CREWS Project Presentation Note to the Steering Committee		
Project Title	Unlocking South Asia Regional Synergies for Resilience Building through Enhanced Access to Early Warning Services – CREWS South Asia Project	
Document Reference	CREWS/RProj/18/South Asia	
Geographic coverage	Bangladesh, Maldives, Myanmar and Nepal (Member countries of the South Asia Hydromet forum with LDC/SIDS status)	
Timeframe	2025-2029 (48 months)	
Total CREWS Contribution	US$ 5,250,000	
Lead Implementing Partner	World Bank (WB)	
	a. Execution	US$ 874,227
	b. Fees (10%)	US$ 87,423
	c. Total	US$ 961,650
Additional Implementing Partners	World Meteorological Organization (WMO)	
	a. Execution	US$ 3,635,000
	b. Fees (13%)	US$ 472,550
	c. Total	US$ 4,107,550
	United Nations Office for Disaster Risk Reduction (UNDRR)	
	a. Execution	US$ 160,000
	b. Fees (13%)	US$ 20,800
	c. Total	US$ 180,800
Disclaimer	The project will not provide funding to the Afghanistan Interim Taliban Administration (ITA) line ministries and departments.	
Main objective(s)	To strengthen regional collaboration for improved hydrometeorological and early warning services in South Asia	
Project Recipient/ Beneficiary (*people and organizations at risk who are the intended beneficiaries of the project at impact level)*	Regional: • South Asia Hydromet Forum (SAHF) National – SAHF member countries with LDC/SIDS status: • National Meteorological and Hydrological Services (NMHS): ▪ Bangladesh Meteorological Department (BMD) ▪ Maldives Meteorological Service (MMS) ▪ Department of Meteorology and Hydrology (DMH) of Myanmar ▪ Department of Hydrology and Meteorology (DHM) of Nepal	

	• User Agencies in SAR, including Ministries/Departments of Agriculture, Transport, Energy, Health, Water Resources, Urban, Climate Change, and Disaster Risk Management and Civil Protection Authorities. • People at risk will benefit through enhanced early warning systems (EWSs) based on better forecasts and warnings, and through enhanced decision support systems aided regionally and implemented through national/sub-national agencies. However, the focus of the CREWS South Asia (SA) project is on strengthening regional collaboration to enhance hydrometeorological (hydromet) and Early Warning Services (EWSs) which results in cascading benefit to the national, sub-national and local level.	
Additional Operational Partners (*intended direct beneficiaries of the project in the form of increased capacity, products and services the project will deliver)*	<u>National – SAHF member countries that don't have LDC/SIDS status</u>: • National Meteorological and Hydrological Services (NMHS): ▪ National Center for Hydrology and Meteorology (NCHM) of Bhutan ▪ India Meteorological Department (IMD) ▪ Pakistan Meteorological Department (PMD) ▪ Department of Meteorology (DoM) of Sri Lanka <u>Additional Operational Partners</u>: • International Federation of Red Cross/Red Crescent Societies (IFRC) • International Telecommunication Union (ITU) <u>Operational Partners contributing to and benefitting from the project</u>: • Regional Integrated Multi-Hazard Early Warning System for Africa and Asia (RIMES) • WMO Regional Specialized Meteorological Centres (RSMCs), including Regional Climate Centre Pune (RCC Pune), Third Pole Regional Climate Centre Network (TPRCC-Network) • WMO Regional Training Centres (RTCs) • Regional Climate Forums (South Asia Climate Outlook Forum (SASCOF), Third Pole Climate Forum (TPCF)) • WMO Regional Centers	
Initial state of play	a. Vulnerability, exposure to risks, disasters impacts (on people and economy)	South Asia (SA), home to 25% of the world's population, is acutely vulnerable to diverse hydrometeorological and climate hazards due to its varied geography, dense population, and socio-economic challenges. Between 2000 and 2024, the region witnessed 957 reported disasters that affected over 1.4 billion people, claimed over 230,000 lives, and caused economic damages estimated at US$ 210 billion. Major hazards affecting the region include floods, droughts, and cyclones, which have transboundary impacts and disproportionately affect the most vulnerable populations. The Hindu Kush-Karakorum-Himalaya (HKKH) region, feeding rivers that sustain 1.5 billion people, faces cascading risks such as floods, landslides, and glacial lake outburst floods (GLOFs), exacerbated by climate change. These impacts threaten to diminish living conditions for up to 800 million people and result in GDP per capita losses in SA that are projected to exceed the global average by up to 7%. Coastal and low-lying areas, particularly in Bangladesh, India, Maldives, and Pakistan, are severely exposed to cyclones, storm surges, and rising sea levels, causing recurrent damage to

		livelihoods and critical infrastructure. For instance, Bangladesh incurs annual disaster losses of US$ 3 billion, roughly 1–2% of its GDP, while Cyclone Sidr in 2007 alone caused losses of US$ 3.8 billion. Meanwhile, droughts remain the single most impactful hazard in terms of people affected, with over 730 million impacted in the last two decades. Heatwaves, another emerging concern in rapidly urbanizing areas, have caused significant loss of life, as seen for instance during the 2015 heatwaves in India and Pakistan.
	b. Status of the EWS, DRM institutions and NHMSs, actors / players present	Timely and actionable hydrometeorological and early warning services are essential in SA, given the hazards, exposure and vulnerability the people of the region are facing. In the following, an overview of existing capabilities at national level and ongoing efforts at regional level is provided: **National level** Several assessments have been undertaken over the past five years on the capacities and capabilities of national meteorological and hydrological service providers in the region. This includes a regional study by the World Bank (Kootval and Soares, 2021), three Early Warning for All (EW4All) assessments (covering Bangladesh, Maldives, and Nepal), and three Country Hydromet Diagnostic (CHD) reports (covering Bangladesh, Bhutan, and Maldives). SA countries are varied in their capacities and access to quality hydrometeorological, early warning and decision support services. However, as they modernize their systems and transition towards delivery of user-oriented and actionable hydrometeorological and early warning services, they face many technical, capacity, sustainability and other challenges which are common across the region. Regional collaboration offers synergies and economies of scale that are not only beneficial, but essential to meet the rising threat of climate impacts as well as increasing user needs, and contribute to overcoming technical, financial and sustainability challenges at national level. The legal framework regulating meteorological and hydrological services in SA countries is generally undeveloped, with specific hydrometeorological laws available only in Bangladesh and under development in Myanmar, Bhutan, and Nepal. Similarly, most of the NMHSs are unable to cover operational expenses through their own budget, with the notable exception of the Indian Meteorological Department (IMD). Common issues affecting observation networks (OBN) in the region include limited number of stations reporting in real- or near-real-time, limited calibrations of stations, financial and human resources to operate & maintain the stations and limited capacities to utilize the data for forecasting purposes (absence of data assimilation). Similar limitations exist for hydrological observation and monitoring networks, however, less information is available, and data sharing between countries is politically

		highly sensitive. To close the gap in meteorological observation contributing to the global basic observing network (GBON), four countries in the region are benefiting from the Systematic Observation Financing Facility (SOFF) support: Maldives and Bhutan are already in the SOFF investment phase, with Bangladesh and Nepal expected to enter the investment phase soon. Most of the NMHSs in the region access global and regional Numerical Weather Prediction (NWP) data and products, including Limited Area Models at different horizontal resolutions. However, developing, maintaining, and operating NWP capability is a major endeavor in terms of financial, scientific, technical, and human resources. As a result, user needs are not met. Many NMHSs in SA are facing serious limitations in personnel (including ICT staff) and budget, which constrains their ability to implement, operate and sustain such systems. The typical NWP related issues include limited use of global and regional NWP, limited understanding and, therefore, application of Ensemble Prediction System (EPS) products, run of low-resolution deterministic NWP, limited capacity for weather prediction in complex terrain (mountain areas), limited objective verification and no post-processing. Furthermore, the ability to anticipate the impact of the weather and act early to mitigate or prevent harm is still nascent in the region. It requires NMHSs to work closely with a range of government and non-governmental partners, as well as those at risk, to co-design, co-develop and co-implement early warning solutions. While several trainings on impact-based forecasting (IBF) have been carried out in the region, significantly increasing the awareness, however, operationalization is still in its early stages. Decision support systems (DSS) play a key role in this context as they help decision makers to analyze data, generate alternatives, and evaluate outputs and outcomes. Coupling DSS and impact-based early warning systems (IB-EWS), decision makers can gain a more comprehensive and accurate understanding of the current and future hazards and risks, as well as the vulnerabilities and capacities of the affected communities and systems. By integrating the analytical and evaluative capabilities of DSS with the forecasting and communication functions of IBF-EWS, decision makers can generate and compare different scenarios and options and select the most optimal and feasible solution. The linked outputs can enable coordinated, deconflicted actions from stakeholders and actors, such as emergency services, civil protection agencies, humanitarian organizations, media and the public. While not widely rolled out yet, the region features several DSS such as the Tamil Nadu System for Multi-Hazard Potential Impact Assessment, Alert, Emergency Response Planning and tracking (TNSMART) developed by RIMES; the Mobilise platform in

		the Kalutara District, Sri Lanka, established by the University of Salford; several sectoral DSS including planning, agriculture, transport etc. developed by RIMES under the Climate Adaptation and Resilience (CARE) for South Asia project; the Aquaculture DSS developed by the International Water Management Institute (IWMI) to facilitate informed decision-making for aquaculture expansion in the Upper Ayeyarwady River Basin of Myanmar; and the Krishi DSS (which is a multi-stakeholder collaboration) led by the Government of India. Actionable hydrometeorological information is required on all time scales, not just short-term but also medium-to long-term to inform infrastructure and adaptation planning with the purpose to mitigate the threat of climate change on society and to maximize productivity of climate sensitive sectors and ultimately create socioeconomic benefits. NMHSs are often not consulted in such planning processes, despite the critical importance of the information they can provide. From the summary above, it becomes clear that 1. many countries are struggling with very similar challenges that can be addressed jointly such as strengthening NWP, forecasting in complex terrain, moving towards impact-based forecasting and effective decision support to the society, while building on successful examples and available expertise in the region, learning from other regions and bringing in global knowledge; and 2. that collaboration can lead to synergies and increased the efficiency enabling countries to enhance hydrometeorological and early warning services with lower human and financial requirements which are a limiting factor across SA Countries. **Regional level** All nine SA countries are part of the WMO Regional Association II (RA-II, Asia). SA hosts one **WMO Regional Climate Center** (RCC) for long-range forecasts (IMD – Pune), and three **Regional Specialized Meteorological Centers** (RSMC). RCC-Pune is a center of excellence that creates regional products including long-range forecasts that support regional and national climate activities to deliver better climate services to national users. RCC-Pune, together with RIMES and the UK Met Office organize the **South Asia Climate Outlook Forum** (SASCOF). The RSMCs in South Asia include the Indian National Centre for Ocean Information Services (INCOIS) as a specialized centers in numerical ocean wave prediction and global numerical ocean predictions, PMD Karachi (Pakistan) as a specialized center in marine meteorological services and IMD New Delhi (India) which acts as the RSMC on marine meteorological service and the Tropical Cyclone Center. The RSMC at IMD hosts Secretariat of the WMO/ESCAP Panel on Tropical Cyclones (PTC), the regional body of the **Tropical Cyclone Programme** (TCP) for the Bay of Bengal and Arabian Sea, which

		covers six countries of the region (Bangladesh, India, Maldives, Myanmar, Pakistan, and Sri Lanka) and the **Severe Weather Forecasting Programme** (SWFP) for South Asia, which aims to strengthen the capacities of NMHSs to deliver improved forecasts and warnings of severe weather. The SWFP South Asia includes eight countries of the region except for Afghanistan. In addition, there are three **Flash Flood Guidance Systems** (FFGSs): the Pakistan and Afghanistan regional FFGS (covering Pakistan and Afghanistan), the South Asia FFGS (covering Bangladesh, Bhutan, India, Nepal and Sri Lanka) and the Myanmar FFGS (Myanmar). Further, India hosts several other Regional Training Centres, namely, IMD Regional Training Centre (New Delhi), Meteorological Training Institute (IMD-Pune), National Water Academy (NWA-Pune) and Indian Institute of Technology Roorkee (IITR), which supports Members in capacity development activities across different domains covering the hydrometeorological services. SAHF members are also supported by the two Regional Instrumentation Centres (RICs) in RA-II, Beijing (China) and Tsukuba (Japan) for provision of calibration service for reference instruments of the Member, by the two Regional WMO Integrated Global Observing System (WIGOS) Centres (RWCs) of Tokyo and Beijing, as well as the Global Information System Centers (GISCs) in Tokyo and Beijing. WMO also recently established the Third Pole (TP) RCC Network, currently in demonstration phase, with the goal to enhance climate services in the Himalaya-Hindu Kush and Tibetan Plateau region. This initiative involves Bhutan, Nepal, Pakistan (lead of the Western TP RCC-Network Node), Afghanistan, Bangladesh and India (lead of the Southern TP RCC-Network Node). **SAHF** provides a platform for regional exchange, collaboration, and fostering innovation on hydrometeorological, early warning and climate services, on behalf of nine countries (members of the WMO RA II) that decided to closely work together (see further details about SAHF in **Attachment 1**). Since its inception in 2018, SAHF has established (i) the Knowledge Hub which provides a one-stop platform for access to observational data across the region, forecast data visualization, high-resolution and high-frequency forecast products, such as forecasting models from leading global weather data centers. This supports increased forecast accuracy of weather and climate hazards and serves as a virtual library and repository for SAHF documents; (ii) weekly forecasters fora to discuss last week's weather and impacts, as well as the coming week's forecasts based on an array of models, the ocean forecast as well as the outlook for the next weeks; (iii) working groups on observation networks, numerical weather prediction, impact-based forecasting, capacity enhancement and hydrology to analyze national and regional capacities and needs, identify regional priorities and propose strategic activities; and (iv) four SAHF conferences and numerous training sessions. In the resolution of their last meeting (Nov 2023), the SAHF Executive

		Council (EC) consisting of the directors of NMHS of all member countries laid out an ambitious agenda, which is reflected in the activities included into this proposed CREWS SA project. This includes a broadening of SAHF beyond meteorology to hydrology, strengthening of mountain meteorology and marine services, strengthening of NWP, enhancing DataEx for regional data-exchange, expand the work on DSS in the region, etc. The nine SA countries are also members of **RIMES** which strives to address gaps in the end-to-end early warning information value chain through technical support, strategic partnership, and capacity building at all levels. RIMES assists its member countries in establishing and maintaining EWSs within a multi-hazard framework according to their unique needs. It also provides expertise to build regional platforms for data sharing, risk communication, and research efforts from a multi-hazard perspective encompassing climatic, seismic, oceanic and hydro-meteorological domains. The SAHF EC designated RIMES to serve as the **SAHF Secretariat and Project Unit**. Bangladesh, Bhutan, India, Myanmar, Nepal, Sri Lanka, and in addition Thailand are also part of the Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC). The **BIMSTEC Centre for Weather and Climate (BCWC)** was established in 2013 and launched in 2014 at the National Center for Medium-Range Weather Forecasting (NCMRWF) operating under the Ministry of Earth Sciences, Government of India. BCWC supports its member countries by preparing and disseminating weather and climate products for societal applications; developing customized models; and providing capacity building in the field of weather and climate. The nine South Asia region countries are also members of the **United Nations Economic and Social Commission for Asia and the Pacific** (ESCAP), which comprises 53 member states and nine associate members. ESCAP supports the WMO/ESCAP PTCs, the Regional Cooperative Mechanism for Drought Monitoring and Early Warning, Asia-Pacific Disaster Resilience Portal, and National Monsoon Forums in several SA countries. Except for Myanmar, all SAHF members are part of the **South Asian Association for Regional Cooperation (SAARC)**, a regional intergovernmental organization founded in 1985, with the goal to promote economic development and regional integration. SAARC established a Disaster Management Center in India, a South Asian University and a Disaster Management Center. **Rationale for regional collaboration** Shared river basins, cross-border impacts of floods and droughts, cyclones and regional monsoon patterns demand coordinated forecasting and action across SA. The transboundary nature of these hazards in combination with the common challenges to provide hydrometeorological and early warning services faced by SA countries and the significant opportunities for economies of

		scale, as indicated above, highlight the urgent need for deepened regional collaboration. With SAHF as a functioning regional collaboration mechanism in place, SA has a unique opportunity to create synergies and enhance hydrometeorological and early warning services efficiently and sustainably. CREWS SA has been designed to prototype operational solutions to significantly enhance forecasting and warnings, tighten bonds between SAHF members and strengthen pooling of expertise, and bring more partners together in support of SAHF. SAHF has been and will continue to coordinate and collaborate with BCWC, ESCAP and SAARC, and operate as a subset of WMO RA-II.
	c. Projects and programs dealing with EWS and hydromet under implementation or preparation	Ongoing national-level projects contributing to the EW value chain include: **Afghanistan** – "AF hydromet & early warning services for resilience" (WB and WMO, financed by CREWS): Key activities include updating of the hydrometeorological roadmap, establishment of a drought EWS and development of a digital agrometeorological services tool prototype. **Bangladesh** – "Weather and Climate Services Regional Project" (WB): Key activities include modernization of meteorological and hydrometeorological systems and forecasting; and establishment of agrometeorological (agromet) services. – Met Norway has been supporting Bangladesh for over 10 years including strengthening forecasting skills, forecast validation and studying the climate of Bangladesh. Met Norway is also serving as peer advisor for SOFF. – Under the framework of the Swedish-funded Early Warnings for All multi-stakeholder accelerator in Least Developed Countries and Small Island Developing States, WMO is supporting the development of Bangladesh's EW4All road map as well as the technical and operational work concerning Pillar 2. **Bhutan** – "Strengthening Risk Information for Resilience" (WB): Key activities include formulation of policy and strategic documents to strengthen hydrometeorological services, flood risk assessments, develop medium range weather forecast, and establishment of an agrometeorological DSS. – The Finnish Meteorological Institute (FMI) has been supporting Bhutan for many years and serves as peer advisor for SOFF. **India** – "National Hydrology Project" (WB): improve and expand the water resources monitoring system, strengthen water resources operation and planning systems, and enhance institutional capacity for water resources management. **Nepal** – "Advancing Reforms toward Climate and Disaster Resilience in Nepal" and "Green, Resilient, and Inclusive Development Advisory Program for Maldives, Nepal and Sri

		Lanka" (WB): hydrometeorological policy, Multi-Hazard EWS (MHEWS) communication and hydrometeorological master plan. – Nepal is also part of the CREWS funded "EW4All Accelerator for LDCs and SIDS Project", the primary objective of which is to strengthen MHEWS. – FMI serves as peer advisor for SOFF. **Maldives** – "Digital Maldives for Adaptation, Decentralization and Diversification" (WB): Piloting of the DSS "Mobilise" for early warnings on the Fuvahmulah island. – "Toward Risk-Aware and Climate-resilienT communities (TRACT)" –Strengthening climate services and impact-based multi-hazard early warning in Maldives project – currently being prepared by the United Nations Environment Programme (UNEP) for submission to the Green Climate Fund (GCF). WMO is a potential technical implementing partner. – USAID Climate Change Adaptation Project - https://www.usaid.gov/maldives/fact-sheets/climate-change-adaptation-maldives (RIMES involved). – FMI serves as peer advisor for SOFF. **Pakistan** – "Integrated Flood Resilience Adaptation Project" (WB): key activities include the strengthening of PMD. **Sri Lanka** – "Climate Resilience Multi-Phase Programmatic Approach" (WB): Strengthening of forecasting and early warning including for floods/landslides **Ongoing regional-level projects include:** – "Climate Adaptation and Resilience for South Asia" (CARE - WB) covering Bangladesh, Nepal, Pakistan - promoting evidence-based climate smart decision-making (implemented by RIMES). – "South Asia Technical Assistance for Regional Capacity and Engagement on Hydromet and Early Warning Services (STARCE)" (WB, under the UK Foreign, Commonwealth & Development Office (FCDO) funded Resilient Asia Program - RAP): Strengthen SAHF's institutional structure for a broader regional dialogue and provide strategic support; enhance regional weather, climate and hydrological data availability for decision support services from early warning to resilience planning; and complementary strengthening of capacities at regional and national level. – FFGS with Global Coverage (USAID funded): FFGS is a global initiative providing meteorological and hydrological forecasters with real-time guidance on flash flood threats. Developed collaboratively by WMO, USAID, NOAA/National Weather Service, and the Hydrologic Research Center (HRC), it uses ground and remote-sensed precipitation data, hydrological models, and forecaster expertise to support the development of localized flash flood warnings. FFGS enables adjustments based on local conditions, numerical weather predictions, and last-minute observations, offering critical tools for disaster management

		agencies to mitigate flash flood risks. FFGSs currently covers 8 of the 9 SAHF Member countries (except Maldives). – Strengthening Last Mile Communications in South Asia Region (SLMC – USAID funded)
	d. Describe the multiplier /leveraging potential of the CREWS investments	There is a significant leveraging potential in SA through ongoing and planned investment projects by the CREWS Implementing Partners and other development partners. As such, the proposed CREWS SA project will complement and inform ongoing/planned projects, enable regional sharing of national-level best practices and support strengthening of regional coordination mechanisms to foster knowledge exchange. Furthermore, the proposed project will develop several prototypes (e.g. NWP in complex terrain, urban flood warning systems, tailored messaging to vulnerable groups through DSS) to test viability of the approaches; if viability is confirmed, required investments for which the relevant specifications will be developed under this project and can be readily picked up by new projects. One of the key activities under the project is the establishment of a WMO-SAHF Partner Coordination Mechanism (PCM), which will facilitate streamlining of international cooperation efforts, ensuring a more coordinated approach to strengthening early warning services and enhancing climate resilience. The WMO-SAHF PCM will align efforts to enhance investment efficiency, foster knowledge sharing, and build capacity to tackle climate change impacts and transboundary hazards. Furthermore, this mechanism can also serve as a platform to mobilize additional financing for the region and its member countries.
	e. Describe measures to ensure coherence with existing initiatives	WB, WMO and UNDRR will work closely together, ensuring coherence with their existing initiatives. The ITU and IFRC are also involved in the implementation of CREWS SA to guarantee that interventions build on and are linked to ongoing/upcoming processes and projects, particularly related and contributing to EW4All. Furthermore, SAHF not only aims at serving as a collaboration platform between its member countries but also as coordination and collaboration mechanism between technical and development partners involved around hydrometeorological and early warning services in SAR, such as UK Met Office, SOFF, FMI, Met Norway, ESCAP, etc.
Project Rationale	a. Who, where and in what ways and to what hazards people and ecosystems are exposed and vulnerable	While fatalities, especially from large-scale events such as cyclones have reduced, particularly more localized phenomena such as landslides and flash floods or convective systems still cause significant losses and damages. Furthermore, there is a huge opportunity to increase the efficiency of SA economies with actionable information to optimize processes and production. Given the transboundary nature of climate and weather hazards, shared difficulties in operationalizing technologically complex

		systems and diverse levels of capacity and expertise across SA countries, regional collaboration offers synergies and economies of scale that are not only beneficial, but essential to meet the rising threat of climate impacts and maximize South Asia's capability to become a region of excellence. The goal of CREWS SA is to complement national level efforts with targeted regional interventions to address shared challenges, national-level sustainability problems, capacity limitations etc. This will be done primarily by further strengthening and connecting ongoing regional initiatives such as SASCOF, FFGS and SWFP South ASia, complemented by key additions to fill gaps such as a virtual platform on DSS. The institutional mechanism to be used is SAHF as sub-set of WMO RA-II, which will serve to connect NMHSs as well as regional, international, development and technical partners to fast-track progress based on regional and global experience, in contribution to strengthening and closing gaps along the EWS value chain. This will be a critical opportunity to support further strengthening and expansion of SAHF to cover all aspects of the early warning value chain and contribute to enhancing climate resilience. Bringing in global best practices and experience from all three implementing partners, WB, WMO and UNDRR will be critical for achieving this integration.
	b. Describe proposed partnerships and approach for stakeholder engagement in design and in implementation	The central institutional mechanism around which the CREWS SA project is built is the SAHF (as a sub-set of WMO RA-II), consisting of the NMHS of all member countries, led by the SAHF EC. As mentioned above, SAHF also aims at bringing regional, global, development and technical partners together, and CREWS SA will aim at strengthening SAHF with respect to this function. Particularly in the context of IBF and DSS, the stakeholder circle expands much further towards the user agencies as well as the population at risk. The mechanism through which this will be achieved is through the virtual platform on DSS, connecting the region on operational DSS and DSS in preparation.
Project design	a. Project components and activities, including describing what and how people centered, risk informed and gender sensitive approaches will be applied and how people most-at-risk, local actors and	The design of this project follows priorities stated in the RA II strategy document, as well as the SAHF EC resolution from November 2023, was elaborated in coordination with the SAHF secretariat (RIMES), and endorsed through a consultation with the SAHF EC as well as WMO Hydrological Advisors in January 2025 (see Attachment 7). Activities fall into three components: **Component 1: Strengthen regional collaboration to enhance hydrometeorological services** This component consists of three interlinked subcomponents aimed at (1.1) strengthening SAHF as regional collaboration mechanism, (1.2) facilitating pooling of expertise, and (1.3) improving hydrometeorological and early warning services through regional collaboration and strategic planning.

	organizations will be engaged	1.1 *Strengthening SAHF as regional collaboration mechanism:* This subcomponent focuses on enhancing the SAHF mechanisms and its advocacy role to foster stronger coordination and collaboration on hydrometeorological, early warning and climate services at regional level to tackle transboundary and shared challenges. This will be achieved through deepening high-level engagement, strategic dialogues and planning by supporting and leveraging the SAHF EC meetings, SAHF Thematic Working Group (WGs) meetings, the SAHF conference, and SAHF Technical Advisory Groups (TAG) services. 1.2 *Facilitating pooling of expertise*: This subcomponent aims at strengthening forecasting capacity by the continuation of the SAHF Forecasters Forum (FF), a weekly event where meteorologists discuss complex weather situations, including imminent extreme events. Additional advisory services will continue to be provided through the engagement of experts from regional specialized centers such as INCOIS or the NCMRWF/BCWC. The SAHF FF will be expanded to include hydrologists and utilize products from SWFP as well as FFGSs in the region. Weekly sessions will continue to be complemented by dedicated pre-, mid- and post-monsoon conversations as well as additional calls to discuss approaching extreme events such as cyclones as needed. Efforts will be made to integrate weekly forecasters forum outputs to feed into impact based DSS through engagement of user sector institutions at the national/ subnational levels on demand basis from SAHF countries. 1.3 *Improving hydrometeorological and early warning services through regional collaboration and strategic planning*: The needs and priorities for hydrometeorological and early warning services development in SA will be assessed through leveraging the SAHF WGs to identify common needs and priorities that can be supported at the regional level. These WGs will develop strategies and workplans covering SAHF priority topics such as Observation Networks and Hydrology (the hydrology WG will be expanded to include hydrologists and link to the strengthening of the three regional FFGSs: Pakistan and Afghanistan Regional Flash Flood Guidance System – PARFFGS, Myanmar FFGS and South Asia FFGS – SAsiaFFGS run by India). These strategies and work plans will leverage the expertise and potential contribution of SAHF development partners (incl. WB, WMO, RIMES, UK Met Office, Met Norway, FMI etc.) and the SAHF TAG. An additional working group or community of practice for climate services will be established with the support of the UK Met Office under the Weather and Climate Information Services (WISER) Asia Pacific Programme. Strengthening of SASCOF will be carried out in close collaboration with this climate services WG.

		Component 2: Improving the quality and efficiency of forecasting and early warning services This component consists of four distinct but inter-connected subcomponents aimed at enhancing the capacities of NMHSs across the region to deliver high-quality and effective services, following a value chain approach. The first subcomponent expands partnerships to co-develop observation networks and improve data exchange, laying a solid foundation for weather forecasting. The second subcomponent focuses on strengthening weather forecasting capabilities through the implementation of a regional capacity development programme. The third subcomponent focuses on prototyping new forecasting techniques and EWSs to inform strengthening of early warning services in the region. The fourth subcomponent enhances last-mile connectivity by improving regional protocols and procedures, ensuring that no one is left behind when disasters strike. *2.1 Expanding co-development of the observation network and data exchange*: This subcomponent aims to further expand partnerships for the co-development of the observation network and data exchange among regional NMHSs, drawing from the experiences of similar inter-regional programs such as EUMETNET[1]. Within this context, the subcomponent will include the assessment of Regional Basic Observation Network (RBON) needs and design of RBON in close coordination with the OBN and NWP WGs. This subcomponent will also closely coordinate with a World Bank led and FCDO financed activity to pilot a regional precipitation grid to enhance spatial coverage and accuracy of precipitation forecasts through a public-private partnership using commercial microwave links. Finally, the existing data exchange platform (DataEx) will be strengthened by adding a quality control module. *2.2 Improve forecasting capacities*: Based on a strategy and road map for the region to strengthen NWP in the short- to medium-term, developed by the SAHF WG on NWP and in consideration of WMO Guidelines on High-resolution NWP (WMO-No. 1311), a series of capacity-building activities will be carried out in collaboration with SWFP-South Asia, covering topics such as interpretation of NWP products, model output verification, validation, bias correction, and the generation and use of seasonal to sub-seasonal forecasts. These activities will be delivered through peer-to-peer exchanges with external NMHSs already active in the region such as FMI, Met Norway, UK Met Office, as well as development partners such as RIMES, BCWC and WMO RCCs. Furthermore, marine forecasting will be strengthened through trainings, peer-to-peer exchange and the pooling of

[1] EUMETNET is the collaborative framework of European national meteorological services.

		expertise to enhance the use and interpretation of marine forecasting products, in close collaboration with INCOIS. *2.3 Enhancing early warning services in the region through prototyping of new forecasting techniques and EWS pilots*: This subcomponent will prototype enhanced weather forecasting in complex terrain using AI downscaling techniques, the ICON NWP model and Integrated Forecasting System of the European Centre for Medium-Range Weather Forecasts (ECMWF) in collaboration with MeteoSuisse and University of Oxford to prototype more localized forecasts and early warnings. Furthermore, urban flood EWS will be piloted and lessons learnt are expected to inform similar efforts across the region. *2.4 Mainstream last-mile connectivity to reach end users*: This subcomponent will support last-mile connectivity through specifically targeting the issuance of warnings and alerts by relevant agencies. This will involve strengthening Common Alerting Protocols (CAPs) and the definition of Standard Operating Procedures (SOPs). Following the guidelines included in WMO Gui*delines on Multi-Hazard Impact-based Forecast and Warning Services* (WMO-No. 1150), and in parallel with the activities under Component 3, this subcomponent will also facilitate the establishment of feedback protocols and quality assurance with the user groups. **Component 3: Ensuring that early warning programmes are driven by people-centered and gender responsive principles; and promoting private sector engagement** This component focuses on increasing the effectiveness of EWSs by ensuring that they are people-centered, end-to-end, and accessible to all. The first subcomponent aims to narrow the divide between the weather and climate science underpinning EWSs and the end-users through the establishment of a virtual platform to co-produce user-tailored knowledge and services. The second subcomponent aims to strengthen the capabilities of NMHSs in engaging with the private sector by leveraging their respective comparative advantages, forging sustainable partnerships to deliver broader socio-economic benefits. *3.1 Ensure EWS are people-centered*: While many aspects of the early warning chain still require attention, one of the key bottlenecks is the connection and exchange between hydrometeorological service producers and users, including all other relevant stakeholders in the conversation. Only such an established communication mechanism will enable the co-production and communication of truly relevant, actionable and timely information to end-users. Weather intelligence can enhance the accuracy and reliability of the data and models used in a DSS, enrich the context and scope of the decision problems and alternatives, and increase the responsiveness and adaptability

		of the system to changing weather conditions and scenarios. DSS are used in a wide variety of sectors, which are also weather-sensitive, including agriculture, energy, health, transportation and disaster management. They are used in businesses and increasingly by individuals through mobile applications. This component will be linked to the ongoing USAID supported SMLC program. This subcomponent will focus on the establishment of a virtual platform for hydrometeorological informed DSS aiming at bringing together national, regional and global stakeholders involved in IBF, EWSs and DSSs in the region such as local and national government representatives, RIMES, ICIMOD, CREWS and EW4All implementing partners, etc. to exchange experience and lessons learnt from existing DSS. Through collaboration with IFRC, the perspectives and needs of the population and vulnerable groups will be integrated into the process to ensure a people-centered approach. The virtual platform will explore the development of a blueprint for the establishment of integrated DSS and EWSs, DSS software, database and related standards, mechanisms for feedback from users, etc. to bridge the gap between early warning service providers and end-users. UNDRR, UNDP and WMO are collaborating to develop a new hazardous event and disaster losses and damages tracking system. The new system will replace the existing DesInventar with a more comprehensive and interoperable tracking system that will cover both hazardous events, as well as disaggregated losses and damages at localized scales. The new system will be synergized with the WMO-approved Cataloguing Hazardous Event (CHE) methodology. This will help link weather observations and hazardous events with related impacts/ losses and damages information and their cascading impacts. Linkages and enhanced collaboration between the National Disaster Management Offices (NDMOs) and NHMSs will extend the losses and damages data value chain to support improved and new analytical options. *3.2 Engagement of the private sector to foster innovation and sustainability in the delivery of hydrometeorological and early warning services*: Weather information is relevant to almost all sectors and areas of the economy and society. With climate change, reliable, actionable and timely information targeted to groups of persons and businesses will only grow in relevance to protect the development gains and further progress towards declared country goals. While NMHSs play a key role in providing early warnings, as well as public services dependent on each country's priorities, tailored services for private actors are equally important. This subcomponent will focus on integrating the private sector into the virtual platform on DSS and facilitating the

		engagement of NMHSs with the private sector, both, private hydrometeorological service providers and private service users. This subcomponent will also include an innovation call focusing on a specific hydrometeorological challenge identified by SAHF and invite applications from institutions, private sector entities, and government agencies. The goal is to encourage the development of innovative, cost-effective technical solutions, which will be piloted to address the identified challenge.
	b. Work plan	Please refer to attachments 3 and 4.

Organization and operating procedures	**a. Institutional framework (Describe the planned project management set up and how all the organizations involved in implementing the project will work together. Give a brief description of each partner/actors key roles by component)**	The project will be implemented by WB (lead implementing agency), WMO and UNDRR, with the involvement of the WMO network (also for WB led activities), especially RIMES which serves as SAHF secretariat. WMO network involvement for WB led activities will be implemented through and in close collaboration with WMO and related funding will appear under WMO's share and with joint technical supervision. A Project Steering Committee (PSC) will consist of WB, WMO, UNDRR, SAHF Secretariat (RIMES), and the SAHF EC co-chairs. The PSC will ensure quality of governance, and the effective delivery of project activities on time and within the expected quality results. The PSC will play an oversight role including: • Review of implementation progress; • Management of project risks; • Guidance and recommendations including for developing synergies and leveraging opportunities with other initiatives in the countries and region. A Project Coordination Unit (PCU) will be established within the first month of project implementation. The PCU will be composed by one member from WB, WMO, UNDRR and the SAHF Secretariat (RIMES). The PCU will have a coordination role on a day-to-day basis, ensuring close alignment between the activities carried out by the implementing entities and coordination with beneficiaries' institutions. The PCU will meet virtually at least once every quarter. Additional PCU responsibilities will include: • Update the project M&E framework; • Draft and finalize CREWS South Asia progress reports; • Facilitate knowledge management and develop a communication strategy.
	b. Monitoring and evaluation system	The framework of expected results (Attachment 4) will be used to monitor progress and achievements against the indicators for each of the outputs. An independent consultant will be hired by WB to evaluate the entire project at mid-term and at the end of the four years. The implementing partners will jointly conduct annual reviews of the progress, highlights, risks and take corrective actions, as required, related to the CREWS reporting cycle. These annual reviews will be in accordance with the CREWS Monitoring, Evaluation, Accountability and Learning (MEAL) approach and the outcomes will be recorded within official reports published by the CREWS Secretariat.

		In addition to the annual reviews, formal project reviews will take place including an external evaluation, conducted mid-way through the project timeline, and at the end of the project to examine the projects performance and provide guidance as necessary. These evaluations will include review of outputs, risks and progress achieved. Furthermore, the PSC will also contribute to monitoring and evaluation of the project.
Project viability and sustainability	a. Main identified risks	**Institutional risk and commitment from participating countries** (low): Given that the project builds upon established and robust institutional mechanisms (WMO mechanisms and SAHF) and activities have been expressed and confirmed as priorities by the SAHF EC and are anchored in the WMO RA-II mechanism and operating plan, the institutional risk and risk of commitment from participating countries is low. *Mitigation measures*: Partners will establish and maintain their strong communication lines with the countries and the different stakeholders through their regional and national networks/offices. Additionally, the PSC will play a key role in addressing any arising institutional and operational challenges. **Political instability** (low): There is the potential for political instability and government changes during the duration of the project with the potential of affecting implementation. However, as WMO RA-II and SAHF are both non-political mechanisms, this limits the potential impact of political instability on the project. *Mitigation measures*: The political situation in the region will be closely monitored and if the situation is in any country or between countries deteriorates, measures will be discussed. However, working through SAHF as regional entity is expected to not be affected by any political developments. Furthermore, since most activities are at regional level, the risk of political instability affecting the implementation is limited. Should challenges arise on account of political instability, the project team in consultation with the PSC will take appropriate mitigation measures. **Human resources / capacity risks** (medium): While the objective of this project is to support countries with limited human resources and capacity through regional collaboration and pooling of expertise, below a certain level, this will become a risk, e.g. when officials are not able to participate in trainings due to staff shortage. *Mitigation measures*: Through consultations with the SAHF EC, adequate models including a combination of regional and national trainings, virtual sessions, training of trainers etc. will be designed for highest impact yet lowest strain on the agencies.
	b. Critical assumptions	Critical assumptions include: • Continued commitment of member states to SAHF and its shared goals; • Cooperation among/between and support from the WMO network of NMHSs, Global and Regional Centres, and partners; • Continued coordination among partners and stakeholders in contribution to the project and ultimately the early warning value chain
	c. Judgment on the project sustainability	**Institutional sustainability**

		The project focuses on expressed priorities and needs in the region, anchored in SAHF as regional collaboration mechanism which will be further strengthened in the process. **Technical Sustainability** The project is centered around the concept of co-creation of technologies and knowledge. Training and capacity development activities aimed at strengthening the technical capabilities of national institutions are embedded in the project design to ensure the long-term sustainability of interventions proposed even after the project ends. Additionally, alignment with SAHF priorities and the regional dimension of the proposed activities, including the engagement with specialized regional centers, further support the sustainability of the interventions also at the national level.

Attachment 1: The South Asia Hydromet Forum (SAHF)

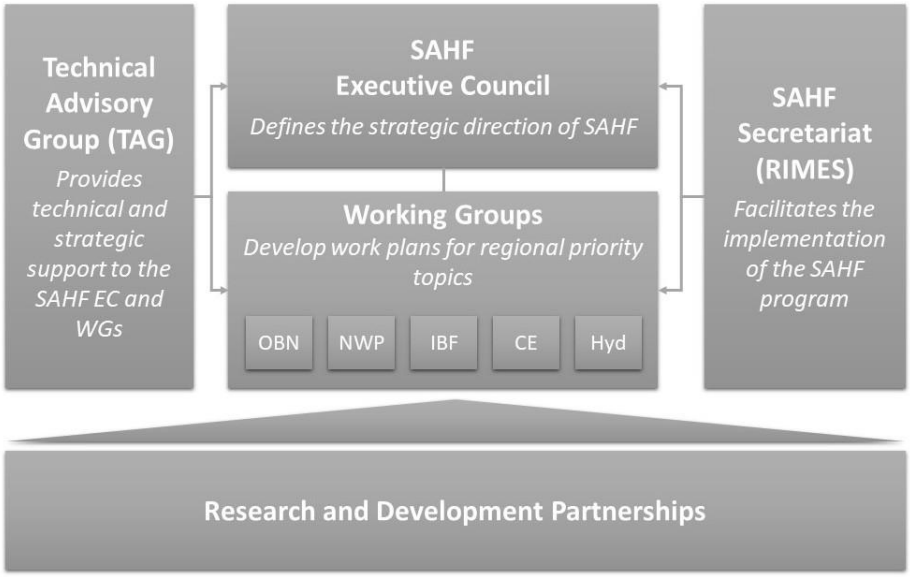
The South Asia Hydromet Forum (SAHF – more info at https://rimes.int/node/1010), established in 2018, brings together National Meteorological and Hydrological Services (NMHS) from Afghanistan, Bangladesh, Bhutan, India, Maldives, Myanmar, Nepal, Pakistan, and Sri Lanka. SAHF is built along three pillars—building capacity, exchanging knowledge, and strengthening regional engagement—to provide accurate and reliable hydromet services. It provides a platform to deepen the NMHS's capacity and collaboration for improved hydromet and early warning services to enhance resilience to climate and disaster risks.

The SAHF Executive Council (EC), composed of the heads of the NMHSs of its nine member countries, provides strategic direction, and the Regional Integrated Multi-hazard Early Warning System for Africa and Asia (RIMES) serves as SAHF's Secretariat.

Five Working Groups (WGs) on priority topics including observation networks, numerical weather prediction, impact-based forecasting, capacity enhancement and hydrology, discuss national and regional priorities, identify key activities and develop programs. Two co-chairs lead each WG and the membership includes representatives from all nine SAHF countries.

The Technical Advisory Group (TAG) was established to as independent advisors to support the EC as well as the WGs with technical and strategic guidance.

Since its inception, research and development partners such as the World Bank, the World Meteorological Organization, FCDO, the European Union, the UK Met Office have played an important role in supporting SAHF, both, financially and with technical expertise.



Attachment 2: Budget Breakdown (USD)

Expected result	Lead IP	Total amount	WB	WMO	WMO network	UNDRR
Output 1.1: SAHF strategic dialogues and high-level engagement deepened		**$610,000**	**$100,000**	**$90,000**	**$420,000**	**$0**
High-level strategic decisions are taken by the SAHF Executive Council (EC) to advance regional collaboration on hydrometeorological services	WB	$230,000	$60,000		$170,000 (RIMES)	
Strategic engagement of the National Hydrological Services in the SAHF EC	WMO	$30,000		$30,000		
SAHF Conference conducted	WB	$280,000	$30,000	$30,000	$220,000 (RIMES)	
WMO-SAHF Partner Coordination Mechanism (PCM) established	WMO	$70,000	$10,000	$30,000	$30,000 (RIMES)	
Output 1.2: Cooperation among forecasters of the SAHF region enhanced through the pooling of expertise		**$240,000**	**$10,000**	**$30,000**	**$200,000**	**$0**
Weekly SAHF Region Forecasters Fora (FF) continued and expanded to discuss weather and ocean situations, as well as monsoon conversations and extreme events (incl. Severe Weather Forecasting Programme (SWFP) & Flash Flood Guidance System (FFGS) products)	WMO	$240,000	10,000	$30,000	$200,000 (RIMES)	
Output 1.3: Hydrometeorological and early warning services enhanced through regional collaboration in SAHF countries		**$535,000**	**$70,000**	**$170,000**	**$295,000**	**$0**
Strategies and work plans developed for SAHF through thematic Working Groups (WGs), Communities of Practice (CoPs), and other regional mechanisms on key regional topics (such as Observation Network, Numerical Weather Prediction (NWP), Impact Based Forecasting (IBF), Decision Support System (DSS), Climate Services, Hydrology)	WB	$535,000	$70,000	$170,000	$295,000 (RIMES)	
Output 2.1: Co-development of the observation network and data exchange expanded		**$370,000**	**$10,000**	**$210,000**	**$150,000**	**$0**
Regional Basic Observation Network (RBON) high priority areas defined and RBON designed	WMO	$200,000		$200,000		

Hydrometeorological data exchange platform for the SAHF region is strengthened through the addition of a quality control module to the DataEx tool	WMO	$170,000	10,000	$10,000	$150,000 (RIMES)	
Output 2.2: Capacities on weather forecasting improved		**$641,000**	**$171,000**	**$70,000**	**$400,000**	**$0**
NMHSs in the region have enhanced capacities in developing, maintaining, and operating NWP capabilities, including interpretation, validation and data assimilation techniques through peer-to-peer exchange and regional trainings	WB	$457,000	$87,000	$70,000	$220,000 (RIMES) $80,000	
Marine and coastal services in SAHF region are strengthened through improved wave and storm surge forecast	WB	$184,000	$84,000		$100,000 (RIMES)	
Output 2.3: New forecasting techniques prototyped and EWS piloted for enhancing future Early Warning Systems in the region		**$710,000**	**$70,000**	**$230,000**	**$410,000**	**$0**
Urban flood EWS are piloted in SAHF region and a scaling up strategy developed to tackle the issue of urban floods	WMO	$200,000		$200,000		
Prototype for weather forecasting in complex terrains with focus on mountain areas developed	WB	$510,000	$70,000	$30,000	$410,000	
Output 2.4: Last-mile connectivity to reach end users supported and mainstreamed		**$150,000**	**$0**	**$150,000**	**$0**	**$0**
Warnings and alerts issued by relevant agencies using the Common Alerting Protocol (CAP) standard and are accessible to all	WMO	$150,000		$150,000		
Output 3.1: Early warning programmes driven by people-centered and gender responsive principles		**$1,190,000**	**$400,000**	**$30,000**	**$600,000**	**$160,000**
Virtual platform established to prototype solutions to improve DSSs and IBF	WB	$1,190,000	$400,000	$30,000	$500,000 (RIMES) $100,000	$160,000
Output 3.2: Private sector engaged to foster innovation and sustainability in the delivery of hydrometeorological and early warning services		**$150,000**	**$0**	**$150,000**	**$0**	**$0**
Public-private engagement in co-production of DSS to broaden the reach and increase the effectiveness of EWSs is piloted	WB	Linked to output 3.1 and respective funding				
Pilot an innovative and low-cost technical solution to address a specific hydrometeorological challenge through an innovation call	WMO	$150,000		$150,000		

Project Evaluation			$43,227			
Project Communication					$30,000 (RIMES)	
	WB total		$874,227			
	WB admin fee (10%)		$87,423			
	WMO total			$1,130,000		
	WMO admin fee (13%)			$146,900		
	WMO admin fee (13%) from WMO network			$325,650		
	WMO network: RIMES				$1,915,000	
	Other partners				$590,000	
	UNDRR					$160,000
	UNDRR admin fee (13%)					$20,800
	Grand total	**$5,250,000**	**$961,650**	**$1,575,250**	**$2,505,000**	**$180,800**
		$5,250,000	**$961,650**	**$4,107,550**		**$180,800**

Attachment 3: Timeline for implementation

	2025				2026				2027				2028				2029	
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
Output 1.1: SAHF strategic dialogues and high-level engagement deepened																		
High-level strategic decisions are taken by the SAHF Executive Council (EC) to advance regional collaboration on hydrometeorological services						x			x				x				x	
Strategic engagement of the National Hydrological Services (NHSs) in the SAHF EC						x												
SAHF Conference conducted						x												
WMO-SAHF Partner Coordination Mechanism established				x	x	x	x	x	x	x	x	x	x	x	x	x	x	
Output 1.2: Cooperation among forecasters of the SAHF region enhanced through the pooling of expertise																		
Weekly SAHF Region Forecasters Fora (FF) continued and expanded to discuss weather and ocean situations, as well as monsoon conversations and extreme events (incl. Severe Weather Forecasting Programme (SWFP) & Flash Flood Guidance System (FFGS) products)		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
Output 1.3: Hydrometeorological and early warning services enhanced through regional collaboration in SAHF countries																		
Strategies and work plans developed for SAHF through thematic Working Groups (WGs), Communities of Practice (CoPs), and other regional mechanisms on key regional topics (such as Observation Network, Numerical Weather Prediction (NWP), Impact Based Forecasting (IBF), Decision Support System (DSS), Climate Services, Hydrology)			x	x	x	x				x	x	x	x	x	x			
Output 2.1: Co-development of the observation network and data exchange expanded																		
Regional Basic Observation Network (RBON) high priority areas defined and RBON designed				x	x				x									
Hydrometeorological data exchange platform for the SAHF region is strengthened through the addition of a quality control module to the DataEx tool				x	x	x												
Output 2.2: Forecasting capacities improved																		
NMHSs in the region have enhanced capacities in developing, maintaining, and operating NWP capabilities, including interpretation, validation and data assimilation techniques through peer-to-peer exchange and regional trainings			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
Marine and coastal services in SAHF region are strengthened through improved wave and storm surge forecast				x	x	x	x	x	x	x	x	x	x					
Output 2.3: New forecasting techniques prototyped and EWS piloted for enhancing future Early Warning Systems in the region																		
Urban flood EWS are piloted in SAHF region and a scaling up strategy developed to tackle the issue of urban floods			x	x	x	x	x	x	x	x	x	x	x					

	2025				2026				2027				2028				2029	
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
Prototype for weather forecasting in complex terrains with focus on mountain areas developed			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
Output 2.4: Last-mile connectivity to reach end users supported and mainstreamed																		
Warnings and alerts are issued by relevant agencies using the Common Alerting Protocol standard and are accessible to all				x	x	x	x	x	x	x	x							
Output 3.1: Early warning programmes driven by people-centered principles																		
Virtual platform established to prototype solutions to improve DSSs and IBF		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
Output 3.2: Private sector engaged to foster innovation and sustainability in the delivery of hydrometeorological and early warning services																		
Public-private engagement in co-production of DSS to broaden the reach and increase the effectiveness of EWSs is piloted			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
Pilot an innovative and low-cost technical solution to address a specific hydrometeorological challenge through an innovation call				x	x	x	x	x	x	x	x	x	x	x				

Attachment 4: Logical framework

Expected result	Indicators	Baseline	Target	Data sources	Data collection method	Frequence	Guidance	Responsible
Impact: National level hydrometeorological and early warning services improved through regional collaboration								
Strengthened resilience to climate shocks and loss and damage averted, minimized, and addressed through increased availability and improved access to forecasts and early warning service.	*# of people living in LDCs and SIDS with access to/and receiving forecasts and early warning services developed or improved through CREWS support – disaggregated by gender* (CREWS MEAL Indicator)	SAHF Member countries (TBD)	TBD	Annual CREWS SA progress reports, TBD: *EW4All dashboard*	*Direct surveys*	End of the project	*Direct surveys with National Meteorological and Hydrological Services (NMHSs) and National Disaster Management Organizations (NDMOs) to confirm improvement of forecasts and warnings. Upon confirmation the assumption is that the benefit covers the entire population.*	WB
Outcome 1: Regional collaboration mechanisms for hydrometeorological services strengthened								
Regional collaboration mechanisms for hydrometeorological services strengthened	*# of coordination mechanisms strengthened to enhance collaboration on forecasting and early warning among national and regional institutions* (CREWS MEAL Indicator)	0	1 (SAHF mechanism)	Annual CREWS SA progress reports and SAHF Executive Council Resolutions	Reports TBD: *Survey with SAHF members*	Annual	Coordination mechanism refers to SAHF, while for strengthening we refer to the enhancement of collaboration and peer-to-peer knowledge exchange on forecasting and	All

Expected result	Indicators	Baseline	Target	Data sources	Data collection method	Frequence	Guidance	Responsible
							early warning service provision	
Output 1.1: SAHF strategic dialogues and high-level engagement deepened								
High-level strategic decisions are taken by the SAHF Executive Council (EC) to advance regional collaboration on hydrometeorological services	*# of SAHF EC Resolutions endorsed*	0	3	Signed SAHF EC resolutions	Report	Annual	Count the number of SAHF EC resolutions adopted. Assumption: one SAHF EC per year, three in total during the CREWS implementation period	WB
Strategic engagement of the National Hydrological Services in the SAHF EC	*# of national hydrological services represented in the SAHF EC*	3 (due to combined hydrometeorological services in Nepal, Bhutan and Myanmar)	At least 5	Signed SAHF EC resolutions	Report	Annual	At least one SAHF EC conducted with increased NHS participation	WMO
SAHF-V Conference conducted	*# of SAHF Conferences organized*	4	5	SAHF-V conference report and CREWS SA progress reports	Report	Annual	SAHF-V conference organized with CREWS financing	WB
WMO-SAHF Partner Coordination Mechanism established	*WMO-SAHF Partner coordination mechanism in place*	no	yes	Meeting minutes and CREWS SA progress reports	Report	Annual		WMO

Expected result	Indicators	Baseline	Target	Data sources	Data collection method	Frequence	Guidance	Responsible
Output 1.2: Cooperation among forecasters of the SAHF region enhanced through the pooling of expertise								
Weekly SAHF Region Forecasters Fora (FF) continued and expanded to discuss weather and ocean situations, as well as monsoon conversations and extreme events (incl. Severe Weather Forecasting Programme (SWFP) & Flash Flood Guidance System (FFGS) products)	*# of Forecasters Fora held*	153 as of Jan. 16, 2025	160 additional FF supported under CREWS SA	RIMES' logs on participation; CREWS SA progress reports; Annual SAHF FF reports	Report	Annual	Count the number of FF held. Assumption: 40 FF event per annum.	WB
Output 1.3: Hydrometeorological and early warning services enhanced through regional collaboration in SAHF countries								
Strategies and work plans developed for SAHF through thematic Working Groups (WGs), Communities of Practice (CoPs), and other regional mechanisms on key regional topics (such as Observation Network, Numerical Weather Prediction (NWP), Impact Based Forecasting (IBF), Decision Support System (DSS), Climate Services, Hydrology)	*# of strategies, workplans, assessments, analyses and other mapping of needs, gaps priorities that inform investment requirements on forecasting & early warning systems* (CREWS MEAL Indicator)	0	3 (Hydro, CS, DSS)	CREWS SA progress reports, strategy/ work plan documents	Report	Annual	Count the number of strategies, workplan, assessments, etc. developed by the Working Groups	WB WMO (hydrology)
Outcome 2: Improved quality and efficiency of forecasting and early warning services								
Detection, observation, monitoring, analysis and forecasting of hazards that	*# of hazards monitoring, analysis and forecasting*	0	2 (marine services &	CREWS SA progress reports,	Reports	Annual	For each priority hazard demonstrate progress of	All

Expected result	Indicators	Baseline	Target	Data sources	Data collection method	Frequence	Guidance	Responsible
threaten the SAHF region are improved and sustained by the countries	*processes developed or improved* (CREWS MEAL Indicator)		urban flooding)	EW4All progress reports			properties such as: Lead time, likelihood, impacts, actionable advice.	
Output 2.1: Co-development of the observation network and data exchange expanded								
Regional Basic Observation Network (RBON) high priority areas defined and RBON designed	*# of RBON high priority areas identified* *# of people trained and actively involved in the RBON design*	0 0	At least 1 At least 5	CREWS SA progress reports, RBON assessment report, RA-II RBON design workshop/ outcomes report	Report	Annual	RBON gap analysis conducted and RBON designed	WMO
Hydrometeorological data exchange platform for the SAHF region is strengthened through the addition of a quality control module to the DataEx tool	*Availability of a Quality Control (QC) module on DataEx*	No	Yes	CREWS SA progress reports / DataEx	Report / online tool	Annual	Assess the availability of Data Ex (yes or no)	WB
Output 2.2: Forecasting capacities improved								
NMHSs in the region have enhanced capacities in developing, maintaining, and operating NWP capabilities, including interpretation, validation and data assimilation techniques through peer-to-peer exchange and regional trainings	*# of additional forecasting and prediction products developed and/or accessed from WMO World Meteorological Centres (WMCs), Global Prediction Centers (GPCs), Regional Specialized Meteorological Centers (RSMCs) and NMHSs as a result of this project.*	0 developed/ accessed as a result of this project	2 developed /accessed as a result of this project	CREWS progress reports WMO Integrated Processing and Prediction System	Report & dashboard	Annual	This counts the number of products on forecasting and prediction developed with CREWS support or newly access to available from the WMO GPCs, RSMS, and NMHSs.	WB

Expected result	Indicators	Baseline	Target	Data sources	Data collection method	Frequence	Guidance	Responsible
	(CREWS MEAL Indicator) *# of (unique) people trained disaggregated by gender, age, disability (as possible)*	0	18	(WIPPS) database				
Marine and coastal services in SAHF region are strengthened through improved wave and storm surge forecast	*# of countries developing or accessing marine operational forecasting*	0	4 (BD, MD, PK, SL)	CREWS SA progress reports	Report	Annual	This counts the number of countries in which marine forecasting has been strengthened with CREWS support.	WB
Output 2.3: New forecasting techniques prototyped and EWS piloted for enhancing future Early Warning Systems in the region								
Urban flood EWS are piloted in SAHF region and a scaling up strategy developed to tackle the issue of urban floods	*# of urban centres (cities) that have operational urban flood early warning systems established under the project*	0	At least 1	CREWS SA progress reports	Warnings and alerts issued by the urban flood EWS	Annual	Count the number of cities with operational urban Flood EWS through CREWS support.	WMO
Prototype for weather forecasting in complex terrains with focus on mountain areas developed	*Prototype for forecasting in complex terrain (mountains) available*	no	yes	CREWS SA progress reports	Report	Annual	Assess the availability and accessibility of a prototype for weather forecasting in mountain areas.	WB
Output 2.4: Last-mile connectivity to reach end users supported and mainstreamed								
Warnings and alerts are issued by relevant agencies using the Common Alerting	Number of countries that are CAP compliant	TBD	TBD	DRM Agencies & NMHSs	Direct survey	At the end of the project	This indicator will count the warnings **prepared and**	WMO

Expected result	Indicators	Baseline	Target	Data sources	Data collection method	Frequence	Guidance	Responsible
Protocol (CAP) standard and are accessible to all							**issued** by the country using the CAP format. Both conditions have to be met	
Outcome 3: People-centered and gender-responsive principles and private sector engagement mainstreamed in early warning programmes								
Early warning programmes are driven by people-centered, gender-responsive and disability inclusive principles and promote private sector engagement	*# of climate and weather information products co-designed to users' needs by groups representing vulnerable segments of exposed populations* (CREWS MEAL Indicator)	0	1	CREWS SA progress reports	Number of products specifying which group was involved in co-design	Annual	This indicator counts the number of weather information products (e.g., weather apps, pushing warnings for cell phones, weather alert systems) designed taking in consideration users needs and with the participation of representatives of vulnerable segments of exposed populations.	All
Output 3.1: Early warning programmes driven by people-centered principles								
Virtual platform established to prototype solutions to improve DSSs and IBF	*Virtual platform established* *# of countries sharing disaster data to the virtual platform through the*	No 0	Yes At least 1 country	CREWS SA progress reports	Report	Annual	Verify the availability of a virtual platform to prototype innovative solutions to improve DSS and IBF	WB UNDRR

Expected result	Indicators	Baseline	Target	Data sources	Data collection method	Frequence	Guidance	Responsible
	disaster loss tracking system as per their data governance policy.						Verify disaster data sharing	
Output 3.2: Private sector engaged to foster innovation and sustainability in the delivery of hydrometeorological and early warning services								
Public-private engagement in co-production of DSS to broaden the reach and increase the effectiveness of EWSs is piloted	*# of agreements with private sector to co-finance or co-implement Early Warning System initiatives* ***(CREWS MEAL indicator)***	0	1	CREWS SA progress reports	Report	Annual	Count the number of agreements with private sector firms signed to co-finance or co-implement EWS.	WB
Pilot an innovative and low-cost technical solution to address a specific hydrometeorological challenge through an innovation call	*# of applicants applying to the innovation call (disaggregated by private sector/research institutions/govt. agencies)*	0	1	Proposals/ Applications submitted	Pilot results (proof of concept) Report	Annual	Count the number of applicants who have submitted their proposals to the innovation call	WMO

Alignment to the CREWS MEAL framework

CREWS MEAL Outcomes	Outcome 1. National and local multi- hazard early warning systems prioritized and funded			Outcome 2. Improved early waning service delivery and accessibility by national and regional institutions				Outcome 3. Early warning programmes are driven by people- centered and gender responsive principles and promote private sector engagement	
CREWS MEAL Outputs / Project Outputs	Output 1.1. A country and/or region has developed or strengthened legislative and/or institutional frameworks to support and sustain multi- hazard early warning systems	Output 1.2. Multi-hazard needs, gaps and priority assessments, analyses and related investment plans for early warning systems in a country or region are driven by CREWS financing	Output 1.3. Partnerships and cooperation frameworks developed for financing and scaling up support to multi-hazard early warning systems	Output 2.1 Risk information and tools generated by countries to enable the delivery of impact-based early warnings	Output 2.2. Monitoring, analysis and forecasting of hazards that threaten the country/region are improved and sustained by the countries	Output 2.3 Warnings are communicated by the countries based on common alerting protocols under agreed standard operational procedures (SOPs)	Output 2.4 Warnings are received, understood and acted upon based on co- produced preparedness and response plans by the countries	Output 3.1 People of different backgrounds, gender, youth, older persons, persons with disability, poor, marginalized, displaced, and non- native, as well as related institutions have co- produced climate and weather information products tailored to their needs	Output 3.2 Private sector is engaged to foster innovation and sustainability in delivery of early warning services
Output 1.1: SAHF strategic dialogues and high-level engagement deepened	✓								
Output 1.2: Cooperation among forecasters of the SAHF region enhanced through the pooling of expertise	✓								
Output 1.3: Hydrometeorological and early warning services enhanced through regional collaboration in SAHF countries		✓							
Output 2.1: Co-development of the observation network and data exchange expanded					✓				
Output 2.2: Forecasting capacities improved					✓				
Output 2.3: New forecasting techniques prototyped and EWS piloted for enhancing future Early Warning Systems in the region					✓				
Output 2.4: Last-mile connectivity to reach end users supported and mainstreamed						✓			
Output 3.1: Early warning programmes driven by people-centered principles								✓	
Output 3.2: Private sector engaged to foster innovation and sustainability in delivery of hydrometeorological and early warning services									✓

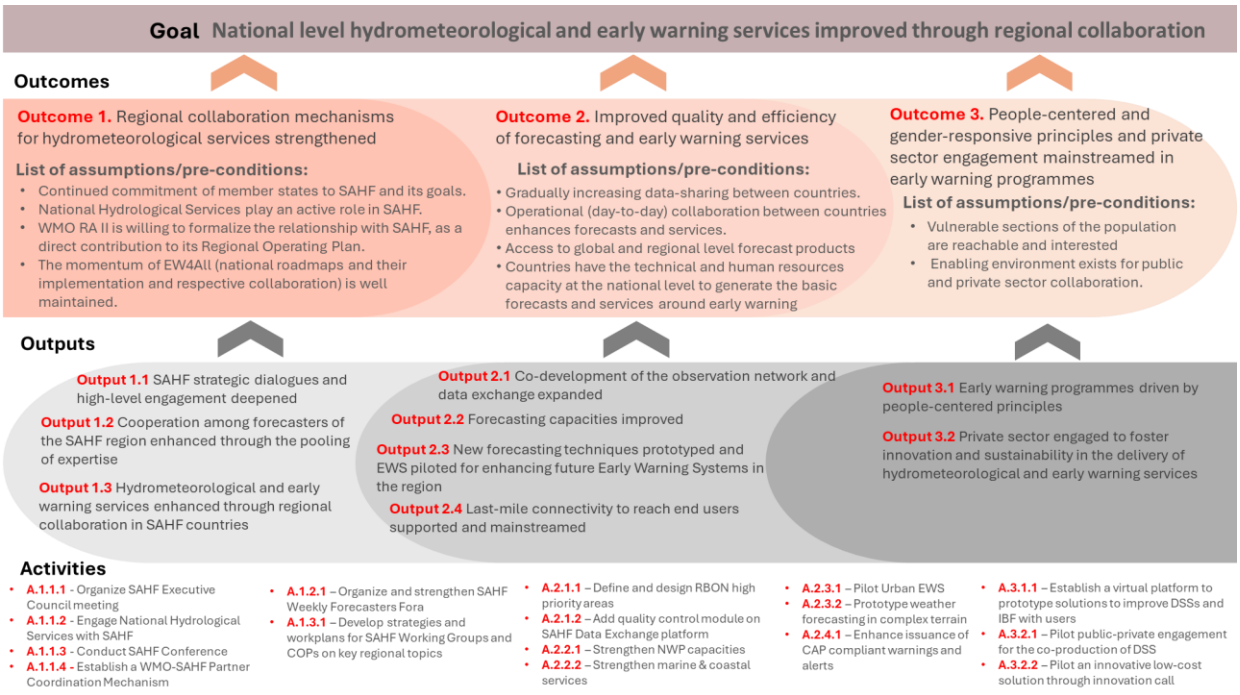
Attachment 5: M&E Plan

1. Theory of Change

The theory of change underlying the CREWS South Asia (SA) Project is fully aligned with the CREWS MEAL framework, as can be gauged by the project's result framework (Attachment 4: Logical Framework of the Proposal). The project goal is to improve national level hydrometeorological and early warning services through regional collaboration. The key causal factors underlying this goal are: 1) The South Asia Hydromet Forum (SAHF) enables countries in SA, which face similar challenges, to address these issues collectively. This includes strengthening Numerical Weather Prediction (NWP), improving forecasting in complex terrains, transitioning to impact-based forecasting (IBF), and providing effective decision support to society. This approach leverages successful examples and existing expertise within the region, incorporates lessons from other regions, and integrates global knowledge; and 2) collaboration fosters synergies and increases efficiency, allowing countries to enhance hydrometeorological and early warning services with fewer human and financial resources, which are limited across all SA countries.

The complete theory of change for the CREWS SA Project is presented in Fig. 1.

Figure 1: Theory of Change for the CREWS South Asia



2. Monitoring

Roles and responsibilities for the monitoring of project activities:

Responsible	*Tasks*
Project Steering Committee (PSC), composed by WB, WMO, UNDRR, SAHF Secretariat (RIMES), and the SAHF EC co-chairs.	Ensure quality of governance and the effective delivery of project activities on time and within the expected quality. The PSC will also review the overall implementation progress of the project, as per the Project Logical Framework and endorse the CREWS SA Project Status Reports before they are shared with the CREWS Secretariat.
Project Coordination Unit (PCU), composed by one member each	The PCU will oversee overall project implementation, ensure alignment with project objectives and goals, and oversee the collection of data underlying the Project Result Framework (Attachment 4: Logical

from the WB, WMO, UNDRR and the SAHF Secretariat.	Framework of the Proposal) by the respective partners. The PCU collects annual outcome-level indicators, while the WB, as lead implementing agency, will be in charge of evaluating the impact-level indicator at project completion.
Implementing partners: WB, WMO and UNDRR	Each implementing partner will collect data on the output level indicators they are responsible for as indicated in the Project Logical Framework. These indicators will be collected yearly, in preparation of the annual Project Status Report.

Baseline data report

Within the first semester of project implementation, the PCU and the implementing partners will produce a baseline data report. The objective of this report is to establish the levels for all indicators in the Project Result Framework of the CREWS SA Project (Attachment 4). Various collection methods will be utilized, ranging from direct collection by implementing partners (particularly for output-level indicators) to third-party surveys (e.g., through national meteorological and hydrological service providers). The report structure will adhere to the format suggested by the CREWS Secretariat in the CREWS Operational Procedure Note N.2 – Monitoring and Evaluation, specifically including the sections: 1. Introduction, 2. Summary of the Intervention, and 3. Baseline Values for the Indicators.

3. Evaluation

As mentioned in the CREWS SA project proposal, the PSC will have the overall responsibility to regularly evaluate the project implementation. In addition to the annual reviews, formal project reviews will take place, including an external evaluation conducted mid-way through the project timeline and at the end of the project. These evaluations will examine the project's performance and provide guidance as necessary. The evaluations will include a review of outputs, risks, and progress achieved.

Evaluation type	Evaluation management		When it will be performed				Resources	Budget [USD]
	Internal	External	Yr1	Yr2	Yr3	Yr4		
Mid-way	x	x		x			International/ regional consultant	17,000
Final evaluation	x	x				x	International/ regional consultant	26,227
Impact evaluation		x				x	International/ regional consultant	

4. Learning

The project design is already built on long-standing engagements and lessons learnt collected over many years, be it in the context of WMO RA-II, WB lending operations across SA or in the context of SAHF since its establishment in 2018. Key lessons include:

- The importance for regional collaboration due to transboundary nature of hydrometeorological hazards and limited financial and human resources at national level, which allows for pooling of expertise among SAHF members, knowledge exchange and economies of scale.
- While many topics concern the entire region, others require sub-regional collaboration, e.g. regarding mountain specific challenges (enhancing forecasting in complex terrain) or strengthening of marine services.

- Regional collaboration mechanisms across the world face financial and sustainability challenges, and viable solutions need to be found medium- to long-term. Broader support to SAHF through many of the regional and global partners involved in SA is one avenue to contribute to sustainability, but needs to be complemented, e.g. through member contributions etc.

The goal of the learning plan for CREWS SA is to describe the learning activities to be carried out over the project timeframe, spec and adapt project implementation based on lessons learnt mid-way/ throughout project implementation.

- The focus of many of the activities under the CREWS SA project is on establishing learning and co-development processes rather than only the final output (product). As such, this implies a learning journey that allows for continuous adjustments in accordance with SAHF member needs and the evolving requirements of the stakeholders involved in the project. For instance, the activity to strengthen meteorology in complex terrain (mountains) will establish a technical group consisting of representatives from Bhutan, Nepal and Pakistan, as well as WB, WMO, MeteoSuisse and the University of Oxford to identify challenges and capacities, identify approaches to be tested and jointly prototype a solution. Another example is the support to the SAHF working groups (observation networks, NWP, impact-based forecasting, climate services and hydrology) to develop strategies and work plans which are envisioned as living documents that are periodically revisited and updated.
- Consultations: Mid-way and at the end of the project, consultations will be held with the SAHF Executive Council (EC), the WMO-SAHF Partner Coordination Mechanism (PCM) and the CREWS SA PSC, as well as select SAHF technical/working groups on the effectiveness of achieving set goals, lessons learned and opportunities for improvement. Learning questions will focus on understanding the effectiveness of regional collaboration through existing mechanisms such as working groups; perceived usefulness/relevance of regional activities for national level hydrometeorological service provision; effectiveness of SAHF to coordinate and align planned/ongoing activities from different partners related to hydrometeorological and early warning services etc.

Type of activity	**Objective/ expected results**	**Target audience/ participants**	**Execution calendar**
Survey/ discussion	Feedback of the effectiveness of SAHF to facilitate regional collaboration and recommendations for further strengthening	SAHF EC	2nd or 3rd SAHF EC meeting Final SAHF EC meeting before project closing
Survey/ discussion	Feedback on the effectiveness of SAHF to enhance regional collaboration, leverage additional resources, ensure alignment of related activities in the region and harmonization, and recommendations for further strengthening	WMO-SAHF partner coordination mechanism	
Survey/ discussion	Feedback on the effectiveness of SAHF to strengthen collaboration at regional level and operational capacities at national level through the working groups and recommendations for further strengthening	SAHF WGs	

Attachment 6: Acronyms

AI	Artificial Intelligence
BCWC	BIMSTEC Centre for Weather and Climate
BD	Bangladesh
BH	Bhutan
BIMSTEC	Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation
BMD	Bangladesh Meteorological Department
CAP	Common Alerting Protocol
CARE	Climate Adaptation and Resilience
CHD	Country Hydromet Diagnostic
CHE	Cataloguing Hazardous Event
CoP	Community of Practice
CS	Climate Services
CREWS	Climate Risk & Early Warning Systems
DHM	Department of Hydrology and Meteorology of Nepal
DMH	Department of Meteorology and Hydrology of Myanmar
DoM	Department of Meteorology of Sri Lanka
DRM	Disaster Risk Management
DSS	Decision Support System
EC	Executive Council
ECMWF	European Centre for Medium-Range Weather Forecasts
EPS	Ensemble Prediction System
ESCAP	Economic and Social Commission for Asia and the Pacific
EUMETNET	European Meteorological Network
EW4All	Early Warning for All
EWS	Early Warning System
FCDO	UK Foreign, Commonwealth & Development Office
FF	Forecasters Forum
FFGS	Flash Flood Guidance System
FMI	Finnish Meteorological Institute
GBON	Global Basic Observing Network
GDP	Gross Domestic Products
GISCs	Global Information System Centers
GCF	Green Climate Fund
HKKH	Hindu Kush – Karakorum - Himalaya
HRC	Hydrologic Research Center
IB-EWS	Impact-Based Early Warning Systems
IBF	Impact-Based Forecasting
ICIMOD	International Centre for Integrated Mountain Development
ICT	Information and Communications Technology
IFRC	International Federation of Red Cross/Red Crescent Societies
IITR	Indian Institute of Technology Roorkee
IMD	India Meteorological Department
INCOIS	Indian National Centre for Ocean Information Services
ITU	International Telecommunication Union
IWMI	International Water Management Institute
LDC	Least Developed Countries
MD	Maldives
M&E	Monitoring & Evaluation
MEAL	Monitoring, Evaluation, Accountability and Learning
MHEWS	Multi-Hazard Early Warning System
MMS	Maldives Meteorological Service
NCHM	National Center for Hydrology and Meteorology of Bhutan
NCMRWF	National Center for Medium-Range Weather Forecasting
NMHS	National Meteorological and Hydrological Services
NOAA	National Oceanic and Atmospheric Administration

NP	Nepal
NWA	National Weather Academy
NWP	Numerical Weather Prediction
OBN	Observation Network
PARFFGS	Pakistan and Afghanistan Regional Flash Flood Guidance System
PCM	WMO-SAHF Partner Coordination Mechanism
PCU	Project Coordination Unit
PK	Pakistan
PMD	Pakistan Meteorological Department
PTC	Panel on Tropical Cyclones
PSC	Project Steering Committee
RA-II	Regional Association II, Asia
RAP	Resilient Asia Program
RBON	Regional Basic Observation Network
RCC	Regional Climate Center
RIMES	Regional Integrated Multi-Hazard Early Warning System for Africa and Asia
RSMC	Regional Specialized Meteorological Center
RTC	Regional Training Center
SA	South Asia
SAARC	South Asian Association for Regional Cooperation
SAHF	South Asia Hydromet Forum
SASCOF	South Asia Climate Outlook Forum
SAsiaFFGS	South Asia Flash Flood Guidance System
SAR	South Asia Region
SIDS	Small Island Developing State
SL	Sri Lanka
SLMC	Strengthening Last Mile Communication
SOFF	Systematic Observation Financing Facility
STARCE	South Asia Technical Assistance for Regional Capacity and Engagement on Hydromet and Early Warning Services
SWFP	Severe Weather Forecasting Programme
TAG	Technical Advisory Group
TBD	To be defined
TCP	Tropical Cyclones Programmes
TCPF	Third Pole Climate Forum
TNSMART	Tamil Nadu System for Multi-Hazard Potential Impact Assessment, Alert, Emergency Response Planning and Tracking
TPRCC	Third Pole Regional Climate Centre
TRACT	Toward Risk-Aware and Climate-resilienT communities
UK	United Kingdom
UNDP	United Nations Development Programme
UNDRR	United Nations Office for Disaster Risk Reduction
UNEP	United Nations Environment Programme
USAID	United States Agency for International Development
USD	United States dollar
WB	World Bank
WG	Working Group
WIGOS	WMO Integrated Global Observing System
WISER	Weather and Climate Information Services
WMO	World Meteorological Organization

Attachment 7: CREWS summary shared with the SAHF EC and WMO Hydrological Advisors & endorsement memo.

Unlocking South Asia Regional Synergies for Resilience Building through Enhanced Access to Early Warning Services – Climate Risk and Early Warning Systems (CREWS) South Asia Project

- Summary for the South Asia Hydromet Forum (SAHF) Executive Council/WMO
Hydrological Advisors for review, feedback and endorsement -

Background

South Asia (SA) exhibits diverse climatic and geographical features and is prone to a range of hydrometeorological and climate hazards. Bangladesh, Nepal, and Pakistan are in the top 10 countries most vulnerable to climate change. Between 2000 and 2024, a total of 957 disasters caused by meteorological, hydrological, climatological hazards were reported in the region, cumulatively affecting over 1.4 billion people in the eight countries targeted by the project — Bangladesh, Bhutan, India, Maldives, Myanmar, Nepal, Pakistan, and Sri Lanka—and leading to over 230 thousand deaths. Economic damages from these disasters are estimated to be close to US$ 210 billion. Floods (riverine, flash and urban floods), coastal inundations, and drought are the most impactful hazards in terms of economic damages and number of people affected and are often transboundary in their impacts. The changing climate could sharply diminish living conditions for up to 800 million people in a region that already has some of the world's poorest and most vulnerable populations. Importantly, climate change related losses in GDP per capita are projected to be higher in SA than the global average by up to seven percent.

SA countries are varied in their capacities and access to quality hydromet, early warning and decision support services. However, as they modernize their systems and transition towards delivery of user-oriented and actionable hydrometeorological and early warning services, they face many technical, capacity, sustainability and other challenges which are common across the region. Regional collaboration offers synergies and economies of scale that are not only beneficial, but essential to meet the rising threat of climate impacts as well as increasing user needs, and contribute to overcoming technical, financial and sustainability challenges at national level.

The South Asia Hydromet Forum (SAHF) provides a platform for regional exchange, collaboration, and fostering innovation on hydromet, early warning and climate services, as subset of WMO region II. The CREWS SA project is built around and in support of strengthening SAHF, and the design of this project follows priorities stated in the SAHF EC resolution from November 2023 as well as the RA II strategy document.

Climate Risk and Early Warning Systems (CREWS)

The Climate Risk and Early Warning Systems (CREWS) initiative is a financial mechanism which funds projects in the Least Developed Countries (LDCs) and Small Island Developing States (SIDS) to establish risk-informed early warning services. Beginning of 2024, the CREWS Steering Committee approved CREWS South Asia (CREWS SA) for the pipeline and requested WB as lead implementing partner to facilitate the formulation of the full proposal. CREWS SA will be implemented by the World Bank (WB – lead implementing agency), the World Meteorological Organization (WMO) and the United Nations Office for Disaster Risk Reduction (UNDRR) with additional

involvement of the WMO network/UN agencies, especially the Regional Integrated Multi-hazard Early Warning System for Africa and Asia (RIMES) which serves as SAHF secretariat, as well as MeteoSuisse, the International Federation of Red Cross and Red Crescent Societies and others.

Objective

The purpose of this document is to inform the SAHF Executive Council (EC) as well as WMO Hydrological Advisors of SAHF countries about the planned activities. **Project implementation arrangements and design**

Activities fall into three components:

Component 1: Strengthen regional collaboration to enhance hydromet services

This component consists of three interlinked subcomponents aimed at (1.1) strengthening SAHF as regional collaboration mechanism, (1.2) facilitating pooling of regional expertise, and (1.3) improving hydromet and early warning services through regional collaboration and strategic planning.

1.1 *Strengthening SAHF as regional collaboration mechanism:* This subcomponent focuses on enhancing the SAHF mechanisms and its advocacy role to foster stronger coordination and collaboration on hydromet, early warning and climate services at regional level to tackle transboundary and shared challenges. This will be achieved through deepening high-level engagement, strategic dialogues and planning by supporting and leveraging the SAHF Executive Council (EC) meetings, SAHF Thematic Working Groups meetings, the SAHF conference, and SAHF Technical Advisory Groups (TAG) services.

1.2 *Facilitating pooling of regional expertise*: This subcomponent aims at strengthening forecasting capacity by the continuation of the SAHF Forecasters Forum (FF), a weekly event where meteorologists discuss complex weather situations, including imminent extreme events. Additional advisory services will continue to be provided through the engagement of experts from regional specialized centers such as the Indian National Centre for Ocean Information Services (INCOIS) or the NCMRWF/BCWC. FF will be expanded to include hydrologists and utilize products from the Severe Weather Forecasting Program (SWFP) as well as the Flash Flood Guidance Systems (FFGS) in the region. Weekly sessions will continue to be complemented by dedicated pre-, mid- and post-monsoon conversations as well as additional calls to discuss approaching extreme events such as cyclones as needed. Efforts will be made to integrate weekly forecasters forum outputs to feed into impact based DSS through engagement of user sector institutions at the national/ subnational levels on demand basis from SAHF countries.

1.3 *Improving hydromet and early warning services through regional collaboration and strategic planning*: The needs and priorities for hydromet and early warning services development in SAR will be assessed through leveraging the SAHF Working Groups (WGs) to identify common needs and priorities that can be supported at the regional level. These WGs will develop strategies and workplans covering SAHF priority topics such as Observation Networks and Hydrology (the hydrology WG will be expanded to include hydrologists and link to the strengthening of the three regional FFGSs: Pakistan and Afghanistan Regional Flash Flood Guidance System – PARFFGS, Myanmar FFGS and South Asia FFGS – SAsiaFFGS run by India). These strategies and work plans will leverage the expertise and potential contribution of SAHF development partners (incl. WB, WMO, RIMES, Met Office of the UK, Met Norway, FMI etc.) and the SAHF TAG. An additional working group or community of practice for climate services will be established with the support of the UK Met Office under the Weather and Climate Information Services (WISER). Strengthening of the South Asia Climate Outlook Forum (SASCOF) will be carried out in close collaboration with this climate services group.

Component 2: Improving the quality and efficiency of forecasting and early warning services

This component consists of four distinct, but inter-connected subcomponents aimed at enhancing the capacities of National Meteorological and Hydrological Services (NMHSs) across the region to deliver high-quality and effective services, following a value chain approach. The first subcomponent expands partnerships to co-develop observation networks and improve data exchange, laying a solid foundation for weather forecasting. The second subcomponent focuses on strengthening weather forecasting capabilities through the implementation of a regional capacitybuilding program. The third subcomponent focuses on prototyping new forecasting techniques and EWS to inform strengthening of early warning services in the region. The fourth subcomponent enhances last-mile connectivity by improving regional protocols and procedures, ensuring that no one is left behind when disasters strike.

2.1 Expanding co-development of the observation network and data exchange: This subcomponent aims to further expand partnerships for the co-development of the observation network and data exchange among regional NMHSs, drawing from the experiences of similar inter-regional programs such as EUMETNET[2]. Within this context, the subcomponent will include the assessment of regional basic observation network (RBON) needs and design of RBON in close coordination with the OBN and NWP WGs. This subcomponent will also closely coordinate with a World Bank led and FCDO financed activity to pilot a regional precipitation grid to enhance spatial coverage and accuracy of precipitation forecasts through a public-private partnership using commercial microwave links. Finally, the existing data exchange platform (DataEx) will be strengthened by adding a quality control module.

2.2 Improve forecasting capacities: Based on a strategy and road map for the region to strengthen NWP short- to medium-term, developed by the SAHF Working Group on NWP and in consideration of WMO Guidelines on Highresolution NWP (WMO-No. 1311), a series of capacity-building activities will be carried out in collaboration with SWFP-South Asia, covering topics such as interpretation of NWP products, model output verification, validation, bias correction, and the generation and use of seasonal to sub-seasonal forecasts. These activities will be delivered through peer-to-peer exchanges with external NMHSs already active in the region such as the Finnish Meteorological Institute, Met Norway, Met Office, UK, as well as development partners such as RIMES, BCWC and WMO RCCs. Furthermore, marine forecasting will be strengthened through trainings, peer-to-peer exchange and the pooling of expertise to enhance the use and interpretation of marine forecasting products, in close collaboration with INCOIS.

2.3 Enhancing early warning services in the region through prototyping of new forecasting techniques and EWS pilots: This subcomponent will prototype enhanced weather forecasting in complex terrain using AI downscaling techniques, the ICON NWP model and Integrated Forecasting System of ECMWF in collaboration with MeteoSuisse and University of Oxford to prototype more localized forecasts and early warnings. Furthermore, urban flood EWS will be piloted and lessons learnt are expected to inform similar efforts across the region.

2.4 Mainstream last-mile connectivity to reach end users: This subcomponent will support last-mile connectivity through specifically targeting the issuance of warnings and alerts by relevant agencies. This will involve strengthening Common Alerting Protocols (CAPs) and the definition of Standard Operating Procedures (SOPs). Following the guidelines included in WMO Gui*delines on Multi-Hazard Impact-based Forecast and Warning Services* (WMO-No. 1150), and in parallel with the activities under Component 3, this subcomponent will also facilitate the establishment of feedback protocols and quality assurance with the user groups.

[2] EUMETNET is the collaborative framework of European national meteorological services.

Component 3: Ensuring that early warning projects are driven by people-centered and gender responsive principles; and promoting private sector engagement

This component focuses on increasing the effectiveness of early warning systems (EWS) by ensuring that they are people-centered, end-to-end, and accessible to all. The first subcomponent aims to narrow the divide between the weather and climate science underpinning early warning systems and the end-users through the establishment of a virtual platform to co-produce user-tailored knowledge and services. The second subcomponent aims to strengthen the capabilities of NMHSs in engaging with the private sector by leveraging their respective comparative advantages, forging sustainable partnerships to deliver broader socio-economic benefits.

3.1 Ensure EWS are people-centered: While many aspects of the early warning chain still require attention, one of the key bottlenecks is the connection and exchange between hydromet service producers and users, including all other relevant stakeholders in the conversation. Only such an established communication mechanism will enable the co-production and communication of truly relevant, actionable and timely information to end-users. Weather intelligence can enhance the accuracy and reliability of the data and models used in a DSS, enrich the context and scope of the decision problems and alternatives, and increase the responsiveness and adaptability of the system to changing weather conditions and scenarios. DSS are used in a wide variety of sectors, which are also weathersensitive, including agriculture, energy, health, transportation and disaster management. They are used in businesses and increasingly by individuals through mobile applications. This component will be linked to ongoing USAID /UCAR supported "Strengthening Last Mile Communications in South Asia Region (SLMC) Program implemented by RIMES

This subcomponent will focus on the establishment of a virtual platform for hydromet informed Decision Support Systems (DSS) aiming at bringing together national, regional and global stakeholders involved in IBF, EWS and DSS in the region such as local and national government representatives, RIMES, ICIMOD, CREWS and EW4All implementing partners, etc. to exchange experience and lessons learnt from existing DSS. The virtual platform will explore the development of a blueprint for the establishment of integrated DSS and early warning systems, DSS software, database and related standards, mechanisms for feedback from users, etc. to bridge the gap between early warning service providers and end-users.

3.2 Engagement of the private sector to foster innovation and sustainability in the delivery of hydromet and early warning services: Weather information is relevant to almost all sectors and areas of the economy and society. With climate change, reliable, actionable and timely information targeted to groups of persons and businesses will only grow in relevance to protect the development gains and further progress towards declared country goals. While NMHSs play a key role in providing early warnings, as well as public services dependent on each country's priorities, tailored services for private actors are equally important. This subcomponent will focus on integrating the private sector into the virtual platform on DSS and facilitating the engagement of NMHSs with the private sector, both, private hydromet service providers and private service users.

This subcomponent will also include an innovation call focusing on a specific hydromeorological challenge identified by SAHF and invite applications from institutions, private sector entities, and government agencies. The goal is to encourage the development of innovative, cost-effective technical solutions, which will be piloted to address the identified challenge.

<< The logical framework (see attachment 4) was shared as part of the summary note with the SAHF EC and WMO Hydrological Advisors >>

Regional Integrated Multi-Hazard Early Warning System
Program Unit/ Early Warning Facility
2nd Fl. Outreach Bldg., Asian Institute of Technology Campus, P.O. Box 4 Klong Luang, Pathumthani 12120, Thailand
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RPU/ SHAF /SEC/ 02/2025

To

Ms. Melanie Kappes
DRM Specialist
World Bank
1818 H Street, NW Washington, DC
United States

5th Februray, 2025

Subject: CREWS South Asia (SA) Proposal - Review, Feedback and Endorsement

I would like to inform that the SAHF Secretariat circulated a summary of the Climate Risk and Early Warning Systems (CREWS) Propsal for a regional project in South Asia to the following SAHF Executive Council (EC) Members and WMO Hydrological Advisers:

1. Mr. Mohammad Nasim Muradi, Afghanistan Meteorology Department (AMD)
2. Mr. Md. Momenul Islam, Director, Bangladesh Meteorology Department (BMD)
3. Mr. Karma Dupchu, Director National Center for Hydrology and Meteorology (NCHM) Bhutan
4. Mr. M. Mohapatra , Director General, India Meteorology Department (IMD)
5. Mr. Kamal Ram Joshi, Director General, Department of Hydrology and Meteorology (DHM), Nepal
6. Mr. Abdullah Wahid, Director General, Maldives Meteorological Services (MMS)
7. Mr. Kyaw MoE Oo, Director General, Department of Meteorolgy and Hydrology (DMH)
8. Mr. Sahibzad Khan, Director General, Pakistan Meteorology Department (PMD)
9. Mr. Athula K. Karunanayake, Department of Meteorology (DoM), Sri Lanka
10. Mr. Saiful Hossain, WMO Hydrology Adviser, Flood Forecasting and Warning Center (FFWC), Bangladesh
11. Eng. Sorriyabandara, WMO Hydrology Adivser, Department of Irrigation (DI), Sri Lanka

The summary included the detailed component description and the results framework (refer to annex), and was shared on January 15, 2025, with request for review, feedback and endorsement by January 29, 2025.

Following the circulation of the summary document, SAHF Secretariat received positive feedback from Mr. Ali Shareef (Maldives), Mr. Athula Karunake (Sri Lanka) and Mr. Nazim Muradi virtually. Mr. Kyaw MoE Oo (Myanmar) and Mr. Md. Momenul Islam (Bangladesh) sent formal letters of endorsement for the project proposal. In the absence of any objection, the proposal has been considered endorsed by the SAHF Secretariat.

A.R. Subbiah
Director General, RIMES

Attachment 8: Comment Matrix (synthesis of comments received from Experts nominated by CREWS Steering Committee Members)