Information note on Earth Information Day 2024

Prepared by the Chair of the Subsidiary Body for Scientific and Technological Advice (SBSTA)

25 October 2024

I. Background and introduction

1. Systematic observation is vital for understanding and monitoring weather and climate to inform climate action. Relevant data that informs climate models and respective pathways, forecasts, products and services, risk management and response mechanisms such as early warning systems are provided by systematic observation networks. Within the UNFCCC process, Earth Information Day provides an opportunity for Parties to engage with the systematic observation community to share and understand latest information, trends and projections to inform negotiations and wider decision-making. Through Earth Information Day, messages on enhancing systematic observation, related initiatives, leveraging opportunities and advancing cooperation have been recognized. Further, Earth Information Day provides a platform to identify gaps and challenges in this regard, and opportunities for addressing them.

2. Earth Information Day 2023[1] provided updates on the state of the global climate, highlighted efforts related to the monitoring of greenhouse gases (GHGs) across the earth's system, and the role and opportunities for Earth observation for climate adaptation, resilience and disaster risk reduction. Further the dialogue profiled partnerships and initiatives advancing Earth system observation.

3. Earth Information Day 2024 will take place on Monday, 11 November 2024 in conjunction with the Baku Climate Change Conference. This note provides an overview of the event, including information on its organization and themes (section II), with background information also provided on activities and updates under the Convention (section III) and activities by relevant programmes and organizations (section IV). All information on Earth Information Day 2024, including a detailed programme will be made available online.[2]

4. Parties are encouraged to consider the key messages, outcomes and discussions from Earth Information Day 2024 during the informal consultations on Research and Systematic Observation and work together to strengthen the global observing system in implementing the Convention and the Paris Agreement. An informal summary report on the event will be prepared, with the support from the secretariat, and made in advance of SBSTA 62.

II. Organization and themes

5. The modalities for organizing Earth Information Day 2024 as well as topics of discussion take into account the submissions made from Parties and non-Party stakeholders, particularly members of the Earth observation community. By October 10, 2024, 18 submissions[3] were received.

[1] Earth Information Day 2023 Summary Report https://unfccc.int/documents/641538.
[2] See event page https://unfccc.int/event/earth-information-day-2024-mandated-event.
[3] Submissions were made from the following: African Group (AGN), Alliance of Small Island States (AOSIS), Arab Group, European Union (EU), Independent Alliance of Latin America and the Caribbean (AILAC), Indonesia, Japan, Joint Committee on Earth Observation Satellites (CEOS) and the Coordination Group for Meteorological Satellites (CGMS) working group on climate, Maldives, Research and Independent Non-Governmental Organizations Constituency (RINGO), Silver Lining,

6. Earth Information Day 2024 will be held in person, and consist of an opening segment, plenary session with updates from relevant organizations and initiatives, and interactive break-out discussions. The deliberations of the event will be webcast on the UNFCCC event page accordingly, allowing for online viewing. The event will be open to registered delegates of the Baku climate conference.

7. In accordance with the submissions and in consideration of ongoing processes within the UNFCCC process, Earth Information Day will launch the knowledge product on innovation and technology by the Technology Executive Committee (TEC)[4], providing relevant updates on the state of the climate, Earth observation and associated initiatives and facilitate thematic discussions on (a) observations for climate change mitigation, (b) observations for climate adaptation, (c) observations for averting, minimizing, addressing loss and damage, and strengthening resilience to extreme events including heat stress, (d) advancing innovation, technology and digital transformation, and (e) enhancing observation in critical ecosystems and vulnerable regions. Guiding questions have been presented, in this information note under the respective breakout session, to facilitate discussions and respond to the information needs presented by Parties and stakeholders.

2. Opening segment and launch of TEC Knowledge product

8. The session will include a high-level opening and remarks from the Chair of the SBSTA, the UNFCCC, World Meteorological Organization (WMO), Intergovernmental Panel on Climate Change (IPCC) and a keynote address on the "*Role of innovation and advanced technologies in Earth observation and risk-informed climate action*". During the opening segment, there will be a launch of the TEC knowledge product, which aims to offer policy-relevant insights for advancing risk-informed climate planning and action, and highlights innovations and technology solutions for improving disaster risk knowledge in support of the overall Multi-Hazard Early Warning Systems (MHEWS) framework and the implementation of Early Warning for All (EW4All) initiative, especially in LDCs and Small Island Developing States (SIDS).

3. Updates on the state of the climate, Earth observation and related initiatives

9. The plenary session will provide relevant updates related to Earth observation including the 2024 State of the Global Climate, Global Greenhouse Gas Watch (G3W) programme[5], Early Warning for All initiative[6] and SOFF[7], and research and science related to systematic observation. The session will therefore provide latest information on the global climate system and provide updates on observed key climate variables, including GHGs, to inform decision making and discussions under the Convention and the Paris Agreement. Institutions responsible for Earth observation will share trends, records and information as well as gaps and emerging opportunities in advancing systematic observation as follows:

(a) Current state of the global climate system including energy imbalance and advancements in systematic observation, including status and implementation of the Global Climate Observing System (GCOS) and efforts related to sustaining observations in delivering long-term data for Essential Climate Variables (ECVs).

(b) GHG monitoring and related observations, and updates on the G3W initiatives, as well efforts in monitoring atmospheric concentrations, information services about key

United Kingdom of Great Britain and Northern Ireland (UK), United Nations Office for Disaster Risk Reduction (UNDRR), United Nations Office for Outer Space Affairs (UNOOSA), United States of America (USA), University of California, Woodwell Climate Research Center and World Meteorological Organization (WMO).

[4] See https://unfccc.int/documents/641185 p.25-26.

[5] See https://wmo.int/activities/global-greenhouse-gas-watch/global-greenhouse-gas-watch-programme

[6] See https://www.un.org/en/climatechange/early-warnings-for-all

[7] See https://un-soff.org/

GHGs and sector-and gas-specific observations- demonstrating how various actors and sectors utilize related observations for decision-making.

(c) Initiatives supporting advancements in Earth observation and early warning systems for climate resilience, particularly the role and contribution of Earth observations in assessing risks across diverse climate hazards and highlight efforts across multi-hazard early warning systems:

a. EW4ALL

b. SOFF and other innovative financing models and initiatives,

(d) Latest science and research findings, from the scientific community including the IPCC, related to the observations of the key drivers of climate change, including long-lived GHGs, short-lived climate forcers, including their impacts on energy balance, tipping points, carbon budgets, extreme events and ocean temperature. The scientific community will further share interlinkages of Earth observations with key sectors such as ecosystems, human health and food security.

10. During the plenary session, the role and contribution of advanced technologies and innovations such as AI and machine learning will be considered in a cross-cutting manner, exploring current efforts, gaps and opportunities therein.

4. Thematic break-out discussions

11. In response to the information needs identified by Parties and stakeholders, five break-out sessions, to be held in parallel, will provide a platform for scientists, the observation community and policymakers to engage on the various topics; in sharing information, experiences, good practices, lessons and gaps and opportunities. Each break-out session will include an expert moderator, information and experiences from institutions or countries and an open dialogue, informed by the guiding questions.

Breakout discussion 1: Observations for climate change mitigation

12. The discussion will highlight progress, latest information and experiences related to observations for climate change drivers, specifically long-lived GHGs, short-lived climate forcers (including methane), including sector specific observations. It will consider efforts to improve estimates such as GHG emissions and identify tools being used to inform decision making. The session will provide an overview of observation networks and discuss efforts in advancing international coordination. The discussion will also tackle how observations in marine ecosystems, such as ocean temperature and ocean acidification, can improve our understanding of climate mitigation strategies.

Guiding questions include:

(a) How can we sustain and improve earth system observations to support long-term climate monitoring and address key challenges in maintaining consistency?

(b) What advancements have been made and are needed to improve observational platforms and technologies for tracking GHGs, short-lived climate forcers, and other climate relevant pollutants, including from sectors such as agriculture, shipping and aviation? What approaches are used in observing methane emissions?

(c) How can observations of GHGs support and improve transparency and accuracy in national and international climate reporting, and how can these observations complement national inventories to support mitigation strategies?

(d) What innovations in ocean observation are advancing our understanding of marine ecosystems and their role in climate mitigation, and how can ocean observations be better utilized to inform mitigation strategies and improve global climate models?

Breakout discussion 2: Observations for climate change adaptation

13. The session will explore opportunities for Earth observations to support climate adaptation and resilience including in monitoring progress and gaps. The discussion will further identify the role of Earth observation in supporting the monitoring of indicators on the global goal of adaptation (GGA). The discussion will also tackle observations in marine ecosystems, particularly oceans, for climate change adaptation, informing NAPs and the resilience of marine and coastal zones.

(a) How can Earth observation systems be used to support adaptation actions and monitor progress towards adaptation goals including GGA indicators?

(b) What strategies or collaborations are needed to sustain and enhance Earth observations for long-term climate adaptation, and ensure effective monitoring and planning?

(c) What innovations in ocean observation are contributing to adaptation actions, particularly in coastal ecosystems, and how can they be better integrated into broader resilience strategies?

(d) How can global efforts be aligned to improve the use of observation systems in supporting adaptation, particularly in vulnerable regions and across sectors such as agriculture, health, and human displacement, and what are the main challenges and opportunities for scaling these systems?

Breakout discussion 3: Observations for averting, minimizing, and addressing loss and damage, and strengthening resilience to extreme events including heat stress

14. The discussion will reflect on the role of Earth observation in assessing and informing efforts to avert, minimize, and address loss and damage associated with adverse impacts of climate change, across various sectors. The session will highlight and discuss the attribution and occurrence of extreme events, particularly heat stress and efforts to improve heat resilience particularly in most-affected regions and ecosystems such as arid regions and ocean ecosystems. The discussion will aim to discuss underlying risks and global efforts and partnerships related to Earth observation that are supporting efforts to improve heat resilience.

Guiding questions include:

(a) What methodologies, frameworks or tools are being used to improve our understanding of the assessment of and efforts to avert, minimize, and address of loss and damage; and attribution of extreme weather events, and how can we enhance their accuracy?

(b) What are the most critical gaps in observing extreme events, including heat stress, and how can we address them to improve overall resilience?

(c) How can real-time data and early warning systems be enhanced to support heat resilience, especially in data-sparse and vulnerable communities?

Breakout discussion 4: Advanced technologies, innovation and digital transformation

15. The discussion will reflect on innovative and transformative systems and technologies to advance data management, data utilization, scientific research, observations infrastructure for Earth observation, as well as for related climate services such as forecasting, modelling, and early warning. Further, advancements and experiences in the applications of scalable-low-cost and high-end solutions to improve Earth observation and inform decision making will be discussed. Specifically, stakeholders and policy makers will review opportunities, gaps and solutions related to Artificial intelligence (AI) and machine learning, big data and technologies in satellite and ground-based observatories. The discussion will also reflect the potential risks and capacity needs in this regard.

Guiding questions include:

(a) What are the latest advancements in Earth observation innovation and technology and what potential do they hold for large-scale implementation?

(b) How can AI and advanced data management systems improve Earth observation, and early warning systems? What are the opportunities for strengthening the capacity of developing countries in managing and utilizing big data and latest technologies in Earth observation?

(c) What are the opportunities and challenges in the deployment and utilization of advanced technologies, such as AI, and scalable solutions to advance climate observation efforts, and how can these inform policy?

Breakout discussion 5: Enhancing observation in critical ecosystems and vulnerable regions

16. The discussion will explore challenges, opportunities and partnerships for addressing observational gaps including approaches to enhance data resolution and accessibility, in under-observed and vulnerable regions, sectors and critical ecosystems. The discussion will also highlight needs and opportunities in research, technologies, capacity-building and innovative financing programmes and partnerships available for countries in vulnerable regions such as SOFF, Global Framework for Climate Services (GFCS) and EW4ALL. Further, stakeholders and policymakers will review opportunities to advance open data and data -sharing, improving access to high-resolution satellite products and long-term climate data records and addressing infrastructure needs and measures to reduce and avoid human-interference to Earth observation.

Guiding questions include:

(a) What strategies can bridge observational gaps and improve access to climate data in vulnerable regions? How can data-sharing systems be strengthened?

(b) What are the main challenges in improving observation systems in vulnerable regions, including SIDS and LDCs, and how can innovative financing opportunities, including public-private partnerships, address these gaps and ensure sustainability?

(c) What successful regional solutions and models can be scaled in vulnerable regions?

(d) What are the latest advancements related to high-resolution satellite imagery, and how can they be applied to benefit developing countries and enhance global atmospheric observations? What gaps should be addressed in this regard?

17. An indicative programme for Earth Information Day is shown below and the final agenda will be published on the event webpage in advance of the event.

	Earth Information Day **Monday, 11 November 2024**	Full list of speakers, panellists and experts/facilitators to be published on the event webpage
13:00-13.45	**Opening segment**	*Moderator:* SBSTA Chair or designate
	Keynote address on the Role of innovations and advanced technologies in Earth observation and risk-informed climate action. ***Launch of TEC knowledge product***	*Technology Executive Committee*
13:45-14:45	**Updates on the state of the climate, Earth observation and related initiatives**	*Contributors include representatives from Earth observation institutions, scientific community, and Parties.*
14:45-15:45	**Five breakout discussions-** ***Refer section 4 above***	*Led by moderators with contributions from experts and participants*
15:45-16:00	**Closing segment**	*SBSTA Chair or designate*

III. Brief update on linked activities under the UNFCCC

18. The TEC has taken steps to promote technologies and innovations that could assist countries in advancing risk-informed climate policies and actions, including for the implementation and scale-up of early warning systems. TEC hosted the event on "Innovation and technology in support of risk-informed climate adaptation and Early Warnings for All" TEC at SB 60 and the Group on Earth Observations (GEO) have prepared a joint policy brief titled, Realising Early Warnings for All: Innovation and Technology in Support of Risk-Informed Climate Resilience Policy and Action. Based on the policy brief, TEC has delivered, for consideration at COP 29 and CMA 6, the key messages and recommendations set out in the Joint annual report of the TEC and the Climate Technology Centre and Network (CTCN) for 2024[8]. TEC, together with Enterprise Neurosystem, launched the AI Innovation Grand Challenge[9] as a climate innovation competition to drive new AI applications for climate mitigation and adaptation action, including early warning systems in developing countries, in particular in LDCs and SIDS.

19. The Executive Committee of the Warsaw International Mechanism for Loss and Damage (WIM ExCom) is updating a Compendium on comprehensive risk management (CRM) approaches, last updated in 2019, informed by over 100 case studies, to set out possible interventions for anticipating and responding to risks associated with representative types of losses and damages, such as those related to: food insecurity due to drought, the impacts of heatwaves on human health; infrastructure damage due to floods; and the impacts of sea level rise on coastal socioecological systems. WIM ExCom also catalyzes knowledge generation and expertise pertinent to assessing and managing losses from the community of practices such as DRM, climate services, disaster relief, humanitarian aid, academics, etc., through the work of its Technical Expert Group on Comprehensive Risk Management that engages WMO, UNDRR, IFRC among others. Recent knowledge products made available through the plan of action of this technical expert group include: A publication on "The Role of Early Warning Early Action in Minimizing Loss and Damage"[10] developed by the IFRC

[8] See https://unfccc.int/documents/641185 p.25-26.
[9] See https://enter.innovationgrandchallenge.ai/2024
[10] See https://unfccc.int/files/resource/early_warning_early_action_loss_and_damage.pdf

and a report on "Key Findings Related to Loss and Damage from the IPCC WGII Report on Impacts, Adaptation and Vulnerability"[11] developed by the IFRC and Climate Analytics.

20. The Least Developed Countries Expert Group (LEG) established the NAP Data Initiative[12] to assist the LDCs with effective and innovative climate data collection, assessment, and planning in the process to formulate and implement NAPs. The aim is to support LDCs in easily integrating data and analysis results in the NAPs and other related outputs, reproducing high-quality displays, and following global trends in open access, data sharing, and use of cutting-edge tools. In addition to climate change data and climate scenario data, there are numerous global and regional datasets that have been meticulously put together for various (global) studies. These include the IPCC Atlas; the WMO climate explorer; World Bank Climate Change Knowledge Portal; and many regional portals. Through the NAP Data initiative, the LEG provides ready data sets using open-source statistical package. These results can be readily used by the LDCs in formulating their NAPs and in developing project profiles. Through the NAP Expos[13], the LEG provides a platform for different organizers and experts to exchange on latest developments in addressing data and methodological needs in assessment, planning and implementation of NAPs, with notable contributions from GEO Group, the WMO, and others.

IV. Brief update of information and activities by UN and other relevant programmes and organizations

21. This section provides brief updates on some of the relevant ongoing activities by the systematic observation community. It is a non-exhaustive list of activities and initiatives by relevant programmes and organizations presenting at Earth Information Day.

22. The Committee on Earth Observation Satellites and Coordination Group for Meteorological Satellites Joint Working Group on Climate (Joint CEOS-CGMS WGClimate) coordinates the long-term availability of climate data records for ECVs that are observable from space and derived from reanalysis. It also coordinates space agency efforts to address the satellite-based actions in the 2022 GCOS Implementation Plan. The WG Climate and its GHG Task Team updated the "Roadmap for a Coordinated Implementation of Carbon Dioxide and Methane Monitoring from Space"[14] to address the evolving needs of international GHG science, policy, and regulatory communities. Additions include an increased focus on stakeholder engagement and new collaborations with initiatives such as the WMO's G3W and UNEP's International Methane Emissions Observatory (IMEO). To enhance the utility of the space-based products to support needs from scientific, policy, and regulatory communities, future GHG and land-use products will be co-developed with early adopters from national inventory agencies. An enhanced focus on training and capacity-building will facilitate the proper use of these products in inventory development and validation.

23. GEO closely collaborated with TEC on the joint policy highlighted in paragraph 18 above. GEO has been advancing the development of the Global Ecosystems Atlas[15], presented at SB 60. The Atlas will provide open and free access to high-resolution spatial data on all the world's ecosystems. By delivering insights into ecosystem extent, condition and risks, it will help countries track adaptation and biodiversity actions, and assess losses and damages on ecosystem services. In collaboration with Convention on Biological Diversity (CBD) secretariat and key partners in technology and conservation science, the Atlas will be unveiled at CBD COP16, along with initial results of the Maldives Atlas Accelerator. Also, the Global Heat Resilience Service (GHRS)[16] is being developed to

[11] See https://www.climatecentre.org/wp-content/uploads/Key-Findings-loss-and-damage.pdf
[12] See https://expo.napcentral.org/NAP-Data-Initiative-at-NAP-Expo.pdf
[13] See https://unfccc.int/topics/adaptation-and-resilience/nap-expo
[14] See https://ceos.org/documents/CEOS_CGMS_GHG_Roadmap_Issue_2_V1.0_for_endorsement.pdf
[15] See https://earthobservations.org/solutions/incubators/global-ecosystems-atlas
[16] See https://earthobservations.org/organization/work-programme/global-heat-resilience-service

provide cities with data-driven insights on the risks of extreme heat. The service will surface and integrate global and local climate and weather data with census, health, and economic data to provide heat risk profiles, trends and pattern analysis. In collaboration with WMO, GHRS will be developing methodologies for mapping and modelling heat risks.

24. IMEO is a UNEP initiative that provides open, reliable and actionable data to the individuals who have the agency to reduce methane emissions at the scale and speed needed to advance the objectives of the Global Methane Pledge and the Paris Agreement. UNEP's IMEO catalyses the collection, reconciliation, and integration of emissions data from a growing number of sources, including satellite observation through its Methane Alert and Response System (MARS)[17]. IMEO's MARS is the first global system that uses over a dozen satellites to detect large methane emissions, links these events to sources and operators, and notifies governments and companies to enable mitigation action. In 2024 alone, many events were held with stakeholders, presenting an key opportunity to embrace transparency and demonstrate credible, near-term progress in the implementation of climate commitments.

25. The United Nations Office for Outer Space Affairs (UNOOSA) is working through UN-Space[18], the inter-agency mechanism convening 33 UN agencies, to inform them of the threat to the continued availability of satellite imagery and the negative impact this would have on the achievement of the UN SDGs. Multiple UN organisations and countries rely on Earth observation for diverse services including environmental monitoring, early warning for vector-borne diseases, disaster risk reduction, food security, monitoring illegal deforestation, controlling illegal, unreported and unregulated fishing, urban planning, meteorology and others. UNOOSA is raising awareness together with relevant industry actors, who supply this data to UN entities, to ensure unfettered access to satellite imagery.

26. The Early Warnings for All (EW4All)[19] initiative aims to ensure that every person on the planet is protected by Early Warning Systems (EWS) by 2027, prioritizing vulnerable communities and addressing climate justice. Tracking coverage and capacities, EW4All progress, and overall EWS effectiveness is key for informed decision-making and monitoring progress against UNFCCC commitments, and the EW4All dashboard[20] helps track these developments by offering a centralized platform to monitor advancements and gaps in EWS, as well as align with other global agendas like the SDGs and the Sendai Framework for Disaster Risk Reduction.

27. The WMO State of the Climate Update 2024, provides the latest year-to-date analysis covering GHG concentration, Global Temperatures, Sea level, Ocean Heat, Sea Ice extent and Glaciers Mass Balance. Updates on progress made in energy transition, climate services and climate finance are also included, using analysis provided by partners. As an interim update, WMO will report on the global temperature from January to the end of October 2024. The year 2023 was the warmest on record and most likely 2024 is following a similar track. The IPCC defines climate change as a change in the state of the climate that persists for an extended period. Therefore, the exceedance of 1.5 °C and 2.0 °C warming levels referred to in the Paris Agreement should be understood as an exceedance over an extended period, typically decades or longer. The long-term global warming is estimated currently at 1.3 °C, representing 0.2 °C below the 1.5°C threshold. Regional State of the Climate reports for the year 2023 can be found on the WMO website.

28. WMO issues annual reports on the state of climate services[21], since 2019. The 2024 edition of the report describes the current state of climate services while also examining and assessing the progress that has been made during the last five years. The report explores the

[17] See https://www.unep.org/topics/energy/methane/methane-alert-and-response-system
[18] See https://www.unoosa.org/oosa/en/ourwork/un-space/index.html
[19] See https://www.un.org/en/climatechange/early-warnings-for-all.
[20] See https://earlywarningsforall.org/site/early-warnings-all/early-warnings-all-dashboard.
[21] See State of Climate Services | 1 | World Meteorological Organization (wmo.int).

climate policy response to the climate challenge and advancements made by National Meteorological and Hydrological Services (NMHS) across the climate service value chain. This year's edition also includes an in-depth look at how a selection of 13 countries have successfully used climate services to deliver socioeconomic benefits at a national, regional, or global level. The case studies also include stories to examine the key enablers, including showcasing the value being created by climate services.

29. The GCOS secretariat is key to supporting efforts towards the sustainability of both observations and coordination, recognizing the role of long-term data series and historical data sharing for informing climate action. The GCOS Climate Monitoring Principles, also adopted by COP 9 in 2009, were recently updated due to significant advancements in monitoring capabilities. These new principles are now included in the new WMO Integrated Global Observing System (WIGOS) Manual that was adopted by the WMO 78th Executive Council in June 2024. Parties may wish to consider revising the "UNFCCC reporting guidelines on global climate change observing systems" (adopted by COP13 in 2007), as appropriate.

30. The Global Atmosphere Watch (GAW) coordinates in-situ observations of the atmospheric composition across the globe, including essential climate variables like ozone, aerosol and GHG, essential for evaluating the performances of climate models and validating atmospheric observations from space. The WMO GHG Bulletin 2023[22] was recently published and reported that the globally averaged surface mole fraction for carbon dioxide (CO_2), methane (CH4) and nitrous oxide (N2O) reached new highs, with CO_2 at 420.0±0.1 ppm, CH_4 at 1934±2 ppb and N_2O at 336.9±0.1 ppb. These values constitute increases of 151 per cent, 266 per cent and 124 per cent relative to pre-industrial (before 1750) levels. The increase in CO_2 from 2022 to 2023 was slightly higher than the increase observed from 2021 to 2022 and slightly lower than the average annual growth rate over the last decade, which is most likely partly caused by natural variability, as CO_2 emissions have continued to increase. For CH_4, the increase from 2022 to 2023 was lower than that observed from 2021 to 2022 but still slightly higher than the average annual growth rate over the last decade. For N_2O, the increase from 2022 to 2023 was lower than that observed from 2021 to 2022, which was the highest increase observed in our modern time record. With the active engagement of its members, WMO is now developing further capacity to deliver more operational products that will support countries in their greenhouse gas mitigation strategies through G3W flagship.

31. SOFF provides financing for essential basic weather and climate observations that are a critical but invisible ingredient for effective climate action, including the UN Secretary-General's EW4ALL. Data collected and shared by countries through SOFF support and the global forecast products built on this data provide the basis for NMHS, which further inform NDCs and NAPs, and strengthens the data going into the global stocktake. As of October 2024, 62 LDC and SIDS are being supported by SOFF. SOFF and its funding partners are responding to the encouragement by the SBSTA 58 to continue to prioritize LDCs and SIDS in its provision of support while striving to explore opportunities to support other developing countries. The 2024 SOFF annual progress report will be published during COP 29 on 14 November, documenting annual advances, major milestones and challenges related to implementation and the SOFF Action Report 2023[23] is available.

32. The preparation of World Climate Research Programme's (WCRP) Coupled Model Intercomparison Project (CMIP) next phase (CMIP7) is proceeding as input to new climate insights that will subsequently be assessed by the IPCC assessment process. CMIP will be downscaled within WCRP's Coordinated Regional Downscaling Experiment (CORDEX) framework, which produces regional climate information. WCRP's Global Precipitation Experiment (GPEX) is planning to address major science gaps in the field of precipitation (rainfall, snowfall etc.) which will be essential to better understand the source of freshwater in regions around the world, including mountainous regions. The new Lighthouse Activity on research regarding the potential benefits and risks of Climate Intervention activities (Solar

[22] See https://library.wmo.int/records/item/68532-no-19-15-november-2023?offset=1.
[23] See SOFF Action Report 2023 - Systematic Observations Financing Facility % (un-soff.org).

Radiation Management, and CO_2 Removal) will provide an assessment of the current state of knowledge and knowledge gaps regarding the topics of solar radiation management and carbon sequestration. WCRP's new Academy[24] includes a training catalogue of opportunities and the institution commenced a new Global South Fellowship program.

33. The global cryosphere is an exceptional indicator of climate change, owing to its strong sensitivity to temperature and yet critical gaps remain in the systematic monitoring of atmospheric conditions (temperature, precipitation, radiation) on glaciers, permafrost and ice sheets. The expansion of the requirements for the Global Basic Observing Network would provide a practical mechanism to overcome existing barriers to the systematic observation of environments where the cryosphere is present, in conjunction with the operationalization of satellite observations of changes in ice and snow. Together with the agile data sharing between research and operational communities, these are the foundation for advancing the predictive capacity and modelling of climate scenarios and reducing uncertainties in understanding impacts on, and from changes in the cryosphere

34. WMO's State of Global Water Resources 2023 report[25] highlights critical water challenges, marked by widespread below-normal river flows and reduced reservoir inflows in 2023. While 2023 was the warmest year on record, it also was the driest year for rivers globally in over three decades and experienced prolonged droughts and numerous floods, exacerbated in frequency and severity by climate change and natural climate patterns. These conditions, coupled with the largest glacier mass loss in five decades, are concerning for global water supplies, affecting communities, agriculture, and ecosystems. Rising temperatures have also accelerated the hydrological cycle, making water availability more unpredictable. Current projections show that over five billion people may face water shortages by 2050. There is a need for improved global water monitoring and data-sharing to better manage water resources and to ensure EW4ALL especially for water-related hazards and the role of the NMHS remains key.

[24] See https://wcrp-academy.org/.

[25] See https://wmo.int/publication-series/state-of-global-water-resources-2023#:~:text=The%20State%20of%20Global%20Water,communities%2C%20agriculture%2C%20and%20ecosystems.