

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

**Operation and Maintenance Plan
(O&M Plan)**

October 2020



COMOROS



MADAGASCAR



MAURITIUS



SEYCHELLES

Contents

Operation & Maintenance Plan	1
1. Introduction.....	1
2. Operation & Maintenance (O&M) Estimated Costs	2
3. Mechanisms to support O&M in the four target countries	2
3.1 <i>Value-added services.....</i>	<i>2</i>
3.1.1 Cost Recovery of meteorological services	3
3.1.2 Commercial Services.....	5
3.2 <i>Public Private Engagement (PPE)</i>	<i>6</i>
3.3 <i>Engagement with the UN and other international partners working in the four target countries</i>	<i>7</i>
3.4 <i>Business Planning and Hydromet Law.....</i>	<i>7</i>
3.4.1 Business plan	8
3.4.2 Revenue generation	8
3.4.3 License fee	9
3.5 <i>The Systematic Observations Financing Facility / Global Basic Observing Network (SOFF/GBON)</i>	<i>9</i>
4. Conclusions.....	9

Operation & Maintenance Plan

1. Introduction

One of the key factors in defining the project's affordability is assessing the Operation and Maintenance (O&M) costs of the future system, which should be done as part of preparing the project design. In developing countries with very limited funding for NMHSs, such as the case of the four target countries in the SWIO region, any modernization effort will generally increase the annual O&M costs. Thus, the government must agree up front to the incremental cost of running the NMHS, in order to ensure that the project will be sustained beyond the lifetime of the project investment.

Operating expenses consist of renewal and maintenance operations and human resources. According to a benchmark from similar projects in Africa, the World Bank proposed O&M costs between 6% and 9% in its economic studies for the Green Climate Fund (Burkina Faso, and Mali). In the South-East Asia, the observed O&M costs after implementation of a project is about 7%. In this Hydromet project proposal for the SWIO region (four target countries: Comoros, Madagascar, Mauritius and Seychelles), 7% of the investment budget in the Observation, Production and Information Systems has been considered to estimate the O&M costs throughout the implementation and after the completion of the project. The detailed estimated costs are provided in section 2. below.

The Governments of Mauritius and Seychelles agreed to support the O&M costs throughout the project implementation (through the Non-Objection Letters and Co-financing Letters issued by the related Ministries). It is expected that such level of commitment by the Governments of Mauritius and Seychelles continue after the completion of the project.

As for Comoros and Madagascar, the Governments have agreed to support partially the O&M costs (further details are provided in section 2. below) during project implementation (through the Non-Objection Letters and Co-financing Letters issued by the related Ministries). It is expected that such level of commitment by the Governments of Comoros and Madagascar continue and possibly increase after the project. During the project implementation, there will be a need to get financial support from AFD and GCF, to cover the remaining O&M costs for Comoros and Madagascar.

At the same time, a number of solutions have been identified (details provided in sections 3 to 8) under this O&M plan that are already being explored and will continue to be during project implementation, to support O&M costs (and possible further improvements in the systems after the project completion) and ensure sustainability of the investments.

2. Operation & Maintenance (O&M) Estimated Costs

As indicated in section 1. above, the O&M costs throughout the implementation and after the completion of the project have been estimated at 7% of the investment budget in the Observation, Production and Information Systems.

The O&M costs estimated for the four target countries (Comoros, Madagascar, Mauritius and Seychelles) independently, as well as at the regional level are described in Table 1 below. This Table also presents the amounts supported by the respective governments and the funds required to be supported by the project co-financiers during the project implementation.

Table 1 – O&M estimated costs and respective financing mechanism

Country	Total O&M costs (kUSD)	O&M type	O&M Type costs (kUSD)	Governments' contribution (kUSD)	Project financing (kUSD)
Comoros	1'990	HR	1'250	1'250	N/R
		MES	740	-	740
Madagascar	1'789	HR	1'070	1'070	N/R
		MES	719	-	719
Mauritius	1'862	HR	1'171	1'171	N/R
		MES	691	691	N/R
Seychelles	1'699	HR	1'028	1'028	N/R
		MES	671	671	N/R
Regional	661	HR	140	-	140
		MES	521	-	521
Total	8001	HR	4'659	5'881	-
		MES	3'342	-	2'120

Notes:

HR – Human Resources; MES – Maintenance of Equipment and systems

N/R – Not Required

In addition, the Government of Seychelles has committed additional 1'000 kUSD to support the construction of a new building to accommodate the regional infrastructures being supported by the project.

After the project completion, it is expected that governments commit the required resources to support the O&M costs, including the regional O&M costs will most likely be supported by the Seychelles Meteorological Service (current negotiations in progress).

3. Mechanisms to support O&M in the four target countries

3.1 Value-added services

The level of government-funded services varies widely between countries, depending on history, finance, legislation, culture and, indeed, the climate and weather of the country. A number of factors have then led to many NMHSs becoming involved in the provision of value-added services, in addition to their core government-funded role. By

value-added services we mean those which are not explicitly funded by the government. There are two types—cost-recovered services and commercial services. The sections below describe the strategies to be put in place under the proposed Hydromet project to ensure that NMHSs of the four target countries will implement and provide “value-added services” in order to support their budget for O&M.

3.1.1 Cost Recovery of meteorological services

Direct government funding will never cover all the meteorological services required by the community at large. Cost recovery is appropriate where the services provided have the character of a “mixed good” or a “private good” (see the definitions in Freebairn and Zillman, 2002)¹ and where, for whatever reason, the NMHS is effectively the only organization providing the service.

Such cost-recovered services are not truly commercial, since there is no market mechanism for establishing prices and no explicit competition or contestability. The amount charged should, in general, reflect the marginal cost of provision, including applicable overheads.

3.1.1.1 Aviation Sector

Meteorological services have many users, including aeronautical users. This is cost-efficient for all users involved but creates specific relationships between the different user groups and the NMHS with respect to costs, amongst other aspects. Aeronautical meteorological services are fully dependent on facilities such as the Observation, Production and Information System, and NMHSs which provide services to international air navigation are bound by the general policy concerning air navigation service charges. These relationships must therefore be acknowledged when establishing general principles for cost allocation and recovery. The World Meteorological Organization (WMO) *Guide to Aeronautical Meteorological Services Cost Recovery – Principles and Guidance* (WMO-No. 904, https://library.wmo.int/doc_num.php?explnum_id=5298) explains in an informal and practical manner the way in which the NMHSs may recover costs for providing aeronautical meteorological services to aviation.

While all hydromet system modernization, as described in Component 2 of the proposed Hydromet project, will contribute to improve aeronautical meteorological services for air navigation, the installation and operation of weather radars are critical for strengthening such services. The installation and operation of weather radars will be part of *Activity 2.1.1 Modernise/upgrade climate-related observation and monitoring network*.

¹ Freebairn, J.W., and J.W. Zillman, 2002: Funding Meteorological Services, *Meteorol. Appl.*, 9, 45-54.

Mauritius and Seychelles

The Mauritius Meteorological Services and the Seychelles Meteorological Authority provide meteorological services for international air navigation, but are fully funded by government funds, according to the WMO Country Profile Database (<https://cpdb.wmo.int>). Through the project implementation, and in coordination with the WMO Regional Association I (Africa) Working Group on cost recovery of aeronautical meteorological services (https://library.wmo.int/doc_num.php?explnum_id=6251), the cost recovery principles applied to aeronautical meteorological data, products and services generated by these NMHSs (which will be strengthened with the support of the proposed Hydromet project) will be applied taking into account the best practices, to ensure that these NMHSs will implement the cost recovery to support their O&M.

Comoros and Madagascar

The Comoros National Meteorological Directorate and the Madagascar Meteorological General Directorate do not provide meteorological services for international air navigation. These services are provided by the *Agence pour la Sécurité de la Navigation Aérienne en Afrique et à Madagascar* (ASECNA, <https://asecnaonline.asecna.aero/index.php/en/>), which has fully implemented the aeronautical meteorological services cost recovery. Through arrangements to be made between the Comoros National Meteorological Directorate and the Madagascar Meteorological General Directorate with ASECNA, it is expected that these NMHSs be able to recover some funds (target to support O&M) against the provision of radar and other data from the new networks that will be implemented under the proposed Hydromet project. These negotiations have not as yet been initiated, but they are expected to be initiated at early stages of the project implementation.

3.1.1.2 Shipping

The proposed Hydromet project will support the NMHSs of the four target countries applying the cost recovery principles to the marine meteorological services for sea navigation, following similar principles (with the required adjustments) as those stated in the WMO *Guide to Aeronautical Meteorological Services Cost Recovery – Principles and Guidance* (WMO-No. 904, https://library.wmo.int/doc_num.php?explnum_id=5298), noting that there is still no specific WMO guidelines applied to this sector. In fact, the development of such guidelines is in process, and through the support of the proposed Hydromet project, the four target countries can showcase and contribute to the WMO Regional Association I (Africa) Working Group on cost recovery of marine meteorological services (https://library.wmo.int/doc_num.php?explnum_id=6251).

While all hydromet system modernization, as described in Component 2 of the proposed Hydromet project, will contribute to improve meteorological services for maritime navigation and fisheries, the installation and operation of wave buoys and meteo-oceanographic buoys are critical for strengthening such services. The installation and operation of wave buoys and meteo-oceanographic buoys will be part

of Activity 2.1.1 *Modernise/upgrade climate-related observation and monitoring network*. Through the project implementation, and in coordination with the WMO Regional Association I (Africa) Working Group on cost recovery of marine meteorological services (https://library.wmo.int/doc_num.php?explnum_id=6251), the cost recovery principles applied to marine meteorological data, products and services generated by these NMHSs (which will be strengthened with the support of the proposed Hydromet project) will be applied taking into account the best practices, to ensure that NMHSs of the four target countries will implement the cost recovery to support their O&M.

In addition, noting that the coastal communities (with large number of fishermen) are highly vulnerable to hydromet hazards, all activities related to the development and establishment of MH-IBF-EWS (primary Activities 2.3.1 to 2.3.5; and 3.1.2, 3.2.2 and 3.3.2) are critical. It is expected that one project site per country for testing and validating the MH-IBF-EWS be at a vulnerable coastal area.

3.1.2 Commercial Services

By commercial services, we mean those value-added services for which the NMHS is not the only possible provider and so the price for them will be set by the market through competition. Although the distinction between cost-recovered services and commercial services may not always be clear, especially in countries where there is not an active private sector, this does provide a useful framework for considering the issues.

Why do NMHSs consider becoming involved in commercial service provision? Five main reasons are:

- Money—for example, seeking additional revenue to compensate for reduced government funding, or to fund O&M, additional activities and staffing;
- Customer culture—wanting to establish a customer-focused culture which can enhance service provision for all areas;
- Innovative culture—desiring the spin-offs in other areas from applying innovation to commercial services;
- Professional ethos—wanting to ensure that customers receive commercial services provided to a high professional standard in accordance with WMO and other guidelines;
- Customer benefit—recognizing that there are unmet customer needs and that real benefit could be provided from additional commercial services, thus leveraging the government funding.

All these five reasons apply in the case of the four target countries. Therefore, though the proposed Hydromet project, there will be activities to support the development and delivery of user-target Climate Products – Climate Services (CP-CS), with the engagement of the user sectors, so that the user needs are considered and the trust is built in order to ensure that the developed CP-CS will become commercialized.

As for the beneficiaries of commercial services in the project, these are:

- (a) the Agriculture sector/Agriculture production. While all hydromet system modernization, as described in Component 2 of the proposed Hydromet project, will contribute to improve agrometeorological products and services, the proposed project design considers specific activities to improve agrometeorological monitoring, forecast products and services that will be generated with the agromet sector. These activities are: 2.1.1 *Modernise/upgrade climate-related observation and monitoring network*, which includes the establishment/upgrade of the agromet network; 2.3.6 *Carry out downscaling of global and regional seasonal forecasts to national level, and use them to produce agrometeorological products*; and 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*.
- (b) the Tourism. Again, all hydromet system modernization, as described in Component 2 of the proposed Hydromet project, will contribute to improve meteorological services for tourism, but the development and establishment of MH-IBF-EWS (activities 2.3.1 to 2.3.5; and 3.1.2, 3.2.2 and 3.3.2), and the development of a “meteoalarm”-type tool (under 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*) are critical.

The implementation of commercial services by the four target countries in the proposed Hydromet project would require revision of the Hydromet Laws in the four countries, which is the *Activity 1.2.3 Review and/or strengthen legal and regulatory materials, including the establishment of a CIEWS fund*. Please see further details under 3.4 below.

3.2 Public Private Engagement (PPE)

The sustainability is a matter for joint action by the public and private sectors, and can be best achieved by assuming complementary roles, which minimize overlap and unnecessary competition, and where the strengths of each sector are reinforced. The Geneva Declaration, adopted by the WMO Congress in 2019, supports the Public-Private-Engagement (PPE) (please see <https://public.wmo.int/en/our-mandate/how-we-do-it/public-private-engagement-ppe>).

One of the possible types of engagement with the private sector include exploring potential business relations with the private sector as part of a pilot project. In most instances, it would be difficult to make firm partnership agreements for private sector engagement with the public sector within the value chain of meteorological and hydrological services without some no-regrets evaluation of the potential benefits. That's why the proposed Hydromet project provides the appropriate environment to test for future implementation of such PPE. Examples include the inclusion in the bidding documents for e.g. observation networks, the specifications for a public-private-partnership (PPP) where the firm will be responsible (as usual) for the supply, installation, testing and commissioning; and for assisting the NMHS in commercializing

the data for specific sectors against getting access to the data and sharing the revenues with the NMHS. The private sector has experience with commercial services; which is not the case of the NMHSs; and will have an incentive to provide the data as a service. Therefore, the NMHSs of the four target countries would significantly benefit from such approach. This is an innovative approach that is being demonstrated through the implementation of World Bank Hydromet Modernization projects in Myanmar and in Nepal.

Other possible mechanism for the engagement with the private sector is through the licensing with an associated fee that the NMHS would receive in case a private company would like to provide meteorological and hydrological services in the four target countries supported by the proposed Hydromet project. This would require revision of the Hydromet Laws in the four countries, which is the *Activity 1.2.3 Review and/or strengthen legal and regulatory materials, including the establishment of a CIEWS fund*. Please see further details under 3.4 below.

3.3 Engagement with the UN and other international partners working in the four target countries

There are a number of UN and other international partners working in the four target countries, such as the World Food Programme (WFP), the Food and Agriculture Organisation (FAO), the German Red Cross, the Catholic Relief Service (CRS) from the USA, CARE International, and its Swiss Alliance 2015 Partner Helvetas. These are critical partners and some of them have regional and national funds covering the four target countries. Therefore, through the proposed Hydromet project, engagement will be sought in order to get their support to the O&M of the NMHSs of the four target countries.

3.4 Business Planning and Hydromet Law

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)².

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)³. Rogers et al (2019)⁴ explains that:

² See WMO, 2017. [*Guidelines on the Role, Operation and Management of National Meteorological and Hydrological Services*](#), 2017 Edition, WMO-No. 1195.

³ See WMO, 2015. [*Basic Documents*](#), 2015 Edition, WMO-No. 15.

⁴ 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.

- (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;
- (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,
- (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&M costs.

3.4.1 Business plan

Developing a business plan tends to help NMHSs securing funding from the government. In particular, if the business plan is based on the social and economic benefits of the new services provided by the NMHSs, it will help them attracting government financing for the additional O&M costs. Business plans will be developed for the four target countries under Component 1 of the proposed Hydromet project.

3.4.2 Revenue generation

A legislative and institutional framework is needed, which allows the NMSs to retain the revenues they receive from cost recovery and commercial services, or donor funds, or else all that happens is that they incur the costs but the money goes into overall government revenues.

In many countries around the world, the only mechanism for NMHSs to receive funds from cost-recovery of their services and for other commercial services (see section 3.1 above) is through the establishment of a Fund that is managed by a Central Committee chaired by the related Ministry and membership from the stakeholders. This needs to be stated in a Decree or Regulation.

Other option for the NMHSs to be able to receive funds is to establish the NMHSs as Agencies with financial autonomy. The WMO recommends that NMHSs become Agencies (please see the *WMO Guidelines on the Role, Operation and Management of National Meteorological and Hydrological Services*, available at https://library.wmo.int/doc_num.php?explnum_id=4221). This also requires revising of the legal aspects of the NMHSs in an Hydromet Law.

The NMHSs of the four target countries in the SWIO region are not Agencies with full financial autonomy; 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. Further discussions with the four target countries are required to understand the possibilities, either through the establishment of a CIEWS fund, or the transformation of the NMHS into an Agency. It might be the case that the two options are applied depending of the countries' legal framework.

3.4.3 License fee

As indicated in section 3.2 above, public and private sectors should have complementary roles, and these must be defined in an Hydromet Law in each of the four target countries, in order to minimize overlaps and unnecessary competition. For a private sector to provide meteorological and hydrological services, the company should be licensed in the country and perform a number of requirements that would be audit by the NMHS; if the country fulfils all required aspects, then it will be licensed against a fee that needs to be renew after a determined period. These aspects will need to be all defined in an Hydromet Law. The revision of the Hydromet Laws in the four countries will be done under the *Activity 1.2.3 Review and/or strengthen legal and regulatory materials, including the establishment of a CIEWS fund.*

3.5 The Systematic Observations Financing Facility / Global Basic Observing Network (SOFF/GBON)

WMO has publicly launched recently the Systematic Observations Financing Facility (SOFF) communication and information products. Please see <https://public.wmo.int/en/our-mandate/how-we-do-it/development-partnerships/Innovating-finance>.

Noting that the proposed Hydromet project will partly support the 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 SOFF/GBON for the completion of the implementation of the network, and eventually support partly the O&M of the networks being implemented under the proposed Hydromet project.

4. Conclusions

The mechanisms described in section 3. of this O&M plan, from added-value services (cost recovery and commercial services), public private engagement, and engagement with the UN and other international partners working on the ground, all supported by a business plan and revised Hydromet Law, are expected to be implemented under the proposed Hydromet project. They are expected to be helpful to the NMHSs of the four countries in the SWIO region to obtain the required funds to support O&M costs, for the sustainability of the investments.