WMO SUBMISSION TO SBSTA 49

Outcomes of the Seventieth session of the WMO Executive Council with updates on other WMO activities with respect to UNFCCC and implementation of the Paris Agreement

Introduction

This submission includes excerpts of decisions relevant to observations and climate science made by the seventieth session of the WMO Executive Council (EC-70), which was held in Geneva, Switzerland from 20 to 29 June 2018. It also includes contributions of WMO programmes, its co-sponsored bodies and National Meteorological and Hydrological Services (NMHSs) to the implementation of the Paris Agreement.

Relevant EC-70 Decisions/Recommendations/Resolutions

The following decisions relate to strengthening hydro-meteorological systems and associated services needed to support mitigation and adaptation action and to address risks of loss and damage.

Decision 8 (EC-70) - Integrated Greenhouse Gas Information System (IG^3IS) Science Implementation Plan and Updates

The Executive Council approved the IG^3IS Science Implementation Plan endorsed by the Commission for Atmospheric Sciences (CAS). WMO plays a leadership role in shaping this initiative, it provides support to the IG^3IS activities and assist in promoting IG^3IS with funding agencies, and work with those Members, who have established capabilities or plan to undertake IG^3IS projects. Members states are urged to undertake pilot and demonstration projects that facilitate implementation of the IG^3IS in their countries utilizing the good practices summarized in the IG^3IS Science Implementation Plan. WMO will further assist in the implementation of IG^3IS and scale up the existing initiatives for regional knowledge transfer and capacity-building for IG^3IS implementation in the Regions.

The urban objective of IG^3IS was represented at the number of sessions of the Cities IPCC conference that took place in Edmonton, Canada from March 5-7, 2018.

Following Executive Council approval of the IG^3IS Science Implementation Plan, an IG^3IS office, supported by Switzerland, started operations on WMO premises.

Decision 9 (EC-70) - Promoting the use and interpretation of climate change projections on regional and national scales

The Executive Council took note of:

a) Good practices in the use and interpretation of climate change projections on regional and national scales and

b) a Memorandum of Understanding signed by WMO with the United Nations Framework Convention on Climate Change (UNFCCC) that includes a project on regional collaboration for supporting adaptation and mitigation action.

Regional climate change projections, largely through downscaling of global model simulations, are being extensively used by Members to assess multisector impacts and implications for adaptation planning. In most cases, such studies are undertaken at the national level and there is a need to compare and contrast the various approaches on a regional scale and to define guidelines for best practices in the generation of these projections. At that scale, it will be beneficial for countries in a region with common climate concerns to share their experience. Because of the large uncertainties in the climate projections, establishing good practices in how to represent these uncertainties in downstream impacts is critical to ensure quality and consistency.

Considerable expansion of opportunities for producing climate change projections has led to an increased volume and accessibility of model simulations for assessing climate change impacts, that are feeding into developing national and other adaptation plans, with the associated risks of misuse and misinterpretation.

The Executive Council decided to:

(1) Encourage regional collaboration, including through adopting the Regional Climate Outlook Forum (RCOF) format as a means of disseminating expert consensus and facilitating discussion among subregional groupings of Members sharing common climate characteristics. This includes approaches in interpreting and using regional climate change projections made available by the concerned programmes and partners including, inter alia, the World Climate Research Programme (WCRP);

(2) Support the Commission for Climatology (CCl) initiative to identify requirements and good practices on producing climate change projections on regional scale, including through highly recommended functions of Regional Climate Centres (RCCs), to promote these good practices and consistent approaches to produce, interpret and use high-resolution climate change projections on regional and national scales;

(3) Invite the hydrological community, including the relevant subsidiary bodies of Regional Associations and the Commission for Hydrology, as well as cryosphere community, to work closely with CCl and WCRP to ensure that climate change impacts on water availability and quality are well-addressed in the proposed methodology and implementation, especially with regard to climate-proof food, energy, and DRR related systems;

(4) Invite the Intergovernmental Panel on Climate Change (IPCC) to be engaged with the development of good practices and to ensure alignment with the climate change assessments being undertaken on the global scale;

(5) Request WCRP to facilitate access to and promote the use of high-resolution data on climate change projections at global and regional scales, including outputs of the Coupled Model Intercomparison Project (CMIP) and Coordinated Regional Climate Downscaling Experiment (CORDEX);

(6) Urge WCRP, in collaboration with Commission for Climatology (CCl), to pursue closer engagement with RCOFs and Regional Climate Centres (RCCs), through the establishment of a joint research-to-operations platform to address research needs for regional optimization of Climate Services Information System (CSIS) operations;

(7) Urge RCOFs in close proximity and having common climate influences to closely align and harmonize their operations to enable the concerned Members to derive optimized benefit from the available regional climate change information.

Decision 54 (EC-70)- Decade of Ocean Science for Sustainable Development

WMO contributes, within existing structures and available resources, to the Decade of Ocean Science for Sustainable Development, as in benefit of all Members dependent on marine and maritime economy or exposed to coastal and marine hazards, in particular, Small Island Developing States and Member Island Territories and coastal least developed and developing countries.

WMO contributes to Sustainable Development Goal 14 – Conserve and sustainably use the oceans, seas and marine resources for sustainable development, through:

(a) International Network for Multi-hazard Early Warning Systems (IN-MHEWS) and Global Multi-hazard Alert System, noting the need to strengthen coordination efforts between IOC Intergovernmental Coordination Groups for the Tsunami Warning and Mitigation Systems and WMO initiatives to address coastal hazards;

(b) Responding to El Niño: improving international coordination for improved early warning;

(c) Weather and climate services for African, Caribbean and Pacific SIDS;

(d) Year of Polar Prediction.

WMO underlines the importance of science in Polar and tropical seas to better understand the dynamics of the global ocean and atmospheric phenomena, noting the contribution of observation campaigns such as the “Years of the Maritime Continent”. It fosters a continuous research-to-operations-to-services value chain to support seamless Earth system forecasting, involving international organizations, government institutions, academia and the private sector, including an enhanced constant interaction on science between WMO and IOC supported by CBS and CAS and other technical commissions.

WMO provides expertise to the planning group for the Decade and contribution to its co-design and implementation, in particular through the Joint Commission for Marine Meteorology (JCOMM) and the co-sponsored programmes WCRP, GCOS, and GOOS, and based on the long-term goals and strategic objectives of the WMO Strategic Plan.

Recommendation 1 (EC-70)- On the approach to cataloguing high-impact events

Recalling:

(1) Resolution 9 (Cg-17) of the seventeenth World Meteorological Congress – Identifiers for cataloguing extreme weather, water and climate events –through which Congress decided to standardize information on weather, water, climate, space weather, and other related environmental hazards and risks, and develop identifiers for cataloguing weather, water and climate extreme events, and

(2) Decision 4 (EC-68) – Systematic characterization and cataloguing of extreme weather, water and climate events and standardization of respective hazard information, which established the WMO Inter-programme Task Team on Cataloguing Extreme Weather, Water and Climate Events;

The Executive Council noted the outcome of International Workshop on Cataloguing and Managing Information on Extreme Weather and Climate Events, (Geneva, 20-23 November 2017), which proposed an approach to cataloguing high-impact events consisting in assigning universally unique identifiers to high-impact events. The Workshop also endorsed a living list of event types.

The Executive Council also noted the decision made by the Regional Association for Europe that National Meteorological and Hydrological Services (NMHSs) of Members and Regional Climate Centres (RCCs) carry out a test phase during 2018-2019 of the proposed approach in collaboration with other stakeholders in the Region.

The test phase is critical to develop guidance for Members on the implementation of the approach and to document its feasibility, including the requirements for data collection, processing and dissemination, and of the collaboration between the stakeholders, for ensuring a swift transition from the test to the operational phase.

WMO has examined the scientific and technical foundations of the proposed approach and considered the recommendation of the Executive Council Working Group on Disaster Risk Reduction to endorse the cataloguing approach and to consider the conclusion of the test phase with further refinement, as necessary.

WMO will assess the results of the test phase in Europe and provide conclusions and recommendations to fine-tune the approach and understand its implications for coordination and operationalization.

WMO urges Members to contribute to the test phase on a voluntary basis in collaboration with World Meteorological Centres, Regional Specialized Meteorological Centres, Regional Climate centres and National Meteorological Centres of NMHSs. It also considers its

approach to cataloguing high-impact events, as a fifth annex to Memorandum of Understanding with UNFCCC.

Recommendation 3 (EC-70)- Strengthening WMO contributions to the provision of climate information and services in support of policy and decision-making

WMO climate science products such as the WMO Statement on the State of the Global Climate, the El-Niño/La Niña Update, the Greenhouse Gas Bulletin and other products under development, such as the Global Seasonal Climate Update, constitute authoritative sources of information which support informed policy- and decision-making and complement the IPCC assessment reports.

The operational responsibilities of National Meteorological and Hydrological Services (NMHSs) and regional and global centres constitute WMO infrastructure and the key roles of climate forums at the regional and national levels in convening stakeholders and aligning their efforts.

Recognizing the particular roles of:

(a) The GFCS, in securing the engagement of international partner organizations in support of improved country-level climate-related development outcomes,

(b) The IPCC, in organizing the scientific community's efforts to provide scientific assessments that inform the Conference of the Parties to the United Nations Framework Convention on Climate Change and other climate-related policy processes,

(c) The World Climate Research Programme, in facilitating the analysis and prediction of climate system variability and change for use in an increasing range of practical applications of direct relevance, benefit and value to society,

WMO is considering establishment of a mechanism encompassing the provision of services to high-level climate-related policy processes in addition to supporting country-level service delivery by Members, taking into account the current mechanism for WMO contributions to the GFCS, and ensuring a focus on delivering to the agreed WMO Strategic Plan and priorities.

Implementation of the Global Cryosphere Watch and the WMO focus on polar and high-mountain activities

The following decisions focus on the cryosphere and climate-sensitive polar and high mountain regions. Melting glaciers are an accurate indicator of anthropogenic climate change. However, glacier response times are typically decades or longer, which implies that the present-day glacier retreat is a mixed response to past and current natural climate variability and current anthropogenic forcing. Although only 25±35% of the global glacier mass loss during the period from 1851 to 2010 is attributable to anthropogenic causes, the anthropogenic signal is detectable with high confidence in glacier mass balance observations during 1991 to 2010, and the anthropogenic fraction of global glacier mass loss during that

period has increased to 69±24%. Without anthropogenic influence, glaciers would have contributed 99±36 mm to global mean sea-level rise from 1851 to 2010. With anthropogenic influence, this number increases to 133±30 mm (Marzeion, et al., 2014)[1].

Moreover, glaciers are strongly connected with society in ways that exceed their role as water sources, involving both local and distant actors. As a consequence, as they recede, glaciers often become the loci of interactions between actors on various scales. Melting glaciers are therefore objects of local, national and global concern. This is particularly true when aesthetics and economic values are assigned to glaciers. Real and perceived changes in the form, reach and outflow of water impact the local populations and shape the kinds of activities undertaken by communities, local actors, state authorities, and international organizations (Gagné et al., 2014[2]).

Recommendation 17 (EC-70)- Preoperational phase of the Global Cryosphere Watch

The Seventeenth World Meteorological Congress (Cg-17, 2015), recognized the cross-cutting nature of polar and high mountain activities and the importance of cryosphere data and products for the development and delivery of climate, weather and water services by Members, including the priority Global Framework for Climate Services (GFCS) areas of food security, water, health, and disaster risk reduction.

Cg-17 established polar and high mountain activities, as one of its seven priorities for 2016-2019, period. Since Cg-17, within this priority, WMO has made significant progress on the implementation of the Global Cryosphere Watch (GCW), including establishing the GCW core surface observing network called CryoNet, as a component of the WMO Integrated Global Observing System (WIGOS). The implementation of GCW is continuing towards mainstreaming GCW as a cross-cutting, end to end, WMO activity providing authoritative observations, data, and information on the state of the cryosphere. Additionally, within the same framework, WMO has continued to strength the Antarctic Observing Network (AntON), a historically under-sampled area of the world, and has provided its full support to the Global Integrated Polar Prediction System (GIPPS), which includes a period of intensive observing, numerical modelling simulations, verification, user-engagement and education activities through the Year of Polar Prediction (YOPP), underway from 2017-2020, with a subsequent research consolidation phase.

To provide a focused scope to its activities in mountain regions, Decision 48 (EC-69) defined high-mountain regions as “mountain areas where seasonal or perennial cryosphere is present and poses potential and serious risks to society related to water scarcity and disaster resilience”.

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1 Marzeion, B., Cogley, J. G., Richter, K., and Parkes, D.: Attribution of global glacier mass loss to anthropogenic and natural causes, Science, 345, 919–921, doi:10.1126/science.1254702, 2014.

2 Karine Gagné, Mattias Borg Rasmussen, Ben Orlove. Glaciers and society: attributions, perceptions, and valuations. WIREs Clim Change 2014, 5:793–808. doi: 10.1002/wcc.315.

Resolution 29 (EC-70)- Global Cryosphere Watch Surface Observing Network (CryoNet)

This Resolution established “The Global Cryosphere Watch Surface Observing Network” with 153 CryoNet Stations and Contributing Stations, covering all regions of the globe, thus playing an important role in the Earth system focus of WMO.

- GCW has been successful in engaging operational organizations, academia, and independent research and operational organizations, on achieving the consistent in situ observation of all components of the cryosphere (snow, glaciers, permafrost, sea ice, ice sheets, lake, and river ice, and icebergs),

- GCW has assumed a leadership role, internationally, in advancing the accessibility and sustainability of cryosphere observations and exchange of cryosphere data, including from regions with significant observation gaps, through a broad range of activities, inter alia, developing and contributing to the development of observing and data exchange standards and best practices guidelines.

Recommendation 17 (EC-70)- Preoperational phase of the Global Cryosphere Watch

EC-70 decided to ask the Eighteenth World Meteorological Congress (Cg-18), to approve the GCW preoperational phase, with the aim of providing to Members the benefits of a fully operational, end-to-end GCW, as a cross-cutting activity, from 2024 onward, thus, making significant contributions to enhancing systematic cryosphere observations and the access to data, e.g. in support of the implementation of the Global Framework for Climate Services (GFCS), and in the framework of Earth system model.

During its operational phase, GCW will focus on further strengthening its surface observing network, by engaging a minimum of 80% of countries where cryosphere is present, as well as improving the access to, and the management of quality of current and past cryosphere data, information, and products, by working together with Member States, with a focus on developing countries, for establishing national frameworks for cryosphere end-to-end monitoring and service partnerships. During the preoperational phase, GCW will develop capacity and mechanisms to provide and publish value-added cryosphere products, relevant to water resources, ecosystem management, natural hazards and risks adaptation strategies, and energy production.

Decision 45 (EC-70) - Polar Space Task Group (PSTG)

This Decision endorsed a gap analysis of the availability and requirements for observing critical Earth System parameters required for improving the availability of systematic observations and monitoring polar and high-mountain regions, and other relevant cryospheric ecosystems (e.g. lake and river ice), both, in situ and remotely sensed observations, and to summarize currently available space cryosphere products in the polar and high-mountain regions, with a view of extending the mandate and membership of PSTG,

thus, complement the mandates of other polar and high-mountain activities, e.g. the Global Cryosphere Watch, in achieving the strategic observations and services objectives for polar, high-mountain regions, with a focus on cryosphere. EC-70 invited members to enhance their satellite programmes in delivering appropriate satellite observing system infrastructure and products and services required for polar and high-mountain regions

Resolution 28 (EC-70) - WMO as an observer with the Arctic Council

This Resolution endorsed the long-term engagement of WMO with the Arctic Council and its Programmes as an Observer. The WMO structures were invited to collaborate with the Arctic Council and its working groups in support of policy decisions on Arctic matters, to achieve well-maintained and sustained observing networks for monitoring changes in the climate, weather, cryosphere and water resources; for enhancing the broad sharing of data and information; for addressing the needs of different stakeholders, including different disciplines of science; and for the development of safety- and sustainability-related services.

Decision 42 (EC-70) - WMO High-mountain Summit 2019

The WMO Executive Council decided to organize a WMO High Mountain Summit, which will take place on 25-27 February 2019, at the WMO Headquarter, in Geneva, organized by WMO together with several key international partners. The High Mountain Summit will address the need for accessible, reliable, and policy-relevant data and information on water resources, natural hazard management, reflecting accelerated changes in high mountain cryosphere and ecosystems, which have cascading and often devastating effects on populations, economic activities, infrastructure and ecosystems in mountain regions, downstream, and in lowland areas, with the objective to inform, and therefore, promote sustainable mountain development.

The Summit will seek to:

1) Mobilize public and private sector leaders to leverage funding for initiatives, contributing to meeting the goals of the 2030 Agenda, towards achieving sustainable mountain development;
2) Promote collaboration for new and ongoing initiatives, by developing a roadmap for strengthening the provision of hydro-meteorological, climate, and prediction observations and services for mountain regions, for optimizing and enhancing cryosphere and high mountain observations, and advancing the scientific research agenda to address emerging gaps, within the framework of programmes and activities of WMO and its partners;
3) Ensure that existing funding mechanisms such as The World Bank, Green Climate Fund, Global Environmental Facility, the Adaptation Fund, and others, identify high mountains as priority areas for investments and projects.

Decision 43 (EC-70) - Proposal for the declaration of 2020 as the United Nations International Year of Snow and Ice

The Executive Council decided to support the initiative proposed by Iceland for designating year 2020 (or 2021), as a United Nations International Year of Snow and Ice, to provide a

coordination mechanism for increasing the focus and sustaining the awareness and understanding of the importance of snow and ice in the climate system and of the implications of impending changes in the Earth's cryosphere for human societies.

Decision 47 (EC-70) - Polar Regional Climate Centres and Regional Climate Outlook Forums (RCOFs)

The Executive Council decided to advance the development of Climate Information Services in polar and high mountain areas, by endorsing the implementation plan of the Arctic Regional Climate Centre Network (ArcRCC-Network), noting the commencement of the demonstration phase of ArcRCC-Network in May 2018, and that the first Pan-Arctic Regional Climate Outlook Forum (PARCOF-1) was organized in May 2018 at Ottawa, Canada. Additionally, it endorsed the structure of the Third Pole RCC-Network (TPRCC-Network) based on geographical distribution of responsibilities, with three notes led by China, India, and Pakistan, respectively, and the initiatives to develop an Antarctic RCC-Network (AntRCC-Network).

Next Steps

In planning its Strategic Objectives for the next 10 years, WMO plans to strengthen its leadership role regarding systematic observations, research, and improvements to services, and it will include a focus on high mountain and polar regions. One of its long-term goals being "Enhance Earth system observations and predictions: Strengthening the technical foundation for the future". To facilitate the engagement and collaboration of relevant stakeholders, and the dissemination of information and results, the following are proposed:

- Organize an Earth Information Day, at the earliest opportunity, with a focus on systematic observations and research in polar and high mountain regions, and in particular on the role of the cryosphere in the Earth system, by building on the activities noted as being underway within the WMO framework.

- Promote a focused Scientific Research Dialogue in the context of the High Mountain Summit, with the goal of better understanding the attribution of accelerated changes in the cryosphere, in these regions, and the associated feedbacks and teleconnection.

Update from WCRP strategy and CIMP6 progress

New Scientific Strategy for WCRP

The new Strategic Plan (2019-2029) of WCRP: https://www.wcrp-climate.org/wcrp-sp-overview) was developed under the overall guidance and leadership of the WCRP Joint Scientific Committee and through extensive consultations with the communities. It outlines the overall strategy to address fundamental scientific questions related to the coupled climate system that require international science coordination and partnerships, and that underpin the implementation of the Paris Agreement of 2015, 2030 Agenda for Sustainable Development, the Sendai Framework for Disaster Risk Reduction and multilateral environmental conventions. In doing so, the Strategy strongly emphasizes the need for joint

planning, joint execution of coordinated experiments, and sharing of data and information; in order to ensure that climate science provides the information necessary to achieve a more resilient, sustainable and equitable world.

WCRP Coupled Model Intercomparison Project Phase 6 (CMIP6)

The WCRP Coupled Model Intercomparison Project Phase 6 (CMIP6: http://www.wcrp-climate.org/wgcm-cmip/wgcm-cmip6) continues to progress, in view of providing a critical foundation of the IPCC 6th Assessment Report. CMIP-endorsed model intercomparison projects (MIPs), implemented by 33 modelling centers around the world, address key science questions on the response to forcings, the variability, predictability and future scenarios, and systematic biases in climate projections. The first CMIP6 dataset was released in August 2018, through a significant improvement in the infrastructure for data management (Earth System Grid Federation: https://esgf.llnl.gov/). Further efforts have been made to enhance the interoperability and data accessibility, for both observing data input and model output.

The CMIP represents one of society's most robust and reliable sources for climate information – The WCRP largely contributes to the climate data service and to the development of climate change scenarios at the national and local levels, through the CMIP and the CORDEX (Coordinated Regional Climate Downscaling Experiment) resources. The growing dependency on CMIP products by a broad research community and by national and international climate services implies that basic CMIP activities, such as the creation of forcing datasets, require substantial efforts.

Updates on the implementation of the WMO-UNFCCC Memorandum of Understanding (MoU)

Annual Reporting on concentrations of greenhouse gases (GHGs) in the atmosphere and the state of the global climate

WMO is working on the finalization of the annual Greenhouse Gas (GHG) Bulletin and the press release, which will take place prior to COP 24 on 22 November 2018. The Bulletin will provide information on the global averaged annual mole fractions of the key greenhouse gases in 2017 and their growth rates. The cover story and the insert will articulate the value of the observations in improving information related to emission estimates. The GHG Bulletin will be submitted to COP 24 as an INF. document.

WMO is coordinating inputs and data from National Meteorological and Hydrological Services (NMHSs) and other contributors from the United Nations system on the provisional version of the WMO Statement on the State of the Global Climate in 2018. A review meeting will be held to verify the information and content. The Statement will be made available to the media and the public on 29 November 2018 and will be submitted to COP 24 as an INF. document.

Both above mentioned reports present the variations and trends in global surface temperature and other climate indicators at COP sessions, to inform policy makers on the

state of the global climate system and the extent of its response to, among other factors, efforts being made in addressing climate change (e.g. limiting global warming and its manifestations in terms of the frequency and/or intensity of extreme events as well as slow onset events such as sea level rise and droughts).

Climate Services for adaptation planning and implementation

- *Climate services*

Strategic collaboration projects encompassed by the MoU in this area include “Climate Services for Adaptation Planning and Implementation”, which aims at further updating supplementary materials to the NAP Technical Guidelines; developing a collection of climate services to guide assessment and identification of adaptation strategies; and supporting at least five developing countries in using climate services for documenting observed impacts, vulnerabilities and risks in a consistent manner, using the supplementary materials developed.

WMO and the GFCS are partnering with the United Nations Institute for Training and Research (UNITAR) for the production of an e-training module titled “Integrating Climate Risk Information into the National Adaptation Plan (NAP) Process”. The module is to be administered as part of the regional workshops organized by the United Nations Framework Convention on Climate Change (UNFCCC) for the Least Developed Countries Expert Group (LEG). The training is being developed as an effort to enable the linkage of climate services to the NAP process through more active participation of National Meteorological and Hydrological Services.

In support of promoting the routine use of climate information services to guide and inform adaptation planning at the national level, sectoral, and local level, the GFCS has been supporting countries to develop National Frameworks for Climate Services (NFCS). These National Frameworks aim to bridge the gap at the national level separating on the one hand the national meteorological and forecasting community and on the other adaptation planners and UNFCCC national focal points in charge of developing the NDCs and NAPs. This gap, common in many countries perpetuates a deep divide between available climate knowledge and the NAP and NDC development process.

- *Memorandum of Understanding with Green Climate Fund (GCF) on Climate Rationale*

GCF Board decision B.07/04 (b) (iii) called for an "(...) increased generation and use of climate information in decision-making." In seeking an increased impact of GCF's investments, the most recent GCF board meeting, in its decision B.19/34 annex I (d)(i), requested the GCF Secretariat to "(...) develop an integrated approach to resolve these interrelated issues for the Board's consideration at its twentieth meeting, including: (i) steps to enhance the climate rationale of GCF-supported activities(...)".

In response to this requirement, WMO has provided a concept of climate rationale that contributes to enhancing the climate science basis for all GCF funded projects and activities. Under an agreement with the GCF Secretariat, WMO is compiling the scientific methodology, data, tools and associated technical resources for enhancing the climate science basis for

GCF funded projects. Among other benefits, these materials will assist in the preparation of NAPs with joint support from WMO and UNFCCC under the UNFCCC-WMO agreement.

Observations-based tools for improved national greenhouse gas emission estimates

WMO and UNFCCC organized a side event titled "Towards a global network for monitoring the implementation of the Paris Agreement" during the 48th session of the Subsidiary Body for Scientific and Technological Advice (SBSTA 48), in Bonn, Germany, May 2018. The side event emphasized the need to enhance the capability to systematically monitor greenhouse gas concentrations and emissions, through in situ and satellite observations, and its relevance in support of the Paris Agreement.

UNFCCC and WMO are working on the potential "Pilot Project on Using Atmospheric Measurements to Establish the Carbon Sequestration Capacity of Bamboo Plantations" with the International Network for Bamboo and Rattan (INBAR). This projects will use IG^{3}IS approach to assess the sink capacity of bamboo and help to establish related emissions factors.

UNFCCC played an important role in providing the political context at the First Integrated Greenhouse Gas Information System (IG^{3}IS) Symposium and User Summit, that was convened in WMO Headquarters, in Geneva, Switzerland from 13 to 15 November 2018. This forum brought together key users from a number of different sectors who engaged in dialogue with technical developers of IG^{3}IS information. Stakeholders and users articulated their needs for data-driven GHG emission information, and the scientific community developing IG^{3}IS services presented existing capabilities that could either meet information needs or reframe the user considerations and the landscape of solutions. The Symposium and Summit also identified gaps between current capabilities and emerging user requirements and will guide IG^{3}IS research and development for future products and services.

Regional collaboration for supporting adaptation and mitigation actions

The objective of this project is to enhance access to data needed for planning and implementation of adaptation actions and also, to some extent, mitigation actions, as well as to facilitate feedback on user requirements through collaboration between the WMO Regional Climate Centers (WMO RCCs) and the UNFCCC Regional Collaboration Centers (UNFCCC RCCs).

- *Asia Pacific Climate Week- Singapore, July 2018*

WMO participated in the Global Climate Action at the Asia Pacific Climate Week in Singapore, July 2018. WMO along with FAO and UNESCAP, UNFCCC, Marrakesh Adaptation Group and Red Cross of Singapore contributed to a session on Strategies to Reach Scale: Adaptation and Climate Resilient Initiatives on Coastal Zones. The meeting emphasized strengthening financial policies which globally support the adaptation process.

- *Latin America and Caribbean Climate Week and Carbon Forum (LACCW), Montevideo, Uruguay, August 2018*

Within the framework of the implementation of the agreement, WMO participated in two joint side events on IG^{3}IS organized by WMO and UNFCCC: “Towards a global network for monitoring the implementation of the Paris agreement” on 2 May 2018 during the SABSTA 48 session in Bonn. An event titled “Innovative observation-based tools to support climate mitigation strategies (WMO)” was held on 22 August 2018 in Montevideo, Uruguay, at the Latin America and Caribbean Climate Week and Carbon Forum.

The first event articulated the role of evidence- and science-based information in driving the development of tools in support of the successful implementation of the Paris Agreement. It reflected on a number of complementary efforts, from the climate indicators assessed by the Global Climate Observing System (GCOS) to the cross-domains initiatives line GEO Carbon.

The second event articulated the role of IG^{3}IS as an international coordinating mechanism to establish and disseminate globally consistent methods and standards to assess emission reduction actions. Such information will support stakeholders through improved knowledge of the national emissions, identified large and additional emission reduction opportunities, and timely and quantified guidance on progress towards their emission reduction strategies and pledges (e.g., NDCs).

In another event, during the LACCW, a WMO representative presented several experiences developed by CIIFEN (Centro Internacional para la Investigación del Fenómeno de El Niño), the WMO Regional Climate Center for Western South America. In the context of regional projects, CIIFEN, in cooperation with National Meteorological Services, has developed a comprehensive analysis of climate variability and projected changes at national and local scales. In parallel, CIIFEN has developed and validated with national and local users a comprehensive and objective methodology to estimate vulnerability with high resolution. This approach involves social, economic, environmental indicators which are combined with some proxies related with governance to approach to adaptive capacity. Both, climate and vulnerability information layers have been combined to produce risk maps and are integrated in an open code platform for visualization and analysis. The provided systems are increasingly used by National and local authorities in the region to support risk management and adaptation plans. Publications, training materials and other information resources were shared with the audience.

The event was also informed of a new project proposal for the Andean region, which WMO has submitted to The Adaptation Fund (Project ENANDES).

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