



Nordic Development Fund

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C139 - Regional Africa - Systematic Observations Financing Facility (SOFF) Final Project Proposal

Board of Directors meeting 1/2022
on 17 March 2022 in Helsinki
Agenda no. 4.2.2

PROJECT INFORMATION SHEET

Project Name	Systematic Observations Financing Facility (SOFF)
Project Number	C139
Partner/Lead Agency	World Meteorological Organisation (WMO), webpage: https://public.wmo.int/en
Target countries/ regions	Least Developed Countries (LDC), Fragile States and Small Island Developing States (SIDS) in Sub-Saharan Africa
Project description	The Systematic Observations Financing Facility (SOFF) is a new initiative with the overall objective to strengthen climate adaptation and resilient development through data collection, processing and availability that will improve weather forecasts, early warning systems and climate information services. SOFF is a global initiative to address a persistent problem in a global and systematic manner – missing surface-based weather and climate observations from LDC/SIDS. The initiative has an exclusive focus on the initial part of the meteorological value chain that creates the foundation for effective policy and investment decisions at local levels. SOFF will provide finance and technical assistance to countries in order to improve their hydromet network, data collection, processing and sharing.
Project duration	2022 - 2025 First phase of a ten-year initiative
Sector	CRS Code: 15143 Meteorological services

PROJECT COST AND FINANCING PLAN		
Total Project Cost	Target EUR 177 million (USD 200 million) ¹	
NDF commitment	EUR 10 million	
Financing Plan		
Financiers	Amount	Instrument
NDF	EUR 10 million (USD 11.48 M)	Grant
Austria	EUR 3 million	Grant

¹ Exchange rate 1 EUR = 1.132 USD (15 February 2022)

Norway	EUR 2.5 million (tbc)	Grant
Denmark	EUR 3 million (tbc)	Grant
Portugal	EUR 5 million (tbc)	Grant
Spain	EUR 10 million (tbc)	Grant
Canada, Finland, Germany, Iceland, Luxembourg, Netherlands, Sweden, Switzerland, Turkey and others	Min. USD 50 million (tbc)	Grant
Total	USD 90.19 million	Grant
Mode of Finance	Joint co-financing through the UN Multi-Partner Trust Fund. The UNMPTF serves as the trustee of SOFF and will manage all the funds.	
Type of Legal Agreement & Contract	SOFF Standard Administrative Arrangement for contributions. This is a TF agreement (standard) with the UN MPTF in New York.	

STRATEGIC ALIGNMENT		
Geographic	x	Least Developed Countries (LDCs)
		Lower Middle-Income Countries (LMICs)
	x	Sub-Saharan Africa
	x	Countries in Fragile Situations
	x	Small Island Developing States (SIDS)
Climate Objectives	Mitigation	Rio Marker: 0
	Adaptation	Rio Marker: 2 Principal Objective
RMF Outcome Areas	<p>Outcome: Climate- and disaster-resilience and adaptability of cities and human settlements strengthened</p> <p>Output 1: Cities and human settlements equipped with solutions for increasing climate- and disaster-resilience and adaptability.</p> <p>Output 2: Climate- and disaster-resilient infrastructure assets and/or services established and/or improved.</p>	

Sustainable Development Goals	1. No Poverty, 9. Industry, Innovation and Infrastructure, and 13. Climate Action.	
Gender Equality Policy	Yes	
Environmental and Social Policy	NDF Minimum Standards: <i>(WB ESS)</i> ; Project type: <i>(Regular)</i> Compliance: <i>(Yes)</i> ; Risk Category: <i>(low to moderate)</i> ; Conditions: <i>(tbd)</i> ; Compliance Supervision: <i>(tbd)</i>	
NDF Added Value: Strategic Pathways & 3Cs	x	Nordic leadership brings competencies and knowledge and creates synergies in strategic partnerships.
	x	Early-stage interventions concentrate funding to where some of the greatest and more innovative high-impact projects can be found.
	x	Catalytic financing and partnerships increase the funding volumes, scales and impact.
	x	Co-create structures and projects with high potential, while drawing on previous experience from similar projects.
	x	Convene like-minded providers of funding to obtain momentum, economies of scale, and critical financing thresholds.
	x	Complement to enable sufficient scales of investment and to bring projects across critical financing thresholds.

Risk Category	
Risk	Rating
Technical / operational	Moderate
Political & governance	High
Financial	Low
Environmental & social	Moderate
Integrity Due Diligence	Low

Clearance / Quality Assurance		
E&S Safeguards [QAR]	3 February 2021	Juha Seppälä
RMF [QAR]	8 February 2021	Sofia Chaichee

Gender Policy [QAR]	3 February 2021	Juha Seppälä
Financial Administration [QAR]	1 February 2021	Mats Slotte
IDD Check [LAS]	10 February 2021	Isa Kujansuu and Mari Rasilainen

Processing Schedule	
Clearance in Principle	14 October 2021
Final Project Proposal for Board Consideration	17 March 2022
Signature and Effective	1 May 2022

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ABBREVIATIONS

AOSIS	Alliance of Small Island States
ClimDev	Climate for Development in Africa Initiative
CREWS	Climate Risk and Early Warning Systems Initiative
EUR	Euro
GBON	Global Basic Observing Network
GCA	Global Center on Adaptation
GEO	Group on Earth Observations
GNDR	Global Network of Civil Society Organisations for Disaster Reduction
HMEI	Association of Hydro-Meteorological Equipment Industry
LDC	Least Developed Countries
NDF	Nordic Development Fund
NHMS	National Hydrological and Meteorological Services
MDB	Multilateral Development Bank
NWP	Numerical Weather Prediction
OECD	Organization for Economic Co-operation and Development
REAP	Risk-Informed Early Action Partnership
RMF	Results Management Framework
SDG	Sustainable Development Goals
SIDS	Small Island Developing States
SME	Small and medium-sized enterprises
SOFF	Systematic Observations Financing Facility
ToC	Theory of Change
UNDP	United Nations Development Programme
UNDRR	United Nations Office for Disaster Risk Reduction
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNMPTF	UN Multi-Partner Trust Fund
USD	United States dollars
WFP	World Food Programme
WMO	World Meteorological Organization

1. RELEVANCE AND STRATEGIC CONTEXT

1.1 Geographic Focus

The Systematic Observations Financing Facility (SOFF) is a new initiative with the overall objective to strengthen climate adaptation and resilient development through data collection and processing to improve weather forecasts, early warning systems and climate information services. The SOFF Programme will focus on Least Developed Countries (LDC) and Small Island Developing States (SIDS). LDCs are low-income countries confronting severe structural impediments to sustainable development. They are highly vulnerable to economic and environmental shocks and have low levels of human assets. SIDS are a group of developing countries that are small island countries which tend to share similar sustainable development challenges. These include small but growing populations, limited resources, remoteness, susceptibility to natural disasters, vulnerability to external shocks, and fragile environments. In Sub-Saharan Africa, there are 28 LDCs and five SIDS (three of which are in both categories). The NDF support will focus on LDCs in Sub-Saharan Africa. Almost all the LDCs in Africa are also classified as countries in Fragile and Conflict-affected Situations.

The LDCs are the poorest countries in the world with an average GNI per capita of less than USD 1,018 (2021). These countries further score very low on human assets indicators related to health and education. Moreover, all LDCs score low on the ND-GAIN Country Index², which summarises a country's vulnerability to climate change and other global challenges in combination with its readiness to improve resilience. SIDS are often geographically remote and low lying, vulnerable to environmental challenges, and small in both size and population. SIDS are highly vulnerable to climate change especially due to rising seas and more extreme weather events.

Globally, 2021 was the sixth warmest year, according to NOAA³, with temperatures 0.84° Celsius above the 20th-century normal. However, in Africa, this trend is more pronounced, and 2021 was the third-warmest year on record. In 2021, the annual temperature was 1.33°C above average for the continent. The rapid changing climate causes more severe weather events such as cyclones (e.g., Mozambique Idah and Kenneth 2019, Eloise 2021), long-term droughts, erosion, desertification and sea-level rise. These trends are occurring despite Africa contributing the least to historical emissions (less than 5%); even today the continent has a very small carbon footprint.

1.2 Nexus between Climate and Development

Effective action on climate adaptation and resilience depends on high-quality hydromet services as well as the observational data that underpin those services, and the capacity to make informed decisions and take action in light of that information. However, many countries face increasing challenges to collect and provide hydromet data, especially LDCs and SIDS.

² Notre Dame Global Adaptation Initiative. ND-GAIN country index rankings 2022: <https://gain.nd.edu/our-work/country-index/rankings/>

³ The U.S. National Oceanic and Atmospheric Administration (NOAA): NOAA National Centers for Environmental Information (2022). State of the Climate: Global Climate Report for Annual 2021.

The SOFF will address the ongoing gap in weather observations from LDCs and SIDS as demonstrated by a global gap analysis undertaken by WMO in 2020⁴. One finding of the WMO gap study is that there are persisting gaps in the global weather observations system, especially in Africa. The main reason is the lack of local resources to cover the costs for their weather data generation and international exchange, especially in LDCs and SIDS. Many LDCs have a very low income combined with large geographic responsibilities which makes it particularly challenging to collect and sustain a weather observation network covering their entire territory. Gaps in the weather information system is a threat to 'Last-mile' projects (e.g., local weather forecasts for farmers and fishers) that rely heavily on the use of global model data.

The large gaps in the weather information services are also a threat to the private sector where companies provide a fast-growing array of hydromet services such as mobile weather forecasts; seasonal and daily forecasts for agriculture and fisheries; weather-index insurance schemes; new visualisation tools; and satellite information. Such private services often rely on data provided by national meteorological and hydrological services (NMHS) funded and managed by the public sector. While these services most often reach the end-user via a private provider, they are based on information from a global NHMS network that collects, digitalises, and analyses a wealth of hydromet data. In fact, these public services have collectively formed the backbone of the global hydromet system, creating fertile ground for the flourishing weather services industry. Strengthening global weather information systems is key for fostering an enabling environment for private sector development, especially in LDCs.

SOFF is a global initiative to address a persistent problem in a global and systematic manner – missing surface-based weather and climate observations from LDC/SIDS. The initiative has an exclusive focus on the initial part of the meteorological value chain (see annex G) that creates the foundation for effective policy and investment decisions at local levels. SOFF would provide finance and technical assistance to countries in order to improve their hydromet network, data collection, processing and sharing.

The Global Basic Observation Network (GBON)⁵ is an internationally agreed global design and corresponding metrics. GBON clearly defines countries' international data exchange obligations for the most essential surface-based weather and climate data. The SOFF investments will be guided by GBON metrics. SOFF provides the resources for beneficiary countries to close the GBON gap. In other words, GBON metrics ensure the appropriate level of investments, and SOFF delivers these investments through an integrated and coherent intervention.

The SOFF overall objective is to strengthen climate adaptation and resilient development through data collection and processing that will improve weather forecasts, early warning systems and climate information services. SOFF scores 2 for adaptation in the OECD Rio Marker framework⁶. SOFF will support adaptation-related climate research including meteorological and hydrological observation and forecasting, impact and vulnerability assessments, etc.

⁴ WMO (2020). The gaps in the Global Basic Observing Network (GBON).

⁵ World Meteorological Congress approved the GBON regulatory material in October 2021 and all 193 member countries are now obliged to implement the GBON on their own territory.

⁶ OECD DAC Rio Markers for Climate: Handbook, 2020

SOFF targets directly priorities found in the Climate Convention (1992) and the Paris Agreement (2015). The UNFCCC convention calls on Parties to promote and cooperate in research, systematic observation and the development of data archives, including through exchange of information; supporting and developing programmes, networks and organisations; and taking into account the needs and concerns, and building the capacity, of developing countries. The Paris Agreement identifies the need to enhance and strengthen systematic observation, climate services and knowledge sharing (Article 7) and indicates that systematic observation and early warning systems are areas of cooperation and facilitation to enhance understanding, action and support (Article 8). Over 75% of all Nationally Determined Contributions (NDC) highlight the need for enhanced climate information and early warning systems.

International efforts are driving a shift from reactive crisis response to proactive, forward-looking risk management approaches to extreme events and climate hazards. Thus, SOFF is well-aligned with and will complement major global ongoing interventions such as the Climate Risk and Early Warning Systems (CREWS), the Risk-informed Early Action Partnership (REAP), and the InsuResilience Global Partnership (IGP). CREWS works directly with LDCs and SIDS to increase the availability of, and access to, early warning systems. REAP works with integration of disaster management into national planning, establishing financing and delivery mechanisms to support early action, as well as investment and coverage in early warning systems with a focus on reaching the most vulnerable. IGP is a coalition of 100+ members that supports climate risk finance and insurance solutions to strengthen the resilience of developing countries and protect the lives and livelihoods of poor and vulnerable people against the impacts of disasters. SOFF will benefit these global initiatives through increasing the data availability that leads to higher forecast skill and the sustainability of forecast generation, SOFF will play a key contributing role to increasing the timeliness and quality decisions in advance of a crisis, for allowing financial resources to be released, saving lives and livelihoods in the most vulnerable countries.

All five Nordic countries have addressing climate change as a top priority in their development cooperation strategies. Several Nordic countries already support hydromet services through their bilateral and multilateral development cooperation. It is also relevant that all five Nordic NHMS have participated in the SOFF project preparation process. The SOFF project is well-aligned with the Nordic climate and development priorities since it will strengthen climate adaptation and resilient development by improving weather and climate observations that in turn support better weather forecasts, early warning systems and climate information services to save lives and livelihoods and protect property. Having the private sector involved is also a key Nordic priority and here SOFF will contribute to the provision of a basic global public good critical to catalysing private sector investments in value-added weather, climate and disaster risk products and tailored services to all sectors.

1.3 NDF Added Value and Rationale for Involvement

The SOFF project will address a fundamental building block for weather and climate predictions. It is also an upstream initiative to deliver global inputs that will allow countries to adapt effectively to climate change and promote resilient development. The past 10+ years of NDF climate finance has validated the assumption that the early-stage engagement is where NDF can add most value. Thus, it makes good sense for NDF to provide an early commitment

that both will catalyse other partners and allow NDF to play an active role in the development and launch of the project.

The SOFF programme is fully in line with the NDF 2025 strategy and well-aligned with the three strategic pathways. The Nordic Leadership dimension is expressed in the fact that NDF has been active in forming a Nordic coalition with Nordic meetings in May and September 2021 and a third meeting in March 2022. NDF also facilitated that the SOFF launch event took place at the Nordic Pavilion at COP26. NDF is an active partner in the Nordic network on climate services with participation in meetings in Oslo and Helsinki. The proposal is also in line with ongoing NDF support to hydromet services (Mozambique, WACA and ClimDev Special Fund) and the SOFF/GBON would both build on and represent a huge step forward to the existing project approaches. The Nordic Climate Facility (NCF) has financed the piloting of different types of mobile applications for weather services led by the private sector.

Regarding the early-stage design and structures, NDF has helped shape the proposed SOFF through participation in the preparatory meetings and direct bilateral meetings with the design team. NDF has raised issues related to the organisational set-up, budget and overhead costs, private sector participation, gender and safeguards, and the results framework. The goal is to establish SOFF in 2022 with an initial three-year phase in a 10-year initiative. The aim is to transform the entire global basic observations network to provide more precise data from all parts of the world. This more complete information will enhance climate adaptation and resilient development through improved weather forecasts, early warning systems and climate information services.

When assessing catalytic finance for launch and scale, it is clear that NDF and other Nordic countries (possibly all five Nordic countries) would help SOFF get off the ground. The target for the first phase is USD 200 million with a minimum of USD 50 million to start the initiative. The potential downstream investments that could be unlocked from a strongly improved basic observation network are substantial. The European Centre for Medium-Range Weather Forecasts has calculated that the value of one additional radio sonde data point from the Pacific is 50 times higher than one additional data point from Europe.

SOFF will work in SIDS and LDCs where many are also fragile and conflict affected states. The SOFF Secretariat will work with Implementing Entities⁷ (in particular those with a large experience in fragile and conflict affected states) to assess the situation, understand the challenges and explore opportunities to implement SOFF and larger hydromet projects in these countries. It is envisaged that a dedicated portion of resources could be approved by the Steering Committee to sustain efforts in these countries. NDF being a member of the Steering Committee would be able to participate in such efforts to target fragile and conflict-affected states. SOFF will also design and implement a gender action plan to ensure that gender considerations are systematically applied in all its activities.

1.4 Lessons Learned

NDF support to hydromet projects has revealed issues related to data exchange, standards, procurement, infrastructure and telecommunications. Lessons from the project in Mozambique show that it is insufficient to only focus on upgrading of weather stations and capacity

⁷ Implementing Entities will be MDB and UN members of the Alliance for Hydromet Development.

development since the existing infrastructure does not allow reliable data processing and exchange. Lessons from the support to the ClimDev Special Fund at AfDB show that substantial investments are still required for improving hydro-meteorological observing network and infrastructure.⁸ Lessons from this evaluation also show that there are challenges with procurement due to low capacity and lack of technical assistance in tender processes, low priority to gender issues, and insufficient attention to the longer-term sustainability. NDF has also experienced problems with insufficient data and data sharing bottlenecks in other projects such as the transport and climate interventions in Zambia and Rwanda. Furthermore, NDF has positive experiences with private companies delivering specialised climate services such as the transport project in Nicaragua and the cities and climate change project in Mozambique.

WMO and the Hydromet Alliance have analysed why many hydromet projects fail and what is needed to secure a well-functioning global basic observation network. The main findings include: Projects tend to be short-term with tight milestones and delivery schedules. Such projects are ill-suited to address systemic issues and cannot provide the necessary long-term support to ensure long-term operation and maintenance of the country's observing system. Another issue is that hydromet projects procure equipment from different vendors, they use different data formats and have no common point of delivery which tend to limit their effectiveness. Especially for LCDs and SIDS there are national capacity and budgetary constraints that translate into observations not exchanged since the network is unable to deliver the data.

The lack of long-term support for maintenance and repair has also contributed to the lack of past successes. This was identified as a key factor in the World Bank's evaluation of its hydromet projects: "Maintenance continues to be a problem. Only four of the 12 closed African projects reported attention to maintenance."⁹ The Board of the Green Climate Fund (GCF) acknowledged that the GCF alone cannot ensure the sustainability of recently approved investments in basic observations.¹⁰

The SOFF project has incorporated the above findings and lessons into its design. All interventions will be based on a hydromet diagnostic and gap assessment report, there will be peer-to-peer technical assistance and capacity-building, use of global standards and requirements, gender action plan, results-based payments, and a vision for long-term sustainability.

2. PROJECT DESCRIPTION

2.1 Project Objectives

The overarching SOFF goal is to contribute to strengthening climate adaptation and resilient development through better data availability to improve weather forecasts, early warning systems and climate information services that save lives and livelihoods and protect property. SOFF will contribute to delivering critical observations needed for adaptation and resilience planning. Weather and climate prediction products are essential to ensure that countries can

⁸ Richard Anyah (September 2021): Independent Evaluation of ClimDev-Africa Special Fund (2009-2021).

⁹ Independent Evaluation Group. World Bank Group, 2012. "Adapting to Climate Change: Assessing World Bank Group Experience--Phase III of the World Bank Group and Climate Change."

¹⁰ Green Climate Fund, 2018. "Enhancing Climate Information and Knowledge Services for resilience in island countries of the Pacific Ocean".

design and implement meaningful and effective adaptation and resilient development programmes. The first phase of SOFF has three components:

Component 1: Readiness. The objective is that a country's GBON gap is defined, and a plan to close the GBON gap developed and verified.

Component 2: Investments. The objective is that GBON compliance is achieved in line with the verified GBON plan through SOFF-funded infrastructure and capacity development investments to eligible countries (SIDS and LDCs).

Component 3: Compliance. The objective is that countries operate and maintain the basic surface-based observation network and the international sharing of data in full compliance with GBON regulations.

The main outcomes would be improved weather and climate prediction products and that the participating LDCs and SIDS achieve sustained compliance with the GBON. The SOFF project would contribute directly to the first outcome area in the NDF RMF by significantly increasing the number of people benefiting from established or improved weather and climate services. Improving weather and climate services is the basis for other of the outcomes and outputs in the NDF RMF such as early warning, climate adaptation planning, etc. As part of further preparations, we may be in a position to put more precise numbers to the indicators.

SOFF is a long-term initiative to establish the GBON in all parts of the world. The first phase will test the intervention logic, establish the working model, and have the first group of countries achieve compliance with GBON requirements.

2.2 Theory of Change

SOFF has a well-defined theory of change. Support is provided in three phases with outputs designed to achieve sustained GBON compliance as an outcome. This outcome, in turn, contributes to the goal of strengthened climate adaptation and resilient development through improved weather forecasts, early warning systems and climate information services crucial to save lives and livelihoods and protect property. The three phases of SOFF support include:

1. The Readiness Phase, during which SIDS and LDCs can access technical and advisory assistance provided by national meteorological services as peer advisors to define their GBON gap and to develop a GBON National Contribution Plan.
2. The Investment Phase, during which SIDS and LDCs receive grants for investments and advisory support to establish the network of GBON stations and strengthen human and institutional capacity for GBON compliance.
3. The Compliance Phase, during which SIDS and LDCs receive results-based finance in support of operation and maintenance expenses for GBON data sharing compliant stations.

SOFF will contribute to delivering critical observation needed for adaptation and resilience planning. Weather and climate prediction products are essential to ensure that countries can design and implement meaningful and effective adaptation and resilient development programmes (see figure 1 in annex A).

SOFF will also contribute to improving the global understanding of past and current climate and the ability to predict and project future climate scenarios. Observations provided through SOFF are essential for the implementation and monitoring of the Paris Agreement. They will contribute to monitoring and assessment (through the Global Stocktake and the annual State of Global Climate), including global temperature trends, and the overall impact of Nationally Determined Contributions (NDC) on the climate system and needed action to increase ambition.

The increased international exchange of observations that will be achieved through SOFF support in SIDS and LDCs will contribute to the substantial improvement of the forecasting and climate reanalysis products delivered by Global Producing Centres.¹¹ SOFF support, and in particular the Compliance component, will ensure that the observations generated by countries are effectively shared with the Global Producing Centres. The Centres will be able to provide free access to WMO Members (193 countries and territories, including SIDS and LDCs) to improved forecasting and climate prediction products. This support will strengthen countries' capacity to effectively use the improved weather and climate prediction products and to transform those products into information and actions that create socio-economic benefits.

SOFF establishes a highly ambitious long-term target of achieving sustained GBON compliance in all SIDS and LDCs. Based on a GBON gap assessment performed in January 2020 by the WMO Secretariat, it is estimated that to meet the GBON regulations in SIDS and LDCs, more than 2000 new or rehabilitated stations (surface and upper air stations) need to become operational and exchange data. This will allow SIDS and LDCs to achieve GBON compliance through more than 2300 stations exchanging observations. Once these stations are operating and sharing the data, observations shared to the Global Producing Centres are estimated to increase by 28 times for surface stations and 12 times for upper air stations compared to the January 2020 baseline. SIDS and LDCs require by far the largest increase in shared observation to achieve GBON compliance.

SOFF will achieve its outcome through eight outputs delivered across the Readiness, Investment and Compliance components. In annex B the Logical Framework is presented and annex C describes how SOFF resources will be deployed to deliver the planned outputs.

The GBON will have weather and climate analysis products to become freely available. These products are generated by the WMO Global Producing Centres and are exchanged internationally via the Global Data Processing and Forecasting System. According to the WMO Unified Data Policy (Extraordinary Session of the World Meteorological Congress, October 2021), these products are to be exchanged on a free and unrestricted basis with all WMO Members. The new data access policy will open new opportunities for the private sector as providers of information and services to parts of the public sector, other businesses and the wider society.

The SOFF project is aligned with the NDF RMF results indicators since it will significantly improve collection and access to weather and climate data. This will help reduce vulnerability to climate-related shocks / hazards (RMF indicator 5.2). SOFF will also increase the number of

¹¹ Regional Climate Centres (RCCs) are centres of excellence that strengthen the capacity of WMO Members in each region to deliver the best climate services to national users. RCC regional products include climate data sets, monitoring products and long-range forecasts.

people benefiting from established or improved weather and climate services, adaptation, and disaster risk management plans and/or early warning systems (RMF indicator 5.2). A well-functioning GBON delivering significantly better weather and climate data will improve disaster risk management, adaptation strategies, plans and/or weather and climate and/or early warning system/services (RMF indicator 3.4).

2.3 Project Activities

The Readiness Component allows LDCs and SIDS to access technical and advisory assistance provided by national meteorological services as peer advisors to define their GBON gap and to develop a GBON National Contribution Plan. There are four steps in the component.

Step 1. Readiness support proposal. Countries submit a request for SOFF Readiness support through their NMHS. Advanced NMHS are selected and contracted by the SOFF Secretariat, in coordination with the beneficiary country and in collaboration with the WMO Secretariat, to provide peer advisory services on a cost-recovery basis. The SOFF Secretariat administers these services. The resource allocation for these services during the Readiness phase is capped at USD 200,000 per country.

Step 2. GBON gap assessment. The GBON gap is verified in line with the GBON regulations by the WMO Technical Authority and serves as the analytical basis to develop the GBON National Contribution plan.

Step 3. GBON National Contribution plan development. Based on the verified GBON gap report, the country NMHS supported by the peer adviser, in collaboration with the Implementing Entity, prepares the GBON National Contribution plan ("GBON plan"). This plan specifies the required investments to close the GBON gap, including infrastructure (stations), telecommunications specifications, installation and operation standards, institutional and human capacity, and training. The GBON plan constitutes the technical basis for the SOFF funding proposal in the SOFF Investment phase (for SIDS and LDCs).

Step 4. WMO Technical Authority review of the GBON National Contribution plan. WMO reviews the consistency of the GBON plan with the GBON gap and regulations and issues a technical review note to the SOFF Secretariat to confirm the technical veracity. The SOFF Secretariat facilitates the dialogue between WMO, the country and the other partners.

The Investment Component supports eligible countries (SIDS and LDCs) through SOFF-funded infrastructure and capacity development investments to achieve GBON compliance in line with the verified GBON plan. The component has two steps: preparation and approval, and implementation. The Implementing Entity and the country manage these steps in close cooperation with the SOFF Secretariat.

Step 1. SOFF funding proposal preparation and approval. The investment phase begins with the approval of the funding proposal by the SOFF Steering Committee upon recommendation of the SOFF Secretariat. Once the SOFF Steering Committee has approved the funding proposal, the Implementing Entity completes the preparation, appraisal, and negotiation of the project with the country's government authorities and in consultation with the SOFF Secretariat.

Upon completion of step 1, the NHMS (in collaboration with other country agencies, as appropriate) proceeds to implement the SOFF-supported activities. These activities include issuing bidding documents to purchase and install equipment for surface observations and human and institutional capacity-building activities. To guarantee that the SOFF-funded systems meet the GBON regulations, WMO provides guidance documents describing expected measurement, communications and other capabilities of hardware or systems to be purchased and installed. This material can be used in the preparation of tender specifications. Also, as part of the SOFF start-up period, in consultation with HMEI, the association of the hydro-meteorological equipment industry, detailed guidance will be developed for possible public-private business models under which GBON compliance might be achieved.

During project implementation, the Implementing Entity and the NHMS can draw on technical assistance from the peer advisors. The costs of this support will be included in the country's funding proposal and be approved by the Steering Committee. Some of the support areas envisioned include (i) technical advice for bid assessment or evaluation; (ii) advice to ensure the correct commissioning and initial operation of equipment; and (iii) advice to support dispute resolution with suppliers on technical matters; (iv) staff training, capacity-building and institutional strengthening. At the end of the investment component, the surface observation equipment should be fully operational, collecting and exchanging data internationally following GBON regulations.

The Compliance Component supports countries to operate and maintain the basic surface-based observation network and the international sharing of data in full compliance with GBON regulations.

Step 1: A legal agreement with the country NMHS will be made. The agreement specifies the requirements and expectations for receiving annual results-based finance for GBON data collected and exchanged internationally.

Step 2. Verification of results. At the end of each calendar year, WMO prepares a GBON compliance and SOFF impact report, published by the SOFF Secretariat as part of the SOFF annual report, using WMO systems and methodology to verify GBON compliance.

Step 3. Annual results-based finance disbursed. Upon WMO annual verification of compliance, the SOFF Secretariat informs the Steering Committee and gives the green light to the Trustee to disburse results-based finance to the NMHS. The results-based payment for each compliant station corresponds to a global average of 75% of operating and maintenance costs that include expenditures on the institutional and human capacity required for the operation of the station and the international exchange of observations. Results-based payments occur annually and represent a contribution to operating and maintenance costs for the year for which compliance has been certified.

Step 4. Continuous GBON compliance monitoring and technical assistance. WMO will make publicly available quarterly compliance updates to facilitate periodic monitoring of GBON compliance of a country's stations. At any time of the year, the NHMS will be able to make a request to the SOFF Secretariat for technical assistance (through the peer advisors) to provide support in addressing possible problems or identified issues with the stations and data sharing.

2.4 Project Beneficiaries and other Stakeholders

The primary target group consists of NHMS in LDCs and SIDS. These national institutions will benefit from an upgrade basic observation network, technical assistance, training and capacity development, results-based payments to maintain their basic observation network and staff, data sharing and access to improved weather and climate prediction products. A secondary target group will be the populations in the LDCs and SIDS, who will benefit from better data and information that will improve weather forecasting, disaster risk management, adaptation planning, and early warning systems.

SOFF preparations began with the establishment of the Alliance for Hydromet Development in late 2019. The SOFF concept and design were developed through intensive consultations, bringing together many stakeholders, including over 30 international organisations. The SOFF consultations and design process have included (i) the establishment of five multi-stakeholder working groups; (ii) formal intergovernmental consultations and decisions taken through the WMO constituent bodies; (iii) in-depth assessments with selected countries; (iv) engagements with the Group of Least Developed Countries, the Alliance of Small Island States (AOSIS), the African Group of Negotiators, the African Ministerial Conference on Meteorology (AMCOMET); (v) consultations with the insurance sector and the Hydro-Meteorological Equipment Industry (HMEI); and (vi) regional consultations with the Global Network of Civil Society Organisations for Disaster Reduction (GNDR).

There is a clear role for the private sector in SOFF. The NMHS in every country has the primary responsibility for the generation, analysis and provision of observational data as well as for the operation and maintenance of the observation infrastructure, but the role of the private sector is rapidly growing. NMHS face significant challenges, particularly in developing countries, where the lack of resources, basic infrastructure, and technical capacity hinder the provision of high-quality hydromet services. Private businesses are not just consumers of data, they also play an important role as technology providers as well as providers of information and services to parts of the public sector, other businesses, and the wider society. SOFF will support countries in developing the most appropriate approach to partnering with the private sector to achieve the goal of GBON compliance. SOFF has identified four basic business models which could be deployed with variations, depending on the specific country context. See Annex G for an outline of the four business models.

2.5 Gender Analysis

Climate change adaptation and resilience-building require a gender responsive approach. WMO¹² has analysed the gendered impacts of weather and climate and the gender-specific needs of climate information and services in Asia, Africa, and Pacific Small Island Developing States. The report found significant gender differences in the use of and needs for weather and climate information and recommended to strengthen gender-responsive climate information delivery at local, national, and global levels. The WMO Gender Equality Policy (2019) and the WMO Gender Action Plan (2019) seeks to improve gender equality inside WMO and its work with NHMS in the 193 member countries. The goal is to ensure gender sensitive development and delivery of all services provided, including equal access and equal user capacity for women and men; and also gender equitable access to, interpretation of and use of information and

¹² WMO 2019: Gendered Impacts of Weather and Climate: Evidence from Asia, Pacific and Africa.

services by both women and men. Moreover, WMO will strive to have all projects and programmes to be gender-sensitive.

SOFF will rely on the implementing entities to apply their respective gender equality policies. The main implementing entities in Africa will be WB, AfDB, WFP, UNDP and UNEP. They all have gender policies in line with the NDF Gender Equality Policy and guidelines. In addition, in collaboration with the SOFF Advisory Board, SOFF will design and implement a gender action plan to ensure that gender considerations are systematically applied in all SOFF activities. The gender action plan will consider among others, the following aspects:

- SOFF governance structure is inclusive and diverse, and it will seek to ensure gender representations in the respective constituent bodies.
- Capacity development: SOFF will work with Implementing Entities, peer advisors and supported countries to promote and ensure gender equality and women's empowerment.
- Communication and partnerships: SOFF will promote the unique contributions of women in disaster risk management activities in collaboration with civil society organisations, including through the partnership with the Global Network of Civil Society Organisations for Disaster Reduction (GNDR).
- Strategic planning, monitoring and compliance: a gender dimension will be included in the evaluation of the SOFF first implementation period.

2.6 Project Cost and Financing

The target size for the SOFF is EUR 177 million (USD 200 million) in grant financing for the first implementation phase 2022-2025 (3 years). NDF will contribute EUR 10 million as a grant for the first implementation phase. An overview budget for SOFF first implementation phase is found in table 1 below.

Table 1: SOFF Budget overview

Source	Amount (EUR)	Amount (USD)	Type of Financing
NDF	10,000,000	11,321,200	Grant
Austria ^a	3,000,000	3,396,360	Grant
Norway (tbc) ^b	2,500,000	2,830,000	Grant
Denmark (tbc) ^b	3,000,000	3,396,360	Grant
Portugal (tbc) ^c	5,000,000	5,660,600	Grant
Spain (tbc)	10,000,000	11,321,200	Grant
Canada, Finland, Germany, Iceland, Luxembourg, Netherlands, Sweden, Switzerland, Turkey among others (tbc)	44,158,650	50,000,000	Grant
Total Initial contribution	77,658,650	87,918,720	Grant
Remaining to be mobilized	98,987,160	112,081,280	Grant

^a Initial pledge with indications of additional future contributions

^b Initial pledge with indications of additional potentially increased contributions in 2023 and 2024

^c Expected contribution at the high-end of the range

The budget above in table 1 is for the first phase 2022-25. The initial lifetime of the SOFF UNMPTF is ten years and there will be a continuous fund-raising effort in order to gradually increase the resources according to the activities and the demand for financing. The NDF grant will be earmarked for LDCs in Sub-Saharan Africa and finance the entire project. The cost estimates for the SOFF first phase is found in table 2.

Table 2: Cost estimates for the SOFF First Phase 2022-2025

No.	Expenditure category	USD Million
1.	Component 1: Readiness Phase (55 Countries)	11
2.	Component 2: Investment Phase (28 Countries)	112
3.	Component 3: Compliance Phase	18.5
4.	SOFF Secretariat	6.5
5.	Implementing Entity fees (7%)	7.8
6.	Trustee fees (1%)	2
7.	Contingencies*	42.2
8.	Total	200

*This USD 42.2 million will allow for possible contingencies, including a greater than expected level of activity, higher than estimated unit costs, and possible delays in the first SOFF replenishment process.

The first component will finance the gap assessment and develop the GBON National Contribution Plan. The resource allocation for these services during the Readiness phase is capped at USD 200,000 per country. Advanced NMHS (including the Nordic NHMS) are selected and contracted by the SOFF Secretariat, in coordination with the beneficiary country and in collaboration with the WMO Secretariat, to provide peer advisory services on a cost-recovery basis.

The GBON plan constitutes the technical basis for the SOFF funding proposal in Component 2, the SOFF Investment phase. The level of funding is particular to each country's GBON gap needs. In the budget a tentative amount of USD 4 million has been set aside per country. The actual investment costs may vary depending on country size and existing stations that can be counted as contribution to the GBON network.

Component 3 is the Compliance phase. Upon WMO certification there will be a results-based payment for each GBON compliant station. The payment corresponds to a global average of 75% of operating and maintenance costs that includes expenditures on the institutional and human capacity required for the operation of the station and the international exchange of observations. Results-based payments occur annually and represent a contribution to operating and maintenance costs for the year for which compliance has been certified.

The SOFF Secretariat, administratively hosted by WMO, is responsible for managing SOFF operations and coordinating and ensuring coherence of action by the many SOFF partners. The costs of the SOFF Secretariat correspond to 3.25% of the total budget. The Secretariat annual budget is USD 2 million for years 1 and 2. For year 3, the budget is USD 2.5 million. The Implementing Entities will have a 7% administration fee on their agreements. The Trustee, the UNMPTF, charges 1% of the TF capital for the financial administration.

More than 15 potential financiers have been identified, and as of now, 10 of those have committed or are planning to support the SOFF. Resource mobilisation has been ongoing for the past 12 months. Four successful Funders Forums took place in 2021, and a fifth is planned for April 2022. There is strong support to the SOFF concept from a long list of stakeholders such as the Group of Least Developed Countries, Alliance of Small Island States, African Group of Negotiators, African Ministers in charge of meteorology (AMCOMET), governments, civil society organizations, and private sector associations such as the insurance industry and the Hydro-Meteorological Equipment Industry.

2.7 Sustainability and Exit Strategy

While some countries will graduate from LDC status, a large number of SIDS and LDCs will remain. SOFF is making the case that without fundamentally changing the financing model for basic observations we will not see a substantial improvement of data generation and international exchange of this data. SOFF also stands for a new partnership between developed and developing countries as it acknowledges the global public good aspect of the data generated and exchanged by these countries through the provision of long-term financial contributions – on a grant basis – to these countries, with data exchange as the measure of success and trigger of finance. Improved observations and data will allow better-informed development, climate action and disaster risk reduction. Without better observations, the world will be severely handicapped in facing an uncertain future.

The present proposal is a first phase of a 10-year initiative. The results-based payment will allow LDCs and SIDS to operate and maintain their weather stations. The results-based payment for each compliant station corresponds to a global average of 75% of operating and maintenance costs that include expenditures on the institutional and human capacity required for the operation of the station and the international exchange of observations. Results-based payments will occur annually and represent a contribution to operating and maintenance costs for the year for which compliance has been certified.

If SOFF is to effectively address the sustainability challenge of observation investments in SIDS and LDCs, its own sustainability has to be assured. The literature is clear that in the long term sustained provision of global public goods requires a global financing mechanism that involves some form of global financial resource mobilisation, similar to the funding of national public goods by national taxation. However, for now, this option appears to be a distant prospect. The possibility of having the operations and maintenance expenditures of basic surface-based observation systems funded from fees charged to private business users of the weather information has been explored with no success. However, the new WMO Unified Data Policy aims to maximise the global benefits of Earth system observations by implementing a free and unrestricted data sharing policy. Under this framework, the private sector does not have an incentive to pay for the generation of basic observations.

This leaves open the regular “replenishment” option for sustainable SOFF resource mobilization in the foreseeable future. SOFF could organize its own replenishment cycle, based on the experience with the current initial resource mobilization effort. Alternatively, SOFF replenishments could be organised alongside one of the regular replenishments of a major development or climate fund. This might broaden the funder base and make for a more efficient replenishment process. It would also reinforce the notion that SOFF funding is a foundational investment that underpins the effectiveness and sustainability of the investments of other

development and climate funds. The Steering Committee, with the support of the Secretariat, will develop a suitable resource mobilisation strategy for SOFF beyond the First Implementation Period.

3. RISKS

3.1 Project Risks and Mitigation Measures

The SOFF preparatory team has undertaken preliminary assessment of the most important risks that could potentially affect project execution, outcomes and results. The preliminary assessment found that there is a high risk related to the country selection, since many are fragile and conflict-affected countries. To mitigate this risk, SOFF will work with Implementing Agencies such as WFP that have long experience with working in fragile countries. In addition, for each funded project and initiative, a specific risk management framework will be developed in cooperation with the Implementing Entities and with a focus on possible conflict or instability. Other risks relate to the nature of SOFF being a new initiative, capacity constraints, follow-up financing and technical support. For all these risks, credible mitigation measures have been identified and they have all been rated as Medium or Low risk. The preliminary risk assessment is outlined in Annex D.

The detailed SOFF risks management framework, including at global and project level with detailed mitigation measures, actions/controls, responsibilities, and timelines will be developed by the SOFF Secretariat and approved by the SOFF First Steering Committee. This framework will allow all SOFF funders to ensure that the final SOFF risks management framework complies with and satisfies the different funders' internal clearances and risks management requirements.

3.2 Environment and Social Risks and Mitigation Measures

The preliminary risk assessment revealed that some of the investments could have negative environmental or social impacts. These could include encroaching on limited natural resources; or observing stations built in protected areas, on fragile or indigenous land; or requirements for land acquisition and involuntary resettlement. Such situations would trigger the applicable social and environmental safeguards. The SOFF Implementing Entities are MDBs, WFP, UNDP and UNEP and they all have social and environmental safeguards that meet international benchmarks. SOFF will rely on the Implementing Entities to apply their social and environmental safeguards and gender policies. As a pass-through financing mechanism, SOFF does not develop and apply its own social and environmental safeguards, including grievance redress mechanisms but relies on those of the Implementing Agencies.

For the results-based finance payments, only the WMO verification of international exchange of observational data is required to trigger payments to the concerned NMHS. Representation of Civil Society Organisations on the Advisory Board also ensures that views and input from environmental, social, and women's organisations are reflected in SOFF investment decisions and evolution.

As mentioned above, SOFF will also design and implement a gender action plan to ensure that gender considerations are systematically applied in all SOFF activities.

The risk rating is medium for the environmental or social risks. One of the mitigation measures would be to deploy modern technologies that are much more compact and have less environmental impact. The reputational risk to NDF is rated as low since detailed risk management framework for each country will be developed in cooperation with the Implementing Entities.

3.3 Integrity Risks and Mitigation Measures

The SOFF preliminary risk assessment identified mismanagement and non-compliance as potential risks. The risk rating for both was low. The rating is based on the fact that UN MPTF has strict trust fund management procedures in place to mitigate such risk. Furthermore, the proposed governance structure has been designed to ensure appropriate policies are developed, implemented, monitored and evaluated, ensuring full oversight of the Facility, as well as full reporting, transparency and accountability functions. The risk that Implementing Entities will not comply with the fiduciary and procurement standards is also rated as being low. All the Implementing Entities have the necessary systems and procedures in place that have allowed them to pass the strict requirements to become accredited to, for example, the GCF. During the Investment phase, SOFF will rely on Implementing Entities to ensure their regular fiduciary and procurement standards are met.

4. IMPLEMENTATION

4.1 Project Management and Coordination

The day-to-day management of the project will be undertaken by the SOFF Secretariat. The role of the Secretariat is to manage SOFF operations, to coordinate and ensure coherence of action by the many SOFF partners. The SOFF Secretariat operates under the overall guidance of the Steering Committee and is accountable to it. The Secretariat delivers on a variety of tasks. Tasks related to SOFF programming and operations include the provision of the secretariat function to the SOFF Steering Committee and the SOFF Advisory Board; preparation of SOFF rules, procedures, operational manual and guidelines for Steering Committee decisions; preparation of the SOFF investment plan; review of funding requests and portfolio overview; and administration of the provision of peer advisory services.

The Secretariat also has tasks related to SOFF monitoring, reporting and learning include reporting to Steering Committee, Advisory Board and Trustee on SOFF progress; development of a monitoring and evaluation framework; and capturing of lessons learned, good practices and innovative solutions, including those related to private sector engagement on SOFF implementation. Regarding partnerships and resource mobilisation the tasks include management of SOFF relationships with all beneficiary countries, funders and stakeholders; SOFF outreach and communications; and support to SOFF fundraising.

The Interim SOFF Secretariat has been established in early 2022 and consists so far of a director and four staff. The SOFF Secretariat is hosted by WMO and responds to WMO administrative policies and procedures. UNDP and UNEP contribute to the Secretariat staffing through secondments. The SOFF Secretariat is technically supported by the WMO Secretariat and the new WMO GBON office, which provides technical backing including support to the national meteorological services that operate as SOFF peer advisers (technical guidance, endorsement of peer advisers, regular refinement of the Country Hydromet Diagnostics tool).

SOFF Implementing Entities

Major multilateral development partners that play an important role in hydromet project implementation serve as SOFF Implementing Entities for the investment phase – MDBs (the World Bank and the regional development banks) and UN organisations (UNDP, UNEP, WFP). All Implementing Entities are members of the Alliance for Hydromet Development¹³. SOFF activities would often be implemented as part of a larger hydromet initiative by one of the IEs.

SOFF peer advisors

Peer advisory support is a foundational element for SOFF implementation and having a strong pool of peer advisors and the provision of high-quality peer advisory services are key to the success. SOFF peer advisors are NMHS that have substantial expertise in the areas of advisory services for SOFF, a track record in partnering and supporting other NMHS, and a commitment to make available adequate human resources. The WMO Secretariat endorses the NMHS interested in serving as peer advisors and establishes the pool of peer advisors. This action is coordinated with the SOFF Secretariat and in dialogue with the interested meteorological offices and according to transparent criteria. A pool of about 25 to 30 peer advisors is envisaged, to ensure that the design of SOFF investments follow consistent, high-quality technical standards and practices as established by WMO and its Members.

4.2 Legal Arrangements and Governance

SOFF is a stand-alone pass-through so-called Joint Programme, which is a financing tool available to UN organisations for pooling funds to support a strategic vision, outlined in a Programme Document with a clear results framework and budget. SOFF has a well-defined and limited scope and is based on a partnership involving the Alliance for Hydromet Development and their sub-national governmental partners. The SOFF project has governance arrangements similar to those of other UN MDTFs.

The governance structure consists of the following bodies: a Steering Committee that guides the fund as its decision-making body; WMO as the Technical Authority that guides and acts as an independent verifier of the GBON technical specifications of SOFF operations; a multi-partner Advisory Board that advises the Steering Committee; the UN MPTF Office that acts as Trustee; a SOFF Secretariat that manages SOFF operations including the provision of peer advisory services; and Implementing Entities that implement SOFF investments (consisting of the Multilateral Development Banks and UN organisations that are members of the Alliance for Hydromet Development). SOFF seeks to ensure a balanced gender representation across all its governance bodies. The different bodies and their roles are described below (see annex D with a figure of the SOFF governance structure). The WMO is responsible for operational and programmatic coordination, including the coordination of narrative reporting. As the appointed Fund Administrator, the MPTF Office receives the contributions from the contributors and channels them to participating organisations based on Steering Committee decisions.

¹³ The Alliance for Hydromet Development members are Adaptation Fund, African Development Bank, Asian Development Bank, Climate Investment Funds, European Bank for Reconstruction and Development, Global Environment Facility, Green Climate Fund, Inter-American Development Bank, Islamic Development Bank, United Nations Development Programme, United Nations Environment Programme, World Bank, World Food Programme, and World Meteorological Organization.

The UN MPTF Office was established in 2003 and is administratively housed within UNDP. It is the UN mechanism for the administration of pooled financing instruments currently totalling more than USD 15 billion. The UN MPTF Office has a track record in 139 countries. It has experience in receiving and pooling financial resources from many bilateral and multilateral public and private sources. Of relevance for SOFF is the UN MPTF Office experience with the direct transfer of resources to countries through results-based financing.

The SOFF was established legally by an MoU between WMO, UNDP, UNEP, UN MPTF Office, signed at COP 26 on 3 November 2021. All financing partners to the SOFF will sign a contribution agreement (largely standardised) with the UN MPTF.

Steering Committee

The Steering Committee oversees the activities of the Facility and decides on its strategic direction. It approves and amends SOFF governance documents and operational guidelines, ensures that the operations of the Facility are consistent with its mandate and objective, and ensures complementarity between SOFF and “last mile” initiatives. It approves overall funding allocations and individual funding requests and receives regular audit reports. The Steering Committee meets as often as needed, at least two times a year virtually or physically. The decisions by the Steering Committee are made by consensus among decision-making members and taking into consideration the views of the non-decision-making members and recommendations of the Advisory Board. SOFF follows an adaptive learning process. Based on inputs from the SOFF Secretariat and the SOFF Advisory Board (see below) the Steering Committee will continuously monitor, assess and, as needed, adjust SOFF operational modalities. The Steering Committee is composed of decision-making and non-decision-making members. Decision-making members are all funding partners (including NDF) and WMO. Non-decision-making members with a voice include UNDP and UNEP as the co-chairs of the Advisory Board, one representative from the LDC Group and one from AOSIS to ensure that SOFF responds to beneficiary countries’ needs, a representative from the Trustee to provide financial information and advice (UN MPTF Office), and the head of the SOFF Secretariat.

SOFF Advisory Board

SOFF is advised by a multi-stakeholder Advisory Board. Its objectives are to ensure that SOFF creates synergies with major adaptation and resilience initiatives, linking SOFF with “last mile” policy and investment decisions; and to ensure that the SOFF strategic direction evolves as GBON evolves. The Advisory Board meets virtually ahead of each Steering Committee meeting to prepare recommendations for the Steering Committee. As SOFF co-founding partners, UNDP and UNEP co-chair the Advisory Board. The co-chairs are expected to leverage the knowledge, advocacy and political influence of their institutions. The Advisory Board brings together the most important SOFF stakeholders. It is composed of the co-chairs and up to 15 members. The Board is expected to include representatives from the Alliance for Hydromet Development, the United Nations Office for Disaster Risk Reduction (UNDRR), the Global Center on Adaptation (GCA), REAP, InsuResilience, the Global Facility for Disaster Risk Reduction (GFDRR), the Climate for Development in Africa Initiative (ClimDev), the Centre for Disaster Protection, the Group on Earth Observations (GEO), a representative from the Global Producing Centres, a representative from the Global Network of Civil Society Organisations for Disaster Reduction (GNDR), and a private sector representative from the Association of Hydro-Meteorological Equipment Industry – HMEI.

4.3 Financial Management and Procurement

The UN MPTF Office as the SOFF Trustee administers the funds and provides fiduciary oversight and other support services in accordance with legal frameworks established between the United Nations, the co-founders (WMO, UNDP, UNEP) and the SOFF funding partners. The UN MPTF Office uses a pass-through modality where each SOFF Implementing Entity applies its own procedures, provided they meet the UN MPTF requirements with regards to safeguards and fiduciary policies. The UN MPTF Office relies on the financial audit systems of the UN organizations and of each participating MDB. The costs for the UN MPTF Office Trustee function correspond to an administrative fee of one percent of the contribution by funding partners.

Contributions from funding partners will be made through a contribution agreement (largely standardised) similar to what all the five Nordic countries already have with the UN MPTF Office. Contributions from funding partners to the SOFF will be received by the Trustee, UNMPTF, and will be disbursed by UNMPTF for purposes agreed by the SOFF Steering Committee.

The Participating UN Organisations will provide the Trustee with the following financial statements and reports prepared in accordance with the accounting and reporting procedures set forth in the SOFF Project Document. The participating UN Organisations will endeavor to harmonize their reporting formats to the extent possible.

- a) Annual financial report as of 31 December with respect to the funds disbursed to it from the Fund Account, to be provided no later 30 April each year; and
- b) Certified final financial statements and final financial reports after the completion of the activities in the approved programmatic document, including the final year of the activities in the approved programmatic document, to be provided no later than 31 May of the calendar year.

The Participating UN Organisations will provide the Trustee with annual narrative progress reports, to be provided no later than 31 March of each year; and the final narrative reports, after the completion of the activities in the approved programmatic document.

The UN MPTF will also provide the donors, Steering Committee and Participating UN Organisations with the following reports on its activities as Trustee:

- a) Certified annual financial statement ("Source and Use of Funds" as defined by UNDG guidelines) to be provided no later than 31 May of each year; and
- b) Certified final financial statement ("Source and Use of Funds") to be provided no later than 31 May of the calendar year in which the financial closing of the Fund occurs.

For other Implementing Entities such as the MDBs, there will in addition to the above requirements, quarterly financial reports to be provided in accordance to agreed time frames.

Results-based payments to countries

Disbursement of annual results-based finance. Upon WMO annual verification of compliance, the SOFF Secretariat informs the Steering Committee and, on a nonobjection basis, gives green

light to the Trustee to disburse results-based finance to the NMHS. The results-based payment for each compliant station corresponds to a global average of 75% of operating and maintenance costs that include expenditures on the institutional and human capacity required for the operation of the station and the international exchange of observations. Results-based payments occur annually and represent a contribution to operating and maintenance costs for the year for which compliance has been certified. Given the retroactive nature of the payments, once authorised, these payments will be made only on the condition that the resources go to the NMHS. There are no additional fiduciary requirements. Payments are made to the NMHS through a jointly held account between the NMHS and the Ministry of Finance. The payment model is based on experiences from other UN MPTF programmes which deliver results-based finance directly to countries.

Contracting of peer advisory services

The SOFF Secretariat will administer the provision of meteorological services peer advisory services to beneficiary countries and Implementing Entities, in collaboration with the WMO Secretariat and Trustee. The SOFF Secretariat will issue regular calls for expression of interest and supports the beneficiary country in the selection of the peer reviewer/advisor, in collaboration with the WMO Secretariat and the Implementing Entity when applicable.

The UNMPTF Office transfers resources to the SOFF Secretariat for contracting peer advisory services. The SOFF Secretariat issues the contract for the selected NMHS to provide the peer advisory services and handles the payments and all contractual matters. The SOFF Secretariat will monitor the timely delivery of the advisory services by the peer review/advisor.

The Implementing Entities will carry out the activities in accordance with their own applicable regulations, rules, policies and procedures including those relating to procurement. The SOFF Secretariat, in collaboration with WMO, will engage with hydromet equipment suppliers to inform them about the SOFF's global programme, about equipment procurement opportunities and about the standard technical specifications. The WMO will also be able to assist Implementing Entities with the technical standards needed for the tender dossier. If needed, the SOFF Secretariat will also be able to provide technical assistance to tender evaluations.

4.4 Monitoring and Evaluation

4.4.1 General monitoring and evaluation provisions

Monitoring of the SOFF Fund will be undertaken in accordance with the structure described in the overall Project Document (TOR). The Steering Committee will meet twice a year, to review the status of the Fund. In addition, the SOFF Secretariat and the donors will discuss any substantive revisions to the SOFF Fund, and promptly inform each other about any significant circumstances and major risks, which interfere or threaten to, which interfere or threaten to interfere with the successful achievement of the outcomes outlined in the TOR, financed through contributions from the donors.

Evaluation of the SOFF Fund including, as necessary and appropriate, joint evaluation by the Participants, the donors, the Host Government (if applicable) and other partners will be undertaken in accordance with the Project Document (TOR). It is planned that the first phase

2022-25 will be concluded with an evaluation. The joint evaluation report will be shared with all partners and be posted on the SOFF website and the Trustee UN MPTF.

In addition, the SOFF Secretariat recognises that the donors may, separately or jointly with other partners, take the initiative to evaluate or review their cooperation with the Trustee and the Participating UN Organisations under the Memorandum of Understanding, with a view to determining whether results are being or have been achieved and whether contributions have been used for their intended purposes. The Trustee and the Participating UN Organisations will be informed about such initiatives, will be consulted on the scope and conduct of such evaluations or reviews and will be invited to join. The Participants will, upon request, assist in providing relevant information within the limits of their regulations, rules, policies and procedures. All costs will be borne by the respective donor, unless otherwise agreed.

4.4.2. Preliminary Monitoring and Evaluation provisions

SOFF is built on a long history of lessons learned about the implementation of observing systems in developing countries and is structured as a learning initiative. Guided by the Steering Committee, the SOFF Secretariat will work closely with WMO, Implementing Entities, NMHS peer advisors, recipient countries and the Advisory Board to track implementation (based on Results Framework – see table below) and lessons learned, test alternative implementation options where appropriate, and build on the emerging experience with its innovative delivery and financing model.

SOFF will also monitor and evaluate the implementation of the gender action plan and risk management plan. The SOFF Secretariat will facilitate the exchange of information and knowledge among all SOFF stakeholders and will capture and exchange information in the following areas:

- Lessons of implementation: good practices and errors to avoid during the three phases of support, including those related to operations and maintenance of surface observation systems and supporting infrastructure;
- Innovations especially related to delivery models, private sector engagement and the creation of links and leverage to “last mile” investments; and
- GBON compliance and the impact of increased observations in forecast performance in SOFF-supported countries and globally, including through the issuance of the GBON compliance and SOFF impact report.

Straddling the third year of the First Implementation Period, an independent external evaluation will be commissioned, in collaboration with the Advisory Board, and submitted to the Steering Committee.

On the SOFF webpage, WMO will make publicly available quarterly compliance updates to facilitate periodic monitoring of GBON compliance of a country’s stations. The NMHS also has access to the WMO data base throughout the year to check near real-time status of the country’s observations. This access allows the NHMS to take early corrective actions.

Envisaged monitoring and evaluation costs for the first three-year implementation period are included in the budget of the SOFF Secretariat (see annex C). A budget of USD 6.5 million has been allocated for the running of the SOFF Secretariat during the first phase 2022-25. There will be a full-time M&E specialist in the SOFF Secretariat. The SOFF Steering Committee will

decide if additional monitoring and evaluation processes are needed and amend the Secretariat budget accordingly.

The SOFF Annual Report will also include key performance indicators according to the RMF. The Annual Report will also include reporting on the risk management framework. As part of the implementation oversight from the SOFF Secretariat there will be a continuous monitoring of Implementing Entities and possible risks related to the implementation.

NDF will use data from the SOFF Annual Report to report to the NDF RMF. In case additional data are needed, NDF will request these from the SOFF Secretariat.

4.5 Communication Plan

The draft Communication Plan is enclosed in annex F.

RECOMMENDATION

The Board approved grant financing of up to EUR 10 million to the project C139 Regional Africa: Systematic Observations Financing Facility (SOFF)

Helsinki, 24 February 2022



Karin Isaksson
Managing Director



Aage Jørgensen
Program Manager

ANNEXES

- A. Project Theory of Change**
- B. Project Logframe**
- C. Project Activity Plan and Budget**
- D. SOFF Governance**
- E. Risk Assessment and Mitigation**
- F. Draft Communication Plan**
- G. The Meteorological Value Chain**
- H. Private sector support for SOFF implementation**

Annex A: Project Theory of Change (ToC)

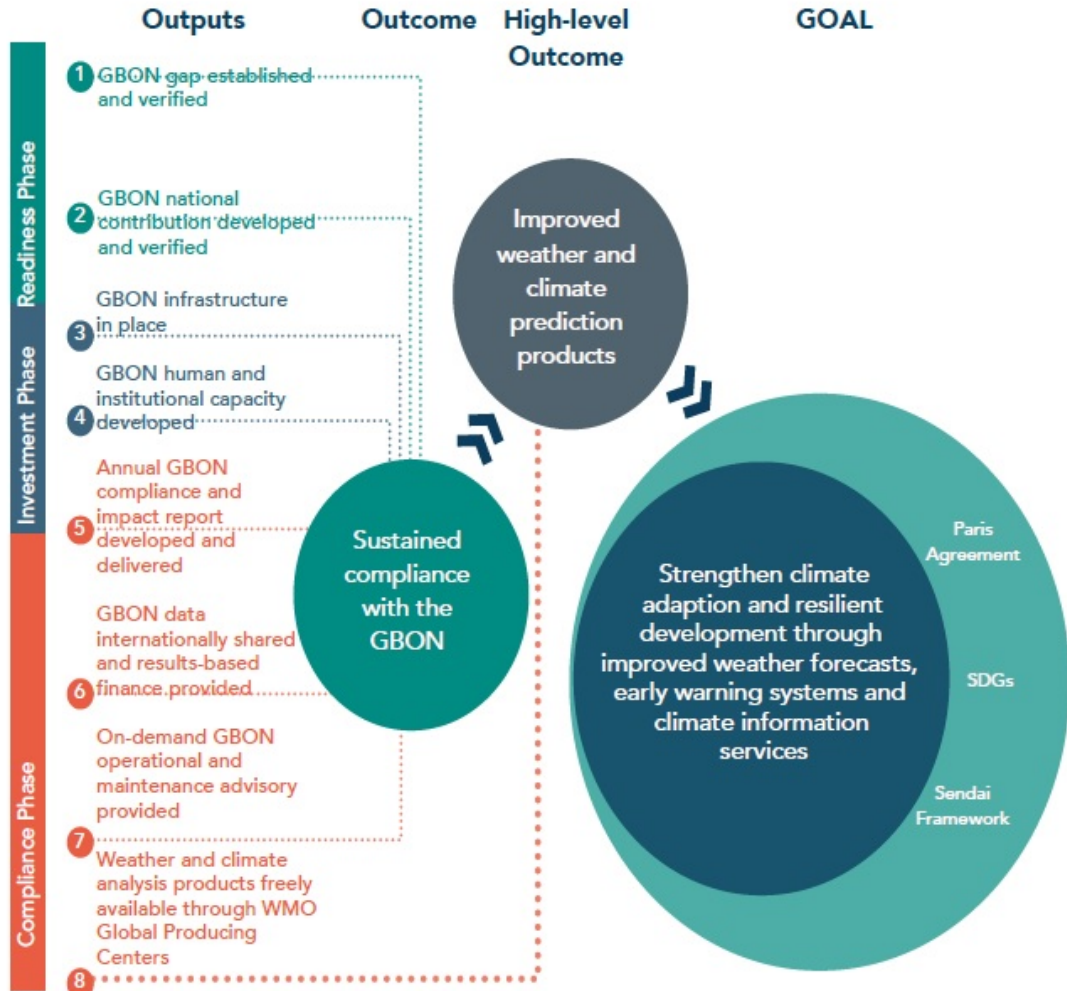


Figure 1: SOFF Theory of Change

The overarching SOFF goal is to contribute to strengthening climate adaptation and resilient development through better data availability to improve weather forecasts, early warning systems and climate information services that save lives and livelihoods and protect property. SOFF will contribute to delivering critical observations needed for adaptation and resilience planning. Weather and climate prediction products are essential to ensure that countries can design and implement meaningful and effective adaptation and resilient development programmes.

Annex B: Project Logical Framework

The draft logical framework for the first phase of SOFF from 2022-2025.

1. End of Project Outcome(s)	Indicators	Relevant RMF indicator	Data source	Data collection frequency
<i>Improved weather and climate prediction products</i>	<i>Numerical Weather Prediction (NWP) standard measures of skill</i>	<i>(5.2) % of projects with at least 80% of end beneficiaries with reduced vulnerability to climate related shocks / hazards.</i>	<i>External Evaluation Report</i>	<i>End of Phase 1</i>
2. Immediate Project Outcome(s)	Indicators	Relevant RMF indicator	Data source	Data collection frequency
<i>Sustained compliance with GBON</i>	<i>Number of countries compliant with GBON regulations</i>	<i>(4.1) # of people benefiting from established or improved weather and climate services, adaptation, and disaster risk management (DRM) plans and/or early warning systems (EWS). Size of area brought under climate change adaptation and disaster risk management (DRM) plans</i>	<i>SOFF Annual Report</i>	<i>Annually</i>
3. Project Outputs	Indicators	Relevant RMF indicator	Data source	Data collection frequency
<i>GBON gap established and verified</i>	<i># of GBON gap reports produced and verified</i>	<i>(3.4) # of disaster risk management, adaptation strategies, plans and/or weather and climate and/or early warning system/ services established or improved.</i>	<i>SOFF Annual Report</i>	<i>Annually</i>
<i>GBON national contribution plan developed and verified</i>	<i># of GBON national contribution plan developed</i>		<i>SOFF Annual Report</i>	<i>Annually</i>
<i>GBON infrastructure in place</i>	<i># of GBON-compliant stations installed and operating and sharing data internationally</i>		<i>(3.1) # of individuals with increased capacities, improved skills and /or raised awareness</i>	<i>SOFF Annual Report</i>

<p><i>GBON human and institutional capacity in place</i></p>	<p><i># of GBON national contribution plans implemented</i></p> <p><i>Capacity strengthened for women as well as men in climate-sensitive sectors through technical and communications education, training and professional development</i></p>		<p><i>SOFF Annual Report</i></p>	<p><i>Annually</i></p>
<p><i>Annual GBON compliance report and SOFF impact report produced</i></p>	<p><i>Annual reports produced</i></p>		<p><i>SOFF Annual Report</i></p>	<p><i>Annually</i></p>
<p><i>GBON data shared internationally and results-based finance provided</i></p>	<p><i>Total # of stations sharing internationally observations</i></p> <p><i># payments to NHMS</i></p>		<p><i>SOFF Annual Report</i></p>	<p><i>Annually</i></p>
<p><i>On-demand GBON operational and maintenance advisory provided</i></p>	<p><i># of satisfactory advisory services delivered</i></p>		<p><i>SOFF Annual Report</i></p>	<p><i>Annually</i></p>
<p><i>Weather and climate analysis products freely available through WMO Global Producing Centres</i></p>	<p><i># of Global Producing Centres that provide free and open access to data</i></p> <p><i># of products that have free and open access</i></p>		<p><i>SOFF Annual Report</i></p>	<p><i>Annually</i></p>

Annex C: Project Activity Plan and Budget (draft)

	Outputs	Year 1	Year 2	Year 3	Total
Readiness	1. GBON gap established and verified	15 countries ^a <i>USD 3 million</i>	20 countries <i>USD 4 million</i>	20 countries <i>USD 4 million (committed)</i>	55 countries USD 11 million
	2. GBON national contribution developed and verified				
Investment	3. GBON infrastructure in place	3 countries ^b <i>USD 12^c million (committed)</i>	10 countries <i>USD 40 million (committed)</i>	15 countries <i>USD 60 million (committed)</i>	28 countries USD 112 million (committed)
	4. GBON human and institutional capacity in place				
Compliance	5. Annual GBON compliance report ^d and SOFF impact report produced	1 report USD 0.3 million	1 report USD 0.3 million	1 report USD 0.3 million	3 reports USD 1 million
	6. GBON data shared internationally and results-based finance provided ^e	-	Retroactive payment for 100-200 stations ^f at the end of year 1 <i>USD 5 million^g</i>	Retroactive payment for 200-400 stations at the end of year 2 <i>USD 9 million</i>	200-400 stations USD 14 million
	7. On-demand GBON operational and maintenance advisory provided ^h	-	15 countries USD 1.5 million	20 countries USD 2 million	35 countries USD 3.5 million
	8. Weather and climate analysis products freely available through WMO Global Producing Centres	-	-	-	-
Overheads	SOFF Secretariat ⁱ	<i>USD 2 million</i>	<i>USD 2 million</i>	<i>USD 2.5 million</i>	USD 6.5 million
	Implementing Entity fees (7%)	USD 0.8 million	<i>USD 2.8 million</i>	<i>USD 4.2 million</i>	USD 7.8 million
	Trustee fees (1%) ^j	<i>USD 0.2 million</i>	<i>USD 0.5 million</i>	<i>USD 0.8 million</i>	USD 2 million^k
	Total overheads	<i>USD 3 million</i>	<i>USD 5.3 million</i>	<i>USD 7.5 million</i>	USD 16 million
	Contingency				USD 42 million
	Total resource requirements First Implementation Period^l	USD 18 million	USD 56 million	USD 83 million	USD 200 million

Annex D: Governance

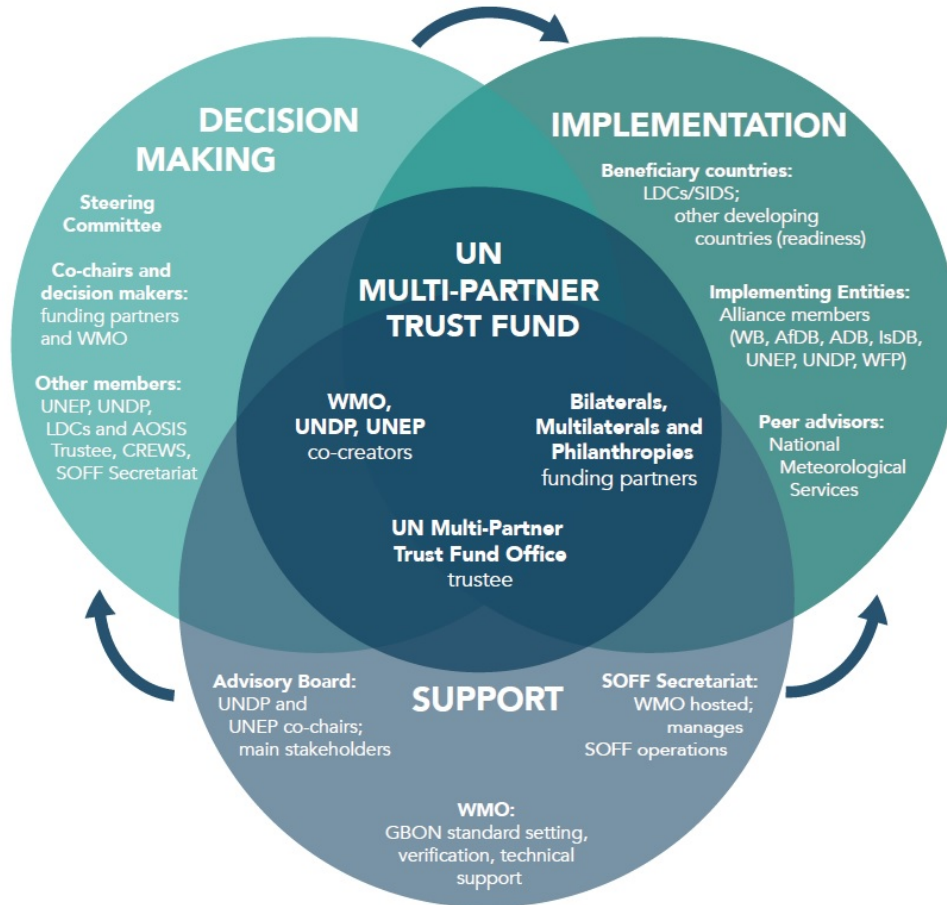


Figure 2: SOFF Governance structure

The governance structure consists of the following bodies: a Steering Committee that guides the fund as its decision-making body; WMO as the Technical Authority that guides and acts as an independent verifier of the GBON technical specifications of SOFF operations; a multi-partner Advisory Board that advises the Steering Committee; the UN MPTF Office that acts as Trustee; a SOFF Secretariat that manages SOFF operations including the provision of peer advisory services; and Implementing Entities that implement SOFF investments (consisting of the Multilateral Development Banks and UN Organisations that are members of the Alliance for Hydromet Development).

Annex E: Risk Assessment and Mitigation Measures

Risk	Rating	Mitigation Measure
Political, governance and macroeconomic risks		
1. Conflict and safety/political insecurity in countries where funded initiatives are to be implemented, negatively affecting selection of countries and implementation (e.g., delays). In some countries, the political, economic, or social situation may be such that conflict or general insecurity may arise. Associated risks and volatility could limit the willingness/ability of the Implementing Entities to prepare hydromet projects with a SOFF component and/or this could negatively affect project implementation and slow or hinder progress and the achievement of outcomes.	High	For each funded project and initiative, a specific risk management framework will be developed that includes a high-risk country/regional assessment and mitigation measures for direct and indirect political risks with a focus on possible conflict or instability, in cooperation with the Implementing Entities. SOFF Secretariat will work with Implementing Entities (in particular those with extensive experience in fragile and conflict-affected states, e.g., WFP) to assess the situation and explore opportunities to promote hydromet projects in this group of countries. A special quota of funding may be reserved for countries with instability or conflict.
2. SOFF Secretariat administrative capacity is limited, especially during the start-up phase. Potential need for multi-country SOFF engagement may not appeal to all Implementing Entities.	Low	SOFF metrics of success – data delivery at endpoints thousands of km away from the origin of the observations – may necessitate the implementation of activities along the data delivery chain, in some cases partly outside the country from which the data are missing. This may limit the effectiveness of potentially earmarked funds and will have to be explained to funders. SOFF Secretariat in collaboration with WMO will work proactively with recipient countries and Implementing Entities to ensure a supranational regional focus where needed.
Technical and operational risks		
1. Insufficient institutional capacity and/or political commitment in recipient countries to ensure successful implementation of SOFF investments. Lack of institutional capacity or political support in recipient countries may hamper implementation.	Moderate	During the Readiness phase, capacity limitations will be assessed and needed capacity-building measures identified for implementation during the Investment phase. The SOFF Secretariat, jointly with Implementing Entities, will communicate with country counterpart organisations to build effective engagement and political support.
2. Limited Implementing Entities' engagement and/or difficult partner coordination during	Moderate	SOFF Secretariat will focus on countries promising “early wins” during the initial three years of implementation; in addition, it will

<p>Readiness and Investment Components. SOFF depends on Implementing Entities' engagement in the hydromet sector in SIDS and LDCs, but not all of them may be requesting assistance, or Implementing Entities may not be able to respond to all requests during the initial five-year SOFF implementation period.</p>		<p>engage intensively with all Implementing Entities, the Alliance for Hydromet Development and with recipient countries in programming SOFF investments to ensure maximum coverage of SIDS and LDCs.</p>
<p>3. Limited or poor-quality peer support for readiness phase and capacity-building during investment phase and on-demand support during compliance phase.</p>	<p>Moderate</p>	<p>SOFF will rely on technical support from NMHS peers for its successful implementation. This may not be forthcoming or of poor quality. The SOFF Secretariat in collaboration with WMO Secretariat will actively reach out to peers and monitor and report on the implementation of peer support on an ongoing basis.</p>
<p>4. Insufficient investment in downstream components of the hydromet value chain. This will limit the motivation of the NMHS to actively engage in SOFF implementation activities.</p>	<p>Low</p>	<p>Reaping the full benefit from improved observations will depend on the effective development of the entire hydromet value chain. Insufficient attention to downstream components will reduce the benefits from improved observations to the recipient country. The Country Hydromet Diagnostics gap analysis offered on an on-demand basis during the Readiness Component will assess the entire value chain and identify gaps across it. SOFF components are expected to be embedded in broader hydromet projects of Implementing Entities, which address other key constraints in the hydromet value chain. Other downstream financing partners and initiatives are proposed to be included in the SOFF governance structure, allowing them to both shape and take advantage of SOFF. The Advisory Board will specifically focus on ensuring that the links between upstream and downstream activities are as effectively developed as possible.</p>
<p>5. Theft, vandalism and other security issues could limit the development of a basic observation network that would allow a county to comply with the GBON requirements.</p>	<p>Moderate</p>	<p>The SOFF Secretariat will in close collaboration with the NHMS and its peer assist - as needed - in selecting the optimal location for the equipment. Many NHMS are aware of these risks and place meteorological equipment in public institutions with security (e.g., schools) that prevent theft and vandalism. As part of the SOFF project there will also be collaboration with Civil Society Organisations in order to</p>

		encourage community ownership to observation stations.
Financial and Integrity		
1. SOFF is not able to mobilise sufficient resources or interest from funders and investors to reach optimal operational levels or function at full capacity and/or initial fund-raising targets not compatible with the willingness of funders to commit.	Low	The SOFF will become operational only if it has sufficient commitment from contributors to establish the first pipeline of country programmes. An active resource mobilisation effort is underway and will continue during the early phases of implementation, with the engagement of UNDP, UNEP and WMO. Targets concerning country coverage will be adjusted in line with available resources, based on consultations with funders.
2. SOFF is mismanaged, compromising its operations, and causing reputational damage.	Low	UN MPTF has strict trust fund management procedures in place to mitigate such risk. The proposed governance structure has been designed to ensure appropriate policies are developed, implemented, monitored and evaluated, ensuring full oversight of the Facility, as well as full reporting, transparency and accountability functions.
3. Non-compliance with fiduciary and procurement standards.	Low	During the Investment phase, SOFF will rely on Implementing Entities to ensure their regular fiduciary and procurement standards are met. The majority of the Implementing Entities are accredited to Adaption Fund, EU, or the Green Climate Fund.
Environmental & Social Risks		
1. Investments have detrimental environmental or social impacts.	Moderate	SOFF-funded investments may have detrimental social or environmental impacts, e.g., encroaching on limited natural resources; or observing stations built in protected areas, on fragile or indigenous land; or requirements for land acquisition and involuntary resettlement. Implementing Entities will ensure that the social and environmental policies are properly applied to the SOFF components of hydromet projects. In addition, SOFF will work with WMO and private sector partners (e.g., HMEI) to pioneer the use of modern technologies to mitigate negative environmental impacts, e.g., of the use of radiosondes. National transition to modern technologies (e.g., from manual to automated observing systems) will need to be planned and managed carefully, taking into account both technical capabilities and structural issues around current staff profiles and training needs.

Annex F: Draft Communication Plan

The Communication Plan will be revised and updated by the NDF communications team and the SOFF Secretariat during the project inception phase.

What? (the message)	When? (the timing)	How? (the mechanism)	Audience(s)	Responsible
1. General information about the programme: its objectives, beneficial countries, expected outputs	Immediately before, at, and after project launch.	<ul style="list-style-type: none"> Website posts Press release Project flyers Social media platforms PowerPoint presentations 	<ul style="list-style-type: none"> General Public globally Hydromet institutions in beneficiary countries Target beneficiaries in countries Nordic met-offices. 	SOFF Secretariat NDF communication team
2. Progress made by the Programme	Annually (end of year)	<ul style="list-style-type: none"> SOFF Annual Report SOFF Webpage 	<ul style="list-style-type: none"> Hydromet Alliance and NDF SOFF SC and Advisory Board Other Programme Partners General Public globally Hydromet institutions in beneficiary countries Target beneficiaries in countries 	SOFF Secretariat NDF communication team
3. The results and impacts of the first phase of the programme; lessons learnt from implementation of the first phase of the programme.	End of phase one	<ul style="list-style-type: none"> Project Completion Report External evaluation SOFF Webpage Project policy briefs Short video documentary for TV and YouTube Social media platform posts Press release 	<ul style="list-style-type: none"> Hydromet Alliance and NDF Other Programme partners SOFF SC and Advisory Board General Public globally Hydromet institutions in beneficiary countries Target beneficiaries in countries International Development community 	SOFF Secretariat NDF communication team

Annex G: The Meteorological Value Chain

All monitoring and prediction of weather and climate start from observations. These data provide the only source of knowledge about the atmosphere and the climate system. Weather and climate are inherently global, and to understand and predict them anywhere, observations even from the farthest reaches of the globe are needed. However, merely making the observations is not enough – in order to make effective use of them for monitoring and prediction, the data need to be made available to the global model systems used for monitoring and prediction.

In this section, the main elements of the meteorological value chain are presented, with the emphasis on its initial, global links. These elements include observations, data exchange, and global numerical prediction models. The role of observations is described, with a focus on the consequences of having an insufficient quantity and quality of them, both locally and globally.



Figure 3. The meteorological value chain: All links in the chain must operate effectively to yield success. Source: WMO Secretariat, 2021

Weather and climate services are generated by the meteorological value chain (figure 1). Good outcomes – users taking action in response to weather and climate prediction, resulting in lives and livelihoods saved, protection of property, and increased economic activity – happen when all links in the chain work and are working effectively together. This value chain can be schematically described as follows:

1. Weather and climate observations are routinely made over all areas of the globe.
2. Observations are exchanged internationally, in particular with global Numerical Weather Prediction (NWP) systems (box 1).
3. NWP output monitoring and prediction data for weather and climate are generated and shared with all WMO Members (193 countries and territories).
4. Global NWP output is used by National Hydrological and Meteorological Services (NMHSs) and other entities, including in the private sector, to generate weather and climate

- information: i.e., local forecast products, watches and warnings, seasonal outlooks, climate monitoring and prediction products, etc.
5. Weather and climate information services are delivered to users, including national and local authorities, businesses, media, academia, Civil Society Organizations (CSOs), and the general public.
 6. Effective decisions in response to weather and climate information are made by authorities, agents in all economic sectors, and individuals.

The global nature of weather and climate implies that unless the first three links of the value chain are functioning, the last three links will be missing needed input and will not be able to deliver the expected outcomes. The first three links in the value chain (shown in red) constitute the global meteorological infrastructure and rely on a global implementation approach (box 1). In contrast, the last three links (in blue) are typically implemented nationally. The importance of the global nature of the first three links cannot be overstated. For a prediction horizon beyond 24 to 36 hours, the use of global observational data and global models to underpin the predictions in any location is needed, even if the target area for a given prediction is very small and local (box 2). Conversely, without local efforts everywhere to make and exchange observations, the models cannot generate the data needed for effective forecasting at the national and local levels. All countries, therefore, share an interest in the first three links in the chain, while they handle the last three primarily individually. “Last-mile” projects predominantly invest in the last three links, due to the perception that this is where the value is created. However, without complementary investments in the first three links, investments in the last three will often not have the expected benefits.

The potential benefits directly enabled by the full implementation of GBON, primarily via its implementation in countries with the largest current data gaps, are estimated to exceed USD 5 billion per year. Based on the overall GBON cost estimates used in the paper, every dollar invested in GBON would help unleash additional economic benefits at a benefit-cost ratio of over 25:1, i.e., for every dollar invested, at least 25 US dollars in socio-economic return can be realised.

Weather and climate observations are essential to fully realise the USD 162 billion of estimated minimum annual socio-economic benefits of weather and climate prediction. Potential global disaster management benefits are estimated at USD 66 billion per year and about USD 96 billion are the estimated annual benefits of improved economic production through the application of weather forecasting in highly weather-sensitive sectors including agriculture, water, energy, transportation and construction. The analysis does not include the many lives saved due to enhanced weather and climate prediction. In addition, there is a wide range of other benefits generated by improved weather prediction, many of which were not considered in the global assessment of economic benefits presented above, such as increased business and capital investment, fiscal stability and reduced future debt exposure, and ecosystem-based co-benefits.

Annex H: Private sector support for SOFF implementation

Archetypal business models

1. Context

The NMHS in every country have the primary responsibility for the generation, analysis and provision of observational data as well as for the operation and maintenance of the observation infrastructure. However, NMHS face significant challenges, particularly in developing countries, where the lack of resources, basic infrastructure, and technical capacity hinder the provision of high-quality hydromet services.

The role of the private sector is rapidly growing, particularly in developed countries. Technological advances and open data policies have created space for a broader role of the private sector in the provision of hydromet services. Private businesses are not just consumers of data that are essential for various sectors reliant on weather and climate; they also play an important role as technology providers as well as providers of information and services to parts of the public sector, other businesses and the wider society.

Services generated within the meteorological value chain have significant economic implications. The socio-economic benefits of a well-functioning value chain can be underestimated by governments, especially in developing countries. Leveraging private sector capabilities, without jeopardising the provision of public services, is a key condition to maximise socio-economic benefits.

Recognising this opportunity, the Geneva Declaration was approved in 2019 by the 193 WMO Member States and territories and highlights the “need to strengthen the entire weather, climate and water services value chain – from acquisition and exchange of observations and information, through to data processing and forecasting, and service delivery – to meet growing societal needs”, taking into consideration the “evolving capabilities and growing engagement of the private sector in contributing to all links of the value chain and accelerating innovation”.

The policy framework in the backdrop is the WMO Data Policy. The new Unified WMO Data Policy (World Meteorological Congress, October 2021) benefits the private sector by providing access to a much broader suite of Earth system monitoring and prediction data, allowing businesses to generate value-added products and provide tailored services to specific users. The policy provides clarity about which types of data must be exchanged on a free and open basis (“core data”). GBON data are defined as core data. Achieving and sustaining GBON compliance is a national responsibility and SOFF supports GBON compliance for countries with limited resources and capacities.

This note explores the role of the private sector in the first part of the meteorological value chain – the generation and exchange of observations – and, more precisely, in the implementation of SOFF. Four archetypal business models have been developed in collaboration with HMEI. They constitute basic models that will be applied with variations in a manner tailored to country circumstances.

2. Archetypal business models

Four potential archetypal business models are being considered for the implementation of SOFF. The decision as to which model or variations of models a country uses depends on the country-specific context including considerations about:

- a. WMO Member roles and responsibilities that can vary from country to country

- b. local incentives for the private sector to engage with SOFF investments
- c. required pre-conditions for the model to work e.g., governance, regulatory framework, etc.

Depending on the country-specific context, variations of the archetypal business models could be pursued. Regardless of the model, WMO member countries and territories have to exchange internationally GBON on a free and open basis. SOFF does not advocate for a specific model but engage with countries to identify the most suitable model to achieve the objective: achieving sustained GBON compliance, i.e., international exchange of GBON data. Through its peer advisors and technically supported by WMO, SOFF supports countries in identifying the best option. The private partner may also be a not-for-profit entity or social enterprise. Each of these models is discussed below.

2.1 Public model

Fully State/NMHS owned and operated

In many countries, the State has full control of the hydromet services, including the generation of observations. In this model, single components of the observing system can be outsourced to commercial entities. However, in developing countries, this model often results in the lack of adequate funding and capacity to operate, leading to gaps in data.

2.2 Observation as a service model

State/NMHS owned – Private Partner operated (BOT: Build – Operate – Transfer) Under this model, the State contracts a private partner to design, construct and operate the basic observations infrastructure, which is fully publicly-funded. The partner is in charge of operation and maintenance. Data ownership remains with the State/NMHS. Data are in the public domain without usage fees. The commercial use of data by the contracted partner is possible. The data can be used to develop commercial activities using economies of scale. Under such arrangements, country-tailored agreements are necessary.

In this model, the State has a significant amount of control over the setup, operation and data delivery via the contract with the private sector and can take a long view concerning the sustainability of the system. It also provides incentives for private sector partners to provide quality products to have the opportunity to engage long-term contracts.

2.3 Concession model

State/NMHS and Private Partner owned– BOOT (Build – Own – Operate – Transfer) Under this model, at least partial investments by the contracted private partner enable the observation system to be built, unlike under model 2 which is funded upfront by the public sector. The contractor is responsible for operation and maintenance. Data ownership is with the contractor. The State pays the contractor to make data available in the public domain free of charge. Payment occurs after data delivery. Data have to be delivered in a form that fulfils GBON criteria. The contractor has an incentive to build commercial services on the data gathered. Country-tailored agreements are necessary.

For such a model to be successful, the partner from the private sector needs to have enough confidence in its own ability to capitalise on the available opportunities in order to make upfront investments and ensure timely delivery of quality approved data. This model can be particularly beneficial to overcome the temporary shortcomings of an NHMS.

2.4 Data as a service model

Fully privately-owned and operated by a private partner with a direct contract with the State/NMHS This model would typically be used where there are already existing observation systems operated by private entities which adapt or enlarge their systems to meet the GBON criteria. The contractor is responsible for operation and maintenance. Data ownership is with the contractor. A concession is required for the NMHS to use and share the data free of charge in the public domain. The contracted

partner can provide further commercial services. This model encourages a competitive market. Country-tailored agreements are necessary.

An increasing number of private sector participants run observation systems that could be upgraded or adapted to GBON/SOFF standards. This model makes use of existing infrastructure and capacity and spurs innovation.

3. Risk Management

	Public Model		Observation as a service model		Concession model		Data as a service model	
	Public	Partner	Public	Partner	Public	Partner	Public	Partner
Implementation	X			X		X		X
Operation	X			X		X		X
Force Majeure	X			X		X		X
GBON-compliance	X			X		X		X
(Pre)finance	X		X	X		X		X
Regulation	X		X		X		X	
Political risk	X		X			X		x

Depending on the model selected, countries would undertake country-specific tenders with support of the SOFF implementing entity and approval by the SOFF Steering Committee. The selection criteria could include amongst others: skills and experience (including in the local environment) and financial capabilities. Care would be given to avoid structures with a potential for future monopolistic market domination by single entities (either from the public or private sector side).

SOFF provides capacity development support for the NMHS in all four models. The type of support depends on the model chosen and the country's situation. Emphasis is put on ensuring that the NMHS maintains basic capacity related to generation and exchange of observations and, for models 2-4, that the State has the expertise and capacity to engage in, monitor and manage the contractual relationships. This includes strengthening regulatory capacity and the ability to supervise the contracts.