Global Gateway

Space for Early Warning in Africa

Africa-EU Space Programme – Strengthening Early Warning in Africa (AESPP – SEWA)

Scoping Study – Early Warning and Impact-based Forecast initiatives across Africa

Volume II: Specification of Requirements

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Table of Contents

Introduction and Context

The Africa-EU Space Partnership Programme

The Africa-EU Space Partnership Programme (AESPP) aims to enhance strategic cooperation between African and European institutions and communities in using space-based technologies and services, focusing on Sub-Saharan Africa. It is embedded in the Global Gateway, which is the European Union's strategy to boost smart, clean, and secure connections in digital, energy, and transport sectors and strengthen health, education, and research systems across the world, under the leadership of the European Commission's Director-General for International Partnerships (DG INTPA).

The programme is structured around three key components:

- Component 1: EU–Africa Space Partnership: supporting institutional collaboration and decision-making processes.
- Component 2: Space and the Green Transition – Focus on Early Warning: developing space-based services, applications, and tools to strengthen Early Warning Systems for hazardous weather and climate-related events.
- Component 3: Space and the Private Sector: increasing the capacity and skills of the private sector, stimulating growth in the space industry, and expanding the data economy.

In response to Component 2, the "Space for Early Warning in Africa" (SEWA) Action was initiated in January 2025 and has a 4-year implementation period.

ECMWF activities under this Action will stimulate the use of ECMWF and Copernicus data, as well as other European-funded and African weather and impact-related data, with the aim of co-developing Impact-based Forecast (IbF) demonstration services and tools at the regional level in Africa with African partners. These tools are envisaged to be developed close to the data, using cloud computing and storage resources. Technical advice and co-designed train-the-trainer activities will further enhance actual uptake.

Central to these activities are the close partnerships between the national meteorological and hydrology services (NMHSs) and other topic specialists on early warning in Europe and the WMO's African Regional Climate Centres[1] (RCCs) and other Sub-Saharan African partners. Peer-to-peer collaborations between European and African entities should be stimulated in this manner. Close links with WMO and their Early Warnings for All (EW4All) initiative are to be established to maximise complementarity.

[1] The RCCs concerned include:

- African Centre for Meteorological Applications for Development (ACMAD): https://acmad.org
- IGAD Climate Predictions and Applications Centre (ICPAC): https://www.icpac.net
- Centre Climatique Régional pour l'Afrique de l'Ouest et le Sahel (AGRHYMET): https://agrhymet.cilss.int
- Centre d'Application et de Prévision Climatologique de l'Afrique centrale (CAPC-AC): https://capc-ac.net , and
- Southern African Development Community – Climate Services Centre (SADC-CSC): https://www.sadc.int/services-and-centres/climate-services-centre

The ECMWF activities will be implemented in close cooperation with the other two implementing partners, the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT) and the African Union Commission (AUC).

Outputs	Role EUMETSAT	Role ECMWF	Role AUC
2.1 Improved access, processing, applicability and use of data and services for Early Warning	**Shared**	**Shared**	Support
2.2 Established and operated African Meteorological Satellite Application Facility (AMSAF)	**EUMETSAT lead**	/	Support
2.3 Enable co-design and delivery of Impact Based Forecast services & tools	/	**ECMWF lead**	Support
2.4 Enhanced coordination with institutional framework and shared knowledge across regions	Support	Support	**AUC lead**
2.5 Strengthened human capacities, knowledge and community shaping	**Shared**	**Shared**	Support

Each partner holds specific responsibilities, which for ECMWF are focused on the following three expected Outputs:

- 2.1 Improved access, processing, applicability and use of data and services for Early Warning
- 2.3 Enable co-design and delivery of Impact-Based Forecast services & tools
- 2.5 Strengthened human capacities, knowledge and community shaping

As part of Output 2.3, an in-depth scoping study shall be conducted to map existing initiatives and data interfaces on early warning, collect user requirements, identify priorities and develop an action plan.

Early Warning for All

Around one-third of the global population lacks access to adequate multi-hazard early warning systems. The United Nations Early Warnings for All (EW4All, https://earlywarningsforall.org/) initiative aims to ensure universal access to weather warnings by 2027.

EW4All is constructed around the following four pillars, which underpin the development of successful Multi-Hazard Early Warning Systems (MHEWS):

- Pillar 1: Disaster risk knowledge
- Pillar 2: Detection, observation, monitoring, analysis and forecasting
- Pillar 3: Warning dissemination and communication
- Pillar 4: Preparedness and response capabilities

ECMWF strongly contributes to Pillar 2 by improving data quality and access, sharing data worldwide and enhancing forecasting capabilities, be it directly in its role as a WMO World Meteorological Centre, as computational centre for the Copernicus Emergency Management Service (CEMS) on behalf of the Joint Research Centre (JRC) or through new developments in

AI/ML and partnerships such as SEWA. A key development is the ECMWF Member and Co-operating States' commitment to transition to open access for ECMWF data, which is viewed as an important milestone in support of EW4All.

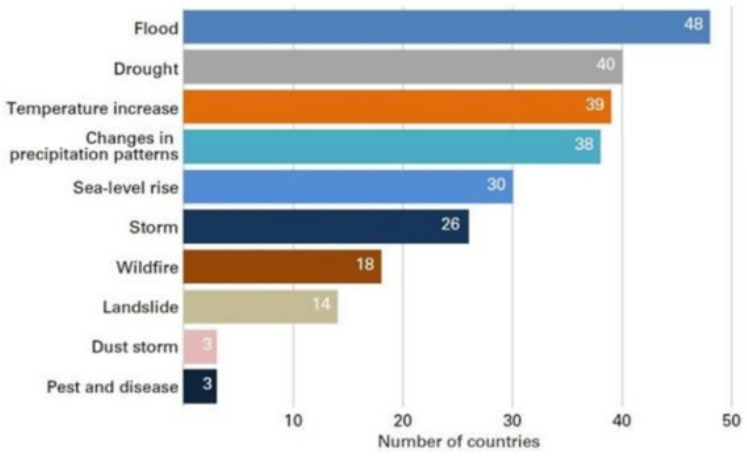
ECMWF's roadmap to open data

Since 2020, ECMWF has progressively expanded access to key forecast and reanalysis datasets under its open data policy: https://www.ecmwf.int/en/forecasts/datasets/open-data

In parallel, the Copernicus Climate and Atmosphere Services, operated by ECMWF, offer openly accessible data and tools that can be used to inform risk assessment, preparedness, and early action planning. These services are available through cloud-based platforms designed to facilitate seamless integration with regional systems.

Context in Africa

As highlighted by the WMO's recent press release of 2 September 2024[2] and the State of the Climate in Africa 2024 report[3], Africa is disproportionately affected by the impacts of climate change, with an increasing frequency and severity of severe weather events, such as droughts, floods and storms.



Hazards of greatest concern for the African region. This graph was generated by WMO using the NDCs of 53 countries in Africa based on the active NDCs submitted as of June 2024.

Effective Early Warning Systems (EWS) are essential for mitigating the impacts of such hazards. Yet, many African institutions face challenges in accessing, processing, and applying available weather information, including space-based data, for timely decision-making.

SEWA seeks to address these challenges in Sub-Saharan Africa by enhancing the capacity of African institutions to access, process, and use space-based meteorological and climate data, in particular.

[2] https://wmo.int/news/media-centre/africa-faces-disproportionate-burden-from-climate-change-and-adaptation-costs

[3] https://wmo.int/publication-series/state-of-climate-africa-2024

Contract Summary

This ITT covers the provision of a scoping study to assess the current landscape of early warning and Impact-based Forecast (IbF) initiatives across Africa. The scoping study is an essential precursor to the four regional IbF pilot demonstrators, focusing on West Africa, East Africa, Central Africa and Southern Africa.

While the regional pilots cover sub-Saharan Africa only, the scoping study shall include the entire African continent and the Indian Ocean Islands. These islands are not formally covered by one of the RCCs but are expected to be included in the Southern Africa regional pilot.

The study will identify existing initiatives, user needs, gaps and priorities to ensure a coherent and complementary approach to strengthening Early Warning systems for hazardous weather and climate-related events and to advance impact-based forecasts, demonstration tools and services across Africa as a continent, the four sub-Saharan regions and the Indian Ocean Islands.

Tenderers are expected to submit proposals that demonstrate their ability to deliver a high-quality study with analytical and strategic outputs founded on scientific and operational understanding and strong insights into weather and climate-induced hazards and impacts, critical aspects of space-based data value chains on early warning in Africa, and the roles of different parties, i.e. the African national meteorological and hydrology services (NMHSs). A solid overview of existing initiatives and data interfaces on the African continent is essential. Tenderers shall also explore the potential use of new digital developments, such as the use of Machine Learning/ Artificial Intelligence (ML/AI). Proposals will be evaluated based on the quality of the proposed methodology, the depth of documented expertise, and the ability to effectively respond to the contract requirements.

Scope of Work and Deliverables

The Contractor shall deliver a comprehensive scoping study. The study shall map the landscape of existing weather and climate-related early warning initiatives, collect user requirements, assess hazard priorities, and propose an action plan for regional Impact-based Forecasting (IbF) pilots. The study will also reflect on sustainability, ownership, and lessons learned from previous scoping study initiatives.

The Contractor is required to deliver the following components:

Work Package 0 (WP0): Management and coordination
Work Package 1 (WP1): Literature review and mapping of existing initiatives, data and interfaces
Work Package 2 (WP2): Stakeholder engagement and user requirements
Work Package 3 (WP3): Hazard and landscape assessment
Work Package 4 (WP4): Reflection on sustainability, ownership, and lessons from past initiatives
Work Package 5 (WP5): Action plan for regional pilots

Work Package 0 (WP0): Management and coordination

The Contractor shall guarantee effective contract management and will coordinate closely with ECMWF and a dedicated working group (WG SCOPING STUDY), composed of representatives from key SEWA stakeholders, including WMO.

ECMWF will facilitate coordination meetings, provide feedback on Deliverables, and ensure alignment with the SEWA programme's objectives and timeline. The Contractor is expected to maintain regular communication with ECMWF, participate in virtual check-ins and milestone reviews, and engage with the working group at key points throughout the contract.

The kick-off meeting will take place in person at the premises of ECMWF in Bonn during month 1. In months 2 to 5, short online review meetings shall be undertaken each month.

A final meeting shall be organised in month 6 in which the Contractor shall present the main outcomes. This meeting will be held in person for the contract team and ECMWF, with interested parties invited to attend online. The Contractor is expected to manage the logistics in coordination with ECMWF and each Tenderer shall propose a dedicated budget to it.

The Contractor shall submit a proposed coordination and delivery plan as part of their offer. This should include:

- A Gantt chart outlining the expected timeline and sequencing of Deliverables
- A proposed meeting schedule, including regular virtual coordination checkpoints
- Options for one or two in-person meetings at ECMWF's premises in Bonn, Germany (to be confirmed based on need and feasibility)

The plan should demonstrate how the Contractor intends to ensure efficient communication, timely delivery, and alignment with ECMWF and the broader SEWA governance structure. If not included in the lump sum, travel-related costs must be clearly itemised in the financial offer.

Contract management and coordination is expected to amount to no more than 7% of the planned use of the resources.

Communication and stakeholder outreach

Any external communication activity related to this contract must be agreed in advance with ECMWF.

A broad range of users and stakeholders shall be consulted. Stakeholder outreach planning, including externally facing text and graphical content, workshops and other events, shall be agreed upon with ECMWF.

Eventual communication and promotional activities, such as press and social media activities, shall be agreed upon with ECMWF.

No dedicated website is expected to be developed for this contract. ECMWF will publish Approved Deliverables on SEWA's webpage, which is currently under development.

All communication and user outreach activities shall be branded with logos and references to the European Union's Global Gateway initiative and ECMWF. Once complete, the agreed-upon activity would also need to be evaluated and reported upon.

Resource planning

The Tenderer shall include a detailed resource plan within their Tender that outlines:

- The proposed team structure, including key roles and responsibilities
- Allocation of person-days/effort per work package
- A skills matrix matching team members' expertise to specific Deliverables
- A distribution of effort across the project timeline
- Contingency planning for key personnel availability

The resource plan shall demonstrate how the Tenderer will ensure adequate coverage across:

- Key weather and climate hazards and their impacts
- Data interoperability, user interface and cloud infrastructure aspects
- Geographical coverage at the continental level as well as for the four African regions

The Tenderer shall identify any subcontractors and other third parties they intend to engage, specifying each of their contributions to the scoping study. Third parties are required to provide a letter of intent.

The Tenderer shall present a quality assurance plan to maintain consistent quality throughout the project duration and among eventual subcontractors. All Deliverables shall be quality-controlled by the Contractor before submission to ECMWF for verification and feedback.

Risk Management

In line with Clause 2.1.2.2. of the General Terms and Conditions, the Tenderer shall include a Risk Register that describes identified risks for the work packages and a mitigation strategy for each identified risk. This mitigation strategy shall comprise both preventative and corrective measures. The Contractor shall update the Risk Register regularly, and any updates shall be reported during the progress meetings.

Reporting

The Contractor is expected to produce short monthly updates (MS Word, sent by email) focused on the following aspects:

- Status of progress of activities, including eventual issues encountered and suggested mitigation actions.
- Overview of planning activities for the next 3 months
- Feedback on how the eventual requested needs from ECMWF and the WG SCOPING STUDY have been considered
- Update on the risk plan

- Any other important issues that might impact the progress or that are of interest to the parties

The updates shall be presented to ECMWF at the review meetings and shall be drafted in concise and clear English language, suitable for sharing with the European Commission.

The Contractor shall support ECMWF as well on eventual additional information requests in the scope of ECMWF's official reporting needs towards the European Commission, including information on progress as presented in the Logical Framework Matrix and the estimated financial value of work done.

At the end of the contract, the Contractor shall submit a Final Report in accordance with the requirements of Annex 4, 'Reporting,' of the General Terms and Conditions.

Work Package 1 (WP1): Literature review and mapping of existing initiatives, data and interfaces

The Contractor shall initiate the study with a combined literature review and mapping exercise to establish a comprehensive overview of existing Early Warning System (EWS) for hazardous weather and climate-related events and Impact-based Forecasting (IbF) initiatives, associated datasets, data interfaces, activities, and services across Africa, with a particular focus on monitoring and forecasting components (Pillar 2 of the EW4All framework), as aligned with the scope of SEWA.

Relevant background information with an initial list of essential stakeholders and initiatives is included in Annex 2.

This component will inform all subsequent stages of the scoping study.

The Contractor shall:

- **Conduct a focused literature review**, starting with the most recent publications, summarising key documents, frameworks, and practices related to EWS, IbF, hazard risk reduction, and space-based data applications for early action in Africa. This shall include an overview of studies focused on long-term trends and patterns in the climate system that can lead to increased frequency or intensity of weather hazards on the African continent.
- **Identify and catalogue relevant initiatives** at regional, continental, and international levels (e.g., AMHEWAS, CREWS, GMES & Africa, EW4All, RCC/RSMC platforms, Copernicus FPCUP, ClimSA, UNDRR and WMO/IFRU/ITU initiatives), including both weather and climate-induced hazards. This should also include key programmes funded by international funding institutions (e.g. the World Bank) and national development agencies (e.g. Norway, UK, Switzerland, Germany), especially where such initiatives contribute to early warning capacity, data access, or risk-informed services in Africa.
- **Data on weather and climate-induced hazards**: Map relevant key datasets and data types used across initiatives, including meteorological and EO-based data and their key characteristics with respect to spatial and temporal resolution. Data shall include all relevant ECMWF numerical weather prediction data products at medium, sub-seasonal and seasonal forecast ranges, EUMETSAT MTG data products and Nowcasting and Very

Short-Range Forecasting (NWC SAF) and other weather forecasting and regional climate model outputs, including those generated by Limited Area Models (LAM). It shall map relevant earth observation data as well, including Copernicus data as made available through CAMS (atmosphere), C3S (climate), CEMS (emergency), CLMS (land) and CMEMS (marine), as well as Copernicus' in-situ and space components.

- **Data on vulnerability and exposure on populations and settlements, farmland, water supply and key transport and energy infrastructure**: Map relevant key regional and national statistics and data, including details on accessibility, availability, quality, and resolution. Qualified proxies on vulnerability and exposure data shall be mapped as well as the applicability of Global and European initiatives such as JRC's Global Human Settlement Layer maps and the Exposure Mapping Component[4] of Copernicus Emergency Management Service[5].
- **Identify potential impact data sources** that could be used for developing and/or evaluating IbF systems. Sources might include, for example, records of impacts caused by past events, accessible insurance datasets, records of numbers affected during historical events. This is not an exhaustive list, and the Contractor should endeavour to establish the range of available options.
- Identify and describe **major data access interfaces** at continental and regional level, including existing web portals (e.g. East Africa Hazard Watch, https://eahazardswatch.icpac.net/mapviewer/) and cloud-based delivery mechanisms relevant to early warning applications. Map eventual further development needs, including (GIS-based) visualisation aspects.
- Where applicable, identify the **potential of post-processing methods** (e.g. machine learning or artificial intelligence techniques, ML/AI) as emerging data handling components, especially in contexts aligned with eventual further advancements in SEWA which will be elaborated with the Contractor.
- Overview on **existing training frameworks and curricula on space-based early warning tools,** including, amongst others, those funded by Copernicus, DG INTPA/ClimSA, WMO, IFRC, REAP, etc. Focus shall be put on learning material and training frameworks on topics including NWP, novel data driven weather forecast methods, climate and environmental monitoring data products and services and shall specify the covered training audiences and the languages in which the curricula are provided.

For each of the above-mentioned aspects, the Contractor shall document at a minimum:

- Type of study, tool or activity: e.g. data provision, decision-support tool, operational service.
- Maturity and technical readiness: categorised as operational, pre-operational, pilot, or experimental, including those linked to post-processing methods such as ML/AI
- Recency: date or period of most recent update or activity.

[4] Copernicus Exposure Mapping: with the Exposure Mapping Component, Copernicus delivers essential global information for understanding disaster risk with consistent open and free, accurate and high-resolution geospatial information about population and infrastructure. Information is updated every 2 years and the Global Human Settlement Layer offers a time series from 1975 to 2030 to assess changes in exposure like spatial expansion of cities and villages, and population dynamics. Exposure information, when combined with hazard and vulnerability data improves the understanding of disaster risk and enables the development of Early Warning Systems for All.
[5] Copernicus Emergency Management Service: https://emergency.copernicus.eu/

- Funding source and longevity outlook.
- Current project status: e.g., completed, underway, superseded. For completed projects, please document its legacy and the sustainability of implemented actions.
- Analyse how weather and space-based data is accessed, used, and shared within each initiative, with specific attention to linkages with ECMWF, EUMETSAT and AUC services. Identify opportunities for synergies, gaps in coverage and areas where SEWA partners can add value.

The Contractor shall deliver:

- A reference catalogue of reviewed documents and initiatives, with metadata (e.g., title, lead institution, year, source, access link if available);
- A data catalogue covering weather and climate hazards, exposure and vulnerability, and impact records that specifies the source, location and a brief overview of dataset content.
- A graphical map or interactive dashboard illustrating:
    - Relationships, overlaps and synergies between initiatives.
    - Gaps in existing early warning and IbF ecosystems.
    - Filtering options by region, initiative type, maturity level, funding source and more.
- A Synthesis Summary (maximum 10 pages) highlighting significant findings relevant to SEWA planning, including observed strengths, gaps and lessons learned.

Outputs should be designed to support strategic planning by ECMWF, EUMETSAT, AUC, DG INTPA, and the WG Scoping Study and allow easy future updates.

The scoping study shall cover immediate priorities to be addressed during the lifetime of SEWA, as well as longer-term gaps and opportunities to inform potential follow-up actions beyond the current programme phase.

Work Package 2 (WP2): Stakeholder engagement and user requirements

The Contractor shall engage with key stakeholders to gather user requirements, document operational contexts and assess readiness for regional Impact-based Forecasting (IbF) pilots.

The four regional pilots shall focus on the ‘upstream’ aspect of Space-based IbFs only. Further ‘downstream’ aspects, including the effective establishment of communications with national and local communities, are not part of the indicative activities, nor shall the pilots cover the actual tasks linked to issuing early warnings. Stakeholder engagement and user requirements shall take this into account. However, any recommendations from the scoping should still consider that IbF pilots would benefit from being compatible with local processes, for example, forecasting and warning, and with the capacity of African RCCs, RSMCs as well as NMHSs to implement them.

Stakeholder engagement shall include:

- Structured interviews, focus groups, and/or workshops with AfSA, AUC, African RCCs, RSMCs, selected African and European NMHSs, ECMWF, EUMETSAT, EUMETNET, the European Commission (INTPA and JRC), IOC, UNDRR, WMO and WMO AMCOMET and other relevant actors. As a general guideline for engagements in Africa, the Contractor is expected to engage with a minimum of 3 key institutions at the continental level and 5 key institutions per region, ensuring both regional and thematic diversity. Tenderers are encouraged to demonstrate the rationale behind their stakeholder engagement plan – who they intend to consult, why those actors are strategically relevant, and how the engagement will contribute to meaningful regional insights. It will also be beneficial for them to outline their strategy for facilitating communication across different languages (incl. English, French and Portuguese), should this be necessary. The final number and format of engagements may be adapted in consultation with ECMWF, based on availability and context.
- The Contractor is stimulated to organise workshops in person in the four regions, ideally back-to-back with other planned meetings and conferences. Workshops shall be focused on a maximum of 12 experts from the relevant RCC and RSMC, selected NMHSs, and other stakeholders in the region. A small travel budget shall be foreseen to enable experts to join, if needed.
- Consultation with stakeholders from different regions shall ensure diversity of operational environments, institutional capacities, and investment contexts.

User requirements collection and assessment shall include:

- Requirements on weather and climate data, data on vulnerability and exposure, user interfaces, cloud infrastructure, post-processing activities (including ML/AI) and training and capacity building. This shall consist of technical specifications and details on parameters;
- Information on existing numerical weather prediction capabilities in place and their concrete use;
- Information on the users themselves, including the type of user and specific reasons for needs;
- Needs related to capacity building, including the absorption capacity of RCCs and other African stakeholders. This shall include needs on technical training, learning curricula and knowledge transfer, including eventual specific language needs;
- Any existing warning protocols, processes or constraints that a new IbF service would benefit from being compatible with or could support/complement;
- Recorded in a table and grouped into categories, which is easy to maintain and extend, as needed.

The Contractor shall also document:

- Regional differences in operational capabilities, priorities, operational contexts and investments, with a focus on understanding context-specific strengths and needs, rather than making competitive comparisons;
- Key challenges to successful IbF implementation, including technical, institutional and policy-related barriers, to help inform prioritisation;
- Stakeholder expectations regarding the benefits and sustainability of regional IbF pilots.

The Contractor shall deliver:

- A stakeholder influence vs priority matrix, plotting:
    - Y-axis: level of influence or role in the Early Warning System chain;
    - X-axis: priority of relevance for engagement in IbF pilot development

This matrix should:

- Be supported by a short justification of each stakeholder or group of stakeholder's allocated position;
- Support strategic planning and internal coordination among SEWA partners;
- Highlight areas where early engagement can maximise pilot success and sustainability;
- Emphasis that all stakeholders are essential partners, with engagement strategies tailored to their specific context, priorities and capacities;
- Avoid framing stakeholders or regions in a way that could be perceived as devaluing their contributions or needs;
- Identify high-priority, high-influence actors for focused engagement;
- Highlight where efforts to minimise barriers (challenges) and maximise the expected usefulness of IbF interventions can have the most significant impact.

In addition, the Contractor is invited to propose simple visual summaries (e.g. quadrant charts) that illustrate:

- Areas where challenges are minimised and the potential impact of IbF pilots is maximised;
- Areas where challenges may require higher investment or risk mitigation to achieve successful outcomes.

Work Package 3 (WP3): Hazard and impact landscape assessment

The Contractor shall assess weather and climate-induced hazards and impacts, primarily focusing on the following:

WMO EW4All priority hazards	Other 'Space' relevant hazards
flash floods	wildfires/smoke
drought/dry spells	dust storms
riverine floods	
tropical cyclones	
thunderstorms	
heatwaves	

While emphasis is placed on individual hazards, cascading or compound (multi-hazard) effects may also be considered where relevant to early warning. It is also important that impacts are considered, as these are the most important factor in EWSs and may not necessarily be linearly correlated with pure hazard magnitude.

Hazards at both weather and climate scales shall be assessed. Hazards' impacts may occur on different timescales, such as a seasonal timescale (e.g. heatwaves), a monthly timescale (e.g. droughts or dry spells), a weekly timescale (tropical cyclones), a daily timescale

(thunderstorms), or a short notice/nowcast timescale (flash floods). Hazards may also arise as risks linked to atmospheric composition (e.g. wildfires, smoke and dust). This shall be considered throughout the assessment.

The assessment shall be carried out for each of the four regions (West Africa, East Africa, Central Africa, and Southern Africa, including the Indian Ocean Islands) and at the continental level to identify cross-cutting issues and opportunities for coordination:

- Identify and prioritise hazards based on impact, prevalence, relevance and stakeholder interest/impact;
- Propose up to three focus hazards per region, ensuring diversity across regions where possible. Proposals should be based on objective criteria such as hazard frequency, severity, societal impact and stakeholder-reported priorities. The Contractor shall explain the basis for the selection, using available data and qualitative input gathered during the stakeholder engagement;
- Each regional assessment should include a short illustrative 'impactful storyline' (maximum one page) describing how a selected hazard played out in the region. These storylines should be grounded in stakeholder input from Work Package 2 and should highlight how improved data, forecasts, or coordination could have changed the outcome. Where relevant, the storyline may reflect cascading or compound hazards to illustrate the added value of integrated early warning approaches;
- The assessment at the continental level shall include anticipated long-term trends and patterns in the climate system that can lead to increased frequency or intensity of weather hazards and impacts.

Work Package 4 (WP4): Reflection on sustainability, ownership, and lessons from past initiatives

As part of the final report and action plan, the Contractor shall include a short reflective (stand-alone) chapter that addresses:

- Sustainability pathways: realistic options for how the pilots and their enabling systems (data flows, tools, training, cloud infrastructure) could be maintained beyond the SEWA funding period, including local hosting, governance models, or open-source approaches.
- Assessment of cloud infrastructure use: including opportunities, bottlenecks, and regional needs related to accessing and scaling cloud-based platforms (e.g. ECMWF's CCI-EWC), to inform future sustainability and operational planning.
- Technical capacity building needs, including training at regional level and knowledge transfer within the regions at national level.
- Suggest pathways to ownership: ways in which African institutions (RCCs, RSMCs, AUC) can retain control over tool development, data usage, and narrative framing to ensure the initiative builds toward long-term autonomy, not dependency.
- Reflection on enhancing RCCs' capacity as regional centres of excellence on weather and climate induced hazards assessments, the use of data interfaces and digital tools for postprocessing such as ML/AI.
- Review of prior efforts: a brief, respectful review of previous EU-funded or international efforts in the same space, identifying both successes and known limitations, particularly where sustainability, uptake, or resource use fell short.

- Provide risk and sensitivity analysis: with recommendations for navigating the political and institutional sensitivities surrounding past experiences, local perceptions of externally funded initiatives, and the need to build trust, transparency, and co-development into the next phase. The views of the AUC should be considered explicitly in this long-term framing.

Work Package 5 (WP5): Action plan for regional pilots

Based on the collected information and findings from the earlier components, the Contractor shall propose an action plan for each of the four regions (West Africa, East Africa, Central Africa and Southern Africa (incl. Indian Ocean islands)). The plan shall outline priority activities for establishing regional IbF demonstrators during the SEWA implementation phase and identify complementary actions that may be considered for follow-up or scale-up.

The action plan should make clear distinctions between different components of demonstrator development and deployment, including:

- Technical developments (e.g. tools, data processing workflows)
- Documentation and reproducibility of methods
- Cloud infrastructure usage and integration (e.g. CCI-EWC)
- Training and knowledge transfer activities
- Optional: potential future use of ML/ AI for forecast post-processing or service customisation

For each region, the Contractor shall address the following (but not limited to):

- Priority hazards
- Data and information on exposure and vulnerability
- Key data interfaces and visualisation tools
- Training and capacity building needs
- Critical gaps to address
- Challenges to address (e.g. institutional, technical, policy-related)
- Potential timeline and sequencing of key activities

Presentation idea: the Contractor is encouraged to propose a visual summary, such as a heatmap or quadrant chart, for each region showing regional readiness versus need. This should reflect both the current level of maturity (e.g. data, capacity, institutional engagement) and the strategic value or urgency of investment. Where relevant, multi-hazard or cascading risk contexts may also be visually represented.

Timeline of the contract and expected Deliverables

The contract is expected to be initiated in the second half of 2025, with a Term of a maximum of 6 months. The Contractor is expected to organise and implement tasks in parallel to accommodate this timeline.

Timings

Phase	Activities	Timing

Phase 1: Kick-off and Inception	Contract signature, Kick-off meeting with ECMWF, Work plan refinement. Submission of initial Stakeholder Engagement Plan outlining proposed institutions, formats, and rationale for each region.	Month 1
Phase 2: Stakeholder Mapping and Contacting	Identify and schedule stakeholders across four regions	Months 1–2
Phase 3: Stakeholder Consultations and Data Collection	Interviews, workshops, literature and initiative mapping	Months 2–3
Phase 4: Analysis and Visualisation	Hazard prioritisation, mapping initiatives, visual outputs (maps, matrices, storylines)	Months 3–5
Phase 5: Drafting Report and Action Plan (*)	Draft scoping study, draft action plan for IbF pilots	Month 4-5
Phase 6: Review and Feedback Integration	WG SCOPING STUDY review rounds, feedback from AUC, DG INTPA	Month 5-6
Phase 7: Finalisation and Delivery	Final report submission, annexes, visual products	Months 6

(*) The Contractor shall plan activities so that the draft version of the action plan is presented to ECMWF before the end of month 4.

Tenderers shall consider the following obligatory Deliverables. All Deliverables shall be quality-controlled before submission to ECMWF for review and approval. Specific deadlines shall be proposed in the Tender.

1. **Stakeholder Engagement Plan**

   - Submitted during the inception phase (month 1)
   - Includes proposed stakeholders (by region), engagement formats, rationale, and timeline
   - Validated with ECMWF, upon consultation with WG SCOPING STUDY

2. **Reference Catalogue of Reviewed Initiatives and Documents**

   - Metadata for each entry (title, lead institution, year, source, link if available)
   - Includes initiatives, tools, data sources, and interfaces

3. **Synthesis Summary of Literature Review and Mapping**

   - Maximum 10 pages
   - Highlights key findings, strengths, gaps, and lessons relevant to SEWA

4. **User Requirements Database (URDB)**

   - Presented as an MS Excel table
   - Sorted and grouped in pre-defined categories with information on information on the users (type of user, sector, location), technical details on user requirements (incl. parameters, data characteristics, etc.) and metadata about the collection process
   - Easy to maintain and extend.

5. **Data catalogue**
   - covering weather and climate hazards, exposure and vulnerability, and impact records that specify the source, location, and a brief overview of dataset content.

6. **Interactive Map or Dashboard**

   - Shows initiative, relationships, gaps, and overlaps
   - Includes filters (region, initiative type, maturity, funding, etc.)
   - Must be designed for future updates (non-technical, lightweight)

7. **Stakeholder Influence vs Priority Matrix**

   - Y-axis: influence/role in EWS
   - X-axis: relevance for IbF pilot engagement
   - Supports strategic coordination and early engagement planning

8. **Narrative Storylines (1 per region)**

   - Maximum 1 page each
   - Real example of a severe weather event + how IbF could have helped
   - Informed by stakeholder input

9. **Hazard Prioritisation Summary**

   - Objective justification for up to three hazards per region
   - Includes prevalence, impact, and stakeholder interest

10. **Regional Action Plans (1 per region)**

    - Draft version by end of month 4, final version by the end of the Term of the contract.
    - Outlines priorities for pilot demonstrators
    - Includes hazards, data interfaces, gaps, challenges and timeline
    - Differentiates:

      - Technical developments
      - Documentation
      - Cloud integration
      - Training
      - (Future) ML/AI applications

11. **Visual Summaries (1 per region)**

    - Heatmap, quadrant chart, or equivalent
    - Shows regional readiness vs need
    - Optionally visualises cascading risks or multi-hazard issues

12. **Reflection Chapter**

- Covers:

    - Sustainability pathways
    - Cloud infrastructure assessment
    - Ownership mechanisms
    - Lessons from past initiatives
    - Risk and sensitivity analysis, including AUC view

13. **Final Report (with annexes and visual outputs)**

    - Integrated synthesis of all components

14. **Risk Register**
    - Updated on a monthly basis

Optional Deliverables

1. **Downloadable Database (CSV or Excel)**

    - Derived from the interactive map/dashboard
    - Allows filtered exports of initiatives

2. **Update Mechanism for Map/Dashboard**

    - Editable spreadsheet or similar low-tech solution

3. **Additional Visuals**

    - E.g. quadrant charts for IbF challenges vs impact potential
    - Visual summaries of hazard overlaps or exposure hotspots

Annex 1: Optional guidance for visual map / dashboard output

To support strategic planning and facilitate future updates, Tenderers are invited (but not required) to consider the following usability features in the design of the interactive map or dashboard:

Suggested Filters:

- Geographic coverage: region, country, basin
- Type of initiative: data provision, decision-support tool, operational service, policy framework, training programme
- Maturity level: operational, pre-operational, pilot, experimental
- Recency: last updated (year or timeframe)
- Funding source: EU, AU, bilateral, multilateral, other
- Longevity outlook: high/medium/low sustainability beyond initial funding
- Status: completed, ongoing, superseded

Suggested Metadata Fields for Each Initiative:

- Initiative name
- Lead institution(s)
- Summary description (maximum 250 words)
- Geographic scope
- Data interfaces/tools involved
- Role of ECMWF, EUMETSAT, AUC, RCCs and RSCMs (if applicable)
- Links to further information (websites, reports)

Suggested Visual Features:

- Network view: showing connections, overlaps, and synergies between initiatives
- Heatmaps or thematic overlays: highlighting areas of high activity or significant gaps
- Downloadable database: enabling users to extract filtered lists (e.g., in CSV or Excel)
- Simple update mechanism: designed so that ECMWF or partners can add new entries without specialist technical skills (e.g., via an editable spreadsheet linked to the dashboard)

Design Principles:

- Keep visualisations clear, lightweight, and user-friendly
- Prioritise strategic decision-making needs (not excessive technical detail)
- Focus on accessibility for AUC and RCC users with limited bandwidth or IT capacity

Annex 2: Relevant Background Information

While it is the objective of the Contractor to make a comprehensive overview of existing initiatives, the following includes an initial list of essential stakeholders and initiatives as an illustration of the expected scope.

Essential African stakeholders to consult

Amongst others, close consultations with the African Union Commission's Africa Multi-Hazard Early Warning System (AMHEWAS) situation room, WMO's African Regional Climate Centres (RCCs), Regional Specialised Meteorological Centres (RSMCs), and the African Ministerial Conference on Meteorology (AMCOMET) are essential. Links with the Indian Ocean Commission (IOC) and selected African National Meteorology and Hydrology Services (NMHS) shall be established as well.

The above mentioned African Regional Climate Centres (RCCs) to consult include:

- African Centre for Meteorological Applications for Development (ACMAD): https://acmad.org
- IGAD Climate Predictions and Applications Centre (ICPAC): https://www.icpac.net
- Centre Climatique Régional pour l'Afrique de l'Ouest et le Sahel (AGRHYMET): https://agrhymet.cilss.int
- Centre d'Application et de Prévision Climatologique de l'Afrique centrale (CAPC-AC): https://capc-ac.net , and
- Southern African Development Community – Climate Services Centre (SADC-CSC): https://www.sadc.int/services-and-centres/climate-services-centre

The mandate of these organisations covers both meteorology and climate. They are not only recognised by WMO as RCCs but also have a role supporting the African Regional Economic Communities (RECs) on meteorology-related tasks.

Initial overview of initiatives to consider

WMO's Africa Development Partner Coordination Mechanism (APCM) for Weather, Water and Climate Services provides a platform for the systematic exchange of project and programme information. The 2022 dashboard provides a good overview of ongoing and closed projects of relevance to EW4All: https://community.wmo.int/en/activity-areas/apcm

In terms of funding sources, priority shall be given to international, European and (European) national initiatives:

- International:
    - Climate Risk and Early Warning Systems (CREWS) initiative;
    - International Financial Institutions such as the World Bank/Adaptation Fund, the African Development Bank, the Nordic Development Fund, European Investment Bank, etc.;
    - Charities such as the Wellcome Trust and Rockefeller Foundation;
    - Other activities under the EW4All umbrella, including the International Federation of Red Cross and Red Crescent Societies (IFRC) and the International Telecommunication Union (ITU);

        - Etc.

- EU-funded programmes and initiatives:
    - GMES & Africa;
    - ClimSA;
    - Copernicus Services CAMS (atmosphere), CLMS (land), CEMS (emergency) and C3S (climate) and Copernicus FPCUP (Framework Partnership Agreement on Copernicus User Uptake);
    - AMESD;
    - PUMA;
    - MESA;
    - Horizon 2020 and Horizon Europe projects;
    - Etc.

- Bilateral and national activities:
    - National development funds, incl. for example GIZ, AFD, FCDO-UK, Norad, FINNIDA, etc.;
    - WISER Africa;
    - SWIFT;
    - Etc.

Glossary

Term / Acronym	Definition
AESPP	Africa-EU Space Partnership Programme
AfSA	African Space Agency
AUC	African Union Commission
AU	African Union
AMCOMET	African Ministerial Conference on Meteorology
AMHEWAS	African Multi-Hazard Early Warning and Early Action System
CCI-EWC	Common Cloud Infrastructure for the Early Warning Component
CAMS	Copernicus Atmosphere Monitoring Service
CEMS	Copernicus Emergency Management Service
CLMS	Copernicus Land Monitoring Service
C3S	Copernicus Climate Change Service
ClimSA	Intra-ACP Climate Services and Related Applications Programme
CREWS	Climate Risk and Early Warning Systems Initiative
DG INTPA	Directorate-General for International Partnerships (European Commission)
DoA	Description of Action (official project definition document)
ECMWF	European Centre for Medium-Range Weather Forecasts
EO	Earth Observation
EUMETNET	Network of European Meteorological Services
EUMETSAT	European Organisation for the Exploitation of Meteorological Satellites
EW4All	Early Warnings for All (global UN initiative)
EWS	Early Warning System
IOC	Indian Ocean Commission
FPCUP	Copernicus Framework Partnership Agreement and Participating States' Contribution
GMES & Africa	Global Monitoring for Environment and Security & Africa Programme
IbF	Impact-based Forecasting
IFRC	International Federation of Red Cross and Red Crescent Societies
IFRU	Infrastructure and Facilities Resilience Unit (WMO)
ITU	International Telecommunication Union
ML/AI	Machine Learning / Artificial Intelligence
NMHS	National Meteorological and Hydrological Service
REAP	Risk-informed Early Action Partnership
RCC	Regional Climate Centre
RSMC	Regional Specialised Meteorological Centre
SEWA	Space for Early Warning in Africa (EU-funded Action)
UNDRR	United Nations Office for Disaster Risk Reduction
WIS	WMO Information System
WMO	World Meteorological Organization
WG SCOPING STUDY	Working Group on the SEWA Scoping Study, providing strategic guidance and review