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SASCOF-CSUF WEEK

Pre-COF Hands-On Training Workshop
34th Session of the South Asian Climate Outlook Forum (SASCOF-34)
Climate Services User Forum (CSUF)

25-30 April 2026 | Malé, Maldives

SUMMARY REPORT

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EXECUTIVE SUMMARY

The SASCOF–CSUF Week was convened in Malé, Maldives from 25–30 April 2026 to strengthen regional coherence, technical capacity, and producer–user engagement for climate services in South Asia. The week brought together the following activities:

- Pre-COF Training – 25-27 April 2026
- SAHF Climate Services Working Group Meeting – 26-27 April 2026
- SASCOF-34 – 28 April 2026
- Climate Services User Forum – 29-30 April 2026

The activities were co-organized by RIMES, RCC-Pune/IMD, UK Met Office, and Maldives Meteorological Service, with support from the UK Government through FCDO, WISER Asia Pacific. The week-long activities were organized in response to the accelerating climate variability and extreme events in South Asia, including erratic monsoon onset, prolonged dry spells, extreme rainfall, heatwaves, compound flood–landslide events, and severe cyclonic activity, all of which affect agriculture, water security, food systems, public health, infrastructure, and national economies.

The week broadly achieved its intended objectives and expected outcomes. The Pre-COF Training strengthened NMHS technical capacity in seasonal forecasting, ENSO monitoring, climate model data preparation, XCast, ESCAP impact analysis tools, FOCUS X, impact-based forecasting, co-production, and sector-specific advisory development. The evaluation confirmed knowledge gains across all seven assessed areas, with the overall self-assessed average rising from 3.18 to 3.69. The largest gains were in XCast model evaluation (+33%) and impact-based forecasting and risk-informed advisories (+26%), confirming that the training addressed genuine capacity needs. Participant satisfaction was high, with an overall agreement score of 4.46 out of 5, and 92% of respondents agreeing or strongly agreeing that the training was useful, well organized, and likely to be applied and shared within their organizations.

The SAHF Climate Services Working Group (CS WG) Meeting provided the institutional bridge between technical capacity development and long-term regional implementation. The meeting reviewed and validated the regional and national climate services assessment findings, discussed the Training Needs Assessment and Training Plan, reviewed the DSS Catalogue and SKHub Communities of Practice Discussion Board, examined proposed enhancements to FOCUS X, and reviewed the CS WG Work Plan through the lens of WMO guidance on Regional Frameworks for Climate Services. The meeting concluded that South Asia has strong foundations for advancing climate services, including SASCOF, CSUF, RCC-Pune, SAHF, national climate outlook forums, regional tools, and active NMHS engagement. However, it also identified common constraints, including uneven observation coverage, data quality and interoperability gaps, limited downscaling and verification capacity, weak translation of climate information into localized and sector-specific advisories, and insufficient mechanisms to track uptake and impact. Overall, the CS WG meeting substantially achieved its objectives by validating key outputs, identifying additional work plan priorities, and agreeing that the work plan should be refined with clearer sequencing, dependencies, technical providers, coordination links, and funding or delivery mechanisms.

SASCOF-34 achieved its core purpose of producing the regional consensus seasonal climate outlook for the JJAS 2026 season, providing a consistent basis for national-level outlook preparation. The consensus outlook indicated below-normal rainfall over many parts of South Asia, particularly central areas, while selected northwestern, northeastern, and southern/eastern areas may experience normal to above-normal rainfall. Above-normal maximum and minimum temperatures were expected over most of the region, with likely El Niño development identified as a key climate driver and possible positive IOD development later in the season. The Forum reinforced the role of SASCOF as the technical platform for regional seasonal outlook generation and as a foundation for national outlooks and user-sector interpretation.

The CSUF strengthened the user-facing side of the climate services value chain by supporting interpretation, communication, and application of the SASCOF outlook among sectoral users. Sessions covered outlook interpretation, impact-based analysis, S2S forecast products, heat-health initiatives, long-term climate projections, climate services decision-making, and sectoral case studies from disaster management, agriculture, transport, humanitarian action, and health. The evaluation showed a 25% increase in overall self-assessed knowledge, rising from 3.25 to 4.06. The largest gains were in the application of climate services in decision-making (+30%) and use of long-term climate projections for infrastructure planning and adaptation (+28%). Participants rated the forum positively, with an overall agreement score of 4.39 out of 5, and 91% agreeing or strongly agreeing that the forum was useful and well organized, meeting the project indicator of more than 90% of participants finding the training useful.

Key outcomes from the week included:

- strengthened producer technical capacity;
- production of the SASCOF-34 seasonal outlook;
- validation of regional and national climate services assessment findings;
- refinement of CS WG priorities;
- improved familiarity with tools such as XCast, ESCAP impact analysis tools, FOCUS X, and the DSS Catalogue;
- strengthened understanding among user sectors of seasonal outlooks, S2S products, heat-health risks, climate projections, and impact-based advisories; and
- clearer recognition that climate services must be co-produced, sector-specific, and tied to decisions, thresholds, exposure, vulnerability, communication channels, and feedback loops.

Next Steps

The next phase should focus on consolidating and operationalizing the gains from the week. For the Pre-COF Training, future iterations should be extended or sequenced to allow more time for hands-on practice, troubleshooting, and country-specific forecast preparation. Step-by-step guides, pre-reading materials, complete training repositories, and follow-up online sessions should be prepared, particularly for XCast, IBF tools, FOCUS X, and forecast verification.

For the SAHF Climate Services Working Group, the updated work plan should integrate the additional priorities identified during the meeting, distinguish activities already covered from

those needing clearer wording or new inclusion, and add indicative timelines, sequencing, dependencies, potential technical providers, and funding or delivery mechanisms. The work plan should also strengthen links with other SAHF working groups, particularly IBF, to avoid duplication and identify joint implementation areas on data systems, impact-based services, capacity development, and user engagement. The updated work plan should be shared online for further review, followed by a virtual CS WG meeting to finalize inputs and support endorsement of related outputs, including the Training Plan.

For SASCOF and CSUF, future cycles should further strengthen the link between regional outlook production and sectoral application. CSUF should become more outcome-oriented, with clearer pre-season identification of sector concerns, structured translation of SASCOF outlooks into sector-relevant guidance, links with NCOFs, short in-season virtual reviews, and documentation of user decisions, gaps, and lessons. Each country may identify one NMHS focal point and at least one user-sector focal point, initially focused on one or two priority sectors, to sustain engagement beyond the Forum.

Future CSUF sessions should also respond to participant feedback by using more interactive formats, structured breakout groups, country-level use cases, and joint NMHS–sector exercises. Broader participation should be sought from agriculture, health, water, disaster risk reduction, transport, tourism, urban planning, humanitarian action, and other climate-sensitive sectors. A 3–6 month follow-up survey should be conducted, drawing on the 83% Pre-COF and 77% CSUF participant consent rates, to assess how tools, training content, and forum outputs are being applied within national institutions.

INTRODUCTION

South Asia continues to experience accelerating climate variability and extreme events, with the summer monsoon season (June–September) increasingly characterized by erratic onset, prolonged dry spells, short-duration extreme rainfall, heatwaves preceding monsoon onset, and compound flood–landslide events. In recent years, the region has witnessed record-breaking temperatures exceeding 50°C in parts of South Asia, deadly pre-monsoon heatwaves affecting millions, catastrophic flooding in Nepal and Pakistan triggered by intense rainfall episodes, and severe cyclonic activity in the Bay of Bengal impacting Bangladesh, India, and Sri Lanka. These events have underscored the growing volatility of monsoon behavior and its cascading impacts on agriculture, water security, food systems, public health, infrastructure, and national economies.

With nearly 70–80% of annual rainfall occurring during the summer monsoon in many South Asian countries, even modest deviations in timing, spatial distribution, or intensity can translate into significant socioeconomic consequences. With high population density, climate-sensitive livelihoods, and persistent vulnerability in several countries, there is a critical need for credible, consensus-based, regionally coordinated seasonal outlooks that can inform national planning, anticipatory action, and sector-specific preparedness measures. The South Asian Climate Outlook Forum (SASCOF) serves as a cornerstone regional mechanism to generate these consensus outlooks, ensuring scientific coherence across National Meteorological and Hydrological Services (NMHSs) and facilitating structured dialogue with user sectors through the Climate Services User Forum (CSUF).

In parallel, the Weather and Climate Information Services (WISER) Asia Pacific programme is supporting transformational improvements in the production, accessibility, and use of weather and climate information services across the region. Under this framework, the South Asia Hydromet Forum (SAHF) Climate Services Working Group (CS WG) is being strengthened in its implementation of its work plan towards enhancing regional coordination, building producer and user capacities, improving decision-support systems, and institutionalizing co-production mechanisms. The project aims to strengthen the coherence, effectiveness, and sustainability of climate services in South Asia by improving technical capacity, strengthening producer–user engagement, and aligning regional platforms with national and global frameworks for climate services.

Support to SASCOF and CSUF is central to achieving these objectives. SASCOF provides the technical platform for generating consensus seasonal outlooks, while CSUF ensures that these outlooks are interpreted, translated, and applied in sectoral decision-making contexts. However, recent assessments and the Training Needs Assessment (TNA) conducted under the SAHF CS WG project have identified critical gaps: varying levels of technical capacity in seasonal forecasting and probabilistic interpretation among NMHSs; limited integration of sub-seasonal and longer-term climate information; uneven understanding among user sectors of forecast uncertainty and application; and insufficient institutional feedback mechanisms between producers and users.

By embedding targeted pre-COF training for forecasters, structured CS WG deliberations, and sector-specific training for users alongside SASCOF and CSUF, the WISER AP-supported

initiative ensures that seasonal outlook generation is technically robust, regionally harmonized, and practically usable. This integrated approach strengthens both sides of the climate services value chain—enhancing the scientific quality of outlooks and increasing their uptake in agriculture, water management, disaster risk reduction, health, and other climate-sensitive sectors.

ACTIVITY OVERVIEW AND OBJECTIVES

The week-long Climate Services activities was held on 25-30 April 2026 in Male, Maldives. Co-organized by the Regional Integrated Multi-Hazard Early Warning System for Asia and Africa (RIMES), Regional Climate Center (RCC)-Pune of India Meteorological Department (IMD), UK Met Office (UKMO), and the Maldives Meteorological Service (MMS), it aimed to strengthen regional coherence, technical capacity, and user engagement across South Asia by integrating targeted pre-COF Training, SAHF CS WG meeting, SASCOF, and CSUF.

It specifically aimed to:

a. Enhance technical capacity of seasonal forecasters through targeted pre-COF training informed by the TNA.
b. Review progress and strategic direction of the SAHF CS WG, including assessment findings and training plan implementation.
c. Develop a consensus seasonal outlook through SASCOF, supporting national climate outlook preparation.
d. Strengthen interpretation and application of seasonal outlooks among user sectors through tailored training and CSUF dialogue.
e. Promote inclusive, GEDSI-response climate services and strengthen feedback loops between producers and users.

HIGHLIGHTS OF THE DISCUSSIONS

I. Pre-COF Hands-On Training Workshop

A. Technical Forecasting and Modelling Capacities

i. Basics of Seasonal Forecast

Dr. O.P. Srijith, RCC-Pune / IMD

The presentation introduced the scientific basis, methods, and operational relevance of seasonal forecasting, with emphasis on South Asian monsoon prediction. Dr. Srijith explained the evolution of seasonal forecasting from empirical approaches, which rely on statistical relationships between climate drivers and rainfall, toward dynamical and multi-model ensemble prediction systems. The presentation highlighted the role of large-scale climate drivers, particularly ENSO, in influencing monsoon rainfall, while also noting that climate change is affecting the stability of historical teleconnections and therefore the interpretation of seasonal outlooks. The presentation also introduced the shift toward objective seasonal forecast generation using calibrated climate model outputs and Python-based forecasting tools.

Key Insights

- Seasonal forecasts provide probabilistic guidance for the coming season and are most useful for preparedness, planning, and anticipatory action rather than exact prediction of daily weather conditions.
- ENSO remains one of the most important climate drivers influencing monsoon rainfall, but its impacts are not uniform across South Asia and must be interpreted together with other drivers.
- Seasonal forecasting has evolved from empirical methods toward dynamical climate model outputs and multi-model ensemble approaches.
- Multi-model ensemble systems improve forecast reliability by combining outputs from different climate models, but model selection should consider skill over the target region.
- Forecast interpretation should account for uncertainty, model limitations, and changing teleconnections under a warming climate.
- Python-based forecasting tools, including XCast, have enabled more efficient processing of high-resolution climate datasets and support deterministic and probabilistic forecast generation.

Open Discussion Summary

The discussion emphasized the need for practical hands-on training to complement the theoretical session. Dr. Sreejith noted that participants would need additional time to apply the forecasting concepts using XCast and to prepare country-specific seasonal outlooks. The session also reinforced that forecast products should be interpreted with meteorological expertise, rather than relying only on automated model outputs.

ii. Introduction to Python Programming and Hands-on Session

Khan MD Golam Rabbani, Nazmul Ahasan & Rajkumar Rai, RIMES

The hands-on Python session introduced participants to the software environment required for climate data processing and seasonal forecast generation. The session covered installation of Anaconda, Python environment setup, package installation, and basic configuration steps needed to run XCast and related climate data scripts. Participants were guided through operating system-specific installation steps, particularly for Windows and Linux users, including use of Windows Subsystem for Linux (WSL)/Ubuntu, Anaconda, Notepad++, and Python package management. The session provided the foundation for subsequent exercises on downloading, processing, and evaluating climate model data.

Key Insights

- Python is a core tool for modern seasonal forecasting workflows because it supports data handling, visualization, statistical analysis, and model evaluation.
- Installation of WSL/Ubuntu is recommended for Windows users to support Linux-based climate data processing commands and tools.
- The XCast environment requires compatible Python versions, with Python 3.9–3.11 recommended due to compatibility issues with newer versions.
- IP kernel installation is needed to connect the XCast environment with Jupiter Notebook for interactive workflows.
- Correct folder paths, environment activation, and package versions are important to avoid errors during hands-on exercises.

Open Discussion Summary

Participants encountered several technical issues during installation, including WSL/Ubuntu setup, Anaconda installation, missing IP kernel packages, and environment activation errors. The facilitators provided installation commands and troubleshooting guidance. Participants were also instructed to join a WhatsApp group for continued technical support and coordination during the training.

iii. Availability of Climate Model in NMME and ECMWF Climate Data Store and Preparation of Climate Model Data

Rajkumar Rai, RIMES

This session introduced participants to major sources of climate model data used for seasonal forecasting, including Copernicus Climate Data Store, ECMWF-related products, NMME model data, ERA5 reanalysis, and other global forecast repositories. The session explained how to access, download, process, and prepare climate model datasets for use in XCast. Participants were guided through the installation and configuration of the ECMWF CDS API, preparation of API keys, downloading of model data, and processing of hindcast and forecast datasets. The session also covered how to prepare observational datasets, interpolate model outputs to match observation resolution, apply regional masks, and organize data for seasonal forecast generation.

Key Insights

- Copernicus provides multiple seasonal forecast models, including ECMWF, Meteo-France, DWD, CMCC, NCEP, JMA, BOM, and UK Met Office products.
- NMME provides model datasets such as CanESM, CFS, GEM-NEMO, NASA GEOS, CCSM4, and CESM1.
- ERA5 reanalysis was used as the observational reference dataset, with finer spatial resolution than many model products.
- Three Python scripts were introduced for downloading and preparing ERA5, Copernicus/CDS model data, and NMME model data.
- Key script modifications include setting the base directory, defining latitude-longitude boundaries, selecting model names, and specifying hindcast/forecast periods.
- Climate model preparation requires harmonizing formats, interpolating model data to match observation resolution, and preparing hindcast and forecast files for validation and prediction.

Open Discussion Summary

The discussion focused on practical setup challenges and the transition away from the IRI Data Library. The facilitators emphasized that participants should be able to prepare both hindcast and forecast data because both are needed for model evaluation and seasonal forecast generation.

iv. New Relative ONI Index for ENSO Monitoring and Prediction

Dr. Sabeerali C.T., RCC-Pune / IMD

The presentation introduced the Relative Oceanic Niño Index, or Relative ONI, as an alternative to the conventional ONI for ENSO monitoring and prediction. Dr. Sabeerali explained that conventional ONI classifications can vary depending on the climatological base period used, especially under ongoing tropical sea surface temperature warming. The Relative ONI adjusts Niño-region SST anomalies against the tropical mean SST, making ENSO classification more stable across different climatological periods. The presentation showed that Relative ONI better captured recent La Niña conditions in 2024, which conventional ONI classified as neutral, and demonstrated improved relevance for monsoon rainfall reconstruction and prediction.

Key Insights

- Relative ONI provides more stable ENSO classification across different climatological periods compared with conventional ONI.
- Recent tropical SST warming means Relative ONI is approximately 0.5°C cooler than conventional ONI in recent decades.
- Relative ONI successfully detected La Niña-like conditions in 2024, while conventional ONI remained neutral.
- Atmospheric circulation and multivariate ENSO indicators supported the Relative ONI interpretation for 2024.
- Relative ONI explained a larger fraction of Indian monsoon rainfall variability, particularly over western, central, and southern regions.
- The Monsoon Mission Climate Forecast System showed improved skill and signal-to-noise ratio when using Relative ONI.

- CPC and the Bureau of Meteorology have already transitioned to Relative ONI, while IMD Pune is experimenting with real-time monthly Relative ONI data.
- WMO is expected to provide further guidance on the use of both conventional and relative ENSO indices.

Open Discussion Summary
The discussion highlighted the operational transition from conventional ONI to Relative ONI. Participants noted that adoption will require coordination among climate centers and clear communication to users, especially because ENSO classifications influence seasonal outlook interpretation. The presentation reinforced the need to update ENSO monitoring practices in response to warming tropical oceans and changing baseline conditions.

v. Introduction to XCast and Hands-on Exercise of Model Evaluation using XCast

Rajkumar Rai, RIMES / Training Team

The XCast hands-on session introduced participants to the installation, configuration, workflow, and application of XCast for seasonal climate forecasting. The facilitator demonstrated how to set up the XCast environment, activate the Python environment, connect it with the IP kernel, copy scripts and data into local directories, read observational datasets, prepare hindcast files, process model data, interpolate outputs, apply regional masks, and evaluate model performance. The session also demonstrated how to generate deterministic and probabilistic forecasts, assess model skill, and produce visual outputs such as anomaly maps, probability plots, ROC curves, and reliability diagrams.

Key Insights
- XCast supports seasonal forecast generation using multiple climate models and observational datasets.
- Participants learned to prepare observation files from ERA5 and model files from Copernicus and NMME sources.
- The workflow includes observation preparation, model data preparation, interpolation, regional masking, hindcast validation, model evaluation, and forecast generation.
- Key configuration parameters include hindcast period, initial condition month, lead times, target season, regional domain, and shapefile masking.
- For the exercise, participants were asked to prepare April initial condition forecasts for the JJAS/JJA season for their respective countries.
- Model evaluation used metrics such as Spearman correlation, Pearson correlation, Ranked Probability Skill Score, ROC curves, and reliability diagrams.
- Participants were advised to use meteorological expertise when selecting models, rather than automatically including all available models.
- A minimum of two models is required to support the multi-model ensemble concept.
- The system produces deterministic anomaly maps and probabilistic tercile forecasts for above-normal, near-normal, and below-normal categories.

Open Discussion Summary
The hands-on discussion focused on technical installation issues, script configuration, shapefile preparation, and model selection. Some participants experienced IP kernel and

environment activation problems, which were addressed through troubleshooting commands. Participants were instructed to prepare country-specific forecast outputs using April initial conditions and present screenshots of their results in the next session. The facilitators emphasized that country teams should evaluate model performance carefully and remove underperforming models where justified by skill assessment.

B. XCAST, QGIS, and FOCUS X

vi. Overview of Impact Analysis Tool with Hands-on Demo

Rahul Suman, ESCAP

ESCAP introduced its impact-based forecasting approach, explaining that the objective is to help users understand not only what the weather or climate condition is expected to be, but what it may do to people, sectors, and critical infrastructure. The session presented the methodology for combining hazard layers, such as seasonal forecast information on above- or below-normal precipitation, with exposure layers such as population, agriculture, health facilities, and other critical infrastructure. This approach supports the WMO Global Framework for Climate Services and Early Warnings for All by translating forecast information into potential impacts. The session introduced the Rapid Impact-Based Forecasting tool, including its online version, which allows users to upload hazard and exposure datasets and generate hotspot maps, exposure statistics, and comparative outputs using current and previous forecast layers.

Key Insights

- ESCAP's impact-based forecasting approach combines hazard, exposure, and vulnerability layers to identify who or what may be affected, where impacts may occur, and the possible level of intensity.
- Hazard layers may include seasonal forecast products, such as SASCOF rainfall outlooks showing above-normal or below-normal precipitation probabilities.
- Exposure layers may include population, agriculture, hospitals, health facilities, infrastructure, and other sectoral datasets.
- The online RapidIBF tool allows users to upload their own hazard and exposure datasets, enabling country-specific and sector-specific analysis.
- The tool conducts geospatial pre-processing by harmonizing coordinate reference systems, grid resolution, and spatial alignment across datasets.
- It automatically recognizes different data formats, such as raster datasets for population or rainfall and point datasets for facilities such as hospitals.
- Core functions include identifying hotspot areas, computing hazard exposure, visualizing exposure, and comparing outputs with previous forecasts.
- The tool can generate maps and charts showing how many people, facilities, or assets are exposed to different probability levels of a forecast hazard.
- ESCAP noted that the approach provides an initial basis for sectoral planning and early action, but the quality of outputs depends on the relevance and quality of the datasets used.

Recommendations / Open Discussion Summary

ESCAP emphasized that countries can use their own national datasets where available, instead of relying only on regional or open-source datasets. This is important for improving the relevance and accuracy of impact analysis. Participants were encouraged to prepare or obtain country boundary files and exposure datasets for use in hands-on exercises. ESCAP also highlighted that the online tool is useful for users who want a portal-based interface, while the offline tool provides greater flexibility and data security for users who need to keep sensitive datasets within their own systems.

vii. Demo of Offline and Online GIS Tool

Rahul Suman, ESCAP

ESCAP demonstrated both the online and offline GIS-based impact analysis tools, with particular emphasis on the newer QGIS plugin version of the offline tool. The facilitator explained that earlier offline versions had high hardware and installation requirements, including the need for relatively high RAM and environment setup. To address these challenges, ESCAP shifted to a lightweight QGIS plugin that can run across Windows, Linux, and Mac systems, works fully offline, and allows users to keep datasets secure on their own computers. The demonstration walked participants through the required input layers, plugin download process, basic QGIS concepts, and the workflow for classifying hazard values, computing exposure, and generating maps, tables, and HTML reports.

Key Insights

- ESCAP developed the QGIS plugin to address limitations of the earlier offline tool, which required heavier hardware and more complex installation.
- The plugin is lightweight, cross-platform, and can operate fully offline, making it more practical for country-level users.
- The tool supports multiple hazard and exposure formats and allows users to keep sensitive datasets within their own systems.
- It currently supports English and Russian, with translations into Dhivehi and Hindi being prepared.
- The tool requires three main inputs:
    - hazard layer, such as SASCOF rainfall projection datasets;
    - exposure layer, such as population or health facility data; and
    - boundary file, such as national or subnational administrative boundaries.
- The session reviewed basic GIS concepts needed to use the plugin, including vector data, raster data, coordinate reference systems, and administrative boundary levels.
- ESCAP advised that for seasonal forecast datasets, admin level 1 is often more appropriate because the forecast resolution may not support highly granular analysis.
- The plugin allows automatic classification or custom threshold classification of hazards.
- Outputs include maps, charts, exposure tables, and a brief HTML report.
- The plugin includes quality assurance features such as input validation, checking of spatial alignment, plausibility checks, and reproducibility of saved settings.
- Training datasets were shared, including hazard datasets, WorldPop population datasets, health facility datasets, and a sample India boundary file.

Recommendations / Open Discussion Summary

Participants were instructed to download the plugin, relevant hazard datasets, population datasets, health facility data, and boundary files for use in the hands-on exercise. Users should select administrative boundary levels carefully as overly detailed boundaries may not be meaningful when using coarse seasonal forecast data. Vulnerability weighting is available in the backend but has not yet been fully exposed in the frontend, because ESCAP first needs feedback from countries on which vulnerability variables are most relevant in their contexts. A questionnaire would be disseminated to help guide future integration of vulnerability weighting into the tool.

viii. Interactive Session and Hands-on Demo on the Updated FOCUS X Tool

Andrew Colman, UK Met Office & Jay Qiu, RIMES

The session introduced the updated FOCUS X tool as a web-based platform for seasonal forecast calibration, multi-model forecast generation, model verification, ensemble forecasting, and CPT-based analysis. Colman first explained the basis of calibrating seasonal forecasts, focusing on canonical correlation analysis, or CCA, and why calibration is needed to correct systematic model biases. He noted that dynamical models may capture large-scale climate signals but still contain errors due to low resolution, imperfect representation of topography, chaos, or misplaced teleconnections. Calibration methods such as CCA help correct indirect signal biases by identifying historical relationships between model forecast patterns and observed outcomes. The hands-on demonstration then showed how FOCUS X integrates earlier FOCUS functions, ensemble forecasting, and a server-based Linux version of CPT with a web interface, allowing users to run model verification, calibrated forecasts, ensemble forecasts, and generate downloadable reports.

Key Insights

- Seasonal forecast outputs can be understood as having three components: direct signal, indirect signal bias, and noise:
    - Direct signal refers to forecast information that is correctly represented by the model in location, timing, and magnitude.
    - Noise refers to unpredictable components caused by atmospheric chaos or model limitations.
    - Signal bias refers to systematic model errors, such as misplaced teleconnections, that may be corrected through calibration.
- Canonical Correlation Analysis, or CCA, identifies historically correlated pairs of patterns between model predictors and observed predictands.
- Calibration can improve forecast skill by correcting model biases and extending useful skill geographically.
- Features of the FOCUS X:
    - addresses the discontinuation of the IRI Library by integrating CPT functions into a web-based system and using Copernicus/C3S data sources.
    - designed to support multi-model forecast runs more efficiently than traditional CPT, which typically handles one model at a time.
    - allows easy checking for missing model data and provides gap-filling options, including average replacement and RIMES machine-learning-generated data.

    - on the RIMES server, reducing the need for users to download large datasets over weak internet connections.
    - the system includes country and regional views, model verification, ensemble forecasting, CPT CCA/PCR workflows, knowledge base pages, data remapping information, and report generation.
    - the model verification function allows users to select parameters, initial conditions, forecast months, models, observation datasets, hindcast periods, shapefiles, verification metrics, and missing data treatment.
    - verification outputs include metrics such as ACC, anomaly RMSE, and standard deviation.
    - the ensemble forecast function uses all available ensemble members and can be computationally heavy due to large data volume.
    - the CPT function allows users to run CCA or PCR for individual models, multi-model ensemble means, or both.
    - observation datasets available in the tool include GPCP, CHIRPS version 2, CHIRPS version 3, and ERA5, with remapping to match model resolution.
    - users can download outputs in NetCDF or TSV format for further analysis in XCast, PyCPT, or local CPT workflows.
    - the report function allows users to select outputs, add comments manually, use the RIMES language model to draft comments, and generate a final PDF report.
- The facilitator cautioned that AI-generated comments must be reviewed and verified by users before use.

Recommendations / Open Discussion Summary

The session recommended that users apply FOCUS X together with other tools such as XCast, PyCPT, and local CPT, rather than treating it as a replacement for all forecasting workflows. Andrew Colman emphasized that calibration does not remove the need for forecaster judgment, because model choice, observation dataset, predictor domain, predictand domain, variable selection, skill measure, training period, and climatology period all affect the output. During the demonstration, the facilitators also noted remaining technical limitations, including dropdown display issues, incomplete station data management, missing ensemble years in some models, and the need to find a solution for UKMO ensemble data gaps. Users were advised to review model verification outputs carefully, select models based on performance over their target area, and validate AI-generated report comments before including them in official products.

C. Translation of Climate Information into Climate Services

ix. Co-Production of Climate Services

Dr. Jane Strachan, UK Met Office

The presentation introduced the concept of climate services and co-production, emphasizing that climate information becomes valuable only when it is prepared, interpreted, delivered, and used in ways that meet user needs. Dr. Strachan explained that climate services include past and current climate observations, monitoring, near-term predictions such as monthly,

seasonal and decadal forecasts, and longer-term climate projections. She situated SASCOF and Pre-COF activities within the broader climate services value chain, particularly as part of the Climate Services Information System and User Interface Platform under the Global Framework for Climate Services. The session highlighted that effective user engagement is central to ensuring that climate services are credible, salient, legitimate, trusted, and useful for decision-making.

Key Insights

- Climate services are not limited to long-term climate projections; they also include historical observations, monitoring, monthly forecasts, seasonal forecasts, decadal predictions, and climate projections.
- Different timescales of climate information support different decisions: resource and emergency planning, seasonal preparedness, agriculture, energy, disaster risk reduction, market planning, adaptation policy, and infrastructure design.
- Climate services require scientifically credible information, appropriate user-provider engagement, and delivery mechanisms that match user needs.
- The Global Framework for Climate Services (GFCS) identifies five priority sectors: health, agriculture and food security, energy, disaster risk reduction, and water management.
- User engagement can range from passive information sharing to consultation, involvement, collaboration, and empowerment.
    - Passive engagement, such as websites or mailouts, can reach wider audiences but provides less tailored support.
    - Interactive engagement, such as workshops and dialogues, helps build trust, identify common needs, and support capacity development.
    - Focused relationships allow deeper co-production of bespoke services, but require more time, resources, and institutional commitment.
    - Co-production involves identifying key actors, building common ground, co-exploring user needs, co-developing solutions, co-delivering services, and evaluating usefulness.
- Evaluation is essential because climate services should improve iteratively based on feedback from users.

Recommendations / Open Discussion Summary

The session emphasized that NMHSs should avoid simply “pushing” climate information to users without understanding their decisions, constraints, language, and preferred formats. Participants were encouraged to identify the relevant actors in each sector, clarify what decisions they make, determine whether climate information can support those decisions, and design engagement at the appropriate level. The session also stressed that co-production should not end at product delivery; feedback and evaluation are needed to determine whether the service was useful and how it can be improved.

x. Co-Development of Seasonal Outlook with Sectoral Stakeholders

Monowar Hossain, Bangladesh Meteorological Department

The Bangladesh Meteorological Department (BMD) representative, Mr. Hossain, presented their experience in transforming seasonal outlooks from generic text-based products into more user-oriented climate services through co-development with sectoral stakeholders. Prior to 2021, Bangladesh's seasonal outlooks were mainly issued in text format, with expected rainfall and temperature information but without probability maps, spatial visualization, sectoral translation, or specific guidance for users. The 2021 Monsoon Forum marked an important shift by creating a feedback loop between BMD and sectoral users, enabling agriculture, water, health, disaster risk management, livestock, and fisheries stakeholders to contribute to the development of sector-specific advisories. This evolution led to a more structured Climate Application Forum process, where seasonal forecasts are combined with maps, monthly forecasts, climatology tables, interpretation guidance, and sectoral advisories in a single bulletin.

Key Insights

- The 2021 Monsoon Forum introduced a feedback loop between BMD and sectoral users.
    - Seasonal outlook products evolved from text to maps, from generic outlooks to sector-tailored advisories, and from one-way dissemination to co-development.
    - The workflow includes internal BMD consensus, pre-forum sharing with sector agencies, development of tailored advisories, and joint presentation during the Climate Application Forum.
    - Sectoral advisories cover agriculture, water, health, livestock, and fisheries.
    - The bulletin includes probabilistic rainfall and temperature maps, monthly and seasonal composites, division-wise climatology, forecast interpretation guidance, and responsible lead organizations.
- Multi-timescale information is used, including seasonal outlooks, sub-seasonal forecasts, short- and medium-range forecasts, rainfall deviation, temperature, cold wave, heat wave, flood outlook, monsoon onset and withdrawal, number of rainy days, wet spells, dry spells, and accumulated rainfall.
- The co-production process improved relevance, trust, sector uptake, and accountability by naming responsible organizations for each advisory.

Recommendations / Open Discussion Summary

The discussion highlighted that co-production is challenging but necessary because stakeholders need clear, sector-specific and actionable information rather than raw meteorological parameters. A question was raised on how long it took Bangladesh to establish co-produced solutions with stakeholders. The presenter explained that the process began around 2021 and has gradually evolved through repeated engagement, feedback, and improved understanding of what users need for action.

xi. Climate Forecast Application in Sri Lanka

Dr. Shiromani Jayawardena, RIMES

Dr. Jayawardena presented examples of forecast-based actions taken by stakeholders following the 28th National Monsoon Forum held in May 2023 in Sri Lanka. The Forum, jointly organized by the Department of Meteorology and RIMES, aimed to improve decision-making

based on reliable climate information, review the previous season's climate and forecast performance, obtain stakeholder feedback, share the SASCOF-based monsoon outlook, and support strategic planning. The presentation highlighted how agriculture, irrigation, water management, hydropower, disaster management, and other sectors used monsoon and shorter-range forecasts to develop advisories, adjust operations, and prepare for potential impacts.

Key Insights

- Sri Lanka's Monsoon Forum serves as a platform for reviewing past forecasts, receiving stakeholder feedback, sharing upcoming seasonal outlooks, and supporting sectoral planning.
- Key participating stakeholders included the Agriculture Department, Mahaweli Authority, Irrigation Department, Water Supply and Drainage Board, Ceylon Electricity Board, National Building Research Organisation, and Disaster Management Centre.
- Agriculture stakeholders used forecasts of late rainfall onset and below-normal rainfall to guide land preparation, field establishment, and agro-met advisories.
- Agro-met advisories were issued monthly through a technical advisory committee that included the Department of Meteorology.
- The irrigation sector reported that 10-day forecasts are useful for flood forecasting and flood management.
- Seasonal forecasts were described as more critical for water management than flood management, because incorrect seasonal outlooks can lead to significant economic damage.
- The Mahaweli Authority used 10-day forecasts to estimate reservoir inflow, control spilling, and optimize hydropower generation.
- The Disaster Management Centre used monsoon outlooks to develop impact scenarios, identify high-, moderate-, and low-risk areas, plan preparedness actions, and coordinate with UN agencies, NGOs, development partners, humanitarian agencies, volunteer organizations, and the private sector.
- Forecast-based actions demonstrated economic and operational benefits, including improved hydropower generation and reduced water spilling.
- The Monsoon Forum strengthened multi-sector coordination, stakeholder engagement, and monthly sharing of forecasts, drought monitoring information, and forecast updates.

Recommendations / Open Discussion Summary

Stakeholders noted several limitations and improvement needs. Seasonal forecast resolution remains limited, with district-level information still insufficient for some users who require more localized forecasts. Stakeholders also requested more detailed probabilistic categories beyond above-normal, near-normal, and below-normal, such as well above normal or well below normal. Water managers emphasized that incorrect seasonal decisions can create high operational and economic risks, especially for reservoirs used for drinking water, irrigation, and hydropower. The presentation also highlighted the need to improve translation of seasonal forecasts into impact information, address sector-specific requirements, strengthen last-mile communication, and improve coordination during high-impact events.

xii. Development of IBF and Risk-Informed Climate Advisories

Asif Uddin Bin Noor, RIMES

The presentation introduced the development of impact-based forecasting and risk-informed climate advisories, focusing on how NMHSs can move from traditional hazard-based forecasts to impact-based and impact-oriented services. The presentation explained the progression from communicating hazard parameters, such as rainfall, to combining hazard information with vulnerability and exposure to understand likely impacts. It emphasized that a well-structured impact forecast should answer the "5Ws": who is affected, what hazard and impact are expected, when it may occur, where it may occur, and why it matters or what actions should be taken. The session also introduced the ADKAR model as a pathway for institutionalizing impact-based forecasting through awareness, desire, knowledge, ability, and reinforcement.

Key Insights

- Traditional forecasts mainly describe hazard parameters, while impact-based forecasts combine hazards with vulnerability.
- Impact forecasts go further by incorporating exposure information and translating likely impacts into advice or recommended action.
- Hazard information may come from nowcasts, short-range forecasts, medium-range forecasts, sub-seasonal forecasts, or seasonal outlooks.
- Vulnerability information includes static or semi-static conditions, such as low-lying settlements, poor households, slum areas, tin-shed housing, or populations sensitive to heat.
- Exposure information includes who or what is present at a specific time, such as standing crops, people on roads during peak hours, or assets in hazard-prone areas.
- A useful impact forecast should answer:
    - Who is the target audience?
    - What hazard and likely impact are expected?
    - When will the hazard occur and for how long?
    - Where will it happen?
    - Why does it matter, and what should users do?
- Seasonal impact outlooks should focus on strategic planning actions rather than emergency response.
- The "why" component is often the most difficult for NMHSs because it requires sectoral information that NMHSs may not hold.
- Impact forecast development requires collaboration between NMHSs and sector agencies that hold exposure, vulnerability, and operational decision data.
- The ADKAR (Awareness, Desire, Knowledge, Ability, and Reinforcement) pathway can help institutions move from awareness to sustained implementation of impact-based forecasting.
- Countries can start small by selecting one priority hazard, one pilot area, and one partner agency before scaling up.
- South Asian countries are well positioned to develop seasonal impact-based forecasting because monsoon-driven hazards have strong seasonal relevance and predictability.

Recommendations / Open Discussion Summary

The discussion emphasized that NMHSs should not be expected to produce impact forecasts alone. According to the session, impact forecasts should be developed jointly by NMHSs and sector agencies because climate services require both hazard information and sectoral exposure/vulnerability information. Participants were asked to reflect on their main challenges in adding the "why" or action component to seasonal outlooks. Responses included uncertainty and lack of local data. The presenter recommended starting with a manageable pilot, such as one hazard, one district, and one partner agency, and then building evidence before scaling to national systems and SOPs.

xiii. Developing Sector-Specific Climate Outlook and Advisories

Dr. Jane Strachan, UK Met Office & Raihanul Haque Khan and Asif Uddin Bin Noor, RIMES

The session was designed as a hands-on exercise to help participants translate seasonal outlooks into sector-specific advisories. Building on earlier sessions on co-production, probabilistic forecasting, and the "5Ws" of advisory development, participants were asked to work in groups using actual past SASCOF outlooks and assigned sector role cards. The exercise emphasized that seasonal forecasts should support proactive planning rather than reactive crisis response, and that advisories should move from "what the climate may be" to "what the climate may do" for specific sectors. Participants were guided to consider rainfall and temperature signals, uncertainty, sector exposure and vulnerability, and practical no-regret actions.

Key Insights

- Seasonal forecasts are probabilistic and should be used to support planning under uncertainty, not treated as deterministic predictions.
- Communicating uncertainty helps manage user expectations, retain confidence, and build trust when done clearly.
- Exercise: Groups were asked to summarize a SASCOF outlook in plain language, identify sector implications, draft advisory text, and recommend actions.
    - Advisory wording was expected to avoid overclaiming certainty and use language such as "more likely," "prepare for," and "monitor updates."
    - Facilitators highlighted no-regret actions, cost–loss logic, and ready-set-go triggers as practical ways to connect forecast probabilities with decision-making.
    - Participants were encouraged to think through the full chain from hazard information to sector risk, then to advisory and action.
- The exercise demonstrated that meteorologists need to understand user-sector decisions, while user sectors need support in interpreting climate signals and uncertainty.

To be added based on the session transcript.

Recommendations / Open Discussion Summary

During the group work and reporting, participants reflected that developing advisories requires more than restating rainfall and temperature categories. They noted the need for better data

sharing between NMHSs and sector agencies, since poor or incomplete sector data can weaken co-produced advisories. One group described this as a “garbage in, garbage out” problem, emphasizing that sectoral exposure and vulnerability information must be shared to make advisories useful.

Participants also recognized that advisories should include feedback loops and update mechanisms. Groups noted that even when a seasonal outlook is broadly accurate, some sub-regions may not verify well, making mid-season updates, shorter-range forecast monitoring, and revision of advisories important. The exercise reinforced that no-regret actions remain useful even when the forecast is imperfect, and that advisory language should explicitly communicate uncertainty while still encouraging preparedness.

The hands-on exercise is a practical activity to be conducted during CSUF or NCOF sessions where NMHSs and sector representatives can jointly translate actual seasonal outlooks into actionable sector-specific guidance.

xiv. Extending DataEx for Seasonal Forecast: Progress and Future Plan

Nazmul Ahasan Shawn, RIMES

The session introduced the DataEx platform as a centralized system for exchanging, storing, processing, and analyzing meteorological observation and forecast data. The presenter explained that DataEx was initially developed to help countries share non-GTS and non-WIS2 station data and access analytics, forecast information, and modeling products through one platform. The system now supports multiple forecast data sources, including ECMWF products, UK Met Office data, and IMD high-resolution forecast data. The presentation demonstrated DataEx functions for forecast visualization, NetCDF subsetting, shapefile-based regional analysis, command-line access, graphics generation, alert subscriptions, and future integration with WIS2, data quality control, and PyCPT workflows.

Key Insights

- DataEx is designed as a meteorological data exchange platform for observation and forecast data. Key features:
    - The platform initially targeted non-GTS stations and has now expanded to include non-WIS2 station data as WIS2 is adopted by countries.
    - Observation data uploaded by a country remain accessible only to that country, addressing data access and confidentiality concerns.
    - Forecast data currently available include ECMWF HRES, ECMWF ensemble, ECMWF seasonal forecast data, IMD three-day high-resolution forecast data, and UK Met Office 10-day forecast data.
    - Users can visualize forecast parameters such as rainfall, maximum temperature, and minimum temperature directly in the platform.
    - The NetCDF subsetting engine allows users to download only the forecast data needed for a selected region and selected variables, reducing the need to download large datasets.
    - Shapefiles can be uploaded to support basin, province, or administrative-area analysis, including areal average rainfall and temperature calculations.
    - A command-line client library that allows users to automate downloads, regional calculations, and data processing.

    - Can generate forecast graphics and animated outputs that can be used in reports, social media, or advisories.
    - An alert and subscription module can notify users when forecast thresholds are exceeded for a selected area.
- Planned developments include data quality control modules, WIS2 integration using MQTT protocol, and hosting of forecast data required for PyCPT because the IRI Data Library is being discontinued.
- The longer-term vision is for DataEx to serve as a centralized data hub feeding tools such as FOCUS X, PyCPT, national DSS platforms, SESAME, RDAS, and hydromet service applications.

Recommendations / Open Discussion Summary

The presenter encouraged member countries to contribute non-GTS and non-WIS2 station data to DataEx, noting that the platform can ingest data in different formats, including Excel sheets and scanned formats, if countries are willing to share. The future development plan under the WMO CREWS project will prioritize quality control, WIS2 integration, expansion of station data, and support for PyCPT-related forecast data access.

The key recommendation was for countries to coordinate with RIMES to identify available datasets, clarify data-sharing arrangements, and integrate their national observation data into the platform where possible.

II. 34th Session of the South Asian Climate Outlook Forum (SASCOF-34)

A. Seasonal Prediction of South Asia for JJAS Season 2026 – Country Perspectives

i. Afghanistan

Afghanistan reported generally limited rainfall during JJAS 2025, with mostly normal rainfall conditions across much of the country, below-normal rainfall in parts of the north and northeast, and above-normal rainfall in some southern and southeastern areas. Extreme weather warnings were issued for heavy rainfall, thunderstorms, flash floods, heavy snow, strong winds with dust storms, and maximum temperatures. For JJAS 2026, Afghanistan's outlook indicated mostly normal rainfall over large areas, with above-normal rainfall likely in parts of the northeast, southwest, and east, and below-normal rainfall in parts of the west. Warmer-than-normal temperatures were expected in western, southwestern, northwestern, and central areas. Afghanistan confirmed general agreement with the proposed SASCOF consensus outlook.

ii. Bangladesh

Bangladesh reported generally below-normal rainfall during JJAS 2025, except for above-normal rainfall in July and localized wetter conditions in some divisions. Temperatures were generally above normal, with heat wave conditions and heavy to very heavy rainfall events recorded during the season. For JJAS 2026, multiple models indicated below-normal rainfall over the northwestern and western parts, near-normal rainfall over central and northeastern areas, and above-normal rainfall over the southeast. Maximum and minimum temperatures were expected to be above normal over most parts of the country, with developing El Niño conditions cited as an important factor supporting the drier rainfall outlook.

iii. Bhutan

Bhutan reported below-normal rainfall during JJAS 2025 despite an earlier outlook indicating normal rainfall, while temperatures remained near normal with a slight positive deviation. Notable extremes included record rainfall at Phuntsholing and a daily maximum temperature record in Punakha. For JJAS 2026, model outputs showed mixed signals, with some indicating above-normal rainfall and others suggesting near-normal to below-normal conditions. During the consensus discussion, Bhutan accepted the SASCOF outlook indicating near-normal conditions over much of the country, while recognizing uncertainties linked to model differences, data limitations, and regional monsoon influences.

iv. India

India reported above-normal monsoon rainfall in 2025, with the southwest monsoon arriving early, covering the country by late June, and withdrawing in mid-October. Temperature conditions were below normal over many areas due to active rainfall. For JJAS 2026, IMD's first-stage forecast indicated below-normal rainfall over most of India, except northeastern India, northernmost areas, and parts of the southern peninsula where slightly above-normal rainfall was possible. The outlook was linked to unfavorable large-scale parameters, particularly likely El Niño development, while a possible weak positive IOD remained

uncertain. Above-normal maximum and minimum temperatures were expected over most parts of the country.

v. Maldives

Maldives reported below-normal rainfall across the country during JJAS 2025, broadly consistent with the previous outlooks. Fewer extreme events occurred compared with other years, although early monsoon rainfall, island flooding, and wind impacts from a stalled cyclonic circulation were noted. For JJAS 2026, model outputs generally suggested above-normal rainfall, though some products indicated spatial variation across northern, central, and southern atolls. During consensus discussion, the broader SASCOF outlook retained above-normal rainfall for Maldives, with some adjustment needed to represent southern atolls. Above-normal temperatures were also expected across the country.

vi. Myanmar

Myanmar reported generally near-normal rainfall and temperature during JJAS 2025, with drier conditions in the north and wetter conditions in the south. Differences between forecast and observed rainfall were linked to tropical systems, vigorous monsoon conditions, and Bay of Bengal depressions. For JJAS 2026, Myanmar's outlook indicated above-normal rainfall in southern Myanmar and near-normal rainfall elsewhere, supported by CPT and global model signals. Above-normal maximum and minimum temperatures were also indicated by several models. Myanmar agreed with the SASCOF temperature outlook and requested that the above-normal rainfall area be extended over the delta and southern Myanmar.

vii. Nepal

Nepal reported normal to below-normal rainfall across wide areas during JJAS 2025, with early monsoon onset and delayed withdrawal. Significant rainfall after the usual monsoon period contributed to higher rainfall when considering the full season. Extreme events included heavy rainfall in October, landslides, floods, thunderbolt deaths, drought conditions in May–June, and heat waves. For JJAS 2026, model outputs were mixed, with several CPT models indicating below-normal rainfall over most areas, while others suggested above-normal rainfall in northern and northwestern areas. Nepal generally accepted the consensus forecast but noted that some eastern areas may be closer to near-normal conditions and requested grid-level adjustment.

viii. Pakistan

Pakistan reported normal to above-normal rainfall during monsoon 2025, with several rainfall spells, urban flooding, and cloudburst events. Temperature was generally normal to slightly above normal, with high positive departures in Gilgit-Baltistan. For JJAS 2026, PMD's outlook indicated mostly below-normal rainfall across Pakistan, with slightly above-normal rainfall possible in northern areas. Above-normal maximum and minimum temperatures were expected over most parts of the country, especially northern and western hilly areas. Pakistan confirmed that the SASCOF outlook was consistent with PMD's interpretation, particularly given expected El Niño conditions and their historical association with below-normal rainfall and above-normal temperatures.

ix. Sri Lanka

Sri Lanka reported below-normal rainfall across much of the country during the 2025 southwest monsoon, except in northern and some central areas, with generally above-normal maximum and minimum temperatures. Drought conditions were experienced before November, followed by severe impacts from Cyclone Ditwah, which brought widespread heavy rainfall and flooding. For JJAS 2026, although some model outputs suggested slightly above-normal precipitation in selected areas, local research and climate driver analysis indicated that El Niño and positive IOD conditions are typically associated with reduced rainfall during the southwest monsoon. Sri Lanka's outlook therefore indicated below-normal rainfall over central catchments and parts of the country, with concern for hydropower reservoirs, and slightly above-normal temperatures. Sri Lanka agreed that the SASCOF consensus forecast was broadly consistent with its national outlook.

B. Seasonal Prediction of South Asia for JJAS Season 2026 – Global and Regional Perspectives

i. Introduction of Emerging ENSO Indices and its Application

Dr. Sabeerali C.T., IMD

The session introduced emerging ENSO indices, particularly the Relative Oceanic Niño Index, as a complementary approach to conventional ENSO monitoring and prediction. The presentation explained that the conventional Niño 3.4 SST anomaly can be affected by the choice of climatological baseline, especially under continued tropical ocean warming. The Relative ONI adjusts the Niño 3.4 anomaly against the tropical mean SST, helping provide a more stable classification of ENSO conditions and a potentially stronger basis for interpreting monsoon-related climate signals.

Key Insights

- The conventional ONI may classify ENSO conditions differently depending on the baseline period used, especially in a warming climate.
- Relative ONI provides a way to account for broader tropical SST warming by comparing Niño 3.4 anomalies with the tropical mean SST.
- The Relative ONI was shown to better capture some recent ENSO-related atmospheric circulation patterns, including cases where conventional ONI suggested neutral conditions but the atmosphere showed La Niña-like behavior.
- The presentation highlighted that Relative ONI may explain a larger share of Indian summer monsoon rainfall variability in some regions compared with conventional ONI.
- Current monitoring indicated ENSO-neutral conditions at the time of the Forum, but warming SSTs, subsurface heat content anomalies, and model guidance suggested likely El Niño development during the 2026 monsoon season.
- The expected development of El Niño was identified as a key factor informing the SASCOF-34 outlook, particularly the increased likelihood of below-normal rainfall over many parts of South Asia.

Recommendations / Open Discussion Summary

The session emphasized the need for climate centres and NMHSs to continue monitoring both conventional and emerging ENSO indicators, particularly as warming trends may affect the interpretation of historical ENSO thresholds. Participants were encouraged to consider Relative ONI as an additional diagnostic tool for seasonal outlook preparation, while maintaining clear communication with users on what the index means and how it affects forecast interpretation. The discussion also reinforced that ENSO information should not be used in isolation, but interpreted alongside other regional and global drivers, model outputs, and expert judgment in the consensus forecast process.

ii. JMA's Seasonal Prediction of South Asian Climate for JJA 2026

Mr. Ken Yamada, Tokyo Climate Center (TCC), Japan Meteorological Agency (JMA)

The session presented the Japan Meteorological Agency's seasonal prediction for South Asian climate for the June–August 2026 season. The presentation introduced JMA's updated Seasonal Ensemble Prediction System and discussed its outlook for sea surface temperature, rainfall, and temperature patterns. The forecast indicated likely El Niño development by boreal summer, with associated impacts on rainfall distribution across South Asia and generally warmer-than-normal conditions over much of the region.

Key Insights

- The model predicted positive sea surface temperature anomalies over the eastern and central equatorial Pacific, supporting the likelihood of El Niño development by summer 2026.
- Below-normal precipitation was predicted from the Arabian Sea toward central parts of South Asia, broadly consistent with typical El Niño-related drying signals.
- Above-normal precipitation was indicated around the northern to eastern Bay of Bengal region, although this signal was presented with greater uncertainty.
- Precipitation forecasts were noted to have considerable ensemble spread, indicating lower confidence compared with temperature forecasts.
- Above-normal temperatures were predicted over many parts of South Asia, consistent with both El Niño conditions and the broader warming background.
- The presentation also showed links between South Asian monsoon activity and East Asian climate anomalies, including reference to Japan's record-breaking hot summer in 2025.

Recommendations / Open Discussion Summary

The session reinforced the importance of using global model outputs as one input into the SASCOF consensus process, while interpreting them together with national forecasts, regional climate drivers, model skill, and expert judgment. The JMA forecast supported the broader consensus signal of warmer-than-normal conditions across South Asia and a tendency toward drier-than-normal conditions over parts of western and central South Asia. However, participants were reminded that rainfall signals, particularly around the Bay of Bengal and eastern South Asia, should be interpreted cautiously due to higher uncertainty and ensemble spread.

iii. Global and Regional Perspectives: WMO LRF

Dr. Jeongmin Han, APEC Climate Centre (APCC)

The session presented global and regional long-range forecast perspectives for the 2026 southwest monsoon season using WMO Lead Centre multi-model ensemble products. The presentation highlighted expected large-scale climate conditions, including the likely transition toward El Niño, and discussed how global producing centre outputs can support the SASCOF consensus process when combined with national forecasts, regional climate drivers, model skill, and expert judgment.

Key Insights

- WMO Lead Centre products indicated a likely transition toward El Niño conditions during the JJAS 2026 period.
- Multi-model guidance generally supported warmer-than-normal conditions across South Asia.
- Rainfall signals were more spatially variable and uncertain than temperature signals.
- Below-normal precipitation was indicated over parts of South Asia, particularly India and adjoining areas.
- Other areas showed mixed or weaker rainfall signals, emphasizing the need for regional interpretation.
- The WMO LRF products provided an important global benchmark for comparison with national and regional outlooks.
- The presentation reinforced the value of using multi-model ensemble guidance to reduce reliance on any single model output.

Recommendations / Open Discussion Summary

The session emphasized that WMO Lead Centre products should be used as an input to the SASCOF consensus process rather than as a stand-alone forecast. Participants were reminded to interpret global model guidance together with national model outputs, calibration results, observed climate drivers, forecast skill, and expert judgment. The discussion also reinforced the need to clearly communicate the higher confidence in temperature outlooks compared with more uncertain rainfall forecasts.

iv. Global and Regional Perspectives: UK Met Office

Andrew Colman, UK Met Office

The UK Met Office presented global and regional seasonal forecast guidance for South Asia, including direct model output and calibrated multi-model products. The presentation examined expected rainfall and temperature patterns for JJAS 2026, with attention to the influence of El Niño, model calibration, and forecast skill. The session contributed additional evidence to the SASCOF consensus process, particularly on the likelihood of warmer-than-normal temperatures and drier-than-normal conditions over parts of western and central South Asia.

Key Insights

- UK Met Office model output indicated a tendency toward drier-than-normal conditions over much of India and adjoining areas.
- Relatively wetter signals were indicated farther east, particularly toward Myanmar and nearby areas.
- Rainfall forecast skill was described as limited or marginal in several areas, requiring cautious interpretation.
- Temperature forecasts showed a clearer warm signal and generally higher forecast confidence than rainfall.
- Calibrated multi-model forecasts identified a climate-change-related warming mode and an ENSO-related mode.
- The ENSO-related signal was consistent with El Niño tending to suppress rainfall over much of India and parts of South Asia.
- The combined forecast supported a strong dry signal across much of the southern half of India and nearby areas, with wetter signals farther east.

Recommendations / Open Discussion Summary

The session recommended using calibrated products and model verification to support interpretation of seasonal forecast signals, especially where raw model outputs differ or rainfall skill is limited. The UK Met Office guidance supported the broader SASCOF consensus of above-normal temperatures across much of South Asia and below-normal rainfall over central and western parts of the region. However, the presentation also emphasized caution in communicating rainfall signals due to uncertainty, ensemble spread, and regional differences in model skill.

C. Pre-Consensus Presentation and Discussions on Outlook; Agreement/Final Remarks on the Draft Text of the Consensus Forecast for JJAS 2026

Dr. Sreejith O.P., RCC-Pune/IMD

The pre-consensus session synthesized inputs from NMHS country presentations, regional climate drivers, global producing centres, multimodel forecast products, calibrated objective forecasts, and expert judgment. RCC-Pune/IMD reviewed the evolution of SASCOF since 2010, noting the transition from subjective statements to increasingly objective, model-based seasonal outlooks supported by calibration tools, verification, traceability, and pre-COF capacity development.

Verification of the 2025 SASCOF outlook showed generally good performance over several parts of the region, particularly where the forecast captured above-normal and below-normal rainfall categories. It was noted that 2025 atmospheric circulation resembled La Niña-like conditions, even though conventional Niño 3.4 thresholds were not always crossed, reinforcing the value of relative ENSO indices.

For JJAS 2026, the key climate driver was the expected development of El Niño. The equatorial Pacific showed warm SST anomalies, significant subsurface heat content anomalies, and model agreement toward El Niño development. The Southern Oscillation Index also suggested that the atmosphere was beginning to respond to Pacific warming. While

there was some possibility of positive IOD development later in the monsoon season, the forecast skill for IOD was considered lower than for ENSO, and uncertainty remained.

The pre-consensus analysis reviewed multiple global and regional model products, including Copernicus, ECMWF, IRI, NMME, WMO Lead Centre products, and national model outputs. Most models indicated below-normal rainfall over central parts of South Asia, particularly India and adjoining regions, with regional variations over northwestern, northeastern, and southern/eastern parts of the region. Temperature forecasts consistently indicated above-normal maximum and minimum temperatures over most of South Asia.

Country representatives were invited to review and comment on the draft consensus map and narrative. Afghanistan, Bangladesh, Maldives, Myanmar, Nepal, Pakistan, Sri Lanka, Bhutan, and other partners provided feedback on regional details. Adjustments were discussed for several areas, including Bhutan, Maldives, Myanmar's delta and southern regions, and Nepal's grid-level representation. Global partners, including JMA and the UK Met Office, expressed support for the overall consensus, while noting uncertainties in some regional precipitation signals.

The key consensus messages discussed were:

1. Below-normal rainfall is most likely during the 2026 southwest monsoon season over most parts of South Asia, particularly across central parts of the region.
2. Normal to above-normal rainfall is likely in some northwestern, northeastern, and southern/eastern parts of the region, including parts of Afghanistan, northeastern India, and southern Myanmar, with spatial differences to be finalized in the consensus map.
3. Normal to above-normal maximum and minimum temperatures are most likely over most parts of South Asia during JJAS 2026.
4. ENSO-neutral conditions were present at the time of the Forum, but El Niño conditions were likely to develop during the 2026 southwest monsoon season.
5. There is some possibility of positive IOD development during the later part of the monsoon season, although forecast confidence is lower compared with ENSO.

The Forum agreed that the draft consensus outlook would be circulated to NMHSs for final review and approval, including the pre-consensus presentation and draft consensus statement. RCC-Pune/IMD emphasized the importance of communicating the outlook to user sectors, particularly given the likelihood of below-normal rainfall and above-normal temperatures. The need to strengthen future heat-health outlooks and translate temperature forecasts into actionable services was also noted, especially in view of the planned heat-health session during the Climate Services User Forum.

III. Climate Services User Forum (CSUF)

A. SASCOF-34 Consensus Seasonal Climate Outlook for JJAS 2026

i. Presentation of SASCOF-34 Consensus Outlook

Dr. Sreejith O.P., RCC-Pune/IMD

The presentation introduced the SASCOF-34 Consensus Outlook for the JJAS 2026 southwest monsoon season. It explained the evolution of SASCOF from subjective forecasting in 2010 toward objective, model-based seasonal forecast generation using calibrated climate model outputs, bias correction, verification, and consensus-building among South Asian NMHSs and regional/global experts. The outlook indicated below-normal rainfall over many parts of South Asia, particularly central areas, while selected northwestern, northeastern, and southern/eastern parts may experience normal to above-normal rainfall. Maximum and minimum temperatures were expected to be above normal over most of South Asia. El Niño development was identified as the major climate driver, while a positive IOD may develop later in the season and could partly modulate rainfall outcomes.

Open Discussion Summary

Tokyo Climate Center/JMA suggested that future SASCOF products could include interpretation of atmospheric circulation features, such as divergence and circulation responses associated with El Niño. RCC-Pune/IMD clarified that while technical circulation information is useful for scientific forums, public consensus statements should remain accessible to policymakers and general users, emphasizing forecast implications, uncertainties, and practical use.

ii. Impact-Based Forecasting Based on the SASCOF Outlook

Leila Salarpour-Goodarzi, ESCAP

UN ESCAP presented how the SASCOF seasonal outlook can be translated into impact-based information by overlaying hazard layers, such as rainfall and temperature outlooks, with exposure and vulnerability layers, including population, agriculture, hydropower, and health facilities. The presentation demonstrated how the outlook could inform potential impacts on rice production, hydropower plants, and population exposure, and introduced ESCAP's Risk and Resilience Portal and Rapid IBF Next QGIS plugin. The tool allows users to run exposure analysis using open-source or national datasets and generate country-level impact reports.

Key Insights

- Impact-based forecasting links climate hazards with exposure and vulnerability to support more actionable decision-making.
- Rice production was used as an example, showing that below-normal rainfall during sowing periods may negatively affect agricultural outcomes.
- Nepal, Pakistan, and Bangladesh were identified as having rice production areas exposed to below-normal rainfall probabilities.
- Hydropower exposure analysis indicated potential risks from below-normal rainfall, especially in India and other countries with hydropower infrastructure.

- Population exposure analysis showed that high temperatures, especially when combined with rainfall deficits, can increase stress on water, health, and energy systems.
- The Rapid IBF Next plugin provides flexibility for country-level users to apply national boundaries, sectoral data, and preferred thresholds.

Open Discussion Summary

Participants raised questions on how to define sector-specific thresholds, particularly for agriculture, and whether heavy rainfall or low rainfall is more damaging to crops. ESCAP clarified that impacts depend on the crop stage, crop type, local exposure, and management options. Discussion also highlighted the need to combine seasonal outlooks with sub-seasonal and short-range forecasts, and to use national/local datasets where available. Sri Lanka requested that hydropower impacts be further analyzed, given below-normal rainfall forecasts over reservoir areas and already low reservoir levels.

B. Sub-Seasonal Products and their Utilization

i. Extended Range Forecast Products

Dr. Avijit Dey, IITM

IITM presented the second version of its Extended Range Prediction System (ERPv2), developed to improve forecast skill beyond two weeks. The system incorporates multi-physics ensemble configurations to address both initial condition uncertainty and model physics uncertainty. The presentation compared ERPv2 with the earlier system, showing improvements in rainfall and temperature forecast skill up to week 3 in several regions. The presentation also highlighted customized forecast products, including monsoon intra-seasonal oscillation forecasts, MJO forecasts, heavy rainfall forecasts, probabilistic rainfall forecasts, heatwave forecasts, cold wave forecasts, and cyclogenesis probability products.

Key Insights

- ERPv2 improves on ERPv1 by incorporating multi-physics ensemble options.
- Rainfall forecast skill improved up to week 3 in several meteorological subdivisions and homogeneous regions.
- Maximum temperature prediction also showed improved skill, particularly for extended-range heatwave forecasting.
- ERPv2 has been handed over to IMD for operational use since July 2025.
- Extended range products have applications in agriculture, health, energy, hydromet services, reservoir management, road repair planning, and urban/rural planning.
- The forecast based on the 22 April initial condition indicated likely dry conditions over much of India, rainfall over the northeast, and elevated heatwave probabilities in northwest, central, and eastern India during parts of May.

ii. Sub-Seasonal to Seasonal Forecast Products

Dr. Ankur Gupta, NCMRWF

NCMRWF presented its coupled model products for sub-seasonal to seasonal forecasting, including products related to cyclogenesis, tropical cyclone heat potential, active and break

phases of the monsoon, ENSO and IOD, snow forecasts, sea surface temperature, sea surface salinity, sea surface height, and sea-ice anomalies. The presentation emphasized that the same modeling system is used across time scales, with different configurations depending on the forecast purpose. It also showed that monthly forecasts initialized 5–10 days in advance may provide useful skill, sometimes exceeding weekly or seasonal skill for rainfall.

Key Insights

- NCMRWF's coupled model provides seamless products across sub-seasonal to seasonal timescales.
- Week 2 forecasts show useful skill in several regions; week 3 skill is more limited but still useful in some areas.
- Monthly mean rainfall forecasts initialized 5–10 days in advance may provide valuable information for decision-making.
- The 2026 seasonal signal showed reduced rainfall anomalies over India, broadly consistent with El Niño impacts.
- ENSO and IOD forecasts need continuous updating, as over- or underestimation of these drivers can affect rainfall outcomes.
- Monthly updates can help refine seasonal interpretations as climate drivers evolve.

Open Discussion Summary

Questions focused on whether pre-monsoon disturbances can be detected using these products and how heat index probabilities are calculated. The presenter noted that pre-monsoon showers were already occurring in northern India but are difficult to resolve at longer lead times. On heat index, he clarified that some values shown represented probability of threshold exceedance rather than temperature, and that thresholds such as 35°C and 40°C were used.

iii. Recent Updates of Tokyo Climate Centre Services

Ken Yamada, Tokyo Climate Center, JMA

Mr. Yamada presented updates to its climate services and tools for NMHSs in Asia and the Pacific. The presentation covered RCC Tokyo and GPC Tokyo products, including seasonal and sub-seasonal forecasts, long-range forecasts, reanalysis data, monitoring products, guidance tools, and ITACS. It also introduced the updated ITACS platform, changes to the one-month guidance tool, and access pathways through the TCC website. The presenter also shared information on TCC's advisory panel for extreme climate events and WMO's Youth Action Plan.

Key Insights

- TCC provides climate information and tools to NMHSs, including forecast maps, verification maps, indices, and guidance tools.
- A new version of ITACS has been launched with a more interactive interface and Python-based framework.
- Some ITACS functions are still limited but full functionality is expected to be restored in future updates.
- One-month guidance now uses JMA's updated coupled prediction system.

- TCC's advisory panel supports analysis and communication of extreme climate events.
- WMO's Youth Action Plan was introduced, with an invitation for countries to share youth-related activities.

C. Status of Climate Services in South Asia

Regional Assessment of Climate Services and Training Needs Assessment

Dr. Anshul Agarwal, RIMES

RIMES presented an overview of the SAHF Climate Services Working Group, the regional and national climate services assessment, and the Training Needs Assessment. The presentation situated climate services as one of SAHF's thematic work areas, alongside impact-based forecasting, numerical weather prediction, observation networks, capacity enhancement, and hydrology. It summarized progress on regional assessment, national assessment, working group facilitation, SASCOF/CSUF support, decision-support systems mapping, and potential improvements to tools such as FOCUS.

Key Insights

- The SAHF Climate Services Working Group was established in response to regional demand for stronger climate services coordination.
- South Asia has strong seasonal engagement through SASCOF and CSUF, but feedback loops, impact tracking, and co-production remain limited.
- Climate service information systems are relatively strong for seasonal forecasting but remain fragmented across timescales.
- Observation gaps remain, especially in remote and mountainous areas, with uneven coverage and limited real-time data exchange.
- Many capacity development activities remain project-based rather than institutionalized.
- Countries were grouped into South Asia-specific categories, from foundational to full climate services, reflecting differing levels of institutionalization and operational capability.
- Key regional priorities include NFCS strengthening, RFCS development, peer learning, standardized capacity development, improved user engagement, sectoral pilots, and sustainable financing.

D. Interpretation of Climate Information and Products

i. Forecasting Impact of Climate Drivers on Agricultural Sector: An ongoing research at RIMES

Raihanul Haque Khan, RIMES

This session examined how major climate drivers such as El Niño and the Indian Ocean Dipole can influence agricultural production across different countries and contexts. The presentation explored relationships between climate anomalies and agricultural outcomes, highlighting the need to translate broad climate signals into sector-specific implications. It contributed to the

Forum's wider objective of helping users understand how large-scale drivers can inform anticipatory planning in agriculture.

Key Insights

- Climate drivers such as ENSO and IOD influence rainfall and temperature patterns that affect agricultural production.
- Impacts vary by country, crop, crop calendar, and production stage.
- Seasonal outlooks can help identify areas requiring closer monitoring, but should be combined with sub-seasonal and short-range forecasts for operational decision-making.
- Agricultural advisories require thresholds and context-specific interpretation rather than direct use of raw climate outlooks.
- Co-production with agricultural agencies and extension systems is essential to make climate information usable by farmers.

Open Discussion Summary

The discussion on agriculture emphasized the need to define crop-stage-specific thresholds and to understand whether rainfall deficits or excess rainfall pose greater risk depending on planting, growing, or harvesting stages.

ii. Interpreting Forecasts and Probabilistic Information

Dr. Jane Strachan, UK Met Office

Dr. Strachan facilitated a session on how to interpret probabilistic forecasts and ensemble information. The session used accessible examples to demonstrate how ensemble members represent different possible outcomes and how uncertainty should be communicated to users. The presentation helped participants understand why seasonal outlooks are probabilistic, why forecasts should not be interpreted deterministically, and how users can use probability information in planning.

Key Insights

- Seasonal forecasts provide probabilities of different outcomes rather than exact predictions.
- Ensemble forecasts help represent uncertainty and possible future scenarios.
- Users need support in interpreting terms such as above-normal, below-normal, probability, confidence, and uncertainty.
- Forecast communication should clarify both the most likely outcome and the range of plausible outcomes.
- Better understanding of probabilistic forecasts can support more informed risk-based decisions.

E. Case-based Discussions: Applications of Climate Services in Decision-Making

i. WFP Use of SASCOF Outlooks for Planning and Resource Allocation

Dr. Jothiganesh Shanmugasundaram, WFP

WFP presented how SASCOF outlooks have been used in humanitarian and food-security planning, including strategic resource allocation and preparedness decisions. The presentation demonstrated how climate outlooks can support anticipatory action by helping organizations identify potential areas of concern before impacts materialize.

Key Insights

- Seasonal outlooks support early planning and prioritization of resources.
- Climate information can inform food security, humanitarian preparedness, and operational readiness.
- Regional outlooks are useful but need to be complemented by national and local information.
- Timely access to outlooks helps organizations align seasonal risks with programming and contingency planning.
- Climate services can strengthen anticipatory action when linked with sectoral vulnerability and exposure data.

ii. Climate Services for Disaster Risk Management in Maldives

Faroosha Ali Naseer, NDMA Maldives

The presentation discussed what climate services mean from a disaster management perspective in Maldives. It focused on the need to translate climate information into localized preparedness and early action, particularly given Maldives' island geography and exposure to rainfall, flooding, storms, sea conditions, and heat stress. The presentation highlighted how localized island-level information could be integrated with forecast products to support preparedness actions.

Key Insights

- Disaster management users need localized, actionable information rather than generalized forecast statements.
- Island-level exposure and vulnerability information are important for interpreting climate risks in Maldives.
- Forecast information can support early actions, preparedness planning, and risk reduction.
- The usability of climate services depends on clarity, timing, communication channels, and alignment with operational decision processes.
- Climate information should be connected with pre-agreed early action protocols where possible.

iii. Agriculture Decision Support System in Bhutan

Tshering Pem, Department of Agriculture Bhutan

The Bhutan presentation demonstrated an agriculture decision-support system that uses forecast information to generate tailored advisories. The system links forecast data with

advisory generation and dissemination workflows, helping users produce bulletins that can be shared with relevant authorities and stakeholders.

Key Insights

- DSS tools can help translate forecast products into actionable agricultural advisories.
- Users can tailor advisories based on forecast information and sectoral needs.
- Automated bulletin generation and dissemination can improve timeliness and consistency.
- Agriculture DSS platforms can strengthen the link between NMHS products and sectoral decision-making.
- Such systems require continuous user feedback and refinement to remain useful.

iv. Climate Services for Transport Sector: Nepal Experience and NAVIGATE DSS

Puja Shakya, RIMES

The Nepal transport sector presentation focused on climate risks affecting roads and mobility, particularly rainfall-triggered landslides, road blockages, and highway damage during the monsoon. It introduced NAVIGATE, a decision-support system developed for Nepal's Department of Roads with RIMES technical support. The tool supports climate risk insights for road assets, maintenance planning, route closure advisories, and early action by integrating forecast data, road exposure, incident reporting, and alert generation.

Key Insights

- Nepal's road transport system is highly exposed to monsoon rainfall, landslides, and climate variability.
- Seasonal uncertainty affects not only mobility but also maintenance scheduling and budget planning.
- NAVIGATE provides forecast maps, incident reporting, road and bridge closure data, and road safety alerts.
- The system currently supports decision-makers rather than directly informing the public.
- Forecast-based alerts can support preventive maintenance, route closure advisories, and disaster risk reduction actions.
- Co-production with line agencies is essential; usable information is more important than forecasts alone.

v. Panel Discussion on User-Sector Applications of Climate Services

Panelists: Malaka Abdul Hameed, Maldives
Soe Moe Win, Myanmar
Nirmala Regmi, Nepal
Y.A.C.R. Kumara, Sir Lanka
Moderator: Raihanul Haque Khan

The panel discussion brought together user-sector representatives from different countries and sectors to reflect on how climate information is used, what constraints remain, and what is needed to make forecasts more actionable. The discussion emphasized that climate

services must go beyond forecast production to support actual decisions, institutional planning, and anticipatory action.

Key Insights

- Users need sectoral use cases to demonstrate how forecasts can be applied in real operational contexts.
- Common needs include clearer communication, regular producer-user dialogue, better translation of advisories, and tailored products.
- Different sectors have distinct needs, thresholds, lead times, and preferred communication channels.
- A community of practice or regular engagement mechanism could help sustain learning beyond CSUF events.
- Technology, online platforms, WhatsApp groups, and structured knowledge exchange could support continued interaction.
- User-sector institutions can also help define priorities, not only receive products.

Open Discussion Summary

The panel demonstrated the need to move from producing forecasts to helping institutions make proactive plans. Participants emphasized producer-user coordination, clear advisory language, and decision-oriented climate services.

F. Heat Health Initiatives for South Asia

i. South Asia Center for Climate and Health Application and Heat Health Hub

Dr. Roxy Koll, IITM

The session introduced the South Asia Center for Climate and Health Application (SACHA), a WMO-supported initiative to be hosted by IITM in partnership with IMD, RCC-Pune, NCDC, and other partners. The presentation situated SACHA alongside the South Asia Heat Health Hub under the Global Heat Health Information Network and WMO-WHO partnership. The aim is to connect research, operations, governance, policy, city action, health systems, and cross-country learning, rather than create parallel systems.

Key Insights

- SASCOF and CSUF provide a strong platform for introducing heat-health action into regional climate services.
- SACHA will focus on the research-to-operations pathway for climate-health applications.
- The Heat Health Hub will support governance, policy engagement, city-level action, health systems, and regional learning.
- The goal is to move from forecast to action and develop a science-based, people-centered South Asia heat-health system.
- Seasonal and sub-seasonal heat outlooks need to be linked to preparedness messages, health advisories, surveillance, and local action.

Open Discussion Summary

Discussion emphasized the need to connect SACHA with the Heat Health Hub and align with partners such as CEW. Dr. K.J. Ramesh noted that heat action plans often lack clear triggers linked to SOPs, particularly at district level, and encouraged the development of targeted triggers for action. He also emphasized the need to include livestock and poultry, given their importance to rural livelihoods. Dr. Koll agreed that agriculture, livestock, and poultry should be linked to heat-health action planning and that regional partners from all countries should be engaged.

ii. Seasonal Heatwave Outlook for the Indian Region

Dr. Rohini P., RCC-Pune / IMD

The presentation discussed the rationale, methodology, and current status of seasonal heatwave outlooks for India, including the increasing relevance of heatwaves under climate change. It explained IMD's station-based heatwave criteria and the percentile-based criteria used for gridded datasets and model outputs. It also presented multi-model ensemble approaches to seasonal heatwave outlook generation, forecast skill, verification, 2026 outlooks, and challenges in extending heatwave outlooks to the broader South Asia region.

Key Insights

- Heatwave risks are increasing due to warming mean temperatures and changing temperature variability.
- IMD's operational heatwave criteria are station-based and not directly applicable to gridded datasets or model outputs.
- A percentile-based heatwave index has been developed for gridded and model data.
- Multi-model ensemble outputs are used to produce seasonal and monthly heatwave outlooks.
- For 2026, above-normal heatwave days were expected over parts of east, east-central, southeast peninsular, northwest, and west-central India during MAM and AMJ.
- Extending heatwave outlooks to South Asia requires historical heatwave records, station data, and country-specific threshold tuning.

Open Discussion Summary

Participants asked whether the outlook could be extended to other South Asian countries and how thresholds could be defined. The presenter noted that the existing index has been tested for Pakistan and may also be relevant for Afghanistan due to similar criteria, but more historical records are needed for other countries. Pakistan highlighted increasing minimum temperatures and the importance of warm nights. Maldives and Sri Lanka raised concerns about humidity, "feels-like" temperature, heat stress, and applicability to island and coastal contexts. The presenter acknowledged the need to improve indices by incorporating minimum temperature, humidity, and heat stress considerations.

iii. Heat Wave Management and Early Warning Services

Dr. Akhil Shrivastava, IMD

Dr. Shrivastava presented its seamless heatwave forecasting and early warning services across seasonal, monthly, extended-range, and short- to medium-range timescales. The presentation explained how seasonal and monthly outlooks support anticipatory and

preparatory actions, extended range forecasts support planning one to four weeks ahead, and daily warnings support on-ground action. It also described IMD's impact-based color-coded warning system, decision-support platform, and heatwave bulletins for sectors such as health and railways.

Key Insights

- IMD follows a seamless forecasting strategy from seasonal outlooks to seven-day warnings.
- Seasonal and monthly outlooks support pre-season preparedness, refresher training, mock drills, and planning.
- Extended range forecasts provide weekly probabilities for heatwaves, warm nights, and above-normal temperatures.
- Seven-day warnings provide color-coded, impact-based guidance for heatwaves, warm nights, and hot/humid weather.
- Impact-based warnings consider maximum temperature, minimum temperature, humidity, wind speed, persistence, percentile status, and co-occurring hazards.
- IMD overlays heatwave warnings with exposure layers, such as railway networks, to produce sector-specific bulletins.
- Vector-borne disease transmission windows, such as for malaria and dengue, are also being explored using temperature thresholds.

Open Discussion Summary

Maldives asked how to harmonize different heat indices, including thermometer temperature, feels-like temperature, UTCI, and wet-bulb globe temperature, especially for public communication and tourism. IMD explained that a single universal index is difficult; instead, locally relevant parameters can be weighted and translated into color-coded warnings. Pakistan asked how model temperature errors are corrected for daily forecasting, to which IMD explained that forecasters often use model trends and multi-model ensemble guidance rather than raw absolute values. Dr. Ramesh suggested producing polygon-based multi-timescale products and analyzing diurnal temperature range to better identify extended heat stress.

iv. India's Preparedness for Heat and Health

Dr. Aakash Shrivastava, NCDC India

NCDC presented India's public health preparedness system for heat under the National Mission on Climate Change and Human Health. The presentation described India's three-tier organizational structure across national, state, and district levels; heat-health risk assessment; national and state heat-health action plans; advisories; public awareness materials; capacity building; health facility preparedness; surveillance; and data systems. It demonstrated how health-sector preparedness is linked with IMD warnings and seasonal/monthly outlooks.

Key Insights

- India addresses heat-health under the National Mission on Climate Change and Human Health.
- A national heat-health action plan guides health-sector preparedness and response.

- All 36 states have developed heat-health action plans, and district-level plans are being developed.
- Advisories are issued before summer and include public health messages, health department preparedness actions, and seasonal/monthly outlook information.
- Training materials and clinical guidelines have been developed for different health cadres.
- Heat stroke management units, emergency cooling, ambulance preparedness, and ORT centers are part of the health-sector readiness system.
- Surveillance collects data on heat stroke cases, suspected heat stroke deaths, mortality, and cardiovascular deaths.
- District-level IMD warnings are disseminated to health program officers through WhatsApp groups, with health-specific advisory text.

Open Discussion Summary
Participants asked how heat-related illnesses and deaths are classified and how people with disabilities are reached. NCDC explained that heat stroke is prioritized in surveillance because it is life-threatening, while broader heat-related conditions are covered in guidance documents. The presenter acknowledged that more work is needed to tailor communication to people with disabilities, including those who cannot see or hear.

v. From Forecast to Action: Synergizing Heat-Health Resilience

Dr. Novil Wijesekara, Sri Lanka

The presentation offered a systems-level perspective on improving heat-health advisories and action across meteorology, health, disaster management, communities, and other sectors. It argued that while heat forecasts are improving, health impacts are not necessarily reducing at the same pace because of gaps in ownership, operationalization, coordination, leadership, communication, equity, and values-based planning. The presentation proposed “synergistic resilience” as a framework for integrating leadership, community action, sectoral collaboration, and inclusive decision-making.

Key Insights
- Forecasts are improving, but health impacts remain high because action systems are not always keeping pace.
- Heat-health risks often suffer from unclear ownership across health, labor, urban planning, education, and community systems.
- Resilience must include stability, adaptability, transformability, and learning beyond response.
- Heat-health action should move beyond reactive response toward anticipatory, mitigatory, preparatory, response, recovery, and learning phases.
- Community, household, health, education, and meteorological systems need to be aligned across levels.
- Equity, diversity, inclusion, trust, leadership, and accountability should be embedded in heat-health action.
- Heat forecasts need to be translated into clear decision triggers at community and health system levels.

Open Discussion Summary

Myanmar asked whether the framework could be applied to agriculture. Dr. Wijesekera explained that the same approach is relevant: forecasts must be translated into locally meaningful guidance for farmers, with attention to livelihood realities, daily wage needs, local institutions, agriculture extension officers, and community-level decision-making.

vi. South Asia Heat-Health Network Initiative

Dr. Vishwas Chitale / GHHIN-related Session

The session introduced regional heat-health networking efforts, including the South Asia Heat Health Hub and related work under the Global Heat Health Information Network. The presentation focused on building a regional platform to connect climate science, health, disaster management, policy, and implementation actors.

Key Insights

- Heat-health action requires a networked approach involving climate, health, disaster, urban, labor, and community actors.
- Regional platforms can support cross-country learning, shared tools, and adaptation of best practices.
- The network can help bridge research, operations, policy, and city-level implementation.
- South Asia needs context-specific thresholds and advisory systems that reflect local climates, exposure, and vulnerability.
- Collaboration with existing SASCOF/CSUF mechanisms can help mainstream heat-health into regular climate service processes.

vii. Open Discussion on Strengthening Heat-Health Advisories

Key Insights

- Defining a single heat-health threshold across South Asia is difficult because risks vary by location, occupation, climate, urban form, vulnerability, and acclimatization.
- Composite heat-risk profiles may be more useful than a single “heatwave” definition in some contexts.
- Population exposure, health facility exposure, and mortality data can help refine thresholds and risk profiles.
- Island and coastal contexts, such as Maldives, require attention to humidity, sea influence, urbanization, reduced greenery, and “feels-like” temperature.
- Users need to clarify what information they require, at what lead time, and in what format.
- Heat-health products should support health and disaster agencies in planning early action, not only issuing alerts.

Open Discussion Summary

UN ESCAP noted that it is developing threshold-based composite heat-risk profiles and exploring mortality datasets to improve threshold realism. Dr. Koll requested health and disaster experts to specify the heat outlook information they need, including lead time and format, so that products can better support early action.

G. Using Long-Term Climate Information

i. Use of Climate Projections to Support Infrastructure Planning and Climate Adaptation Strategies

Dr. Sabin TP, CCCR-IITM, Pune

The presentation introduced available and upcoming CCCR-IITM climate projection datasets for South Asia, including IITM Earth System Model outputs, CORDEX South Asia simulations, CMIP6-based datasets, planned CMIP7 simulations, and bias-corrected high-resolution products. It highlighted how these datasets can support climate risk assessment, adaptation planning, infrastructure design, water management, coastal planning, and sectoral climate applications.

Key Insights

- South Asia faces increasing risks from temperature extremes, monsoon variability, extreme rainfall, tropical cyclones, sea-level rise, and Himalayan warming.
- Future simulations suggest increased monsoon rainfall and more intense extreme rainfall over much of South Asia.
- Tropical cyclogenesis may increase by around 15–30% in future periods, with implications for coastal communities.
- Extreme sea-level events may become more frequent, posing risks to island and coastal countries.
- The Himalayan region is projected to warm faster, with declining snow amounts affecting glaciers, water resources, hydropower, and mountain infrastructure.
- CORDEX South Asia 50-km datasets are already available, while higher-resolution 27-km and bias-corrected products are expected to be released once ESGF server issues are resolved.
- Upcoming CMIP7 simulations are expected to provide improved global resolution, supporting better representation of smaller countries and island contexts.

Open Discussion Summary

Participants expressed interest in accessing the datasets and linking them with SAHF training needs. Dr. Sabin noted that some datasets are already available through ESGF, while newer datasets can be provided offline until server upgrades are completed. Training on data access, reformatting, and use of projection datasets may be coordinated with IITM/CORDEX and RIMES. Dr. Ramesh suggested developing additional products on West Pacific cyclogenesis and decade-wise extreme rainfall and temperature percentiles to support flood, heat, and infrastructure planning.

ii. Use of Climate Projections for Planning and Climate Adaptation Strategies

Leila Salarpour-Goodarzi, ESCAP

The presentation introduced ESCAP's approach to risk analysis across different timeframes, from seasonal and operational decision-making to long-term development planning. It highlighted the Asia-Pacific Disaster Report 2025, ESCAP's Risk and Resilience Portal, country risk profiles, and emerging coastal risk tools such as ClimaCoast. The presentation

emphasized that climate risk analysis should combine hazard data with exposure, vulnerability, socioeconomic data, and sectoral information to support more integrated, multi-hazard and multi-sector planning.

Key Insights

- ESCAP's risk analysis approach combines hazard, exposure, vulnerability, and socioeconomic datasets to identify hotspots and support planning.
- The Risk and Resilience Portal brings together tools and datasets for historical evidence, operational decision-making, country profiles, sectoral analysis, and long-term planning.
- ESCAP is working to integrate national datasets, such as Maldives' DALA disaster data, into country profiles to improve visibility and use of national information.
- Downscaled climate risk information has been developed for countries such as Maldives and Bhutan, including higher-resolution projections to support national decision-making.
- The coastal risk work under CARA focuses on Maldives and Sri Lanka, examining coastal flooding, tsunami, sea surface temperature, population exposure, infrastructure, roads, fisheries, tourism, reefs, mangroves, and coral ecosystems.
- ClimaCoast is being developed as a dedicated tool for coastal risk information, with regional and country-level pages for Asia-Pacific, Maldives, and Sri Lanka.
- ESCAP is also exploring AI and machine learning to match nature-based solutions with local risk profiles and recommend more context-appropriate adaptation options.

Open Discussion Summary

Participants welcomed the tools and datasets and encouraged countries to engage with ESCAP to access and apply them. Dr. Ramesh highlighted the value of the coastal risk methodology for South Asia and suggested expanding the approach beyond Maldives and Sri Lanka to other coastal zones and island areas, including Bay of Bengal and Arabian Sea islands. ESCAP noted that country-level work depends on national data, user needs, and collaboration with local institutions.

iii. INSTANT South Asia Portal Demonstration

Khan MD Golam Rabbani, RIMES

The INSTANT South Asia portal demonstration introduced a platform for accessing indicators related to heat, cold, and other temperature-related hazards. The session aimed to show how countries can use portal-based information for operational and planning purposes.

Key Insights

- The portal is intended to support countries in accessing relevant indicators for heat and cold hazards.
- Such tools can help translate technical climate information into risk-relevant products for operational users.
- Portal-based products should be aligned with national needs, thresholds, and institutional workflows.

- Demonstrations can support uptake by showing users how to access, interpret, and apply available information.

H. Analyzing and Communicating Sector Specific Climate Risks

Interactive Session on Co-Production of Climate Outlooks and Advisories

Raihanul Haque Khan and Asif Uddin Bin Noor, RIMES

The final session of the CSUF was conducted as a hands-on co-production exercise designed to help participants translate the SASCOF-34 seasonal outlook into practical, sector-oriented advisories. The activity brought together NMHS representatives and user-sector participants to jointly interpret the regional outlook and discuss what the forecast could mean for different sectors, sub-regions, and decision contexts. It was intended to move participants beyond simply restating the seasonal forecast, toward identifying likely implications, no-regret preparedness actions, monitoring needs, and coordination requirements.

Each group was asked to use the SASCOF-34 outlook and the participant worksheet to prepare four main outputs: a 3–4 sentence plain-language summary of the outlook; sector implications for selected sectors; short decision-oriented advisory text for each sector; and at least three recommended actions for each sector. The recommended actions were expected to include one immediate action, one monitoring or update action, and one coordination action.

The groups were also guided to apply an advisory quality checklist. Their outputs were expected to clearly state what the outlook suggests, explain what it may mean for the sector, recommend actions that can be taken now, avoid overclaiming certainty, and mention the need for updates and continued monitoring. Participants were reminded to use cautious language such as “is more likely,” “prepare for,” and “monitor updates,” rather than deterministic wording such as “will happen.”

The exercise encouraged groups to differentiate implications by sub-region rather than turning the regional SASCOF outlook into a single national or regional message. Participants were asked to select sectors relevant to their group composition, such as agriculture, water resources, disaster management, public health, tourism and island operations, and local government or urban services. The role cards helped participants think from the perspective of specific users and identify what information each sector would need from the forecast team to support planning and early action.

Overall, the exercise served as a practical demonstration of co-production, bringing together meteorological expertise and user-sector perspectives to develop more actionable climate advisories. It also highlighted the importance of plain-language communication, sector-specific interpretation, realistic treatment of uncertainty, and continued coordination between NMHSs, local governments, sector agencies, and other stakeholders after the Forum.

Group Presentation Highlights

<u>Group 1: Agriculture and Health</u>

A. *Sector Implication and Advisory Summary*

For agriculture and food security, the group noted that above-normal rainfall in northwestern South Asia may affect harvesting and crop production, including possible nutrient loss, while below-normal rainfall in central South Asia may require irrigation support and changes in crop production planning. The group also identified waterlogging risks in wetter areas and dry-spell impacts on crop establishment in drier areas. Suggested advisories included using climate-resilient crop varieties, adjusting cropping management, and considering insurance mechanisms.

For health, the group highlighted above-normal temperatures as a concern for heat stress, heat stroke, skin burns, water deficiency, and risks to vulnerable groups such as the poor, elderly, and children. The group recommended disseminating heat advisories through multiple channels and encouraging the public to take precautions, stay hydrated, and regularly monitor weather updates.

B. *Recommended Actions*

For agriculture, the group recommended ensuring climate-resilient varieties are available before the season, informing farming communities about the climate outlook and necessary actions, and coordinating with government offices to allocate budget for immediate actions. For health, the group recommended disseminating heat advisories, monitoring daily temperatures, and coordinating with meteorological agencies and relevant stakeholders.

<u>Group 2: Agriculture/Food Security and Health</u>

A. *Sector Implication and Advisory Summary*

For agriculture and food security, the group identified drought stress in rice crops and possible yield reductions in central South Asia, crop destruction risks in eastern South Asia, disruption to fisheries near island areas due to above-normal precipitation, and coral bleaching risks in island areas due to high temperatures. The group also noted opportunities for rainfed crops in northwestern and northeastern areas, while also warning of higher irrigation demand and waterlogging risks.

For health, the group linked above-normal temperature and precipitation to possible increases in vector-borne diseases across South Asia and water-borne diseases in areas expecting above-normal rainfall. The group recommended precautionary measures for vector-borne diseases, readiness for vaccination programmes where applicable, prepositioning of medical consumables, enhanced water safety measures, and cleaning of houses and drainage systems.

B. *Recommended Actions*

For agriculture and food security, the group recommended sharing the outlook with local governments, initiating action plans, stocking drought-resistant seeds, holding sectoral and local government coordination meetings, keeping updated with weather information, and mobilizing contingency budgets. For health, recommended actions included sharing information with local governments, activating public health preparedness plans, monitoring disease prevalence in real time, and arranging weekly Health Emergency Operations Centre coordination meetings.

Group 3: Agriculture and Socioeconomic/Disaster Preparedness

A. Sector Implication and Advisory Summary

For agriculture, the group noted that lower water availability could make rainfed crops difficult to grow, while high temperatures could increase soil evaporation and drought risk. The group recommended selecting drought-resistant crop varieties, preparing irrigation in rainfed areas, and constructing tube wells where appropriate.

For the socioeconomic/disaster preparedness sector, the group identified lower rainfall and higher maximum and minimum temperatures as possible drivers of drought and heat stress, with implications for water management. Suggested water management measures included drip irrigation, rainwater harvesting, recharge ponds, and reservoir development. For areas expecting higher rainfall, the group identified urban flooding and flash flooding as potential scenarios requiring preparedness and monitoring.

B. Recommended Actions

For agriculture, immediate actions included using drought-resistant varieties and preparing irrigation systems. Monitoring actions included use of mulch shields to retain soil moisture and water spraying where irrigation is not available. Coordination actions included linking farmers without tube wells to those with tube wells and seeking government support for irrigation access through tanks or canals. For disaster preparedness, the group recommended identifying flood-prone areas, conducting hazard mapping, holding regular disaster-related meetings among concerned agencies, and developing and implementing disaster preparedness action plans.

Group 4: Tourism and Agriculture

A. Sector Implication and Advisory Summary

For tourism, the group noted that above-normal temperatures and lower rainfall may increase glacier and snowmelt risks, potentially contributing to glacial lake outburst floods, landslides, damage to roads and bridges, transport disruption, and heat-related health issues. Coastal areas were also noted as potentially experiencing higher “feels-like”

temperatures due to humidity. The group advised precautionary measures when accessing flood-risk areas, glacial areas, and coastal areas, especially during daytime.

For agriculture, the group emphasized that higher-than-usual temperatures and below-normal rainfall could create water scarcity during cultivation, especially in rainfed areas. This may reduce crop yields, affect fodder crops, and indirectly affect livestock. The group advised farmers to assess current water capacity, pre-plan crop calendars, consider drought-resistant crops, and monitor official PMD advisories because seasonal forecasts may change as conditions evolve.

B. Recommended Actions

For both sectors, the group recommended communicating the seasonal prediction to national and regional levels in both local and English languages and activating local governance bodies. For monitoring, the group proposed real-time monitoring systems and feedback mechanisms with focal points. For coordination, the group recommended coordination among relevant authorities, including proper drills for tourism and disaster-related risks, and coordination among authorities, farmers, NDMA, and relevant agriculture actors for agricultural preparedness.

ANNEX I: ACRONYMS

ACC	Anomaly Correlation Coefficient
ADKAR	Awareness, Desire, Knowledge, Ability, and Reinforcement
AI	Artificial Intelligence
AP	Asia Pacific
APCC	APEC Climate Centre
APEC	Asia-Pacific Economic Cooperation
API	Application Programming Interface
BMD	Bangladesh Meteorological Department
BOM	Bureau of Meteorology, Australia
C3S	Copernicus Climate Change Service
CCA	Canonical Correlation Analysis
CCCR-IITM	Centre for Climate Change Research, Indian Institute of Tropical Meteorology
CCSM4	Community Climate System Model, Version 4
CDS	Climate Data Store
CESM1	Community Earth System Model, Version 1
CFS	Climate Forecast System
CHIRPS	Climate Hazards Group InfraRed Precipitation with Station Data
CMCC	Euro-Mediterranean Center on Climate Change
CMIP6	Coupled Model Intercomparison Project, Phase 6
CMIP7	Coupled Model Intercomparison Project, Phase 7
COF	Climate Outlook Forum
CORDEX	Coordinated Regional Climate Downscaling Experiment
CPC	Climate Prediction Center
CPT	Climate Predictability Tool
CREWS	Climate Risk and Early Warning Systems
CS	Climate Services
CSUF	Climate Services User Forum
DataEx	Data Exchange Platform
DSS	Decision Support System
DWD	Deutscher Wetterdienst/German Meteorological Service
ECMWF	European Centre for Medium-Range Weather Forecasts
ENSO	El Niño–Southern Oscillation
ERA5	ECMWF Reanalysis, Version 5
ERPv1	Extended Range Prediction System, Version 1
ERPv2	Extended Range Prediction System, Version 2
ESCAP	United Nations Economic and Social Commission for Asia and the Pacific
ESGF	Earth System Grid Federation
FCDO	Foreign, Commonwealth & Development Office
GEDSI	Gender Equality, Disability and Social Inclusion

GEOS	Goddard Earth Observing System
GFCS	Global Framework for Climate Services
GHHIN	Global Heat Health Information Network
GIS	Geographic Information System
GPC	Global Producing Centre
GPCP	Global Precipitation Climatology Project
GTS	Global Telecommunication System
HRES	High-Resolution Forecast
HTML	HyperText Markup Language
IBF	Impact-Based Forecasting
IITM	Indian Institute of Tropical Meteorology
IMD	India Meteorological Department
IOD	Indian Ocean Dipole
IRI	International Research Institute for Climate and Society
ITACS	Interactive Tool for Analysis of the Climate System
JJA	June–July–August
JJAS	June–July–August–September
JMA	Japan Meteorological Agency
LRF	Long-Range Forecast
MAM	March–April–May
MJO	Madden–Julian Oscillation
MMS	Maldives Meteorological Service
NASA	National Aeronautics and Space Administration
NCDC	National Centre for Disease Control, India
NCEP	National Centers for Environmental Prediction
NCMRWF	National Centre for Medium Range Weather Forecasting
NCOF	National Climate Outlook Forum
NDMA	National Disaster Management Authority
NetCDF	Network Common Data Form
NFCS	National Framework for Climate Services
NGO	Non-Governmental Organization
NMHS	National Meteorological and Hydrological Service
NMME	North American Multi-Model Ensemble
ONI	Oceanic Niño Index
ORT	Oral Rehydration Therapy
PCR	Principal Components Regression
PDF	Portable Document Format
PMD	Pakistan Meteorological Department
PyCPT	Python interface for the Climate Predictability Tool
QGIS	Open-source Geographic Information System software
RAM	Random Access Memory

RapidIBF	Rapid Impact-Based Forecasting
RCC	Regional Climate Centre
RFCS	Regional Framework for Climate Services
RIMES	Regional Integrated Multi-Hazard Early Warning System for Asia and Africa
ROC	Receiver Operating Characteristic
S2S	Sub-seasonal to Seasonal
SACHA	South Asia Center for Climate and Health Application
SAHF	South Asia Hydromet Forum
SASCOF	South Asian Climate Outlook Forum
SKHub	South Asia Knowledge Hub
SOP	Standard Operating Procedure
SST	Sea Surface Temperature
TCC	Tokyo Climate Center
TNA	Training Needs Assessment
TSV	Tab-Separated Values
UK	United Kingdom
UKMO	UK Met Office
UN	United Nations
UTCI	Universal Thermal Climate Index
WFP	World Food Programme
WG	Working Group
WHO	World Health Organization
WIS 2.0	WMO Information System 2.0
WISER	Weather and Climate Information Services
WMO	World Meteorological Organization
WSL	Windows Subsystem for Linux

ANNEX II. AGENDA – PRE-COF HANDS-ON TRAINING WORKSHOP

Pre-COF Hands-On Training Workshop

25–27 April 2026 | 09:00 – 17:00 (UTC+5) | Malé, Maldives

DAY 1 – 25 April 2026 (Saturday): Technical Forecasting and Modelling Capacities	
09:00 – 09:30	Registration
09:30 – 10:00	Inaugural Session
10:00 – 10:30	***High Tea***
10:30 – 11:00	Basics of Seasonal Forecast Dr. O. P. Sreejith, IMD
11:00 – 11:30	Introduction to Python Programming and Hands-on session Khan MD Golam Rabbani, Nazmul Ahasan & Rajkumar Rai, RIMES
11:30 – 12:00	Availability of Climate model in NMME and ECMWF Climate Data Store and Preparation of Climate Model data Rajkumar Rai, RIMES
12:00 – 13:00	***Lunch***
13:00 – 13:30	New Relative ONI Index for ENSO Monitoring & Prediction Dr. Sabeerali C T., RCC-Pune
13:30 – 15:30	Introduction to Xcast and Hands-on Exercise of Model evaluation using Xcast Rajkumar Rai, Khan MD Golam Rabbani, RIMES / Sabeerali C. T., RCC-Pune
15:30 – 16:00	***Tea Break***
16:00 – 17:00	Hands on Training on Xcast Rajkumar Rai, Khan MD Golam Rabbani & Nazmul Ahasan, RIMES
DAY 2 – 26 April 2026 (Sunday): XCAST, QGIS, and FOCUS X	
09:00 – 10:30	Hands-On: Xcast Rajkumar Rai, Khan MD Golam Rabbani, RIMES
10:30 – 12:00	Overview of Impact Analysis Tool with Hands-on Demonstration Leila Salarpour Goodarzi & Rahul Suman, UN ESCAP
12:00 – 13:00	***Lunch***
13:00 – 14:30	Demonstration and Hands-on Demonstration of Offline and Online GIS Tool Leila Salarpour Goodarzi & Rahul Suman, UN ESCAP
14:30 – 15:00	***Tea Break***
15:00 – 16:00	Interactive Session: Presentation and hands-on demo on the updated FOCUS Tool Jie Qiu, RIMES & Andrew Colman, UKMO
16:00 – 16:30	Open Discussions
DAY 3 – 27 April 2026 (Monday): Translation of Climate Information into Climate Services	
09:00 – 09:30	Communication of Forecast Uncertainty to Sectoral Stakeholders RCC-Pune
09:30 – 10:30	Co-Production of Climate Services Dr. Jane Strachan, UK Met Office
10:30 – 11:00	***Tea Break***
11:00 - 11:15	Co-Development of Seasonal Outlook with Sectoral Stakeholders
	Monowar Hossain, BMD
11:15 - 11:30	Climate Forecast Application in Sri Lanka Shiromani Jayawardena, RIMES
11:30 – 12:00	Development of IBF and Risk-Informed Climate Advisories Asif Uddin Bin Noor, RIMES
12:00 – 13:00	***Lunch***
13:00 – 15:30	Developing Sector-Specific Climate Outlook and Advisories Raihanul Haque Khan and Asif Uddin Bin Noor, RIMES, & Dr. Jane Strachan, UK Met Office
15:30 – 16:00	***Tea Break***
16:00 – 16:30	Extending DataX for Seasonal Forecast: Progress and Future Plan Nazmul Ahasan, RIMES
16:30 – 17:00	Valedictory Session and Feedback
	End of Pre-COF Hands-On Training Workshop

ANNEX III. AGENDA – SASCOF-34

34th South Asian Climate Outlook Forum (SASCOF-34)

28 April 2026 | 09:00 – 17:00 (UTC+5) | Malé, Maldives

34th SOUTH ASIAN CLIMATE OUTLOOK FORUM (SASCOF-34) – TUE 28 April 2026	
09:00 – 09:30	Registration
09:30 – 10:00	Opening Session • Recitation of Holy Quran • Remarks/Messages ○ Dr. O.P. Sreejith, RCC-Pune, IMD ○ Director General Abdulla Wahid, MMS ○ Dr. Anshul Agarwal, RIMES-SAHF ○ Dr. Jane Strachan, UKMO
10:00 – 10:20	Participants' Introduction
10:20 – 10:30	Group Photo Opportunity
10:30 – 11:00	***Tea Break***
Session I: Seasonal Prediction of South Asia for JJAS Season 2026 – Country Perspectives (Part 1) Session Chair: Dr. Sreejith	
11:00 – 11:15	Afghanistan Soma Popalzai, AMD (online)
11:15– 11:30	Bangladesh Monowar Hossain, BMD
11:30 – 11:45	Bhutan Kinley Tenzin, NCHM
11:45 – 12:00	India Dr. Aarti Bandgar, IMD (online)
12:00 – 13:00	***Lunch Break***
Session I: Seasonal Prediction of South Asia for JJAS Season 2026 – Country Perspectives (Part 2)	
13:00 – 13:15	Maldives Nasooh Ismail, MMS
13:15 – 13:30	Myanmar Dr. Tin Mar Htay, DMH
13:30 – 13:45	Nepal Sudarshan Humagain, DHM
13:45 – 14:00	Pakistan Dr. Gohar Ali, PMD
14:00 – 14:15	Sri Lanka Gayana K. Hendawitharana, DOM
14:15 – 14:30	Open Discussion
Session II: Seasonal Prediction of South Asia for JJAS Season 2026 – Global and Regional Perspectives Session Chair: Mr. Ahmed Rasheed	
14:30 – 14:45	Introduction of Emerging ENSO indices and its application Dr. Sabeerali, C.T., RCC-Pune
14:45 – 15:00	***Health / Tea Break***
15:00 – 15:15	JMA's Seasonal Prediction of South Asian Climate for JJA 2026 Ken Yamada, Tokyo Climate Center-Japan Meteorological Agency (TCC-JMA)
15:15 – 15:30	Global and Regional Perspectives: WMO Lead Center for Long-Range Forecast Dr. Jeongmin Han, APEC Climate Center (APCC)
15:30 – 15:45	Global and Regional Perspectives: UK Met Office Andrew Colman, UKMO
15:45 – 16:10	Pre-Consensus Presentation and Discussion on Outlook Dr. Sreejith O.P., RCC/IMD
16:10 – 16:30	Agreement / Final Remarks on the Draft Text of the Consensus Forecast for JJAS 2026
	End of SASCOF-34 Program

ANNEX IV. AGENDA – CLIMATE SERVICES USER FORUM (CSUF)

Climate Services User Forum (CSUF)

29–30 April 2026 | 9:00 – 16:00 (UTC+5) | Malé, Maldives

DAY 1 – 29 April 2026 (Wednesday)	
08:30 – 09:00	Registration

09:00 – 09:45	Opening / Inaugural Session
	• Recitation of Holy Quran
	• Remarks/Messages
	  ○ Dr. OP Sreejith, RCC-Pune, IMD
	  ○ Mr. David Corbelli, UKMO
	  ○ Honorable Ali Shareef, Minister of Climate Change, Environment and Energy

09:45 – 10:00	Overview of the Forum, Participant Acknowledgment Dr. Anshul Agarwal, RIMES
10:00 – 10:10	Group Photo Opportunity
10:10 – 10:30	***Health / Tea Break***
Session I: SASCOF-34 Consensus Outlook for JJA 2026 Season Session Chair: Ken Yamada, TCC-JMA	
10:30 – 10:50	Presentation of SASCOF-34 Consensus Outlook Dr. Sreejith, RCC/IMD
10:50 – 11:10	Presentation on Impact Outlook Developed for the South Asian Region at SASCOF-34 and its implications for key sectors Leila Salarpour Goodarzi, ESCAP
Session II: Sub-Seasonal Products and their Utilisation Session Chair: Dr. Jane Strachan, UKMO	
11:10 – 11:25	Extended-Range Forecast Products Dr. Avijit Dey, IITM
11:25 – 11:40	S2S Forecast Products from NCMRWF Dr. Ankur Gupta, NCMRWF
11:40 – 12:00	Introduction of Recent Updates of Tokyo Climate Center (TCC)'s Services Ken Yamada, TCC-JMA
Session III: Status of Climate Services and Impact-Based Forecasting	
12:00 – 12:15	Presentation of the Regional Assessment on the Status of Climate Services and TNA Report Dr. Anshul Agarwal, RIMES
12:15 – 13:00	***Lunch Break***
Session IV: Interpretation of Climate Information and Products Session Chair: Mr. David Corbelli, UKMO	
13:20 – 13:40	Forecasting Impact of Climate Drivers on Agricultural Sector: An ongoing research at RIMES Raihanul Haque Khan, RIMES
13:40 – 14:10	Interpretation of Seasonal Outlooks, Probabilistic Forecasts, and Climate Advisories Dr. Jane Strachan, UK Met Office
14:10 – 14:25	User Sector Presentation Dr Jothiganesh Shanmugasundaram, WFP
14:25 – 14:40	***Health / Tea Break***
Session V: Case-based Discussions: Application of Climate Services in Decision-Making Session Chair: Mr. Raihanul Haque Khan, RIMES	
14:40 – 14:50	Climate Services for Disaster Management

	Ms. Faroosha Ali Naseer, NDMA Maldives
14:50 – 15:00	Climate Services for Agriculture: SESAME DSS Ms. Tshering Pem, Department of Agriculture Bhutan
15:00 – 15:10	Climate Services for Transportation Puja Shakya, RIMES
15:10 – 15:40	From Outlook to Action: Translating Climate Information into Practical Decisions Across User Sectors Malaka Abdul Hameed, Maldives / Soe Moe Win, Myanmar / Nirmala Regmi, Nepal / Y.A.C.R. Kumara, Sir Lanka / Moderator: Raihanul Haque Khan
15:40 – 16:00	Open Discussion

DAY 2 – 30 April 2026 (Thursday)	
09:00 – 09:20	Registration, Recap of Day 1 Asif Uddin Bin Noor, RIMES
Session VI: Heat Health Initiatives for South Asia **Session Chair: Dr. Sreejith**	
09:20 – 09:35	Framing and Objectives Dr. Roxy Mathew Koll, IITM
09:35 – 09:50	Seasonal Heat Outlook for Indian Region and South Asia Dr. Rohini P., IMD / WMO RCC
09:50 – 10:05	Sub-seasonal Heat Outlook and Forecast Use for Early Action Dr. Akhil Shrivastava, IMD
10:05 – 10:30	Heat-Health Advisory and Public Health Preparedness Dr. Aakash Shrivastava, NCDC/MOHFW
10:30 – 10:50	***Health / Tea Break***
10:50 – 11:30	From Forecasts to Action: Synergizing Heat Health Resilience across Meteorology, Health Sectors, and Communities in South Asia Dr. Novil Wijesekaram, Sri Lanka
11:30 – 11:40	Demonstration of the INSTANT South Asia Portal Khan MD Golam Rabbani & Nazmul Ahasan Shawn, RIMES
Session VIII: Using Long-Term Climate Information Session Chair: Dr. Anshul Agarwal, RIMES	
11:40 – 12:00	Use of Climate Projections to Support Infrastructure Planning and Climate Adaptation Strategies Dr. Sabin T.P., IITM (online)
12:00 – 13:00	***Lunch Break***
13:00 – 13:15	GHHIN South Asia Dr. Vishwas Chitale, GHHIN South Asia
Session VIII: Using Long-Term Climate Information *(continuation)*	
13:15 – 13:30	Use of Climate Projections to Support Infrastructure Planning and Climate Adaptation Strategies Leila Salarpour Goodarzi, UN ESCAP
Session VII: Analyzing and Communicating Sector Specific Climate Risks **Session Chair: Dr. Anshul Agarwal**	
13:30 – 15:00	Interactive Session: Co-Production of Climate Outlook and Advisories Raihanul Haque Khan & Asif Uddin Bin Noor, RIMES

15:00 – 15:20	Open Discussions and way forward
15:20 – 15:30	Closing Remarks • Director General Abdulla Wahid, MMS • Dr. Sreejith O.P., RCC-Pune, IMD • Mr. David Corbelli, UKMO • Dr. Anshul Agarwal, RIMES
15:30 – 16:00	***Tea Break***
	End of SASCOF-34 & CSUF Programme

ANNEX V. PARTICIPANT LIST

NMHSs

	Name	Designation	Organization
1	MD Monowar Hossain	Meteorologist	BMD
2	Kinley Tenzin	Meteorology Hydrology Officer	NCHM
3	Jamyang Phuntshok	Officiating Chief, Hydrology and Water Resources Services Division	NCHM
4	Sreejith O.P.	Scientist F	IMD
5	Sabeerali C.T.	Scientist D	IMD
6	Sanjay Damodar Raskar	Met-A	IMD
7	Abdullah Wahid	Director General	MMS
8	Ahmed Rasheed	Director Meteorology	MMS
9	Thameem Abdul Razzaq	Senior Meteorological Technician	MMS
10	Mohmed Shafiu		MMS
11	Shaheema Ibrahim	Director for Administration	MMS
12	Ibrahim Humaid	Seismologist	MMS
13	Hussain Waheed	Meteorologist	MMS
14	Nasooh Ismail	Meteorologist	MMS
15	Azeema Ahmed	Meteorologist	MMS
16	Aishath Rasheeda	Meteorologist	MMS
17	Shwe Yee Nwe	Staff Officer	DMH
18	Tin Mar Htay	Deputy Director	DMH
19	Sudarshan Humagain	Meteorologist	DHM
20	Sujan Subedi	Chief of Climate Section	DHM
21	Gohar Ali	Meteorologist	PMD
22	Dr. Sohail Babar Cheema	Meteorologist	PMD
23	A.M.A.H.D Alagiyawanna	Research Assistant	DOM
24	G.K. Hendawitharana	Deputy Director	DOM

Sector Representatives

	Name	Designation	Organization	Country
1	Abu Hasnat Md Moinuddin	Deputy Secretary	Ministry of Defence	Bangladesh
2	Tshering Pem	Senior Horticulture Officer	Department of Agriculture	Bhutan
3	Thibyan Ibrahim	Director	Ministry of Climate Change, Environment and Energy	Maldives
4	Ali Shareef	Minister	Ministry of Climate Change, Environment and Energy	Maldives
5	Fathmath Shafua		Ministry of Tourism and Civil Aviation	Maldives
6	Ali Shareef	Former DG	DOM	Maldives
7	Faroosha Ali Naseer	Director, Emergency Management	National Disaster Management Authority	Maldives
8	Fathmath Shaufa	Senior Officer, Resource Management	National Disaster Management Authority	Maldives
9	Ahmed Shabin		Maldivian Red Crescent	Maldives
10	Ibrahim Raidh Ameen	Marine Biologist, Reef-based Fisheries Monitoring and Research	Marine Research Institute	Maldives
11	Abdulla Khaleel	Senior Agriculture Field Assistant	Ministry of Agriculture and Animal Welfare	Maldives
12	Mohamed Azan Abdulla	Senior Environment Management Officer	Ministry of Climate Change, Environment and Energy	Maldives
13	Fathimath Hulwa Khaleel	Environmental Safeguards Specialist	Ministry of Climate Change, Environment and Energy	Maldives
14	Malaka Abdul Hameed	Director of Security and Crisis Management	Ministry of Tourism and Civil Aviation	Maldives
15	Soe Moe Win	Staff Officer	Department of Agriculture	Myanmar
16	Nirmala Regmi	Meteorologist	NDRRMA	Nepal
17	Y.A.C.R. Kumara	Chief Engineer	Irrigation Department	Sri Lanka

Technical and Development Partners

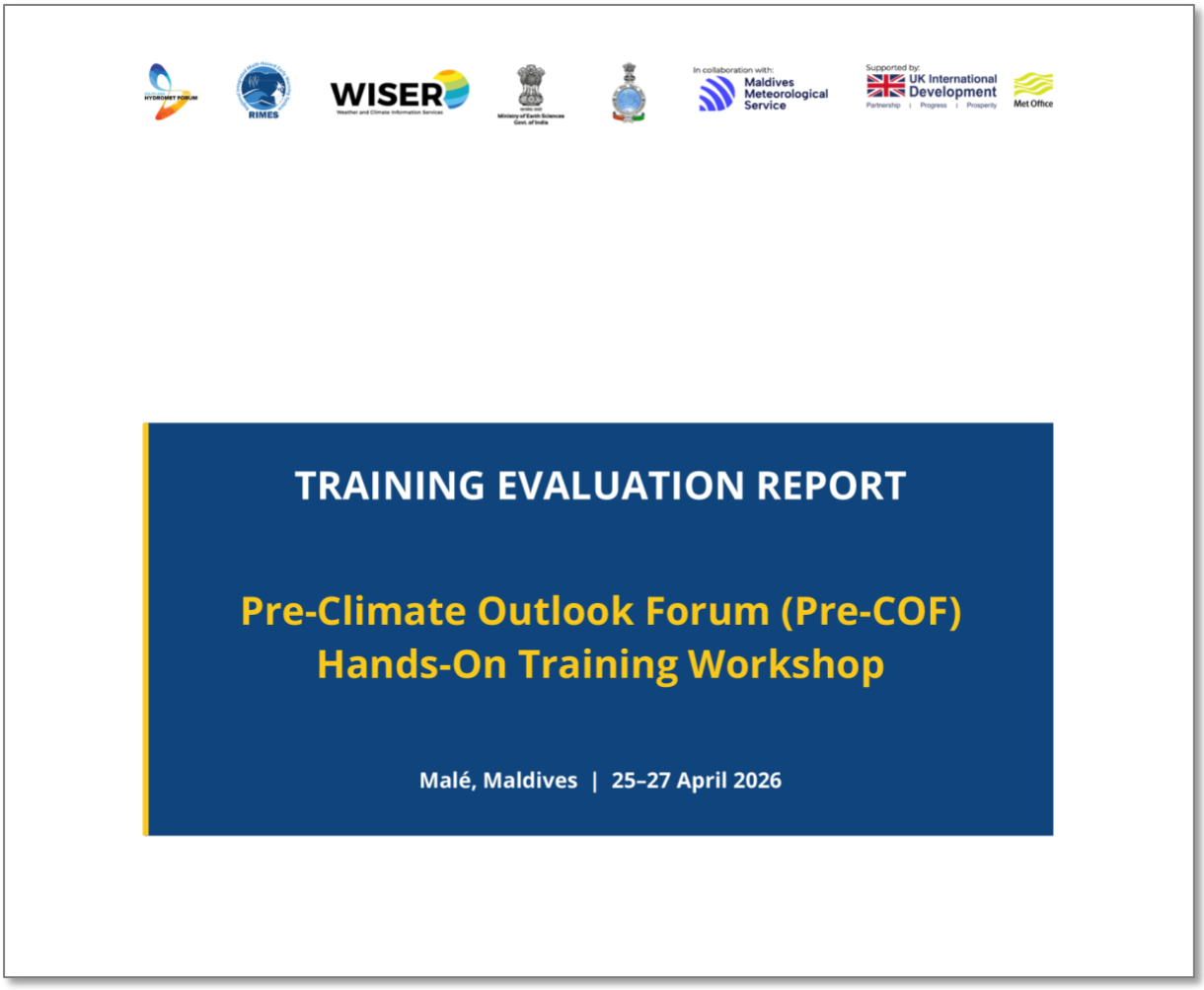
	Name	Designation	Organization
1	David Corbelli	Senior International Development Manager	UK Met Office
2	Jane Strachan	Head of International Applied Science	UK Met Office
3	Leila Salarpour Goodarzi	Associate Economic Affairs Officer	UN ESCAP
4	Rahul Kumar Suman	Technical Expert	UN ESCAP
5	Roshni Dave	Scientific and Project Officer	WMO
6	Ken Yamada	Scientific Officer	Japan Meteorological Agency
7	Anshul Agarwal	India Program Adviser	RIMES
8	Raissa Ancheta	Project Officer, Climate Services Project / Documentation Specialist	RIMES
9	Danna Faye Valdez	Project Manager, Climate Services Project	RIMES
10	Thanut Rittchai	MEL Specialist	RIMES
11	Puja Shakya	Nepal Country Program Lead	RIMES
12	Thiti Palasuwan	Operations and Program Officer	RIMES
13	Raihanul Haque Khan	Bangladesh Country Program Lead	RIMES
14	Asif Uddin Bin Noor	Climate Service Expert	RIMES
15	Khan MD Golam Rabbani	Weather Expert	RIMES
16	Nazmul Ahasan Shawn	Country Tehnical Lead	RIMES
17	Jie Qiu	Systems Research and Development Specialist	RIMES
18	Raj Kumar Rai	Project Associate	RIMES
19	Supakorn Kosuma	Administrative Associate	RIMES

Online Participants and Resource Persons

	Name	Organization
1	Ahmad Reshad Ahmad Zai	AMD
2	Fawad Auobi	AMD
3	Mohammad Mozamel Fazli	AMD
4	Nasim Muradi	AMD
5	Nasir Ahmad Ahamadi	AMD
6	Soma Popalzai	AMD
7	Dr. Jeongmin Han	APCC
8	Dr. Vishwas Chitale	Council on Energy, Environment and Water
9	Dr. Hunter Jones	GHHIN/WHO/WMO Climate-Health
10	Dr. Farooq Azam	ICIMOD
11	Dr. Avijit Dey	IITM
12	Dr. Roxy Mathew Koll	IITM
13	Dr. Sabin TP	IITM
14	Dr. Susmitha Joseph	IITM
15	Dr. Aarti Bandgar	IMD
16	Dr. Akhil Shrivastava	IMD
17	Dr. Rohini P.	IMD
18	Dushmanta Ranjan Patanaik	IMD
19	Prasad Bhor	IMD
20	Dr. Novil Wijesekara	Ministry of Health and Mass Media Sri Lanka
21	Dr. Aakash Shrivastava	NCDC/NPCCHH
22	Dr. Ankur Gupta	NCMRWF
23	Faisal Saeed Syed	PMD
24	Dr. KJ Ramesh	RIMES
25	Dr. Shiromani Jayawardena	RIMES
26	Md. Ranveer Hossain Munim	RIMES
27	Peter Khalil Ferrer	RIMES
28	Chet Tamang	Save the Children Bangladesh
29	Andrew Colman	UKMO
30	Becks Parfitt	UKMO
31	Elisabeth Thompson	UKMO
32	Laura Burgin	UKMO
33	Nicola Golding	UKMO
34	Stefan Lines	UKMO
35	Dr Jothiganesh Shanmugasundaram	WFP

ANNEX VI. SURVEY EVALUATION REPORT

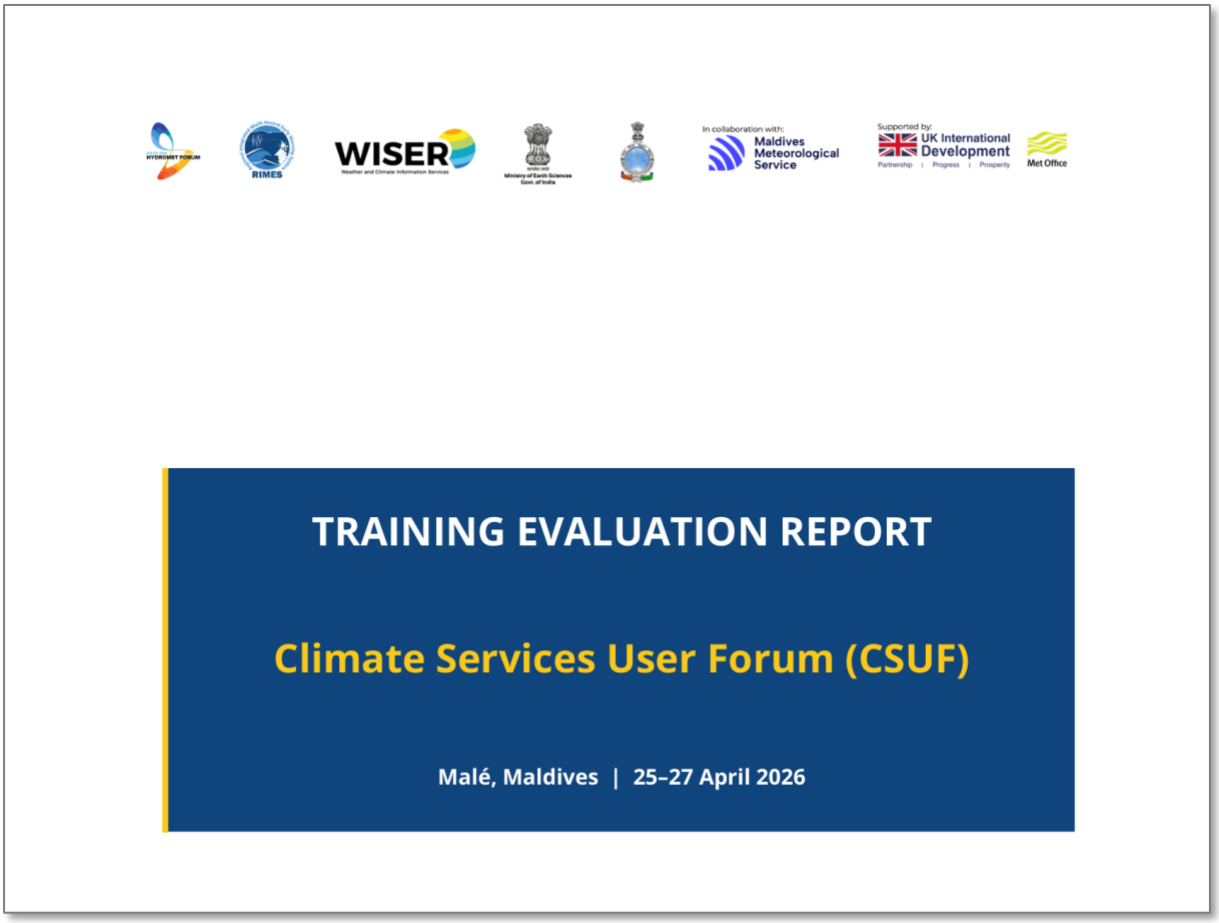
Pre-COF Training Evaluation Report



To view the full report, please click this link: Pre-COF Training Evaluation Report (April 2026)

ANNEX VII. SURVEY EVALUATION REPORT

CSUF Training Evaluation Report



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ACRONYMS