pdf)

<sup>c</sup> The World Bank, Poverty and Equity Data Portal (2019). 'Poverty and Equity Brief: Mauritius'. Technical Note (online). Accessed 07 August 2019. Available at: [https://databank.worldbank.org/data/download/poverty/33EF03BB-9722-4AE2-ABC7-AA2972D68AFE/Global\\_POVEQ\\_MUS.pdf](https://databank.worldbank.org/data/download/poverty/33EF03BB-9722-4AE2-ABC7-AA2972D68AFE/Global_POVEQ_MUS.pdf)

<sup>d</sup> The World Bank, Poverty and Equity Data Portal (2019). 'Poverty and Equity Brief: Seychelles'. Technical Note (online). Accessed 07 August 2019. Available at: [https://databank.worldbank.org/data/download/poverty/33EF03BB-9722-4AE2-ABC7-AA2972D68AFE/Global\\_POVEQ\\_SYC.pdf](https://databank.worldbank.org/data/download/poverty/33EF03BB-9722-4AE2-ABC7-AA2972D68AFE/Global_POVEQ_SYC.pdf)

<sup>e</sup> UNDP & University of Oxford (2019). *Table 1: Multidimensional Poverty Index*. Composite Index Data. Accessed 07 August 2019. Available at: [http://hdr.undp.org/sites/default/files/mpi\\_2019\\_table\\_1.pdf](http://hdr.undp.org/sites/default/files/mpi_2019_table_1.pdf)

<sup>35</sup> The World Bank, Data Help Desk (2018). 'Poverty Data: National and International Poverty Lines'. Technical Note (online). Accessed 07 August 2019. Available at: <https://datahelpdesk.worldbank.org/knowledgebase/articles/193309-should-i-use-national-or-international-poverty-line> for more.

<sup>36</sup> UNDP & OPHI (2019). *Global MPI 2019: Illuminating Inequalities*. Report. Accessed 15 August 2019. Available at: [http://hdr.undp.org/sites/default/files/mpi\\_2019\\_publication.pdf](http://hdr.undp.org/sites/default/files/mpi_2019_publication.pdf)

<sup>37</sup> The World Bank, Development Research Group (2015). 'Women Left Behind? Poverty and Headship in Africa'. Working Paper no. 7331. Accessed 10 August 2019. Available at: <http://documents.worldbank.org/curated/en/277221468189851163/pdf/WPS7331.pdf>

<sup>f</sup> The World Bank & Union des Comores (2017). *Comoros Poverty Assessment*. Report. Accessed 15 August 2019. Available at: <http://documents.worldbank.org/curated/en/342321528113131924/pdf/125069-WP-P156542-OUO-9-Comoros-Poverty-Assessment-revised.pdf>

<sup>g</sup> United Nations Population Fund (2012). *Population Dynamics and Household Structure*. Country Implementation Profile. Accessed 28 August 2019. Available at: [https://www.unfpa.org/sites/default/files/resource-pdf/FINAL\\_Mauritius.pdf](https://www.unfpa.org/sites/default/files/resource-pdf/FINAL_Mauritius.pdf)

<sup>h</sup> World Health Organization – WHO (2016). *Country Cooperation Strategy 2016 – 2021*. Policy Document. Accessed 28 August 2019. Available at: <https://apps.who.int/iris/bitstream/handle/10665/254891/ccs-syc-2016-2021-en.pdf;jsessionid=E8B0B324965D261078C3BA1B2C44A0BC?sequence=1>

## Comoros

The poverty incidence indicators presented above show Comoros' position as compared to the other three IOC countries. Given Comoros' status as an LDC, the statistics lay bare the intensity and extent of poverty, identified along both national and international poverty line indicators, as well as UNDP – OPHI's MPI. The latter goes a step further to enumerate the sections of the population that can be exposed to multidimensional poverty, implying the possibility of poverty traps and risks associated with external shocks (in the context of this project relating to the lack of EWS and hydromet services) to an already-vulnerable context.

However, a World Bank Poverty Assessment report<sup>38</sup> finds that although Comoros has slow GDP and GNI growth, available household surveys and national accounts show important increases in consumption patterns. This highlights the importance of the informal sector and heavy reliance on remittances (which flow through informal channels), as well as the lack of data and enumeration capacities.<sup>39</sup>

The pervasiveness of the informal economy and remittance-based capital channels influence household decision-making. This, in turn, plays an important role in the determination of poverty, adaptation access and mitigation opportunities. The proportion of female-headed households (FHHs) has reached 27.7% (2014), showing a 6.2 percentage point increase from 2004 figures.<sup>40</sup> Further, the report finds that between 2004 and 2014, the proportion of bottom 40% households headed by women increased by almost 10 percentage points, from 18.6% in 2004 to 27.9% in 2014. Overall, however, there are fewer FHHs in the archipelago as compared to male-headed households (MHHs).<sup>41</sup>

Thus, it can be posited that FHHs have not witnessed a proportionate increase in income and consumption with the advances made in household expenditure and consumption patterns (with the caveats that the data quality is low and the nature of the FHH is transient, factors which are beyond the scope of this assessment).

---

<sup>38</sup> The World Bank & Union des Comores (2017). *Comoros Poverty Assessment*. *Ibid.*

<sup>39</sup> *Ibid.*

<sup>40</sup> *Ibid.*

<sup>41</sup> *Ibid.*

## Madagascar

The poverty incidence indicators presented above show Madagascar's position as compared to the other project countries. In a recent report<sup>42</sup>, the World Bank identified Madagascar as the poorest country in the sub-Saharan Africa (where internationally comparable data was available), with present real GDP lower than in the 1960s. This poverty is associated with low and declining labour productivity – by 2012, Madagascar's GDP per employed worker had fallen to the lowest in the world except for the Democratic Republic of the Congo (DRC).<sup>43</sup> The high level of multidimensional poverty (over 55%) also reveals the intensity of deprivation and different types of poverty faced by the majority of the Malagasy population. Given that an additional ~12% of the population is vulnerable to multidimensional poverty, it can be posited that even minor external shocks can destabilise household consumption patterns and lead to poverty (where the household is vulnerable to multidimensional poverty) and entrench poverty levels (where households are already facing multidimensional deprivation).

A complementary study conducted by the World Bank in 2014<sup>44</sup> finds that about a fifth of all households nationally are headed by women – primarily because they are widowed, divorced, or separated. While on primary inspection, FHHs do not appear, as a group, to be significantly worse off than MHHs, the situation is different when the study controls for certain covariates including location and age, as well as, importantly, the marital status of the household head.<sup>45</sup> Conditional on location only, FHHs in both rural and urban areas experience lower consumption than MHHs.<sup>46</sup>

## Mauritius

The poverty incidence indicators presented above show Mauritius' position as compared to the other project countries. In contrast to the LDC status of Comoros and Madagascar, the World Bank classifies Mauritius as an upper-middle income country with low levels of poverty and inequality, having diversified its economy and accomplishing unprecedented structural transformation.<sup>47</sup> However, in 2010, after sugar and textile (the main Mauritian exports) lost preferential status from western markets<sup>48</sup>, the economy has witnessed initial setbacks. Concurrently, inequality has risen, lowering the living standards of the poorer sections of the populace – which has complex gendered aspects that inform it.

The main contributor to rising inequality is the variance among earnings (males) situated in different social classes – showing the imperatives of redistribution and pro-poor investment in the country. Mauritius, additionally, has low female labour participation (compared to peer economies – see table below), and women continue to be disadvantaged in access to the labour market, which can

---

<sup>42</sup> The World Bank (2016). *Shifting Fortunes and Enduring Poverty in Madagascar*. Report. Accessed 15 August 2019. Available at: <http://documents.worldbank.org/curated/en/413071489776943644/pdf/113582-v2-FINAL-PUBLIC-7817-Madagascar-Poverty-Report.pdf>

<sup>43</sup> The World Bank (2016). *Shifting Fortunes and Enduring Poverty in Madagascar*. *Ibid.*

<sup>44</sup> The World Bank, Poverty Reduction and Economic Management (PREM) – Africa (2014). *Face of Poverty in Madagascar: Poverty, Gender and Inequality Assessment*. Report. Accessed 15 August 2019. Available at: <http://documents.worldbank.org/curated/en/538821468271809604/pdf/781310PRIORITY0English0Apr900May012.pdf>

<sup>45</sup> The World Bank, PREM – Africa (2014). *Face of Poverty*. *Ibid.*

<sup>46</sup> *Ibid.*

<sup>47</sup> The World Bank (2017). *Mauritius: Addressing Inequality through More Equitable Labour Markets*. Report. Accessed 17 August 2019. Available at: <https://openknowledge.worldbank.org/handle/10986/29034>

<sup>48</sup> The World Bank (2015). *Mauritius: Inclusiveness of Growth and Shared Prosperity*. Report. Accessed 17 August 2019. Available at: <https://openknowledge.worldbank.org/handle/10986/23804>

be attributed to traditional models of domestic and care work persistent in most Mauritian households. The World Bank finds<sup>49</sup> that the disproportionate expansion of the female labour force is through the entry of women primarily from affluent households – contributing to greater inequality between households. To elucidate, since affluent households possess certain advantages over their poorer counterparts, women are increasing the income of these households while women in poorer households lack access to productive and economic resources (*ipso facto*, widening the inequality gap in the country).

Economic inequality is an important consideration for this project as the main focus is towards increasing climate risk resilience and disaster preparedness through CS, EWS and other hydromet products. External shocks caused by cyclones and storms, which are common in Mauritius, are known to push vulnerable households into poverty and keep poor households caught in the cycle of poverty traps. With rising household income inequality in Mauritius, more and more households will continue to be exposed, impacting also on the existing rates of low female labour participation in the market from these economic strata as well as increasing the household care and domestic work burden.

### **Seychelles**

The poverty incidence indicators presented above show Seychelles' position as compared to the other project countries. Similar to Mauritius, the archipelago nation is different from its Indian Ocean counterparts: Seychelles has the highest GDP per capita in Africa (\$15,410 in 2016).<sup>50</sup> The Seychelles also has better social indicators than comparator small countries – it achieved most of the Millennium Development Goals (MDGs), especially for education, health, poverty eradication, and the environment.<sup>51</sup> However, income inequality remains significant in the country, with a GINI Index score of 46.8 (2013), placing it among the top-25 most unequal countries.<sup>52</sup>

The persistently unequal distribution of income, despite Seychelles' long-standing policy focus and high spending on public services, social protection and housing incentives, point to constraints in accessing economic opportunities and reduction of productivity in the economy, according to the World Bank.<sup>53</sup> These constraints could well intensify as the economy develops further with current trends, causing income gaps and capacity barriers, especially with increasing climate risks in the region.

Key informant interviews conducted with the Ministry of Social Affairs, Community Development and Sports also revealed the correlation of high unemployment rates among youth with gendered drug (heroin) abuse in the main islands, particularly among young boys and men. United Nations Office on Drugs and Crime (UNODC) provides empirical confirmation of this: Seychelles is among the countries and areas with the highest rates of injected drug use (more than 3.5 times the global average).<sup>54</sup>

---

<sup>49</sup> The World Bank (2017). *Mauritius: Addressing Inequality through More Equitable Labour Markets*. *Ibid*.

<sup>50</sup> The World Bank (n.a.). 'Seychelles: Country Overview'. Online. Accessed 17 August 2019. Available at: <https://www.worldbank.org/en/country/seychelles/overview>.

<sup>51</sup> The World Bank (2012). *Country Partnership Strategy: Seychelles*. Policy Document. Accessed 17 August 2019. Available at: <http://documents.worldbank.org/curated/en/524151468165858183/pdf/669190CASOP1240OfficialUseOnly090.pdf>

<sup>52</sup> The World Bank, Development Research Group (2013). 'Gini Index'. Online Databank. Accessed 20 August 2019. Available at: [https://data.worldbank.org/indicator/SI.POV.GINI?end=2017&most\\_recent\\_value\\_desc=true&start=1979&view=chart](https://data.worldbank.org/indicator/SI.POV.GINI?end=2017&most_recent_value_desc=true&start=1979&view=chart)

<sup>53</sup> The World Bank (2017). *Seychelles: Systematic Country Diagnostic*. Report. Accessed 20 August 2019. Available at: <https://openknowledge.worldbank.org/handle/10986/27559>

<sup>54</sup> United Nations Office on Drugs and Crime – UNODC (2013). *World Drug Report 2013*. Accessed 23 August 2019. Available at: [https://www.unodc.org/unodc/secured/wdr/wdr2013/World\\_Drug\\_Report\\_2013.pdf](https://www.unodc.org/unodc/secured/wdr/wdr2013/World_Drug_Report_2013.pdf)

These issues can be identified as indirect exposure risks to climate hazards and disasters, as well as impediments in adaptation capacities and opportunities. Given that Seychelles is particularly dependent on imports, rising commodity prices (especially food and fuel) also are high risk factors for households struggling with lower income as well as drug addiction and abuse problems in the backdrop of climate-related risks.

The World Bank Country Partnership Strategy for the Republic of Seychelles<sup>55</sup> identifies the vulnerabilities of being a small island nation and reiterates the importance of enhancing its ability to cope with increased climatic variability through mechanisms like EWSs and better coordination with other agencies, such as the meteorological wing. It also recommends the formulation of social safety nets (with the potential of to be scaled up) in connection with EWS and CS in the country.

#### 4.1.2 Labour and Education

LABOUR AND EDUCATION INDICATORS	COMOROS	MADAGASCAR	MAURITIUS	SEYCHELLES
% of Labour Force Participation – Female	37.4 <sup>a</sup>	83.6 <sup>b</sup>	45.4 <sup>c</sup>	66.9 <sup>d</sup>
% of Labour Force Participation – Male	44.1 <sup>a</sup>	89.2 <sup>b</sup>	74.2 <sup>c</sup>	73.9 <sup>d</sup>
% Agricultural Labour – F	63.3 <sup>e</sup>	65.0 <sup>f</sup>	6.0 <sup>g</sup>	-
% Agricultural Labour – M	52.6 <sup>e</sup>	71.0 <sup>f</sup>	8.0 <sup>g</sup>	-
% Non-Agricultural Informal Labour – F	19.5 <sup>h</sup>	38.0 <sup>i</sup>	-	-
% of Formal Labour – F	17.0 <sup>a</sup>	-	-	-
% of Formal Labour – M	39.7 <sup>a</sup>	-	-	-
% Adult Literacy Rate – F	77.6 <sup>e</sup>	68.0 <sup>j</sup>	91.0 <sup>j</sup>	94.0 <sup>j</sup>
% Adult Literacy Rate – M	84.0 <sup>e</sup>	75.0 <sup>k</sup>	95.0 <sup>k</sup>	93.0 <sup>k</sup>

#### NOTE:

LABOUR FORCE PARTICIPATION: The labour force participation rate is a measure of the proportion of a country's working-age population that engages actively in the labour market, either by working or looking for work; it provides an indication of the size of the supply of labour available to engage in the production of goods and services, relative to the population at working age. The breakdown of the labour force (formerly known as economically active population) by sex and age group gives a profile of employment distribution of the labour force within a country.<sup>56</sup>

GENDER-DISAGGREGATED LABOUR STATISTICS: These figures show the percentage of female and male labour force involved in different sectors of the economy – agriculture (which is the primary sector in Comoros and Madagascar), non-agricultural/non-farm informal sector and formal sector. It is important to introduce heterogeneity in labour statistics to analyse, evaluate and monitor the way an economy is performing and the effectiveness of current and longer-term policies in generating employment.

LITERACY RATE: According to UNESCO UIS, literacy rate is the percentage of the population aged 15 years and over who can read and write with understanding a short simple statement on his/her everyday life. Generally, 'literacy' also encompasses 'numeracy' – the ability to make simple arithmetic calculations.

Sources of data/information for this table:

<sup>a</sup> Quoted in Arab Development Portal (2019). *Comoros Statistical Snapshot 2019*. Figures from the International Labour Organisation – ILO & Institute National de la Statistique et des Etudes Economiques et Démographiques – INSEED (2013).

<sup>55</sup> The World Bank (2012). *Country Partnership Strategy: Seychelles*. *Ibid*.

<sup>56</sup> ILO (n.a.). 'ILOSTAT Technical Note'. Online. Accessed 16 August 2019. Available at: [https://www.ilo.org/ilostat-files/Documents/description\\_LFPR\\_EN.pdf](https://www.ilo.org/ilostat-files/Documents/description_LFPR_EN.pdf)

Data Report. Accessed 24 August 2019. Available at:

<http://data.arabdevelopmentportal.com/StatisticalSnapshot/?In=en&type=country&query=COM/>

<sup>b</sup> ILOSTAT (2015). 'Country Profile: Madagascar'. Online Databank. Accessed 24 August 2019. Available at:

<https://www.ilo.org/ilostatcp/CPDesktop/?list=true&lang=en&country=GBR>

<sup>c</sup> ILOSTAT (2017). 'Country Profile: Mauritius'. Online Databank. Accessed 24 August 2019. Available at:

<https://www.ilo.org/ilostatcp/CPDesktop/?list=true&lang=en&country=GBR>

<sup>d</sup> ILOSTAT (2017). 'Country Profile: Seychelles'. Online Databank. Accessed 24 August 2019. Available at:

<https://www.ilo.org/ilostatcp/CPDesktop/?list=true&lang=en&country=GBR>

<sup>e</sup> The World Bank, Gender Data Portal (2019). 'Comoros'. Online Databank. Accessed 24 August 2019. Available at:

<http://datatopics.worldbank.org/gender/country/comoros>

<sup>f</sup> The World Bank, Gender Data Portal (2019). 'Madagascar'. Online Databank. Accessed 24 August 2019. Available at:

<http://datatopics.worldbank.org/gender/country/madagascar>

<sup>g</sup> The World Bank, Gender Data Portal (2019). 'Mauritius'. Online Databank. Accessed 24 August 2019. Available at:

<http://datatopics.worldbank.org/gender/country/mauritius>

<sup>h</sup> African Development Bank – AfDB (n.a.). *Comoros: Country Gender Profile*. Report. Accessed 26 August 2019. Available

at: <https://www.afdb.org/fileadmin/uploads/afdb/Documents/Project-and-Operations/Comoros%20-%20Country%20Gender%20Profile.pdf>

<sup>i</sup> The World Bank, Human Development Department – Africa (2010). *Labour Markets Conditions in Madagascar*. Report. Accessed 24 August 2019. Available at:

<http://siteresources.worldbank.org/INTMADAGASCAR/Resources/LaborMarkets.pdf>

<sup>j</sup> The World Bank, Open Data (2019). 'Literacy rate, adult female 15+' (collated from UNESCO UIS). Online Databank.

Accessed 30 August 2019. Available at: <https://data.worldbank.org/indicator/SE.ADT.LITR.FE.ZS>

<sup>k</sup> The World Bank, Open Data (2019). 'Literacy rate, adult male 15+' (collated from UNESCO UIS). Online Databank.

Accessed 30 August 2019. Available at: <https://data.worldbank.org/indicator/SE.ADT.LITR.MA.ZS>

## Comoros

Indicators compiled for the labour and education sectors show the interrelated nature of the two sectors, and how these help determine both individual and national well-being. Comoros, among the four countries targeted by this project, displays the lowest labour force participation (both male and female) – testifying to its status as an undiversified economy, dependence on remittances and high levels of non-wage activities. In the context of climate change and increasing disasters, the lack of diversification in the economy and natural resource-based livelihoods for a majority of the population can create impediments to adaptation opportunities, access to climate services and *ex-post* disaster relief.

An AfDB Country Gender Assessment<sup>57</sup> finds that the labour market in Comoros is characterised by the feminisation of precarious employment, informal activities, and unemployment – the agricultural sector employs the largest number of women (about 67%) while the civil service employs only 30% of women, particularly in low-level jobs. There are more self-employed women (56.1%) than men (47.5%), in tandem with 47% of the unemployed in Comoros being women.<sup>58</sup> To cite an example, the field visits revealed that women also tend to be employed in 'add-on' activities: in the fishing communities, *pêcher à pieds* (fishing by feet) is a common practice. Men undertake boat-capture fishing, while women extract small fishes, oysters and crabs by walking along the sea coast during low tides. In the non-agricultural informal sector (traders, small entrepreneurs and the self-employed), women occupy a further 19.5% of jobs.<sup>59</sup> Female employment in Comoros remains

<sup>57</sup> African Development Bank – AfDB (n.a.). *Comoros: Country Gender Profile*. *Ibid.*

<sup>58</sup> *Ibid.*

<sup>59</sup> *Ibid.*

low with only 13.7% of women in the wage-earning group, 69.2% of which are in 'unsheltered employment'.<sup>60</sup>

### **Madagascar**

The International Labour Organisation – ILO in its flagship *Key Indicators of the Labour Market – KILM* study<sup>61</sup> finds a positive correlation between education and productive employment in different countries. In Madagascar, ILO's findings are conclusively replicated: although labour force participation is high, the country has uniquely high poverty rates in the region, as large sections of the population are dependent on agriculture. In fact, literacy rates collated for the country are misleading: over half of the population (and consequently, the workforce) lack qualified training and knowledge to enter the formal sector (which accounts for less than 3%<sup>62</sup> of the total economy). The agricultural livelihoods-dependent economy and households are vulnerable to external shocks and climate risks, reiterating the importance of robust CS, EWS and hydromet products and services to strengthen income strategies and resilience.

Further, the World Bank identifies a three-tiered gender gap in Madagascar.<sup>63</sup> For example, median earnings for women in non-agricultural employment reach only two-thirds of earnings tabulated for men.<sup>64</sup> The differences are partly explained by differences in levels of education, yet women with similar characteristics as men are paid comparatively less.<sup>65</sup> Additionally, the gender wage gap is highest in the informal private non-agricultural sector, and this appears to be largely linked to firm size and other characteristics.<sup>66</sup> Women, thus, appear to face difficulties and possibly discrimination in at least three areas: access to education, access to higher paying jobs and same pay in those jobs, and access to financial capital and other institutions that favour firm growth.<sup>67</sup>

### **Mauritius**

Indicators compiled on labour and education display the linkages between the two sectors, and how these help determine both individual and national well-being. In Mauritius, the gendered dynamic of the labour market is evident: female labour force participation is quite low compared to peer economies. This can be primarily attributed to tradition- and faith-based norms that inform domestic and household labour (care, reproductive and related work) in Mauritian society.

A study<sup>68</sup> conducted on gender, education and labour market however problematises the 'common sense' hypothesis suggesting better educational access imply better labour market opportunities. In fact, Gokulsing et al find that though girls outperform boys at all education levels (primary, secondary and tertiary), their access to job opportunities is reduced.<sup>69</sup> The female unemployment rate is higher than that of males, while women who manage to enter the labour market are

---

<sup>60</sup> *Ibid.*

<sup>61</sup> ILO (2016). *Key Indicators of the Labour Market*. Report. Accessed 01 September 2019. Available at: [https://www.ilo.org/wcmsp5/groups/public/---dgreports/---stat/documents/publication/wcms\\_498929.pdf](https://www.ilo.org/wcmsp5/groups/public/---dgreports/---stat/documents/publication/wcms_498929.pdf)

<sup>62</sup> The World Bank, Human Development Department – Africa (2010). *Labour Markets Conditions in Madagascar*. *Ibid.*

<sup>63</sup> *Ibid.*

<sup>64</sup> *Ibid.*

<sup>65</sup> *Ibid.*

<sup>66</sup> *Ibid.*

<sup>67</sup> *Ibid.*

<sup>68</sup> Gokulsing, D. and Tandrayen-Ragoobur, V. (2014), "Gender, education and labour market: evidence from Mauritius", *International Journal of Sociology and Social Policy*, Vol. 34 No. 9/10

<sup>69</sup> *Ibid.*

segmented to remain in low-occupation jobs.<sup>70</sup> As mentioned in an earlier section, women entrants from affluent households primarily fuelled the recent expansion of female labour – showing how women’s access to the market and remunerative prospects are stymied by existing household income levels.<sup>71</sup>

These existing gaps translate into inequalities, such as in: decision-making authority and power within the household; control over economic and productive resources; and access to capital, savings and investment opportunities; which are crucial in determining resilience capacities, disaster response and the ability to capitalise on adaptation opportunities.

### **Seychelles**

The archipelago nation presents distinctive statistics for labour and education sectors, as compared to peer economies or other African countries. A SACMEQ (Southern and Eastern Africa Consortium for Monitoring Educational Quality) study<sup>72</sup> which conducted a cross-country analysis of the magnitude of the variation in reading and mathematics scores, and the between- and within-school components of that variation, show the differences between Seychellois girls and boys. Girls outperformed boys in all SACMEQ indicators, evincing different rates of streaming at different education levels with the gender disparity favouring the former.

Despite higher levels of education, however, female labour force participation still lags behind male labour force participation by almost 10%<sup>73</sup>, with the Gender Secretariat reporting considerable dropout and occupational streaming rates for women from the labour market. A study conducted by the University of Cape Town finds that women are more likely to be under-paid (19.6% relative to males’ 11.2%), when selected characteristics for minimum wage violation levels and depth are explored. Seychelles presents a unique case for labour and education performance, underscoring the complex social phenomena that inform socioeconomic indicators, which provide the baseline upon which climate adaptation and resilience can be built.

#### **4.1.3 Health and Social Indicators**

HEALTH & SOCIAL INDICATORS	COMOROS	MADAGASCAR	MAURITIUS	SEYCHELLES
# # Maternal Mortality Ratio (MMR) Per 100,00 Live Births <sup>a</sup>	335	353	53	-
# Under-Five Mortality Rate, Per 1000 Live Births <sup>b</sup>	69	44	13	14
% Exposure to Gender-Based Violence (GBV)	5 <sup>c</sup>	-	24 <sup>d</sup>	58 <sup>e</sup>

**Note:**

MATERNAL MORTALITY RATIO & UNDER-FIVE MORTALITY RATE: The World Health Organisation (WHO) identifies MMR or complications during pregnancy and childbirth as a leading cause of death and disability among women of reproductive age in developing countries. The MMR represents the risk associated with each pregnancy, i.e. the obstetric risk. It was a MDG and is an SDG 3 indicator. Similarly, the under-five mortality rates take stock of preventable child deaths below the age of 5. Inequities in child mortality between high-income and low-income countries remain large, according to the WHO. In 2017, the under-five mortality rate in low-income countries was 69 deaths per 1000 live births – around 14 times the average rate in high-income countries (5 deaths per 1000 live births). Reducing these inequities

<sup>70</sup> *Ibid.*

<sup>71</sup> The World Bank (2015). *Mauritius: Inclusiveness of Growth and Shared Prosperity*. *Ibid.*

<sup>72</sup> Government of Seychelles, Department of Education and Human Resources Development (n.a.) Streaming in Seychelles: from SACMEQ research to Policy Reform. Accessed 22 August 2019. Available at: <http://www.sacmeq.org/sites/default/files/sacmeq/research/Papers%20from%20the%202005%20International%20Invitational%20Educational%20Policy%20Research%20Conference/leste.pdf>

<sup>73</sup> ILOSTAT (2017). ‘Country Profile: Seychelles’. *Ibid.*

across countries and saving more children's lives by ending preventable child deaths are important priorities, particularly under the post-2015 SDG agenda.

LIFETIME EXPOSURE TO GBV: According to the World Bank, around 1 in every 3 women in the world will face physical and/or sexual abuse during their lifetime; and 1 in 4 children bear witness to domestic or GBV. Although the data is sketchy, incidence of GBV is common and normalised through local beliefs and customs in the Indian Ocean Islands. Gender Links, a South Africa-based women's organisation, finds that cultural contexts of preserving family honour, shame stemming from experiencing violence, and lack of redressal and grievance mechanisms as well as low support for GBV survivors result in continued and elevated rates of GBV in the region.

Sources of data/information for this table:

<sup>a</sup> The World Bank, Open Data (2015). 'MMR, modelled estimate (collated from WHO/ UNICEF/ UNFPA/ UNDESA). Online Databank. Accessed 22 August 2019. Available at: <https://data.worldbank.org/indicator/SH.STA.MMRT>

<sup>b</sup> The World Bank, Open Data (2017). 'Mortality Rate, under 5 (collated by the UN Inter Agency Group for Child Mortality Estimation). Online Databank. Accessed 23 August 2019. Available at: <https://data.worldbank.org/indicator/SH.DYN.MORT>

<sup>c</sup> The World Bank, Open Data (2017). 'Comoros: Proportion of women subjected to sexual/ physical violence in last 12 months (collated by the UNDS). Online Databank. Accessed 24 August 2019. Available at: <https://data.worldbank.org/indicator/SG.VAW.1549.ZS?locations=KM>

<sup>d</sup> Gender Links (n.a.). 'Mauritius: VAW Baseline Research'. Online. Accessed 24 August 2019. Available at: <https://genderlinks.org.za/what-we-do/justice/research/violence-against-women-baseline-research/mauritius-vaw-baseline-research/>

<sup>e</sup> Gender Links (n.a.). 'Seychelles: GBV National Baseline Research'. Report. Online. Accessed 24 August 2019. Available at: <https://genderlinks.org.za/what-we-do/justice/research/violence-against-women-baseline-research/seychelles-vaw-baseline-research/>

## Comoros

Selected health and social indicators presented above, particularly the staggering maternal mortality ratio (MMR) and under-five mortality rate, display how the health system in Comoros is plagued by limited access to medical centres, insufficient resources with frequent drug shortages, skilled staff shortages, inadequate staff training opportunities, and weaknesses in health data collection, analysis, and processing.<sup>74</sup> In 2003, the MMR was 381 deaths per 100,000 live births, and has seen a downward trend marked at 335 deaths in the latest survey (2015). Although GBV rates are lower and atypical in the region, Comoros has a high rate of child marriage (32%, according to the UN Women Global Database on Violence Against Women).

The WHO suggests<sup>75</sup> that climate change effects on health outcomes and indicators can be based on approximation, however even conservative predictions have tended towards highlighting the negative impacts it can have on a populace. Indeed, with erratic weather events and increasing frequency (and intensity) of climate-related disasters, a limited healthcare system can only be expected to falter (if not fail entirely), underpinning the necessities of strengthened climate services in the country.

## Madagascar

The data gathered on Madagascar for health and social indicators reveal a similar predicament to that of Comoros. High MMR and under-five mortality rates, along with the country's struggles with pneumonic plague in 2017 and 2018, indicate a lack of investment in the public health system,

<sup>74</sup> African Development Bank – AfDB (n.a.). *Comoros: Country Gender Profile*. *Ibid*.

<sup>75</sup> <https://www.who.int/news-room/fact-sheets/detail/climate-change-and-health>

limited access to healthcare, and gaps in preparedness, surveillance and response capabilities. Although national GBV rates are not available yet for the country, a UNFPA pilot study (in Antananarivo, Diego and Tulear) found about 30% of women reported having experienced GBV.<sup>76</sup> Further, Madagascar has a high rate of child marriage (41%, according to the UN Women Global Database on Violence Against Women).

Given this baseline, climate-sensitive health impacts/disease outbreaks (such as malaria, typhoid, and cholera in the aftermath of disasters) can be expected to further destabilise households, create income shocks, and lead to preventable loss of life. The latter is also a marked gender phenomenon, as gender differences have been shown to have conclusive linkages with meteorological hazards due to physiological, behavioural and socially constructed influences on health outcomes.<sup>77</sup>

### **Mauritius**

In contrast to Comoros and Madagascar, Mauritius' performance on health and social indicators is better, proving the importance of consistent and relevant government investment in the public health sector and social institutions. According to time-series data reported by the Government of Mauritius, however, there are recent spikes in MMR and under-five mortality (especially in 2017).<sup>78</sup> Gender Links finds that about a quarter of women in Mauritius have experienced some form of GBV in their lifetime, including partner and non-partner violence, while a similar proportion of men admit to perpetuating violence against women in their lifetime.<sup>79</sup> Violence occurs primarily in intimate partner relationships, showing how IPV is the predominant type of GBV in the island country, in addition to minimal rates of reporting: only 0.3% of women in Mauritius have reported domestic violence.<sup>80</sup> It can be speculated from the Gender Links baseline study that actual levels of GBV (and IPV) are higher and go underreported in the country.<sup>81</sup>

Linkages between health indicators, climate change resilience and GBV are less tenuous than previously assumed and have been emphasised more and more through targeted socio-anthropological research.<sup>82</sup> For the overall success of climate change adaptation efforts, these considerations need to inform mainstreaming activities, to ensure better targeting of beneficiaries and delivery of project goals.

### **Seychelles**

In a similar vein to Mauritius, Seychelles has better indicators of health outcomes (such as life expectancy and child mortality rates) than many other small island states, primarily because of free access to healthcare provided by the state. Since the 2000s, the country has recorded zero maternal mortality; births attended by skilled health staff hovers between 99 and 100%, and the proportion of women receiving prenatal care has consistently been over 99%.<sup>83</sup> The island nation achieved

---

<sup>76</sup> The New Humanitarian (2013). 'Small steps in Madagascar's fight against GBV'. Online News Report. Accessed 03 September 2019. Available at: <http://www.thenewhumanitarian.org/feature/2013/12/10/small-steps-madagascar-s-fight-against-gender-based-violence>

<sup>77</sup> Neumeyer, E. & Plümper, T. (2007). 'The gendered nature of natural disasters: the impact of catastrophic events on the gender gap in life expectancy, 1981 – 2002' in *Annals of the Association of American Geographers* (Vol. 97, No. 3).

<sup>78</sup> Government of Mauritius (2017). *Health Statistics Report 2017*. Government Report. Accessed 03 September 2019. Available at: <http://health.govmu.org/English/Documents/2018/ANNUAL%20REPORT%202017%20FOR%20PRINTING.pdf>

<sup>79</sup> Gender Links (n.a.). 'Mauritius: VAW Baseline Research'. *Ibid.*

<sup>80</sup> *Ibid.*

<sup>81</sup> *Ibid.*

<sup>82</sup> <https://genderandenvironment.org/2018/08/survey-linkages-between-gender-based-violence-gbv-and-the-environment/>

<sup>83</sup> The World Bank (2012). *Country Partnership Strategy: Seychelles*. *Ibid.*

most of the health-related MDGs, and is on track to operationalise policy and budgetary allocations towards SDG 3 (Good Health and Well-Being).

Yet, challenges crop up in the broader health landscape in the Seychelles. UNODC reports that Seychelles is among the countries and areas with the highest rates of injected drug use (more than 3.5 times the global average).<sup>84</sup> Interviews held with the Gender Secretariat in Victoria confirmed these findings and revealed the gendered nature of substance abuse in the country: demand for illegal heroin and other substances originate primarily from unemployed youth and men in the country.

GBV studies in Seychelles have uniquely featured both women and men: in partnership with Gender Links, the Government has determined that the most common form of violence against men is emotional violence (29%), followed by physical violence (12%), economic violence (9%), and sexual violence (3.3%). Violence against women stands at a staggering 58%, showing the prevalence of different types and complex incidence of GBV in the islands. Although the linkage between GBV and environment is a nascent topic of research, the evidence of violence as a threat multiplier of risks (as well as exposure to them) is mounting.<sup>85</sup>

The WHO suggests<sup>86</sup> that SDG 13 (Climate Action) and SDG 3 (Good Health and Well-Being) are closely related, with results gained in one sector positively impacting results in the other. Targeted health-related investment for continued results, thus, is important for the archipelago – with better CS, EWS and hydromet products assisting in disaster-related health outcomes.

## 4.2 Policy environment

This sub-section takes stock of the policy environment and legal frameworks available for gender-responsive climate change adaptation in the project countries (including international conventions such as the Convention on the Elimination of all Forms of Discrimination against Women or CEDAW, national laws and policies, strategy documents on gender and climate change), as well as a list of potential institutions for collaboration on gender mainstreaming during the project cycle. Identification of legal tools and enabling policies, particularly at the baseline outset, are crucial in ensuring that gender inequality can be addressed through tangible and formal procedures. Additionally, the inclusion of local and national gender partners develops capacity and technical knowledge towards future gender efforts while establishing ownership of the project and the change narrative being implemented.

The Social Institutions and Gender Index (SIGI)<sup>87</sup> category (very low to very high discrimination), indicating the relative strength of legal and social institutions in the country, is presented for Madagascar (only aggregate available), and scores in other indicators are presented for all four IOC countries targeted by the project. The SIGI covers four dimensions<sup>88</sup> of discriminatory social institutions, spanning major socioeconomic areas that affect women's lives: discrimination in the family, restricted physical integrity, restricted access to productive and financial resources, and restricted civil liberties.

---

<sup>84</sup> UNODC (2013). *World Drug Report 2013*. *Ibid.*

<sup>85</sup> <https://genderandenvironment.org/2018/08/survey-linkages-between-gender-based-violence-gbv-and-the-environment/>

<sup>86</sup> <http://www.euro.who.int/en/health-topics/health-policy/sustainable-development-goals/publications/2019/policy-briefs-on-health-and-the-sustainable-development-goals/sdg-13-health-and-climate-action>

<sup>87</sup> Organisation for Economic Cooperation and Development – OECD, Development Centre (2019). 'What is SIGI?'. Official Website. Accessed 08 September 2019. Available at: [www.genderindex.org](http://www.genderindex.org)

<sup>88</sup> *Ibid.*

Social Institutions and Gender Index 2019 (SIGI) <sup>89</sup>	Comoros <sup>90</sup>	Madagascar <sup>91</sup>	Mauritius <sup>92</sup>	Seychelles <sup>93</sup>
Categorisation into 5 segments from very low to very high discrimination	-	HIGH	-	-
% Prevalence of Discrimination in the Family	81	57	53	41
% Restricted Physical Integrity	28	32	-	-
% Restricted Access to Financial and Productive Resources	-	39	19	-
% Restricted Civil Liberties	-	59	41	-
<b>NOTE:</b>				
<p>Calculated by the Organisation for Economic Cooperation and Development (OECD)'s Development Centre, the SIGI is a cross-country measure of discrimination against women in social institutions (formal and informal laws, social norms, and practices) across 180 countries. Discriminatory social institutions intersect across all stages of girls' and women's lives, restricting their access to justice, rights and empowerment opportunities and undermining their agency and decision-making authority over their life choices.</p> <p>As underlying drivers of gender inequalities, discriminatory social institutions perpetuate gender gaps in development areas – such as education, employment and health – and hinder progress towards rights-based social transformation that benefits both women and men.</p> <p>The SIGI's variables quantify discriminatory social institutions such as unequal inheritance rights, child marriage, violence against women (GBV/VAW), and unequal land and property rights. Through its 180 country profiles, country classifications, unique database and its innovative simulator, the SIGI provides a strong evidence base to effectively address the discriminatory social institutions that hold back progress on gender equality and women's empowerment, allowing policy makers to scope out reform options and assess likely effects on gender equality in social institutions.</p>				

COMOROS	
CEDAW, Maputo Protocol	Comoros acceded to the CEDAW on 31 October 1994, but has not yet ratified it. The island nation also ratified the Maputo Protocol (The Protocol to the 'African Charter on Human and Peoples' Rights' on the Rights of Women in Africa) as one of the earlier signatories.
Gender Policies	In Comoros, the law prohibits discrimination based on gender and the government has taken steps to improve the political participation of women. The Constitution was revised in 2018 <sup>94</sup> to include the Articles 30, 34 and 36 to ban abandonment and GBV, and increase political representation – with provision for government intervention, where necessary, for the actualisation of these rights.
Governmental Mechanisms	The National Commission on Solidarity, Civil Protection and Promotion of Gender is the primary socio-civic organisation for the mobilisation of gender mainstreaming efforts. The Beijing 25+ report produced by the Commissariat shows that baseline understanding of gender inequality

<sup>89</sup> OECD, Development Centre (2019). '2019 Results'. Official Website. Accessed 08 September 2019. Available at: [www.genderindex.org/countries](http://www.genderindex.org/countries)

<sup>90</sup> OECD, Development Centre (2019). *Country Profile: Comoros*. Accessed 08 September 2019. Available at: <https://www.genderindex.org/wp-content/uploads/files/datasheets/2019/KM.pdf>

<sup>91</sup> OECD, Development Centre (2019). *Country Profile: Madagascar*. Accessed 08 September 2019. Available at: <https://www.genderindex.org/wp-content/uploads/files/datasheets/2019/MG.pdf>

<sup>92</sup> OECD, Development Centre (2019). *Country Profile: Mauritius*. Accessed 08 September 2019. Available at: <https://www.genderindex.org/wp-content/uploads/files/datasheets/2019/MU.pdf>

<sup>93</sup> OECD, Development Centre (2019). *Country Profile: Seychelles*. Accessed 08 September 2019. Available at: <https://www.genderindex.org/wp-content/uploads/files/datasheets/2019/SC.pdf>

<sup>94</sup> UN Women & Union Des Comores, Commissariat National à la Solidarite, à la Protection, et à la Promotion du Genre (2014). *Rapport Pays sur les Progres Realises dans la Mise en Œuvre de la Plateforme D'Action de Beijing+25*. Ibid.

	issues in the country exists.
--	-------------------------------

MADAGASCAR	
CEDAW, Maputo Protocol	Madagascar ratified the CEDAW on 17 March 1989. Madagascar has also signed the Maputo Protocol but is yet to ratify it through national prerogatives due to reservations regarding abortion-related policies.
Gender Policies	<p>The following policy tools towards gender mainstreaming exist in the country: Gender and Elections strategy (2015–2020), aimed at enhancing the representation and participation of women in decision-making; and a National Action Plan for combating GBV.</p> <p>Madagascar is identified as having ‘high’ discrimination on the SIGI index, which takes stock of discrimination in the family, restricted physical integrity, restricted access to productive and financial resources, and restricted civil liberties.</p> <p>Under the Constitution all citizens are equal before the law and are protected from discrimination based on gender.<sup>95</sup> Yet, regarding basic citizenship rights, the status of women and men is uneven. Until 2017, for example, the Nationality Code did not allow a Malagasy woman to confer her nationality to her children. Under civil law, women and men have equal rights marry. In 2007, the law was amended to increase the legal age of marriage for women and men to 18. Further, the law recognises both civil and traditional ceremonies (if legally registered by an officer of civil status) and prohibits bigamy (Law on Marriage and Matrimonial Regimes, 2007).<sup>96</sup> In practice, customary marriages are widely practiced, and few are legally registered, leaving women without the protections offered through the civil law. Traditional and faith-based norms, a national CEDAW shadow report<sup>97</sup> identifies, perpetuate unequal treatment of women in family matters such as marriage, divorce, and child custody.</p>
Governmental Mechanisms	Ministry of Population, Social Protection and Promotion of Women is the national gender machinery for the country and has extensive experience working with different funds and UN/aid agencies.

MAURITIUS	
CEDAW, Maputo Protocol	Mauritius acceded to the CEDAW on 09 July 1984, but is yet to ratify it. In June 2017, Mauritius also ratified the Maputo Protocol (with reservations), noting the commitment of the government of Mauritius to securing the rights of every woman and child through various programmes.
Gender Policies	<p>Under the 1968 Constitution all citizens are equal before the law and are protected from discrimination based on gender.<sup>98</sup> The state’s Constitution affords both women and men the same rights to access justice, including provisions for legal aid and interpretation services, for example.</p> <p>Yet, while discrimination of all forms is prohibited by the state’s Constitution, the law provides exemptions in matters relating to personal status, including marriage, divorce, death and inheritance.</p> <p>However, Mauritius has been proactive in incorporating gender mainstreaming goals through its state machinery, and is currently developing a draft National Gender Policy Framework with EU</p>

<sup>95</sup> OECD, Development Centre (2019). *Country Profile: Madagascar*. *Ibid.*

<sup>96</sup> *Ibid.*

<sup>97</sup> The Madagascar Coalition of Civil Society Organization (2015). *CEDAW Shadow Report: Madagascar*. Accessed 12 September 2019. Available at: [https://tbinternet.ohchr.org/Treaties/CEDAW/Shared%20Documents/MDG/INT\\_CEDAW\\_NGO\\_MDG\\_21897\\_E.pdf](https://tbinternet.ohchr.org/Treaties/CEDAW/Shared%20Documents/MDG/INT_CEDAW_NGO_MDG_21897_E.pdf)

<sup>98</sup> OECD, Development Centre (2019). *Country Profile: Mauritius*. *Ibid.*

	support to replace the 2008 version. <sup>99</sup> Further, a National Action Plan to Combat Domestic Violence was formulated by the Family Welfare and Protection Unit in 2007.
Governmental Mechanisms	The Ministry of Gender Equality, Child Development and Family Welfare is the primary organisation for the mobilisation of gender mainstreaming efforts. It is proactive and well equipped for gender-responsive activities, has previously developed (and is developing a replacement) policy framework, and has a demonstrated knowledge of the intersections between gender and environmental issues.

SEYCHELLES	
CEDAW, Maputo Protocol	Seychelles acceded to the CEDAW on 05 May 1992, but is yet to ratify the convention. The archipelago nation also ratified the Maputo Protocol (2006), and is one of the frontrunners in fulfilling its commitments to the African Union.
Gender Policies	<p>The Seychelles has the following two gender-specific policies: the National Strategy for Domestic Violence 2008 – 2012; and the National Action Plan on Gender-Based Violence 2010 – 2011.<sup>100</sup></p> <p>Seychelles has been one of the better performers for gender indicators in the continent – the CEDAW, for example, particularly recognises the high representation of women in parliament (~44%) and in the public service. The Committee also welcomes the quality and accessibility of maternal and child health-care services by the government, in addition to the results achieved regarding de facto equality between girls and boys in the education sector.</p> <p>The country also welcomed an election observation mission (exclusively staffed by women) on 04 September 2016 by the African Union Commission (AUC). Additionally, in 2012, the Gender Secretariat of the Government of the Seychelles developed the ‘Gender and the Law Manual’ to provide parliamentarians, judges, lawyers and law enforcement agencies with legal guidance, information and resources on gender sensitivity.<sup>101</sup></p>
Governmental Mechanisms	The Gender Secretariat, housed within the Ministry of Social Affairs, Community Development and Sports, is the primary gender mainstreaming machinery in the country. The Secretariat is currently developing a climate change and gender action plan, in line with the protocols laid down by the South African Development Community (SADC).

### 4.3 Composite Indices – HDI, GDI, GGI, GGGI, and MPI

Implementing gender-responsive adaptation action requires situating the project’s results framework on a thorough and context-driven baseline. A collation exercise of scores and rankings from composite indices, especially due to the lack of decentralized, nationally available data, has been included in this assessment to reflect the overall gender performances of the four countries. These indices have differing methodologies, and are being employed as indicative (and *not* conclusive) measures of current levels of development, gender equality, poverty, and labour force participation.

As Booyesen’s research<sup>102</sup> shows, composite indices present both challenges and advantages. For example, numerous fallacies have been identified in the methodologies employed in composite indexing. These indices are mainly quantitative, and present empirical and aggregate measures of

<sup>99</sup> African Union Commission – AUC & United Nations Office for High Commissioner of Human Rights – UNOHCHR (n.a.). *Development in Laws since the Maputo Protocol*. Report. Accessed 12 September 2019. Available at: <https://www.ohchr.org/Documents/Issues/Women/WRGS/DevelopmentsinLawsinfoGraphics.pdf>

<sup>100</sup> AUC & UNHCR (n.a.). *Development in Laws since the Maputo Protocol*. *Ibid.*

<sup>101</sup> OECD, Development Centre (2019). *Country Profile: Seychelles*. *Ibid.*

<sup>102</sup> Booyesen, F. (2002). “An Overview and Evaluation of Composite Indices of Development” in *Social Indicators Research*, (Vol. 59 No. 2). Journal Article.

complex development phenomena, making values apparently objective, at the cost of subjective nuances. Yet, these also remain invaluable as useful supplements to income-based development indicators, understanding relative degrees of development, simplifying complex measurement constructs as well as providing access to non-technical audiences.

This baseline, at the outset, uses scores of three different UNDP composite indices: **Human Development Index (HDI)**, **Gender Inequality Index (GII)** and **Gender Development Index (GDI)** as points of departure. Secondly, the baseline collates scores from the **World Economic Forum (WEF)’s Global Gender Gap Index (GGGI)** and **Oxford Poverty and Human Development Initiative (OPHI)’s Multidimensional Poverty Index (MPI)**, although data for some project countries are unavailable.

HDI	COMOROS	MADAGASCAR	MAURITIUS	SEYCHELLES
HUMAN DEVELOPMENT INDEX				
UNDP (2018) – out of 189 countries <sup>103</sup>	165	161	65	62

**NOTE:** This index measures and combines three basic dimensions of human development (long and healthy life, knowledge and decent standard of living) and provides an overall socioeconomic landscape of a country.

In line with Booyesen’s argument, however, the HDI should be treated as indicative, not conclusive. It provides an overview of relative degree of development in a particular country but remains a ‘synthetic indicator’. Recent research has shown the need to supplement the HDI with other indicators associated with economic and social cohesion, sound development strategies, and sustainability in growth models.<sup>104</sup>

GII	COMOROS	MADAGASCAR	MAURITIUS	SEYCHELLES
GENDER INEQUALITY INDEX				
UNDP (2018) – out of 189 countries <sup>105</sup>	-	161	-	-

**NOTE:** This index, showing inequality in achievement between men and women in three aspects (reproductive health, empowerment and labour market), provides a useful gender baseline in terms of health equity, economic capital and financial access, speaking to the gender opportunities of men and women in the countries. It provides a primary understanding of the different levels of achievement on basic development indicators between men and women. This displays useful features towards the gender status quo hypotheses, which could then be derived in the context of this project. GII should be treated as indicative: note that Pernmayer finds that the functional form of the index could be unclear, particularly the inclusion of relative performance indicators for women vis-à-vis men, along with absolute women-specific indicators.<sup>106</sup>

GII scores for Comoros, Mauritius and Seychelles are unavailable as of August 2019.

GDI	COMOROS	MADAGASCAR	MAURITIUS	SEYCHELLES
GENDER DEVELOPMENT INDEX				

<sup>103</sup> UNDP – United Nations Development Programme (2018). *Human Development Reports*, ‘Table I: HDI and its Components’. Website. Accessed 02 August 2019. Available at: <http://hdr.undp.org/en/composite/HDI>

<sup>104</sup> Bilbao-Ubillos, J (2011). “The Limits of HDI” in *Sustainable Development*, (Vol. 21 No. 6). Journal Article.

<sup>105</sup> UNDP (2018). *Human Development Reports*, ‘Table V: Gender Inequality Index’. Website. Accessed 02 August 2019. Available at: <http://hdr.undp.org/en/composite/GII>

<sup>106</sup> Pernmayer, I (2013). “A Critical Assessment of UNDP’s Gender Inequality Index” in *Feminist Economics*, (Vol. 19 No. 2). Journal Article.

UNDP (2018) – grouped in 5 for absolute deviation <sup>107</sup>	5	2	2	-
--	---	---	---	---

**NOTE:** The GDI (UNDP) index shows the ratio of female to male HDI values. GDI expresses values in deviation, hence, to facilitate understanding GDI grouped categories have been used (as grouped by UNDP) to show the absolute deviation from gender parity in HDI values (1 being the highest, and 5 being the lowest). This further reiterates the results of the HDI (UNDP) and GII (UNDP), and shows the real gender gap in human development achievements. Geske Dijkstra and Hanmer find that although gender-related development indices have increased attention towards ‘feminization of poverty and underdevelopment’, more robust data needs and indicators are required to create aggregate indices that are sensitive to contemporary trends in gendered privation, particularly with the categorisation of ‘women’.<sup>108</sup>

GDI grouping for Seychelles is unavailable as of August 2019.

GGGI	COMOROS	MADAGASCAR	MAURITIUS	SEYCHELLES
GLOBAL GENDER GAP INDEX WEF (2018) – out of 144 countries <sup>109</sup>	-	84	109	-

**NOTE:** The GGGI (WEF) benchmarks 144 countries on their progress towards gender parity on four thematic dimensions – economic participation and opportunity, educational attainment, health and survival, and political empowerment. The Index takes stock of national gender gaps on economic, political, education- and health-based criteria, and provides country rankings that allow for effective comparisons across regions and income groups.

GGGI rankings for Comoros and Seychelles are unavailable as of August 2019.

MPI	COMOROS	MADAGASCAR	MAURITIUS	SEYCHELLES
MULTIDIMENSIONAL POVERTY INDEX (2019) – out of 101 countries <sup>110</sup>	65	94	-	-

**NOTE:** Calculated by the Oxford Poverty and Human Development Institute (OPHI) and UNDP, the global Multidimensional Poverty Index (MPI) measures acute poverty in developing countries (covering 76% of the population). It complements traditional income-based poverty measures by capturing severe deprivation regarding different indicators: education, health, and living standards. The index not only identifies those living in multidimensional poverty, but the extent (or intensity) of their poverty. The MPI can support the effective allocation of resources by making it possible to target those with the greatest intensity of poverty, addressing SDGs strategically and monitoring tangible impacts of policy intervention.<sup>111</sup>

MPI scores are calculated for developing countries<sup>112</sup> – hence, data is available only for Comoros and Madagascar due to Mauritius’ categorisation as an ‘upper middle income’ country by the World Bank with ‘High Human Development’

<sup>107</sup> UNDP (2018). *Human Development Reports*, ‘Table IV: Gender Development Index’. Website. Accessed 02 August 2019. Available at: <http://hdr.undp.org/en/composite/GDI>

<sup>108</sup> Geske Dijkstra, A. & Hanmer, L. C (2002). “Measuring Socio-Economic Gender Inequality: Towards an Alternative to the UNDP Gender Index” in *Feminist Economics*, (Vol. 6, No. 2). Journal Article.

<sup>109</sup> WEF – World Economic Forum (2018). *The Global Gender Gap Report*. Report. Accessed 06 August 2019. Available at: [http://www3.weforum.org/docs/WEF\\_GGGR\\_2018.pdf](http://www3.weforum.org/docs/WEF_GGGR_2018.pdf)

<sup>110</sup> UNDP & Oxford Poverty and Human Development Initiative – OPHI (2019). *Human Development Reports*, ‘Multidimensional Poverty Index: Developing Countries’. Website. Accessed 06 August 2019. Available at: [http://hdr.undp.org/sites/default/files/mpi\\_2019\\_table\\_1.pdf](http://hdr.undp.org/sites/default/files/mpi_2019_table_1.pdf)

<sup>111</sup> UNDP & OPHI (2019). *Human Development Reports*, ‘MPI Technical Note’. Technical Note. Accessed 06 August 2019. Available at: [http://hdr.undp.org/sites/default/files/hdr2019\\_technical\\_notes.pdf](http://hdr.undp.org/sites/default/files/hdr2019_technical_notes.pdf)

<sup>112</sup> See: <https://ophi.org.uk/background-to-the-mpi/>

according to the UNDP's HDI rankings, and Seychelles' categorisation as a 'high-income' country by the World Bank with 'High Human Development' according to the UNDP's HDI rankings.

## 5 CONCLUSION: REGIONAL POTENTIAL & WAY FORWARD

This Gender Assessment has identified and expounded upon both explicit and implicit gender and socio-economic issues that could be addressed through the project components. The findings from the Assessment also form the basis for the Gender Action Plan (Section 5), which will specify this proposal's desired results, corresponding actions, indicators, timelines, responsible parties, and budget allocations, through the results framework (Section E of the funding proposal or FP).

**Given** mounting evidence that dynamic, long-term planning for the uncertainties posed by climate change must be inclusive, gender-responsive and stakeholder-friendly, this project will pioneer gender mainstreaming in climate services. Gender equality has also gained priority in the GCF, AFD, and other agencies' portfolios **as a part of implementing a holistic social development mandate with inclusive engagement**. With that policy background this project partakes in the international conversation on gender mainstreaming in climate change adaptation efforts.

If implemented effectively, this project has the potential to become a good practice gender-mainstreaming guide for future interventions in the Comoros, Madagascar, Mauritius and Seychelles (nationally), the Indian Ocean region (regionally) as well as among other SIDS and LDCs, and globally.

## 6 GENDER ACTION PLAN

This section provides the Gender Action Plan. The first table shows the main outputs and responsibilities expected from the Gender Consultant to be hired during the project cycle. The Gender Consultant will also participate in activity 1.4.1, which will conduct a baseline study of access to climate services, institutional capacities of NMHSs, and needs of these different institutions. This will be conducted with the aim to build upon the formative research on gender mainstreaming presented in Annex 8, and develop agreed-upon and needs-based outputs for the four countries. The gender mainstreaming action points will also pertain to regional and national priorities and deliver on greater gender equality in the region. The second table puts forward a gender action plan with a gender impact statement and expected outcome for each component. Gender mainstreaming action points are then presented for each activity of the expected results, with the required outputs towards identified targets and indicators.

<b>SUMMARY TABLE OF GENDER TARGETS</b> <i>(to be undertaken by the Hydromet Project Gender Consultant)</i>	
COMPONENT	GENDER TARGET
<b>COMPONENT 1: CAPACITY BUILDING, INSTITUTIONAL DEVELOPMENT, REGIONAL COOPERATION AND PUBLIC-PRIVATE ENGAGEMENT</b>	<ul style="list-style-type: none"> <li>→ Include gender-responsive policy inputs in regional and national frameworks developed for climate services (with reference to WMO Gender Strategy)</li> <li>→ Ensure gender capacity building through the design of training modules to assist transition and development plans of NMHSs, DRR institutions and relevant sectoral ministries</li> <li>→ Increase gender parity in new staff and trainees hired for EWS, CS, and hydromet services</li> </ul>
<b>COMPONENT 2: HIGH-QUALITY CLIMATE-RELATED DATA, IMPROVED MULTI-HAZARD IMPACT-BASED FORECASTS AND EWSs, AND CLIMATE RISK ASSESSMENTS</b>	<ul style="list-style-type: none"> <li>→ Ensure gender-engagement training of observers and forecasters, particularly those involved in impact forecasting and nowcasting, to increase gender-responsiveness of EWS and CS products</li> <li>→ Research and include community and social vulnerabilities, particularly gendered impacts and gender-differentiated capacities of resilience, in the hazard maps and climate vulnerability maps developed for each country</li> </ul>
<b>COMPONENT 3: ENHANCED USE OF CLIMATE SERVICES FOR CLIMATE CHANGE ADAPTATION, AND IMPROVED CAPABILITIES IN IMPLEMENTING A PEOPLE-CENTERED MH-IBF-EWS FOR DRR</b>	<ul style="list-style-type: none"> <li>→ Conduct needs assessments to ensure gender-responsiveness of daily weather bulletins, seasonal forecasts and agricultural advisories</li> <li>→ Ensure gender-responsiveness in EW dissemination, particularly with regard to the limited access women have in public spaces (mosques in Comoros), or to information channels (radios in Madagascar)</li> <li>→ Incorporate time use analysis to ensure effective and meaningful participation of women and other vulnerable groups in any trainings and/or information campaigns for EW and CS</li> </ul>

**COMPONENT 1: CAPACITY BUILDING, INSTITUTIONAL DEVELOPMENT, REGIONAL COOPERATION AND PUBLIC-PRIVATE ENGAGEMENT**

**GENDER IMPACT STATEMENT:** Strengthened institutions reinforced capacity and greater regional cooperation among the four IOC countries and their NMHSs with gender mainstreaming will ensure that a standardised gender-responsive approach is pioneered and operationalized for EWS and CS in the region.

**COMPONENT OUTCOME:** A standardised mainstreaming approach for greater gender equality, particularly for climate change adaptation through CS, EWS, hydromet, for the IOC countries.

**OUTPUTS:**

1.1: A REGIONAL CLIMATE CHANGE CENTRE NETWORK AND R/NFCSs ESTABLISHED IN THE SWIO REGION **WITH GENDER-RESPONSIVE POLICIES**

1.2: INSTITUTIONAL ARRANGEMENTS FOR NMHS OPERATIONS STRENGTHENED AND CIEWS FUND ESTABLISHED **TO DELIVER USER-FRIENDLY AND ACCESSIBLE CS**

1.3: IMPROVED STAFFING CAPACITY AND CAPABILITY OF THE RCC, NMHS AND OTHER RELEVANT INSTITUTIONS **WITH A FOCUS ON INCREASED GENDER PARITY**

1.4: DETAILED DESIGN AND SYSTEMATIC INTEGRATION OF PROJECT ACTIVITIES **TO DELIVER GENDER-RESPONSIVE CS, EWS AND HYDROMET SERVICES**

ACTIVITY	RELEVANCE	GENDER ACTION POINT	INDICATOR/S	BASELINE (VALUE, YEAR)	TARGET (VALUE, YEAR)	RESPONSIBLE PARTY	MEANS OF VERIFICATION	MONITORING (UNIT, DISAGG.)	ASSUMPTIONS
1.1.1 Develop regional and national frameworks for climate services (RFCS & NFCS)	<p>The establishment of the RFCS and NFCS will be a pioneering effort in the Indian Ocean region for cohesive climate adaptation efforts involving the four member countries. Without replacing the functions of NMHSs, this will promote a regional methodology based on the WMO GCFS.</p> <p>This activity, hence, will have a <b>policy-level</b> and <b>institution-level action point</b>.</p>	<p>Include gender and vulnerability context monitoring in the regional and national frameworks developed for climate services</p> <p><b>Organise specific working sessions, adapted to women and girls daily activities. When possible these specific sessions shall be animated by women expert to identify the specific needs,</b></p>	<p>RFCS with gender strategy</p> <p>NFCSs, which reflect national gender priorities</p>	<p>0 (2019)</p> <p>0</p>	<p>1</p> <p>4</p>	<p><u>AE PMU – GENDER CONSULTANT (GC)</u> through participation in sub-activities 1.1.1.1 (stakeholder consultation), 1.1.1.2 (regional workshop), and 1.1.1.4 (national workshops).</p> <p>The GC will refer to WMO policies and efforts on gender equality and mainstream the same in the R/NFCSs.</p> <p>See: <a href="https://public.wmo.int/en/resources/gender-equality">https://public.wmo.int/en/resources/gender-equality</a></p>	<p>Minutes from stakeholder consultation, regional workshop and national workshops <b>and specific women sessions</b></p> <p>Gender content in the RCFS</p> <p>Gender content in the NCFS</p>	<p>Data for this indicator will be qualitative and collected as a part of other activities through the main Logical Framework (Section E – FP)</p>	<p>National stakeholders are willing to explicitly include gender strategies within the overarching R/NFCSs.</p>

		ease and smooth the expression of needs and expectations							
1.1.2 Design the legal, institutional, financial and organisational strategy to establish the RCC within the IOC	<p>The RCC profile generated through the preceding activity, will lead to the establishment of an RCC for the SWIO region within the IOC. It will provide regional services and facilities to IOC member states (pertaining to activities 2.2.1, 2.2.2, 2.3.2, 3.3.3, and 3.3.4).</p> <p>It will carry on the gender-inclusive policies identified for the RCFS and NCFSS, ensuring scaled-up gender mainstreamed model for the region.</p> <p>This will also, hence, have a combined <b>policy-level</b> and <b>institution-level action point</b>.</p>	Include gender and vulnerability context monitoring in the legal, institutional, financial and organisational strategy for the RCC	Gender components for the RCC Strategy – which will consolidate 50% – 50% male and female representative hiring for the RCC	0	1	<p><u>AE PMU – GENDER CONSULTANT</u></p> <p>through contribution to 1.1.2.1 (RCC Network plan) and 1.1.2.2 (Validation Workshop)</p> <p>The GC will include gender-, climate change- and environment-related priorities of each country and choose standards accordingly towards the RCC. This effort will be informed by WMO’s and SWIOCOF’s multi-hazard, gender-responsive approach identified in 2015. See: <a href="https://www.gfdr.org/sites/default/files/2.a.%20WMO%20ASG%20CG%20GFDRR.pdf">https://www.gfdr.org/sites/default/files/2.a.%20WMO%20ASG%20CG%20GFDRR.pdf</a></p>	<p>Minutes from validation workshop</p> <p>Gender mainstreaming clauses / priorities in the RCC Network Plan - organizational, legal and financial frameworks, policies and MoUs – agreed upon by national and local institutions</p>	Data for this indicator will be qualitative and collected as a part of other activities through the main Logical Framework (Section E – FP)	National stakeholders are willing to explicitly include gender strategies for the RCC
1.1.3 Design, define strategies and operating plans for the establishment of: (i) a regional laboratory for maintenance and annual calibration of equipment as a	These strategies focus on technical capacity strengthening. Here, gender mainstreaming will take the form of involvement of more women in technical capacities, ensuring greater gender parity (currently favoured towards men) in the meteorological sectors of the countries.	Ensure gender-equitable participation through the strategies and operation plans developed to set up the calibration and maintenance lab (WMO Regional Centre)	Rapid analysis (baseline) gender-disaggregation of existing personnel in each NMHSs	Exact figures N/A, annex 8 study suggests skewed towards male	ideal: 50 – 50 M/F  min: 65 – 35 M/F	NMHSs to present personnel data for baseline establishment to AE PMU GENDER CONSULTANT	Baseline studies delivered under activity 1.4.1 will reflect this information, by country and by gender-disaggregation	Data for this indicator will be qualitative and collected as a part of other activities through the main Logical Framework (Section E – FP)	National stakeholders are able to share the details of NMHSs personnel

WMO Regional Instrument Centre; and, (ii) regional center for specialized training	This will, thus, have two <b>technical-level action points</b> for (i) and (ii).	Ensure specialized training equips new and existing personnel for gender mainstreaming	Gender mainstreaming module to be included in specialized training for new and existing staff	0	1	<u>AE PMU GENDER CONSULTANT</u> to develop gender module for specialized training programme	Gender module content in the specialized regional training programme		Countries are willing to agree on a regionally standardised gender training module
1.1.4 Prepare a strategy to improve Regional Numerical Weather (NWP) and Climate Prediction (NCP)	This is a technical activity that will ensure the harmonization of climate products across countries, based on WMO standards.  Given the focus on harmonization across the range of different capacities of the countries, it will be important to operationalize gender mainstreaming actions based on WMO's policy and strategy on gender equality. Within this, gender-responsive design will be mainstreamed according to WMO strategy.  This will, thus, have a <b>technical-level action point</b> .	Inform the NWP and NCP with gender and vulnerability context monitoring	Gender components in NWP and NCP	0	1	<u>AE PMU – GENDER CONSULTANT</u> through participation in 1.1.4.3 (regional workshop) is able to onboard NMHSs representatives from each country, as well as external, relevant partners towards harmonization of gender-responsive, regional climate products	Gender mainstreaming clauses reflected in the NWP and NCP	Data for this indicator will be qualitative and collected as a part of other activities through the main Logical Framework (Section E – FP)	Country representatives are willing to agree on regionally standardised climate products with gender-responsive components
1.2.1 Strengthen the institutional, operational and financial strategy of NMHSs for each target country	This activity focuses on development and implementation of capacity building. Here, gender mainstreaming will take the form of involvement of more women in technical capacities, ensuring greater gender parity (currently	Ensure gender equitable (where possible based when relevant on GbV identified practices ) participation in	– 1.1.3 (i)	– 1.1.3 (i)	– 1.1.3 (i)	<u>AE PMU – GENDER CONSULTANT</u> Under sub-activities 1.2.1.1 – 1.2.1.3 the staffing needs of the met services will be assessed, and quick gender analysis in terms of disaggregation will be	Baseline studies delivered under activity 1.4.1 will reflect this information, by country and by gender-disaggregation	NUMBER of: existing personnel & new personnel hired, disaggregated by country and by gender	Availability of gender-diverse human resource for each NMHSs  Countries are willing to hire more female staff for their NMHSs

	favoured towards men) in the meteorological sectors of the country  Hence, this activity will have a combined <b>capacity- and technical-level action point</b> .	the NMHSs of each country				performed. Adherence to gender-equal hiring policies will be gradually ensured, to improve both participation and representation, in the meteorological services.	End of project cycle numbers for personnel in NMHSs	PERCENTAGE: change in representation (whether increase registered for women's representation)	
1.2.2 Design the transition support plan of each NMHS, DRR institutions and relevant sectoral ministries (Capacity Development Plans)	This activity focuses on development and implementation of capacity building. Here, gender mainstreaming will take the form of increasing awareness regarding gender-climate change-hydromet services nexus issues.  The <b>action point</b> for this will be at <b>capacity- and technical-level</b> .	Ensure gender is mainstreamed in the Capacity Development Plans while <b>paying attention to GbV if any identified</b> .	Gender components in Capacity Development Plans	0	1	<u>AE PMU – GENDER CONSULTANT</u> New training programmes will include modules on gender-climate change adaptation-hydromet services nexus issues. These modules will also be included in the training exercises for new recruits under activity 1.2.1.	Gender module content in the training programmes and Capacity Development Plans	Data for this indicator will be qualitative and collected as a part of other activities through the main Logical Framework (Section E – FP)	National stakeholders are willing to include gender as a part of capacity development planning
1.2.3 Review and/or strengthen legal and regulatory materials, including the potential establishment of a CIEWS fund	This activity focuses on a regulatory framework that establishes the mission and mandate of the NMHSs and a ring-fenced CIEWS fund.  This activity therefore will have both <b>policy-level and institution-level action point</b> .	Ensure gender-sensitive grievance mechanisms are legally mandated, with access guaranteed for women and <b>prevent from GbV if any identified</b>	Grievance mechanisms are made part of the legal and institutional frameworks	0	4	<u>IOC NMHSs in collaboration with AE PMU – GENDER CONSULTANT</u>  The GC to specify, based on contextualised research, how grievance mechanisms can be designed in each country and how they can be made accessible particularly to women	Detailed reporting on each mechanism mandated for the IOC country in context, and how it can be accessed especially by women and local actors	Data for this indicator will be qualitative and collected as a part of other activities through the main Logical Framework (Section E – FP)	NMHSs agree with legal mandate to create and operationalize grievance and redressal mechanisms
1.3.1 Recruit new staff members for the RCC-	The activity focuses on increasing the human resources available in each	Ensure gender-equitable representation in the RCC	More female staff hired to balance existing inequalities that	Exact figures N/A, annex 8	ideal: 50 – 50 M/F	<u>AE PMU – GENDER CONSULTANT</u> Under sub-activities 1.2.1.1 – 1.2.1.3 the	Baseline studies delivered under activity 1.4.1 will reflect this	<b>NUMBER of:</b> existing personnel &	Availability of gender-diverse human resource for each NMHSs

Network and NMHSs	<p>NMHSs of the IOC countries.</p> <p>Thus, this activity will have a <b>capacity-based action point</b> mirroring the actions undertaken by the GC for activities 1.1.3 (i) and (ii), as well as 1.2.1.</p>	<p>Network and NMHSs while paying attention to GbV to direct and indirect practices.</p>	<p>favour male representation in these institutions, with aim to hire at least 1 qualified female candidate per country</p>	<p>study suggests Higher male staff currently in each NMHSs</p> <p>0</p>	<p>min: 65 – 35 M/F</p> <p>1</p>	<p>staffing needs of the met services will be assessed, and quick gender analysis in terms of disaggregation will be performed. Adherence to gender-equal hiring policies will be gradually ensured, to improve both participation and representation, in the meteorological services.</p>	<p>information, by country and by gender-disaggregation</p> <p>End of project cycle numbers for personnel in NMHSs</p> <p>Profile of female, qualified candidates hired exchanged between countries – organized by GC</p>	<p>new personnel hired, disaggregated by country and by gender</p> <p>PERCENTAGE: change in representation (whether increase registered for women's representation)</p>	<p>Countries are willing to hire more female staff for their NMHSs</p>
1.3.2 Train new and retrain existing staff	<p>The activity focuses on increasing the capacity of human resources available in each NMHSs of the IOC countries.</p> <p>Thus, this activity will have a <b>capacity-based action point</b> mirroring the actions undertaken by the GC for activities 1.1.3 (i) and (ii), as well as 1.2.1. and 1.3.1.</p>	<p>Ensure gender-equitable participation in trainings while paying attention to GbV to direct and indirect practices.</p> <p>Ensure risk exposure component of training includes modules on gender and social inclusion modules</p>	<p>More female staff hired under 1.3.1 (min. 1 / country) are provided with better training</p> <p>Gender and social inclusion modules included under risk exposure component with a minimum of 1 gender mainstreaming module or session per training</p>	<p>Exact figures currently N/A, AE PMU GC will request personnel records as part of previous activities (1.2.1.1 – 1.2.1.3)</p>	<p>ideal: 50 – 50 M/F</p> <p>min: 65 – 35 M/F</p>	<p><u>AE PMU – GENDER CONSULTANT</u></p> <p>will collaborate with the NMHSs to ensure a minimum of 1 qualified female candidate is hired per country.</p> <p>While designing modules the GC will deliver a minimum of 1 gender mainstreaming session / training planned for new and existing staff. It will be important to tune this output towards the different and specific cultural context of each IOC country.</p>	<p>Training records and attendance sheet from each NMHSs</p> <p>Content and records of the gender mainstreaming session or module</p>	<p>– 1.1.3 (i)</p> <p>– 1.2.1</p>	<p>– 1.1.3 (i)</p> <p>– 1.2.1</p>
1.4.1 Conduct baseline studies on how CP-CS and MH-IBF-EWS for hydro-	<p>The goal of this activity is to have an increased understanding of who has access to CP-CS in each beneficiary country, how,</p>	<p>Establish implementation gender baseline for each country,</p>	<p>Updated Gender Assessment and Action Plan</p>	<p>1 (Annex 8)</p>	<p>2 (Updated Report and Annex 8)</p>	<p><u>AE PMU – GENDER CONSULTANT</u></p> <p>to develop a gender baseline report as a part of the reassessment of the baseline, which will</p>	<p>Gender Report, as part of the CONOPS</p>	<p>Data for this indicator will be qualitative and collected as a part of other activities</p>	<p>Subject to COVID-19 and related risk</p> <p>IOC countries agree to validate update Gender Assessment</p>

<p>meteorological hazards are used in each beneficiary country, and on user requirements for improving such services</p>	<p>and how CP-CS are used in decision-making.</p> <p>The studies will be conducted to assess access to, and use of CP-CS at baseline in the following sectors: agriculture and fisheries (Comoros and Madagascar); agriculture and tourism (Mauritius); fisheries and tourism (Seychelles); as well as access to early warnings for tropical cyclones and other hydro-meteorological hazards in all countries.</p> <p>Thus, this activity will have a <b>research action point</b> which will expand the intermediary baseline presented in Annex 8.<sup>113</sup></p>	<p>building on Annex 8</p> <p>Organise specific working sessions, adapted to women and girls daily activities. When possible, these specific sessions shall be, animated by women experts to identify the specific needs, ease and smooth the expression of needs and expectations</p>				<p>inform the implementation stage of IOC Hydromet</p> <p>The baseline shall be developed by mobilizing women community representatives in Host countries in order to set the optimum calendar and daily time slot allowing women and girls to participate actively in the co-design and co-implementation of the climates products and services and when appropriate, in coordination with relevant regional partners such as IFRC-PIROI</p>		<p>through the main Logical Framework (Section E – FP)</p>	<p>and Action Plan as a part of CONOPS</p>
<p>1.4.2 Produce a detailed design of the hydromet observational networks, modelling, forecasting and service delivery systems for each NMHS, taking a</p>	<p>This activity seeks to ensure harmonization of the various systems across the SWIO region through the preparation of implementation plans, technical specifications and tender documents for equipment and services, taking a regional approach. As such, it is an ideal opportunity to ensure the</p>	<p>Ensure gender is mainstreamed in the technical designs produced through this activity.</p> <p>Ensure gender-equitable</p>	<p>Gender components in the technical designs produced through this activity.</p> <p>More female representation</p>	<p>0</p>	<p>N/A (dependant on number of technical specifications produced)</p> <p>Ideal:</p>	<p><u>AE PMU – GENDER CONSULTANT</u></p> <p>through contribution to technical specification and design.</p>	<p>Minutes from validation workshop</p> <p>Baseline studies delivered under</p>	<p>Data for these indicators will be qualitative and collected as a part of other activities through the main Logical Framework (Section E – FP)</p>	<p>National stakeholders are willing to explicitly include gender components in the technical specifications.</p> <p>National stakeholders can</p>

<sup>113</sup> Understanding and analyses of current levels and accessibility of CP-CS among men and women are crucial to design gender-responsive, inclusive, end-users’ services. Progressive capacity-building in the provision of gender-mainstreamed early warning systems and climate information services require gender mainstreaming to capture the varying needs and vulnerabilities of different interest groups in a community. Apropos of in-country missions and Gender Assessment undertaken during the preparation phase, each country presents different gendered dynamics in the usage of CP-CS. In Madagascar, women tend to have limited access to ICTs, such as radio or SMS service. Similarly, in Comoros, women reported constraints in accessing the public sphere, such as community mosques or public squares, where early warnings were announced for Cyclone Kenneth. In Mauritius and Seychelles, gender accessibility to CP-CS are better balanced, however, information may not often cater to the different household duties or roles played by men and women.

regional harmonized approach (regional and national CONOPSS)	integration of gender issues from the outset of these activities. This activity therefore will have <b>policy-level</b> and <b>institution-level action point</b> .	representation in the procurement of services undertaken based on the tender documents produced through this activity.	in services procured to balance existing inequalities that favour male representation in these industries. Rapid analysis (baseline) gender-disaggregation of existing service providers.	Exact figures N/A, annex 8 study suggests skewed towards male	50 – 50 M/F  min: 6 5 – 35 M/F	NMHSs to present personnel data for baseline establishment to <u>AE PMU GENDER CONSULTANT</u>	activity 1.4.1 will reflect this information, by country and by gender-disaggregation		share the details of personnel engaged through procurement processes to provide services.
1.4.3 Ensure full system integration from observation stations to delivery of CP-CS to end-user	This activity includes the development of step-by-step practices and procedures for system integration and coordination of project activities. As such, it is an ideal opportunity to ensure the integration of gender issues from the outset of these practices and procedures. This activity therefore will have <b>policy-level</b> and <b>institution-level indicator</b> .	Ensure gender mainstreaming in the practices and procedures produced through this activity.	Gender components in the practices and procedures produced through this activity.	0	N/A (dependent on number of practices and procedures produced)	Ensure gender is mainstreamed in the practices and procedures produced through this activity.	Gender components in the practices and procedures produced through this activity.	Data for these indicators will be qualitative and collected as a part of other activities through the main Logical Framework (Section E – FP)	– 1.4.2

**COMPONENT 2: HIGH-QUALITY CLIMATE-RELATED DATA, IMPROVED MULTI-HAZARD IMPACT-BASED FORECASTS AND EWSs, AND CLIMATE RISK ASSESSMENTS**

**GENDER IMPACT STATEMENT:** Improved climate data and risk assessments, leading to more precise climate change projections, will provide a ‘gender lens’ to risk exposure in the IOC countries.

**GENDER OUTCOME STATEMENT:** Adopting a gender lens to analyse potential risks and hazards will prioritise the identification of gendered vulnerabilities, leading to targeted and effective action. Further, altering the skewed gender ratio will not only help representation rates, but also create a bona fide cycle of engaging and empowering women through climate change adaptation processes.

**OUTPUTS:**

2.1: ENHANCED HYDRO-METEOROLOGICAL OBSERVATION AND MONITORING BY MAKING USE OF INNOVATIVE TECHNOLOGIES FOR COST-EFFECTIVENESS **AND GENDER-RELEVANCE**

2.2: REGIONAL FACILITIES FOR MAINTENANCE AND TRAINING ESTABLISHED **WITH FOCUS ON INCREASING CAPACITY IN TANDEM WITH GENDER PARITY**

2.3: SCIENCE-BASED MULTI-HAZARD WEATHER AND CLIMATE RISK INFORMATION GENERATED **AND DISSEMINATED TO TARGET CLIMATE-VULNERABLE AUDIENCES IN THE SELECTED SECTORS**

ACTIVITY	RELEVANCE	GENDER ACTION POINT	INDICATOR/S	BASELINE (VALUE, YEAR)	TARGET (VALUE, YEAR)	RESPONSIBLE PARTY	MEANS OF VERIFICATION	MONITORING (UNIT, DISAGG.)	ASSUMPTIONS
2.1.1 Modernise / upgrade climate observation and monitoring network	The project will deliver a modernised climate observation and monitoring network based on a capacity gap analysis following the WMO technical regulations and standards. Therefore, a <b>technical-level action point</b> has been identified for this specific activity.	Ensure women and other marginalized groups, identified through 1.4.1 by the GC, benefit from improved technology in the IOC countries	Gender content in the CONOPSS produced under 1.4 which will inform 2.1.1	To be reassessed using activity 1.4.1	To be determined after the reassessment of the baseline	<u>IOC with the support of the PMU and the AE PMU GENDER CONSULTANT</u>	MoV for this indicator is qualitative and will be drawn from other activities, such as 1.4.1 and 1.4.2	Data for this indicator will be qualitative and collected as a part of other activities through the main Logical Framework (Section E – FP)	National stakeholders are willing to explicitly include gender strategies within the overarching R/NFCSS.
2.1.2 Modernise / upgrade the information and communication technology system	The project will deliver a modernised information and communication technology system. Therefore, a <b>technical-level action point</b> has been identified for this specific activity.	Ensure end user access through the sub-activity 2.1.2.7 (service delivery platform), particularly for vulnerable demographics	Gender training (1 session / country) for forecasters, nowcasters, and observers to ensure relevance of hydromet information	To be reassessed using activity 1.4.1	To be determined after the reassessment of the baseline	<u>AE PMU – GENDER CONSULTANT</u> through the gender modules developed in earlier activities for training will deliver this output.  The GC will ensure that the training modules reflect the cultural	Training records / attendance sheets  Satisfaction survey conducted in each	NUMBER of: attendants for gender training	Gender training is encouraged and operationalized by country stakeholders for new and existing personnel

			for different user groups			specificities of each country.	country after training session on gender		
2.2.1 Establish a maintenance and calibration laboratory (WMO Regional Instrument Centre)	This technical output builds on the strategy and planning envisioned under activity 1.1.3. Therefore, the gender considerations from that activity will be brought forward to enable continuity with activity 2.2.1.	– 1.1.3 (i) & (ii)	– 1.1.3 (i) & (ii)	– 1.1.3 (i) & (ii)	– 1.1.3 (i) & (ii)	– 1.1.3 (i) & (ii)	– 1.1.3 (i) & (ii)	– 1.1.3 (i) & (ii)	– 1.1.3 (i) & (ii)
2.2.2 Refurbish the specialized training centre for the region hosted by Mauritius NMHS (which contribute to the WMO Global Campus)	This technical output builds on the strategy and planning envisioned under activity 1.1.3. The specialized training centre will be complementary to the WMO Regional Instrument Centre established through 2.2.1. Thus, succeeding 2.2.1, this activity too will build on the indicator, baseline, target, MoV etc. of activity 1.1.3.	– 1.1.3 (i) & (ii)	– 1.1.3 (i) & (ii)	– 1.1.3 (i) & (ii)	– 1.1.3 (i) & (ii)	– 1.1.3 (i) & (ii)	– 1.1.3 (i) & (ii)	– 1.1.3 (i) & (ii)	– 1.1.3 (i) & (ii)
2.3.1 Downscale and calibrated meteorological forecasts by making use if numerical weather prediction / ensemble prediction systems (NWP/EPS) and applying modern techniques such as artificial intelligence	This will improve the production of short-range ‘day-to-day’ forecasts and warnings in each target country. Staff members of NMHSs, with the support of DRM institutions, will be trained in probabilistic forecasts and on its use to produce impact-based forecasts (IBF) to translate hydromet hazards into sector and location-specific impacts.  Therefore, a combined <b>technical-level indicator and a capacity-building action point</b> have been	Ensure women and other marginalized groups, identified through 1.4.1 by the GC, benefit from improved technology in the IOC countries  Ensure gender-	The needs of women and other marginalized groups are considered in the downscaling and calibration of forecasts.  Rapid analysis (baseline) gender-	To be reassessed using activity 1.4.1  Exact figures N/A,	To be determined after the reassessment of the baseline  ideal: 50 – 50 M/F	<u>IOC with the support of the PMU</u>  NMHSs to present personnel data for baseline establishment to	MoV for this indicator is qualitative and will be draw from other activities, such as 1.4.1 and 1.4.2  Baseline studies delivered under activity 1.4.1 will reflect this	Data for these indicators will be qualitative and quantitative, and collected as a part of other activities through the main Logical Framework (Section E – FP)	National stakeholders are willing to explicitly include gender strategies within systems.  National stakeholders can share the details of NMHSs personnel

	identified for this specific activity.	equitable participation in training while paying attention to GbV direct and indirect practices. This will be supported by gender-equitable recruitment.	disaggregation of existing personnel in each NMHSs, supplemented with analysis of access to training opportunities.	annex 8 study suggests skewed towards male	min: 6 5 – 35 M/F	AE PMU GENDER CONSULTANT	information, by country and by gender-disaggregation		
2.3.2 Establish threshold values for issuing warnings based on extreme value analysis and review of historical hydrometeorological events	This activity will identify threshold values for each hazard (flooding or otherwise) for each country by using extreme analysis tools, available climate data as well as historical hydrometeorological data.  Therefore, this activity will have a <b>technical action point, combined with capacity analysis (exposure risks)</b> .	Ensure threshold values reflect gendered exposure risks	Harmonized national thresholds for hydromet events developed to reflect gendered and social vulnerabilities	0	4	<u>AE PMU – GENDER CONSULTANT</u> will assist IOC and PMU to coordinate with NGOs and other knowledge brokers, as well as using the implementation gender baseline developed under activity 1.4.1 to ensure thresholds reflect on-the-ground concerns and vulnerabilities.	Baseline studies delivered under activity 1.4.1 will reflect parts of this information  List of NGOs and other relevant institutions to participate in workshops organized with NMHSs and	Data for this indicator will be qualitative and collected as a part of other activities through the main Logical Framework (Section E – E – FP)	Success of baseline gender study conducted under activity 1.4.1 to capture relevant information regarding thresholds and impacts  NGOs and other relevant institutions are willing to participate
2.3.3 Develop hazards maps	This activity will create hazard maps to be utilised by NMHSs and DRM institutions. These maps will take into account climate change impacts on return period/intensity of selected hazards of the four countries.  This will be <b>technical action point, combined with</b>	Ensure hazard maps are gender-responsive, community-informed and stakeholder-owned	Hazard maps that mainstream community and gendered vulnerabilities through stakeholder consultations	0	8 (2 hazard maps / country)	<u>IOC NMHSs in collaboration with AE PMU – GENDER CONSULTANT</u>  The GC to assist with sub-activity 2.3.3.3, wherein communities and stakeholders will be consulted to understand the frequency and intensity of the selected hazards	Consultation and meeting minutes  Stakeholder and community engagement report by the GC	NUMBER of: community members consulted, by gender-disaggregation by location and by country	Communities are able to provide objective analysis of different hazards which can be harmonized across the country  NMHSs show interest in mainstreaming community and local stakeholder

	<b>capacity analysis (exposure to hazards).</b>								interest in hazard maps
2.3.4 Develop climate vulnerability maps	This activity will be based on the hazard maps produced under activity 2.3.3. and will constitute a mapping exercise for climate-risk vulnerability (of people and assets).  This will, therefore, be a <b>technical-level as well as at capacity-level action point</b> like the preceding activities 2.3.3 and 2.3.2.	Ensure climate vulnerability maps are gender-responsive and community-informed and stakeholder-owned	Climate vulnerability maps that mainstream community and gendered vulnerabilities through stakeholder consultations	0	4 (1 climate vulnerability map / country, each reflecting two areas within the country)	<u>IOC NMHSs in collaboration with AE PMU – GENDER CONSULTANT</u>  The GC to assist with sub-activities 2.3.4.1 – 2.3.4.4, towards the development of the climate vulnerability maps	Consultation and meeting minutes  Stakeholder and community engagement report by the GC	NUMBER of: community members consulted, by gender-disaggregation by location and by country	Vulnerable sections of communities are able to meaningfully participate and represent their needs and interests  NMHSs show interest in mainstreaming community and local stakeholder interest in climate vulnerability maps
2.3.5 Undertake risk analysis incorporating hazard, exposure and vulnerability to identify potential impacts from extreme events	This output will deliver risk maps by developing a tool that is able to quantify and characterize hazards, vulnerabilities and exposure risks based on existing datasets.  This will, therefore, be a <b>technical-level action point</b> like 2.3.3 & 2.3.4.	Ensure gendered vulnerabilities are considered within the risk maps, mirroring activity 2.3.3.	– 2.3.3	0	8 (2 per country)	– 2.3.3	– 2.3.3	– 2.3.3	– 2.3.3
2.3.6 Carry out downscaling of global, regional and seasonal forecast to national level, and use them to produce agrometeorological products	This activity will focus on the development of agrometeorological advisories, which are climate products that will service particularly Comoros, Madagascar and Mauritius.  This will function both at the <b>technical and capacity</b> levels, as women are	Ensure agrometeorological training provided mainstreams gender requirements, particularly needs of women subsistence farmers	Agrometeorological advisories that are viable, stakeholder-friendly and cover the 'last mile'	0	4	<u>IOC NMHSs in collaboration with AE PMU – GENDER CONSULTANT</u>  The GC to assist using research undertaken for reassessment of baseline (activity 1.4.1), and for sub-activities under activities 2.3.2 – 2.3.5.	Consultation and meeting minutes  Stakeholder and community engagement report by the GC	NUMBER of: community members consulted, by gender-disaggregation by location and by country	NMHSs agree to incorporate gender perspectives explicitly into agrometeorological advisories

	heavily (and often disproportionately) involved in agriculture.								
2.3.7 Build the capacity to downscale climate models for national purposes	This activity will enable the development of impact assessments of various sectors in each country based on the downscaled climate change projections. The climate change models and projections as well as the sectoral models and impact assessments will be shared on the UIP, allowing for greater information sharing at a regional level, while tailoring end products to local context.	Ensure women and other marginalized groups, identified through 1.4.1 by the GC, benefit from improved technology in the IOC countries	The needs of women and other marginalized groups are considered in the downscaling and calibration of forecasts.	To be reassessed using activity 1.4.1	To be determined after the reassessment of the baseline	<u>IOC with the support of the PMU</u>	MoV for this indicator is qualitative and will be drawn from other activities, such as 1.4.1 and 1.4.2	Data for this indicator will be qualitative and collected as a part of other activities through the main Logical Framework (Section E – FP)	National stakeholders are willing to explicitly include gender strategies within systems.
2.3.8 Build the capacity for hydrological modelling for flood forecasting (i.e. flood propagation model)	This activity will focus on increasing knowledge and building capacity identified gaps in monitoring hydrology data, hydrology expertise and forecasting floods in the four target countries through training of NHMS staff. Therefore, a <b>capacity-building action point</b> has been identified for this specific activity.	Ensure gender-equitable participation in trainings. This will be supported by gender-equitable recruitment, as noted above.	Rapid analysis (baseline) gender-disaggregation of existing personnel in each NMHSs, supplemented with analysis of access to training opportunities.	Exact figures N/A, annex 8 study suggests skewed towards male	ideal: 50 – 50 M/F  min: 6 5 – 35 M/F	NMHSs to present personnel data for baseline establishment to AE PMU GENDER CONSULTANT	Baseline studies delivered under activity 1.4.1 will reflect this information, by country and by gender-disaggregation	Data for this indicator will be qualitative and quantitative, and collected as a part of other activities through the main Logical Framework (Section E – FP)	National stakeholders can share the details of NMHSs personnel

**COMPONENT 3: ENHANCED USE OF CLIMATE SERVICES FOR CLIMATE CHANGE ADAPTATION, AND IMPROVED CAPABILITIES IN IMPLEMENTING A PEOPLE-CENTERED MH-IBF-EWS FOR DRR**

**IMPACT STATEMENT:** User-friendly climate services for climate change adaptation will shift the needle on existing gender inequalities exacerbated by climate risks and natural hazards in the region.

**OUTCOME STATEMENT:** Strengthened NMHSs staff capacity, knowledge brokers, as well as regional platforms, to deliver on gender-responsive CP-CS, EWS.

**OUTPUTS:**

**3.1: PRODUCTION, DISSEMINATION AND UPTAKE OF CP-CS, INCLUDING MH-IBF-EWS, IMPROVED AND GENDER-RESPONSIVE**

**3.2: SHORT- AND LONG-TERM RISK REDUCTION AND ADAPTATION PLANS IMPROVED OR DEVELOPED BASED ON HIGH QUALITY CLIMATE-RELATED DATA, RISK/VULNERABILITY ASSESSMENTS AND CLIMATE CHANGE PROJECTIONS INCLUDING ANALYSES ON GENDERED VULNERABILITIES AND MAINSTREAMING ACTION**  
**3.3: TRAINING FOR IMPROVED DISSEMINATION AND PREPAREDNESS INVOLVING USERS AND END-USERS OF CP-CS ESTABLISHED WITH FOCUS ON DISEMPOWERED WOMEN**

ACTIVITY	RELEVANCE	GENDER ACTION POINT	INDICATOR/S	BASELINE (VALUE, YEAR)	TARGET (VALUE, YEAR)	RESPONSIBLE PARTY	MEANS OF VERIFICATION	MONITORING (UNIT, DISAGG.)	ASSUMPTIONS
<p>3.1.1 Set up / update protocol to produce and deliver improved daily weather bulletin, multi-hazard impact-based forecasts, seasonal forecasts, and agrometeorological advisories</p>	<p>This activity addresses the key finding of Annex 2 (FP): the need to improve the production and delivery of daily weather bulletins, IBF, seasonal forecasts, and other weather products among the population of the four target countries. Therefore, three combined <b>technical-level and capacity-level action point</b> has been identified for this specific activity.</p>	<p>Design weather products that are user-friendly</p> <p>Mainstream gendered interests and needs of vulnerable socioeconomic groups</p> <p>Ensure communication channels chosen for dissemination are accessible to marginalized and vulnerable user groups</p>	<p>Targeted content in the weather bulletins, multi-hazard forecasts, seasonal forecasts, agromet advisories</p>	<p>To be reassessed using activity 1.4.1</p>	<p>To be determined after the reassessment of the baseline</p>	<p><u>AE PMU – GENDER CONSULTANT</u></p> <p>The GC to assist with sub-activities 3.1.1.1, 3.1.1.2, 3.1.1.3. Through sub-activity 3.1.1.4, the GC will ensure meaningful participation from key stakeholders (particularly women involved in subsistence agriculture) who are marginalized.</p> <p>The GC to advise how communication channels identified through 3.1.1.5 and dissemination through 3.1.1.6 can serve women better, given limited access in</p>	<p>Survey report</p> <p>Gender report (as part of CONOPSs – activity 1.4.1)</p>	<p>Data for this indicator will be qualitative and collected as a part of other activities through the main Logical Framework (Section E – FP)</p>	<p>The project is able to engage with marginalized subsets of the beneficiaries without cultural or socio-political hindrances</p> <p>NMHSs and country partners are willing to mainstream gendered needs in climate products</p>

						certain contexts (Annex 8).			
3.1.2 Set up protocols (standard operating procedures) to strengthen MH-IBF-EWS dissemination for and uptake by key sectors and among the general public	This activity will build on the technical advances made under component 2 (instalment of modern meteorological equipment). Through this, the project will undertake in-depth end user analysis to ensure synergy between needs and solutions while packaging EW and CS.  Therefore, the <b>action point</b> identified for this project combines <b>technical and monitoring</b> aspects.	Ensure an end user-focused dissemination channel  Prioritise vulnerable socioeconomic groups in identified dissemination channels	MH-IBF-EW gender-responsibly packaged and disseminated among targeted vulnerable groups	0 (2019)	1 regional strengthened MH-IBF-EWS  4 national strengthened MH-IBF-EWS	<u>AE PMU – GENDER CONSULTANT</u>  to bring forward gender actions for sub-activity 2.1.2.7 (service delivery platform), and contribute to sub-activity 3.1.2.2 to ensure better targetting	Training records / attendance sheets  Gender-responsive end user satisfaction survey and in-depth analysis	Data for this indicator will be qualitative and collected as a part of other activities through the main Logical Framework (Section E – FP)	Gender training is encouraged and operationalized by country stakeholders for new and existing personnel under previous sub-activity 2.1.2.7  Target vulnerable groups are able to meaningfully participate in end user surveys
3.2.1 Improve data sharing and coordination with emergency services for on-the-ground interventions at national and local levels	Through this activity, the project will strengthen the collaboration between NMHSS and DRM institutions. The activity will pilot two local emergency plan per country, to demonstrate how to downscale national emergency response plans.	Deliver national and local emergency response plans which prioritise gendered exposure risks	Local emergency response plans includes gender and vulnerability assessments for exposure risks to improve risk mitigation, mitigation and recovery	To be reassessed using activity 1.4.1	4 national emergency response plans  8 local emergency response plans (2 piloted per country)	<u>AE PMU – GENDER CONSULTANT</u>  to bring forward gender research undertaken for activity 1.4.1 and present a list of DRM institutions and regional and national active NGOs as such PIROI/CRC/IFRC and UN agencies with prior and	GbV trend analysis report in the 2 pilot sites selected in each country  Compilation of historical information and data on <i>ex-ante</i> , <i>during</i> , <i>ex-post</i> GbV and disaster for each country, to be included in 1.4.1 gender deliverable	PERCENTAGE of: people experiencing GbV, disagg. by gender, by pilot site by each country	The GC is able to access information about GbV prevalence in selected pilot sites in a culturally sensitive manner  GbV survivors are willing to share information and personal experience with the GC

	Therefore, the <b>action point</b> identified for this project combines <b>technical and capacity</b> aspects.	Mainstream gender-based violence (GbV) as a key issue for analysis  Mobilize the last-mile partners such as PIROI/CRC/IFRC and its national counterparts, NGOs and UN agencies	Prevention, mitigation and redressal mechanisms for gender-based violence are identified in local emergency response plan			ongoing experience with gender-responsive DRM and GbV  (for example: C for C in Madagascar, consulted for Annex 8 formative research, has extensive experience with GbV)		Additional data for this indicator will be qualitative and collected as a part of other activities through the main Logical Framework (Section E – FP)	
3.2.2 Develop risk matrices for each hazard with agreed risk-levels and colour-coded, and description of related impacts and response/actions; test and validate in selected sites in the four countries; expand and roll out nationwide	Activity 3.2.2 builds on the preceding activity 3.2.1.  Therefore, the <b>action point</b> identified for this project derives from activity 3.2.1.	– 3.2.1	– 3.2.1	– 3.2.1	– 3.2.1	– 3.2.1	– 3.2.1	– 3.2.1	– 3.2.1
3.2.3 Develop a knowledge and decision support system to support the implementation	This activity will develop a web-based knowledge and decision support system that can provide colour-coded risk-based warnings. Through	Deliver a gender, responsive stakeholder-friendly Common Alert Protocols for each country	Knowledge and DSS mainstreams gender and socioeconomic concerns	– 3.2.1	– 3.2.1	– 3.2.1	– 3.2.1	– 3.2.1	– 3.2.1

<p>of MH-IBF-EWS at regional, national and local levels</p>	<p>this, it can support the selected socioeconomic sectors in each country (agriculture, fisheries and tourism) and therefore the stakeholders involved in these climate-vulnerable sector.</p> <p>Therefore, the action point serves at a combined <b>technical and capacity-level</b>. This activity will also benefit from gender action taken under activities 1.4.1 and 3.2.1.</p>		<p>User-friendly CAPs which go the 'last mile'</p>						
<p>3.2.4 Update long term climate change adaptation plans responding to the needs of each country</p>	<p>The project has identified that Comoros, Madagascar and Mauritius are developing National Adaptation Plans (NAPs) and Seychelles is developing a Coastal Management Plan (CMP).</p> <p>These long-term climate change adaptation plan can benefit from the project's efforts</p>	<p>Ensure gender is mainstreamed in long-term climate change adaptation plans <b>for each country taking into account direct and indirect GbV.</b></p>	<p>Gender content in NAPs and CMP</p>	<p>0 (2019)</p>	<p>3 NAPs 1 CMP</p>	<p><u>AE PMU – GENDER CONSULTANT</u></p> <p>to bring forward gender research undertaken in the preparation phase (Annex 8) for activity 1.4.1, and activities 3.2.1 and 3.2.2.</p> <p>The GC will highlight key issues to be covered in the long-term plans (summary notes)</p>	<p>4 summary notes highlighting gender-environment-climate change issues for each IOC country</p> <p>4 ToRs for national consultants for each IOC country</p>	<p>Data for this indicator will be qualitative and collected as a part of other activities through the main Logical Framework (Section E – FP)</p>	<p>Ministry of Environment / Climate Change units in each country are willing to hire national gender consultants for updating the long-term climate change adaptation plans (i.e. 3 NAPs and 1 CMP)</p>

	towards gender mainstreaming as well as existing work on gender and climate change in each country.  Thus, the <b>action point</b> identified for this activity is <b>research-oriented</b> .					and assist Ministry of Environment / Climate Change units to develop TORs for national consultants to be hired in the NAPs and CMP processes			
3.3.1 Train staff members of NMHS and in the RCC on how to package climate-related information in a user-friendly way	This activity will organize workshops with NMHSs and CP-CS users in priority areas of the GFCS to ensure better design of climate products prepared by the NMHSs including sector-tailored forecasts and EWS.  Thus, the <b>action point</b> identified will deliver on a <b>capacity-level</b> .	Ensure gender parity in training for NMHSs staff  ensure that gender-based violence (GbV) dimension is taken into consideration to design and package appropriate and user friendly CP-CS including for women and girl	50 – 50 M/F representation in trainings	To be determined through activity 1.1.3	Minimum 15 staff trained from each NMHSs, with 50 – 50 M/F representation	<u>AE PMU – GENDER CONSULTANT</u> will determine, using action taken under activity 1.1.3, the gender disaggregation of personnel  The GC will ensure 50 – 50 M/F representation, where possible, and a minimum of 35% representation	Training attendance sheet	NUMBER of: existing personnel & new personnel hired, disaggregated by country and by gender  NUMBER of: personnel trained disagg. by country and by gender	Availability of gender-diverse human resource for each NMHSs  Countries are willing to hire more female staff for their NMHSs
3.3.2 Train knowledge brokers – including NGOs, red crescent/cross, local leaders and extension officers – and representatives of sectors in the	This activity will focus on key knowledge brokers, which are active particularly at local level for disaster risk prevention, mitigation and response.  Thus, the <b>action point</b> identified will	Train local knowledge brokers to consider gender needs and to develop GBV prevention programmes  Organize workshops with special sessions	50 – 50 M/F representation in trainings  Women are prioritised in workshops through gender-friendly sessions	To be determined through research undertaken under activity 1.4.1	Trained knowledge brokers mobilized at local level	<u>AE PMU – GENDER CONSULTANT</u> to bring forward gender research undertaken for activity 1.4.1 and present a list of DRM institutions and NGOs with prior and ongoing experience with	Training attendance sheet  Compendium of selected and potential knowledge brokers, with key informant/contact from each	NUMBER of: Individuals trained, disaggregated by gender by institution by location and by country and	NGOs and other knowledge broker entities are willing to participate in training provided by the project  Availability of gender-diverse human resource in these entities

GFCs areas (public and private organisations) on how to interpret and use CP-CS for decision-making	deliver on a <b>capacity-level</b> .	for women and other marginalized groups and develop awareness message on GbV against women and girls.				gender-responsive DRM and GbV that will be vetted and selected as knowledge brokers  (for example: C for C in Madagascar)			
3.3.3 Strengthen the User Interface Platform (UIP)	Through this activity, the project will strengthen the existing Regional Climate Portal developed by IOC and hosted by Seychelles (SMA). The products developed under output 2.3 will be made available on this platform.  The platform will have a feedback mechanism where users of CP-CS can review the services they receive.  Thus, the <b>action point</b> identified will be at <b>technical-level</b> .	Strengthen UIP to establish a reliable feedback mechanism between NMHSS and CP-CS users	UIP information is shared at trainings, consultations	1 (2019)	1 strengthened regional UIP	<u>IOC with support of PMU</u>	MoV for this indicator will be collected as a part of the main activity	Data for this indicator will be qualitative and collected as a part of other activities through the main Logical Framework (Section E – FP)	N/A
3.3.4 Support SWIOCOFs to ensure the active participation of	SWIOCOF is convened annually by IOC. Under this activity, SWIOCOF will be reviewed by meteorological	Ensure SWIOCOF ties in with regional and national gender-responsive FCSs	SWIOCOF is user-oriented and gender-responsive	1 (2019)	1 strengthened SWIOCOF	<u>IOC with support of PMU AE GENDER CONSULTANT</u> to review the SWIOCOF strategy	MoV for this indicator will be collected as a part of the main activity	Data for this indicator will be qualitative and collected as a part of other activities	N/A

climate services users	expert to ensure the platform more user-friendly.  Thus, the <b>action point</b> identified will be at <b>technical-level</b> .	Ensure gender-equitable participation to SWIOCOF			Ideal participants: 50 – 50 M/F  min: 6 5 – 35 M/F	and identify pathways for increasing women’s participation (e.g. SWIOCOF will cover themes which are of interest to women)	SWIOCOF participation list	through the main Logical Framework (Section E – FP)	
------------------------	---	--	--	--	--	--	----------------------------	---	--

**GENDER DELIVERABLE CHART: CORE OUTPUTS, PERIPHERAL INPUTS TO BE PROVIDED BY THE GENDER CONSULTANT**

*The Gender Consultant is expected to be hired for 13,5 months at both regional and national level to provided beaded expertise (full-time expertise not required) and their per diem will be capped at 2000 USD/month .*

TENTATIVE GENDER BUDGET LINE: 32500 (apart for activity costs which will include overhead costs required for travel, gender sessions in training, validation workshops etc.)

DELIVERABLE	RELEVANT FOR:	EXPECTED Months	START YEAR	END YEAR	COST
<b>GENDER BASELINE REPORT</b>  <b>This is the core deliverable for the GC. It will be delivered through Activity 1.4.1. However, it will underscore the project implementation phase as it will provide the reassessment of the gender baseline. The report will be used to update the Gender Action Plan presented in Annex 8.</b>	COMPONENT 1: 1.1.3, 1.2.1, 1.2.2, 1.2.3, 1.3.1, 1.3.2, 1.4.1, 1.4.2, 1.4.3;  COMPONENT 2: 2.1.1, 2.3.8; and,  COMPOENT 3: 3.1.1, 3.2.2, 3.2.1, 3.2.2, 3.2.3, 3.2.4, 3.3.3, 3.3.4	4 months	(mid) 2021	(mid) 2022	<b>8,000 USD</b>

<p><b>GENDER ASSESSMENTS</b></p> <p>These will be brief assessments which into Activities 2.3.2 – 2.3.7. The GC will assist with these assessments towards the threshold values being determined, hazard and climate vulnerability mapping, risk exposure analyses etc.</p>	<p>COMPONENT 2: 2.3.1 2.3.2, 2.3.3, 2.3.4, 2.3.5, 2.3.6, 2.3.7</p>	<p>2 months</p>	<p>Expected start with Output 2.3</p>	<p>Expected end with Output 2.3</p>	<p><b>4,000. USD</b></p>
<p><b>GENDER TRAINING MODULE</b></p> <p>This deliverable will feed into the activities with training components. The GC will deliver a gender module for these trainings highlighting the importance of gender analyses for EWS, CS and hydromet. Particularly, information on user-based analyses (for example women’s participation in agriculture) and gender-disaster management nexus will be highlighted. The GC has to tune the training module for each country.</p>	<p>COMPONENT 1: 1.1.3;</p> <p>COMPONENT 2: 2.1.1, 2.1.2, 2.2.1, 2.2.2; and,</p> <p>COMPONENT 3: 3.3.1, 3.3.2 .</p>	<p>5 months</p>	<p>Expected start with Outputs 2.1 and 3.3</p>	<p>Expected start with Outputs 2.1 and 3.3</p>	<p><b>10,000 USD</b></p>
<p><b>POLICY NOTES</b></p> <p>The GC will assist by developing policy notes for the Outputs 1.1 and 1.2. Since these outputs will focus on legal frameworks and establishing institutional arrangements, the GC will step in to ensure gender-responsive policies receive <i>de jure</i> verification</p>	<p>COMPONENT 1: 1.1.1, 1.1.2, 1.1.4.</p>	<p>1 month</p>	<p>Expected start with Outputs 1.1 – 1.2</p>	<p>Expected start with Outputs 1.1 – 1.2</p>	<p><b>2,000 USD</b></p>
<p><b>FIELD ACTIVITY</b></p>		<p>1,5months</p>	<p>(mid) 2021</p>	<p>(mid) 2024</p>	<p><b>3,000 USD</b></p>

<p>These are days allocated for field activities such as workshop facilitation, interviews with key stakeholders etc.</p>	<p>–</p>				
<p>EXPECTED COST FOR GENDER CONSULTANT (in USD)</p>					<p>27,000.</p>

## 7 Bibliography

- African Development Bank – AfDB (n.a.). *Comoros: Country Gender Profile*.
- AFD – Agence Française de Développement (2018). *Towards a World in Common: AFD Group 2018 – 2022 Strategy*. Policy Document. Accessed 2 August 2019. Available at: <https://www.afd.fr/sites/afd/files/2018-09-04-05-09/afd-group-strategy-2018-2022.pdf>
- AFD (2019). 'Gender Equality'. Official Website. Accessed 2 August 2019. Available at: <https://www.afd.fr/en/page-thematique-axe/gender-equality>
- AFD Gender Profiles (Africa). Accessed 20 January 2020. Available at: [https://www.afd.fr/fr/ressources/profil-genre-afrique?fbclid=IwAR104PGZ\\_TlhVqDdO2ie3V6KeACfxzckkYajNAUWBCp93m5\\_4TOUqKn-M](https://www.afd.fr/fr/ressources/profil-genre-afrique?fbclid=IwAR104PGZ_TlhVqDdO2ie3V6KeACfxzckkYajNAUWBCp93m5_4TOUqKn-M)
- African Union Commission – AUC & United Nations Office for High Commissioner of Human Rights – UNOHCHR (n.a.). *Development in Laws since the Maputo Protocol*. Report. Accessed 12 September 2019. Available at: <https://www.ohchr.org/Documents/Issues/Women/WRGS/DevelopmentsinLawsinfographics.pdf>
- Bilbao-Ubillos, J (2011). "The Limits of HDI" in *Sustainable Development*, (Vol. 21 No. 6). Journal Article.
- Booyesen, F. (2002). "An Overview and Evaluation of Composite Indices of Development" in *Social Indicators Research*, (Vol. 59 No. 2). Journal Article.
- Butterfield, R. (2018) 'Bringing rights into resilience: revealing complexities of climate risks and social conflict' in *Disasters*. Journal Article.
- CGIAR CCAFS – Research Program on Climate Change, Agriculture and Food Security (2013). 'Investigating Climate Information Services through a Gendered Lens'. Working Paper no. 42.
- DIE – Deutsches Institute für Entwicklungspolitik (2009). "Climate Change Adaptation from a Gender Perspective". Discussion Paper.
- EU & C for C (2018). *Rapport Final des Activités du Project – Couvrant la Période du 01er Avril 2016 au 31 Mars 2018*. Project Evaluation Report. .
- GCF – Green Climate Fund and UN Women (2017). "Mainstreaming Gender in Green Climate Fund Projects". Policy Document. Accessed 07 August 2019. Available at: [https://www.greenclimate.fund/documents/20182/194568/Guidelines\\_GCF\\_Toolkit\\_Mainstreaming\\_Gender.pdf/860d1d03-877d-4c64-9a49-c0160c794ca7](https://www.greenclimate.fund/documents/20182/194568/Guidelines_GCF_Toolkit_Mainstreaming_Gender.pdf/860d1d03-877d-4c64-9a49-c0160c794ca7)
- GCF (2018). *Updated Gender Policy and Action Plan*. Policy Document. Accessed 22 April 2019. Available at: [https://www.greenclimate.fund/documents/20182/1087995/GCF\\_B.20\\_07\\_-\\_Updated\\_Gender\\_Policy\\_and\\_Action\\_Plan\\_2018\\_2020.pdf/9bd48527-6e35-a72a-2f52-fd401d16d358](https://www.greenclimate.fund/documents/20182/1087995/GCF_B.20_07_-_Updated_Gender_Policy_and_Action_Plan_2018_2020.pdf/9bd48527-6e35-a72a-2f52-fd401d16d358)
- Gender Links, Young Queer Alliance, Media Watch Organization, and SOS Femmes (2018). *Report to CEDAW from Mauritius*. Shadow Report. Accessed 2 August 2019. Available at: [https://tbinternet.ohchr.org/Treaties/CEDAW/Shared%20Documents/MUS/INT\\_CEDAW\\_CSS\\_MUS\\_32569\\_E.pdf](https://tbinternet.ohchr.org/Treaties/CEDAW/Shared%20Documents/MUS/INT_CEDAW_CSS_MUS_32569_E.pdf)
- Gender Links (n.a.). 'Mauritius: VAW Baseline Research'.
- GermanWatch (2019). *Climate Vulnerability Index 2019*. Report. Accessed 09 September 2019. Available at: [https://germanwatch.org/sites/germanwatch.org/files/Global%20Climate%20Risk%20Index%202019\\_2.pdf](https://germanwatch.org/sites/germanwatch.org/files/Global%20Climate%20Risk%20Index%202019_2.pdf)
- Geske Dijkstra, A. & Hanmer, L. C (2002). "Measuring Socio-Economic Gender Inequality: Towards an Alternative to the UNDP Gender Index" in *Feminist Economics*, (Vol. 6, No. 2). Journal Article.
- Gokulsing, D. and Tandrayen-Ragoobur, V. (2014), "Gender, education and labour market: evidence from Mauritius", *International Journal of Sociology and Social Policy*, Vol. 34 No. 9/10
- Government of Mauritius (2017). *Health Statistics Report 2017*. Government Report. Accessed 03 September 2019. Available at: <http://health.govmu.org/English/Documents/2018/ANNUAL%20REPORT%202017%20FOR%20PRINTING.pdf>
- Government of Seychelles, Department of Education and Human Resources Development (n.a.) Streaming in Seychelles: from SACMEQ research to Policy Reform. Accessed 22 August 2019. Available at: <http://www.sacmeq.org/sites/default/files/sacmeq/research/Papers%20from%20the%202005%20International%20Invitational%20Educational%20Policy%20Research%20Conference/leste.pdf>

- Government of Seychelles (2013). *Seychelles Damage Loss and Needs Assessment Report 2013*. Report. Accessed 09 September 2019. Available at: [https://www.gfdrr.org/sites/default/files/publication/Seychelles\\_DaLA\\_2013\\_Floods.pdf](https://www.gfdrr.org/sites/default/files/publication/Seychelles_DaLA_2013_Floods.pdf)
- IFRC – International Federation of Red Cross and Red Crescent Societies (2015). *Unseen, Unheard: GBV in Disasters*. Report.
- ILO (n.a.). 'ILOSTAT Technical Note'. Online. Accessed 16 August 2019. Available at: [https://www.ilo.org/ilostat-files/Documents/description\\_LFPR\\_EN.pdf](https://www.ilo.org/ilostat-files/Documents/description_LFPR_EN.pdf)
- ILO (2016). *Key Indicators of the Labour Market*. Report. Accessed 01 September 2019. Available at: [https://www.ilo.org/wcmsp5/groups/public/---dgreports/---stat/documents/publication/wcms\\_498929.pdf](https://www.ilo.org/wcmsp5/groups/public/---dgreports/---stat/documents/publication/wcms_498929.pdf)
- ILOSTAT (2017). 'Country Profile: Seychelles'.
- The Madagascar Coalition of Civil Society Organization (2015). *CEDAW Shadow Report: Madagascar*. Accessed 12 September 2019. Available at: [https://tbinternet.ohchr.org/Treaties/CEDAW/Shared%20Documents/MDG/INT\\_CEDAW\\_NGO\\_MDG\\_21897\\_E.pdf](https://tbinternet.ohchr.org/Treaties/CEDAW/Shared%20Documents/MDG/INT_CEDAW_NGO_MDG_21897_E.pdf)
- Neumeyer, E. & Plümpert, T. (2007). 'The gendered nature of natural disasters: the impact of catastrophic events on the gender gap in life expectancy, 1981 – 2002' in *Annals of the Association of American Geographers* (Vol. 97, No. 3).
- Nelson, V., Meadows, K., Cannon, T., Morton, J., & Martin, A. (2002) 'Uncertain predictions, invisible impacts and the need to mainstream gender in climate change adaptations' in *Gender and Development*. Journal Article.
- The New Humanitarian (2013). 'Small steps in Madagascar's fight against GBV'. Online News Report. Accessed 03 September 2019. Available at: <http://www.thenewhumanitarian.org/feature/2013/12/10/small-steps-madagascar-s-fight-against-gender-based-violence>
- Organisation for Economic Cooperation and Development – OECD, Development Centre (2019). 'What is SIGI?'. Official Website. Accessed 08 September 2019. Available at: [www.genderindex.org](http://www.genderindex.org)
- OECD, Development Centre (2019). '2019 Results'. Official Website. Accessed 08 September 2019. Available at: [www.genderindex.org/countries](http://www.genderindex.org/countries)
- OECD, Development Centre (2019). *Country Profile: Comoros*. Accessed 08 September 2019. Available at: <https://www.genderindex.org/wp-content/uploads/files/datasheets/2019/KM.pdf>
- OECD, Development Centre (2019). *Country Profile: Madagascar*. Accessed 08 September 2019. Available at: <https://www.genderindex.org/wp-content/uploads/files/datasheets/2019/MG.pdf>
- OECD, Development Centre (2019). *Country Profile: Mauritius*. Accessed 08 September 2019. Available at: <https://www.genderindex.org/wp-content/uploads/files/datasheets/2019/MU.pdf>
- OECD, Development Centre (2019). *Country Profile: Seychelles*. Accessed 08 September 2019. Available at: <https://www.genderindex.org/wp-content/uploads/files/datasheets/2019/SC.pdf>
- Pernmayer, I (2013). "A Critical Assessment of UNDP's Gender Inequality Index" in *Feminist Economics*, (Vol. 19 No. 2). Journal Article.
- ReliefWeb (2019). 'Comoros Humanitarian Situation Report – Cyclone Kenneth'. Online Report. Accessed 09 September 2019. Available at: <https://reliefweb.int/report/comoros/comoros-humanitarian-situation-report-no-2-cyclone-kenneth>
- UNDESA – United Nations Department of Economics and Social Affairs (2018). *LDC Country Profile: Comoros*. Brief Report. Accessed 1 August 2019. Available at: [https://www.un.org/development/desa/dpad/wpcontent/uploads/sites/45/LDC\\_Profile\\_Comoros.pdf](https://www.un.org/development/desa/dpad/wpcontent/uploads/sites/45/LDC_Profile_Comoros.pdf)
- UNDESA (2018). *LDC Country Profile: Comoros*. Brief Report. Accessed 1 August 2019. Available at: [https://www.un.org/development/desa/dpad/wpcontent/uploads/sites/45/LDC\\_Profile\\_Madagascar.pdf](https://www.un.org/development/desa/dpad/wpcontent/uploads/sites/45/LDC_Profile_Madagascar.pdf)
- UNDP – United Nations Development Programme (2018). *Human Development Reports*, 'Table I: HDI and its Components'. Website. Accessed 02 August 2019. Available at: <http://hdr.undp.org/en/composite/HDI>
- UNDP (2018). *Human Development Reports*, 'Table IV: Gender Development Index'. Website. Accessed 02 August 2019. Available at: <http://hdr.undp.org/en/composite/GDI>
- UNDP (2018). *Human Development Reports*, 'Table V: Gender Inequality Index'. Website. Accessed 02 August 2019. Available at: <http://hdr.undp.org/en/composite/GII>

- UNDP & Oxford Poverty and Human Development Initiative – OPHI (2019). *Human Development Reports*, ‘Multidimensional Poverty Index: Developing Countries’. Website. Accessed 06 August 2019. Available at: [http://hdr.undp.org/sites/default/files/mpi\\_2019\\_table\\_1.pdf](http://hdr.undp.org/sites/default/files/mpi_2019_table_1.pdf)
- UNDP & OPHI (2019). *Human Development Reports*, ‘MPI Technical Note’. Technical Note. Accessed 06 August 2019. Available at: [http://hdr.undp.org/sites/default/files/hdr2019\\_technical\\_notes.pdf](http://hdr.undp.org/sites/default/files/hdr2019_technical_notes.pdf)
- UNDP & OPHI (2019). *Global MPI 2019: Illuminating Inequalities*. Report. Accessed 15 August 2019. Available at: [http://hdr.undp.org/sites/default/files/mpi\\_2019\\_publication.pdf](http://hdr.undp.org/sites/default/files/mpi_2019_publication.pdf)
- United Nations Office on Drugs and Crime – UNODC (2013). *World Drug Report 2013*. Accessed 23 August 2019. Available at: [https://www.unodc.org/unodc/secured/wdr/wdr2013/World\\_Drug\\_Report\\_2013.pdf](https://www.unodc.org/unodc/secured/wdr/wdr2013/World_Drug_Report_2013.pdf)
- UN-OHRLS – Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries, and Small Island Developing States (2015). *Small Island Developing States in Numbers: Climate Change Edition 2015*. Report. Accessed 16 July 2019. Available at: [https://sustainabledevelopment.un.org/content/documents/2189SIDS-IN-NUMBERS-CLIMATE-CHANGE-EDITION\\_2015.pdf](https://sustainabledevelopment.un.org/content/documents/2189SIDS-IN-NUMBERS-CLIMATE-CHANGE-EDITION_2015.pdf)
- UN Women & Government of Seychelles, Ministry of Family Affairs (2019). *Seychelles: National Comprehensive Review*. Report. Accessed 2 August 2019. Available at: <https://www.unwomen.org/-/media/headquarters/attachments/sections/csw/64/national-reviews/seychelles.pdf?la=en&vs=4554>
- UN Women & Union Des Comores, Commissariat National à la Solidarité, à la Protection, et à la Promotion du Genre (2014). *Rapport Pays sur les Progrès Réalisés dans la Mise en Œuvre de la Plateforme D’Action de Beijing+25*. Government Report. Accessed 2 August 2019. Available at: <https://www.unwomen.org/-/media/headquarters/attachments/sections/csw/64/national-reviews/comoros.pdf?la=en&vs=2402>
- USAID (n.a.). *Gender and Information Communication Technology (ICTs)*. Survey Toolkit.
- Accessed 01 October 2019. Available at: [https://www.usaid.gov/sites/default/files/documents/15396/Gender\\_and\\_ICT\\_Toolkit.pdf](https://www.usaid.gov/sites/default/files/documents/15396/Gender_and_ICT_Toolkit.pdf)
- USAID (n.a.). *Gender and Information Communication Technology (ICTs)*. This was particularly true for Comoros – where women (in focus group discussions) revealed the lack of access to technology within the household (for example, mobile phones). Further research can identify the sociocultural norms informing this, which remains beyond the scope of this assessment.
- WEF – World Economic Forum (2018). *The Global Gender Gap Report*. Report. Accessed 06 August 2019. Available at: [http://www3.weforum.org/docs/WEF\\_GGGR\\_2018.pdf](http://www3.weforum.org/docs/WEF_GGGR_2018.pdf)
- Wodon, Q. & Bardasi, E. (2006). “Measuring Time Poverty and Analyzing its Determinants: Concepts and Applications to Guinea” in *Economics Bulletin* (Vol. 10, No. 12). Journal Article.
- The World Bank, Human Development Department – Africa (2010). *Labour Markets Conditions in Madagascar*.
- The World Bank (2012). *Country Partnership Strategy: Seychelles*. Policy Document. Accessed 17 August 2019. Available at: <http://documents.worldbank.org/curated/en/524151468165858183/pdf/669190CASOP1240Official0Use0Only090.pdf>
- The World Bank, Development Research Group (2013). ‘Gini Index’. Online Databank. Accessed 20 August 2019. Available at: [https://data.worldbank.org/indicator/SI.POV.GINI?end=2017&most\\_recent\\_value\\_desc=true&start=1979&view=chart](https://data.worldbank.org/indicator/SI.POV.GINI?end=2017&most_recent_value_desc=true&start=1979&view=chart)
- The World Bank, Poverty Reduction and Economic Management (PREM) – Africa (2014). *Face of Poverty in Madagascar: Poverty, Gender and Inequality Assessment*. Report. Accessed 15 August 2019. Available at: <http://documents.worldbank.org/curated/en/538821468271809604/pdf/781310PRIORITY0English0Apr900May012.pdf>
- The World Bank (2015). *Mauritius: Inclusiveness of Growth and Shared Prosperity*. Report. Accessed 17 August 2019. Available at: <https://openknowledge.worldbank.org/handle/10986/23804>
- The World Bank, Development Research Group (2015). ‘Women Left Behind? Poverty and Headship in Africa’. Working Paper no. 7331. Accessed 10 August 2019. Available at: <http://documents.worldbank.org/curated/en/277221468189851163/pdf/WPS7331.pdf>

- The World Bank (2016). *Shifting Fortunes and Enduring Poverty in Madagascar*. Report. Accessed 15 August 2019. Available at: <http://documents.worldbank.org/curated/en/413071489776943644/pdf/113582-v2-FINAL-PUBLIC-7817-Madagascar-Poverty-Report.pdf>
- The World Bank (2016). *Shifting Fortunes and Enduring Poverty in Madagascar*.
- The World Bank & Global Facility for Disaster Reduction and Recovery – GFDRR (2016). *Disaster Risk Profile: Mauritius*. Accessed 09 September 2019. Available at: <https://reliefweb.int/sites/reliefweb.int/files/resources/mauritius.pdf>
- The World Bank (2017). *Mauritius: Addressing Inequality through More Equitable Labour Markets*. Report. Accessed 17 August 2019. Available at: <https://openknowledge.worldbank.org/handle/10986/29034>
- The World Bank (2017). *Seychelles: Systematic Country Diagnostic*. Report. Accessed 20 August 2019. Available at: <https://openknowledge.worldbank.org/handle/10986/27559>
- The World Bank & Union des Comores (2017). *Comoros Poverty Assessment*.
- The World Bank, Data Help Desk (2018). 'Poverty Data: National and International Poverty Lines'. Technical Note (online). Accessed 07 August 2019. Available at: <https://datahelpdesk.worldbank.org/knowledgebase/articles/193309-should-i-use-national-or-international-poverty-lin> for more.
- The World Bank (n.a.). 'Seychelles: Country Overview'. Online. Accessed 17 August 2019. Available at: <https://www.worldbank.org/en/country/seychelles/overview>.