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INFORMATION DOCUMENT

WMO-IOC-ICSU WORLD CLIMATE RESEARCH PROGRAMME (WCRP): YEAR 2013 REPORT

Summary

This document informs the IOC Assembly at its 27th session of WCRP progress since its last session in June 2011 (IOC/INF-1285) subsuming the WCRP report to the IOC Executive Council at its 45th session in June 2012 (IOC/INF-1296).

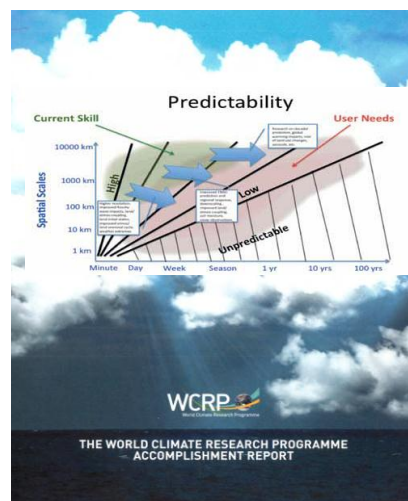


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General background

The World Climate Research Programme (WCRP) was established in 1980 by the World Meteorological Organization (WMO) and International Council for Science (ICSU) to address two objectives: determine the predictability of climate and determine the effects of human activities on climate for use in an increasing range of practical applications of direct relevance, benefit and value to society. Since 1993, WCRP has also been co-sponsored by the IOC of UNESCO.

This report provides a brief summary of the main WCRP ocean-related activities since the WCRP presentation to the IOC Assembly in June 2011. More information on recent WCRP activities, especially in the domain of oceanography, is available from the WCRP, CliC, CLIVAR, and GEWEX websites (see <http://www.wcrp-climate.org>, <http://www.climate-cryosphere.org/>, <http://www.clivar.org>, and <http://www.gewex.org>, respectively). In March 2013 WCRP published a major report on its recent accomplishments, which is available at: http://www.wcrp-climate.org/images/documents/reports_flyers/WCRP_report03_2012.pdf.

Planning and implementing the WCRP activities

The WCRP and its network of projects and scientists strive to fulfil the Programme mandates with due consideration to its three sponsors' strategic initiatives such as the Global Framework for Climate Services (GFCS), the Future Earth initiative, and the Framework for Ocean Observing, which is led by IOC and dates back to the landmark OceanObs'09 Conference in Venice. The activities and accomplishments reported below reflect scientific priorities outlined in the WCRP Programme Implementation Plan (WCRP 2009, WMO/TD-No. 1503).

Major events for the past biennium

WCRP organized the very successful Open Science Conference (OSC) entitled "Climate Research in Service to Society" (<http://conference2011.wcrp-climate.org>) that was held in Denver, Colorado, USA, in October 2011 and attracted over 1900 participants, many of them oceanographers, from 86 countries. More than 500 scientists from developing nations and regions and 250 young scholars were among the participants. A major emerging theme from the OSC was the need for "actionable" science to support decision-makers who are confronted with the challenges and opportunities posed by changes in the environment, in the sector of energy and in economic development associated with the impending rapid growth in world population. To ensure adequacy of such information and its timely access and use, WCRP is engaged in an active dialogue with these stakeholders and decision-makers in all phases of its research activities, from the project design to the dissemination of resulting scientific knowledge and information.

WCRP co-sponsored and contributed to planning and organization of the successful 2nd PICES/ICES/IOC Symposium "Effects of climate change on the world's oceans" (Yeosu, Republic of Korea, 15–19 May 2012, in conjunction with Ocean Expo-2012). In addition, WCRP organized a wide range of regional scientific workshops, as well as capacity development and training activities that are described in the subsequent section of this report.

Main sessions of WCRP working bodies

The Extraordinary Session of WCRP Joint Scientific Committee (JSC) was held on 29 and 30 October 2011 in Boulder, just after the completion of the OSC. The 33rd session of JSC was convened on 16–20 July 2012 in Beijing, China, and the 34th session at the time of writing of this report was being planned for 27–31 May 2013 in Brasilia, Brazil. WCRP is grateful to IOC for active participation and engagement of the IOC Executive Secretary and IOC staff in these meetings and for effectively conveying IOC research priorities and needs to the JSC.

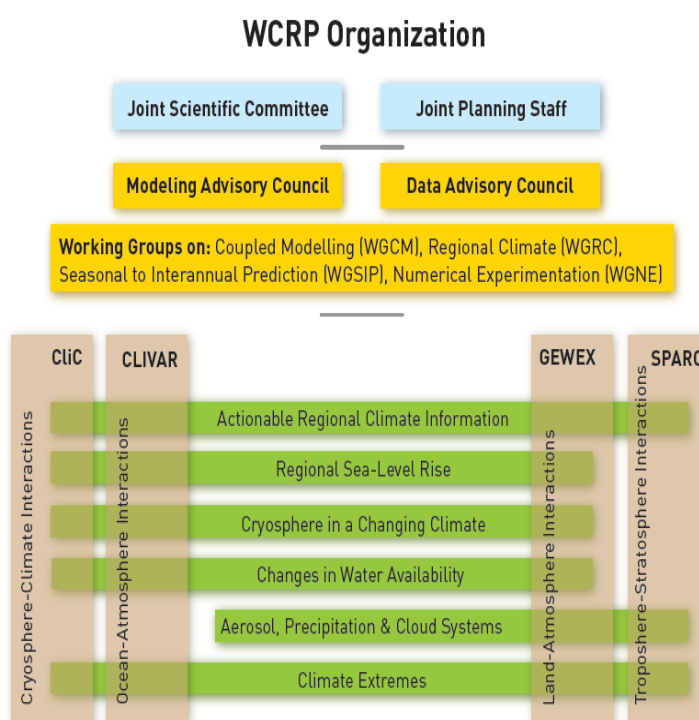
In association with the 33rd JSC Session, the first meetings of the recently established WCRP Data Advisory and Modelling Advisory Councils (correspondingly, the WCRP Data Advisory Council—WDAC and Modelling Advisory Council—WMAC) were held. The main objective of these Councils

is further strengthening of coordination of data and modelling activities between the WCRP Core Projects and with sister Global Environmental Change Programmes. Another newly established body of WCRP is the Working Group on Regional Climate (WGRC). It met for the first time on 4–6 April 2013, in Vienna, Austria. The WGRC's main role is to facilitate support for development of regional science-based climate information for decision makers through such initiatives as GFCS.

Targeting WCRP climate research to meet societal needs

Following the independent review of the Programme by its major sponsors (i.e. ICSU, IOC/UNESCO and WMO) in 2008–2009 (IOC/INF-1266), WCRP began a series of consultations and deliberations with the international scientific community on its research plan and priorities for the ensuing decade. These efforts culminated in a series of community-based scientific papers that were discussed at the OSC in 2011. Published as a monograph, they will serve as the WCRP science strategy. Six major scientific grand challenges were identified in this process to serve as the basis for integrating the research activities across the entire WCRP and provide the foci for the development of targeted research efforts that meet the information needs of decision makers with the likelihood of significant progress over five to seven years. These Grand Science Challenges are:

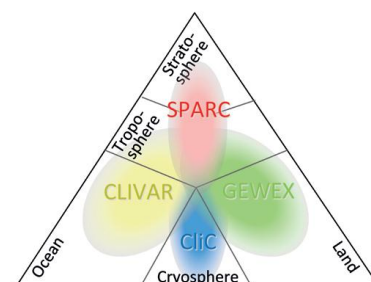
- Provision of skilful future climate information on regional scales (e.g. decadal predictability);
- Regional sea-level variability and change;
- Cryosphere response to climate change (including ice sheets, water resources, polar predictability, permafrost and carbon);
- Improved understanding of the interactions of clouds and radiation (including the role of aerosols and precipitation and contributions to climate sensitivity);
- Past and future changes in water availability (with connections to water security and water-resources management); and
- The science underpinning the prediction and attribution of extreme events.



The WCRP new proposed structure (see figure) and governance will facilitate interdisciplinary research towards fundamental understanding of the Earth's complex climate system, while ensuring timely delivery of scientific knowledge resulting from these efforts to decision makers through newly established initiatives such as the GFCS and Future Earth.

Developments in WCRP Projects

The Grand Science Challenges presented above stimulated significant discussion among the Core Projects and the JSC about how to organize the Projects' activities for effective integration and delivery of the knowledge. For example, the GEWEX (the new name of the Project is Global Energy and Water Exchanges) project is focussing the research on predicting global and regional energy and water variations, trends, and extremes (such as heat waves, floods, and droughts) through



improved observations and modelling of land and atmosphere, and their interactions, thereby providing the scientific underpinnings of climate services. The CliC (Climate and Cryosphere) project main objectives are to address the role of the cryosphere in the climate system, facilitate improved understanding of the predictability of the Arctic and Antarctic climate systems, terrestrial cryosphere, and past, current, and future contributions of glacier and ice sheet melt to sea-level variability and change. SPARC (starting in 2014 the name of the project will be Stratosphere-troposphere Processes And their Role in Climate) updated research focus is on atmospheric dynamics, chemistry and composition. SPARC activities are now evolving towards a greater emphasis on stratosphere-troposphere coupling and their influence on air quality. CLIVAR is focussing on the ocean and ocean-atmosphere interactions in order to better understand climate variability, predictability and change including topics such as regional sea level and extreme events. The envisioned coordination and integration among the four Core Projects, in the context of a holistic approach to Earth's climate system observation, research, modelling and prediction, is captured by the figure above.

Expanding and enabling climate research for regional decision makers

Major WCRP experiments provide the framework for advancing research on modelling of climate change and variability and for improving climate projections and predictions. These experiments create the basis for assessing climate variability and change in support of science-based environmental assessments such as the IPCC Fifth Assessment (AR5), Quadrennial Ozone Assessment, the newly established Biodiversity Assessment, etc.

The Coupled Model Intercomparison Project, Phase 5 (CMIP5) represents the most ambitious multi-model inter-comparison and analysis project ever attempted. 24 modelling groups from around the world are participating in it. The scope of CMIP5 is much broader than that of the previous intercomparison project (CMIP3) and includes consideration of four new representative concentration pathways (RCPs) to support developing mitigation scenarios in addition to the long-term concentration-driven Atmosphere-Ocean Global Circulation Model (AOGCM) and emission-driven Earth System Model (ESM) experiments. This experiment includes climate projections on the time scales of centuries and predictions of decadal climate variability.

WCRP is also continuing its multi-model, multi-institutional set of experiments on seasonal prediction – the Climate system Historical Forecast Project (CHFP). In an attempt to build a joint weather and climate (“seamless”) prediction system, WCRP combined efforts with the World Weather Research Programme in the development of a sub-seasonal to seasonal prediction project (S2S).

In order to coordinate development of international regional climate information, WCRP developed a framework for the Coordinated Regional Climate Downscaling Experiment (CORDEX). The framework is facilitating the evaluation and, where possible, the improvement of regional climate downscaling techniques for use in many regions worldwide, and to support the vulnerability, impact and adaptation analyses and assessments. Many CORDEX regions are already self-organizing and are developing matrices of regional climate change projections. In some regions, one example being Africa, access to reliable regional climate-change information is particularly limited. The international community therefore targeted Africa for intensive collaboration, and the effort is already producing a significant amount of information on African climate, both to support the AR5 and to provide useful climate information to decision-makers involved in African climate risk management and adaptation planning.

Unprecedented volumes of data containing climate historical simulations, climate predictions and projections, and observational datasets and their reanalyses are being made available openly to scientists and other users through the Earth System Grid Federation (ESGF) archive. These data include the results from CMIP5, CHFP, CORDEX, the four major international re-analysis products from USA, Japan and Europe, and observation-based data sets prepared by the U.S. National Aeronautics and Space Administration (NASA) for inter-comparison with some of the CMIP5 model

results. The ESGF is a highly distributed system with nodes in all major continents around the world to ensure ease of access to these large scale data sets on one hand, and consistency of protocols, formats, projection maps, documentation, etc., on the other hand, to enable more effective analysis and intercomparison among them. WCRP is promoting a pilot effort to improve the connection between data experts and scientists involved in climate model development and evaluation, which is called Obs4MIPs (<http://obs4mips.llnl.gov:8080/wiki>). It aims to greatly improve intercomparisons of models and observational datasets.

Ocean model development

The CLIVAR Working Group on Ocean Model Development (WGOMD) met for its tenth session in Venice, Italy, in January 2012, and for its eleventh session in Hobart, Australia, in February 2013. WGOMD, which is the leading coordinating body for ocean modelling, continues to develop the Coordinated Ocean - ice Reference Experiments (CORE) based on the CORE II protocol. A special online issue of the Ocean Modelling journal is in preparation. It will document the state-of-the-science in global ocean-sea ice modelling available through the CORE-II protocol.

Sea level variability and change

Analysis, assessment and prediction of sea-level variability and change, especially at the regional level, are a key focus for WCRP and an area of active cooperation with IOC. A dedicated WCRP Workshop hosted by UNESCO-IOC in Paris in February 2011 reviewed the state-of-the-knowledge in sea-level observations, research and modelling. In February 2013 these discussions were continued at another WCRP workshop jointly organized by the CLIVAR and CliC Projects in Hobart, Australia. The main foci of this workshop were ocean dynamics and sea-level change, ocean-ice shelf interactions, and dynamics of ice sheets. The outcomes of these two workshops are highly instrumental for current and future assessments of sea level. Based on their outcomes, it is possible to state that major progress is being made in improving the observing networks and developing models capable of capturing essential dynamics of ice-sheets, sea-ice, and glaciers. Another recent observation-based finding discussed at these workshops is the enhanced net mass loss from the major ice sheets, which, if it continues at recently detected rates, will mean that the contribution of the ice sheets to 21st century sea-level rise will be larger than from any other contributing factor (such as the mass loss of glaciers and ocean water thermal expansion).

To manage the potential risks of sea-level changes and develop adaptive measures, it is imperative to know not only the global mean sea-level value but also its regional and temporal variations. WCRP is supporting research on understanding the underlying physical and dynamic processes that contribute to the patterns and magnitude of sea-level variability and change on regional scales. These studies have revealed some patterns of such variability, showing clearly that while sea level is rising on the global average, it may be rising more in some regions of the world and even falling in others, owing to the specifics of ocean dynamics and other geophysical processes. Regional sea-level rise increases the risk of coastal flooding, which also depends on local tides, storm-surges, precipitation, and local hydrological conditions. Research on global and regional sea level including its extremes is WCRP's direct response to the guidance received on this subject from the IOC at its Assembly in 2009.

Progress in ocean observations and synthesis

Ocean observations continue to be an important focus for WCRP. Together with GOOS and GCOS, WCRP sponsors the Ocean Observations Panel for Climate (OOPC) and contributes to development of the Framework for Ocean Observing (FOO). The WCRP CLIVAR Project, at its recent 20th Scientific Steering Group meeting in Kiel in May 2013, agreed to identify appropriate contacts to provide for the OOPC the necessary input with respect to development of observations of Essential Ocean Variables and Essential Climate Variables.

The utility of ocean measurements is continuously being enhanced through the efforts of the WCRP CLIVAR Global Synthesis and Observations Panel (GSOP). GSOP coordinates its contribution to implementation of FOO with OOPC. The main objective of GSOP is to create the best possible syntheses of in situ ocean observations, satellite measurements and model outputs. Such ocean synthesis products are needed to understand sea-level changes in the context of climate change and variability and to measure changes in the meridional overturning circulation that could lead to rapid climate change. They also form the basis for assimilation of ocean observations into climate prediction systems, and, in particular, those to be used for decadal prediction. Synthesis products that include information about carbon help to understand and monitor the role of the ocean as a carbon sink. Ocean data synthesis, coordinated by WCRP and involving representatives from all the major modelling centres around the world, provides key information about the state of the ocean to a wide range of users. Significant discussion is ongoing as well on the issue of accumulation of the excess heat in the ocean and its apportionment between the upper 700 m and the deeper layers, which are accessible to Argo.

New measuring techniques such as gliders and integrated physical and biogeochemical sensors are continuously being tested and refined in WCRP international field programmes. For instance, the New Guinea Coastal Undercurrent and its variation has been a major gap in El Niño-Southern Oscillation (ENSO) diagnosis and the link between extra-tropics and tropics. CLIVAR is now addressing this gap in observations through the use of ocean gliders. These autonomous instruments provide a relatively inexpensive means to produce time series measurements. Ultimately it is expected that this sort of instrument will become part of a sustained ocean climate observing system.

Observing and modeling ocean – atmosphere fluxes

The ocean and atmosphere interact through fluxes of energy, matter, and momentum at their interface. Progress in quantitative understanding of surface fluxes is the necessary condition for proper modelling of ocean circulation and for all climate predictions. In January 2012 WCRP published an Action Plan for WCRP Research Activities on Surface Fluxes, which contains recommendations on flux measurement and data processing to create validated datasets for evaluation of model-based fluxes.

Integration of physical, biogeochemical and ecosystem research in the ocean

More and more, experiments in the domain of physical oceanography are merged with ecosystem and biogeochemical research, largely coordinated by the IMBER (Integrated Marine Biogeochemistry and Ecosystem Research) project of the International Geosphere-Biosphere Programme (IGBP) and the Scientific Committee on Oceanic Research (SCOR). The CLIVAR Scientific Steering Group (SSG) at its 19th session in La Paz (Mexico, June 2012) and the IMBER Scientific Steering Committee held a day-long joint session and agreed to form a task team with a mandate to formulate a strategic approach to future joint work. Research on marine biophysical interactions and dynamics of upwelling systems is now included in the list of science priorities for CLIVAR. The CLIVAR “tiger team” will develop by the end of 2013 a white paper on upwelling research opportunities. CLIVAR Scientific Steering Group recommends developing this effort in close cooperation with IOC and its regional bodies.

WCRP maintains its sponsorship of the very active and fruitful IGBP/SCOR/WCRP/International Commission on Atmospheric Chemistry and Global Pollution (iCACGP) Surface Ocean–Lower Atmosphere Study (SOLAS, <http://www.solas-int.org>). In a recent article “Evolving Research Directions in Surface Ocean–Lower Atmosphere (SOLAS) Science”, published in *Environmental Chemistry* in 2013, new SOLAS research strategies are described. A SOLAS Open Science Conference was held in 2012 in Cle Elum, Washington State, USA. Another notable event was the conference “Earth Observation for ocean-atmosphere interactions science” that was organized in November–December 2011 in Frascati, Italy, by SOLAS together with the European Space Agency

(ESA), European Geophysical Union (EGU), and European Cooperation in Science and Technology (COST) Action 735.

Regional ocean observing systems, field experiments, and process studies

WCRP and its Core Projects provide scientific support to regional ocean observations and help to coordinate them. For example, the 9th Session of the CLIVAR–IOC/GOOS Indian Ocean Panel was held in October 2012 in Cape Town, South Africa, in conjunction with the 9th Session of the Indian Ocean Global Ocean Observing System (IOGOOS), the 3rd SIBER (Sustained Indian Ocean Biogeochemistry and Ecosystem Research) SSG meeting, and the 3rd Indian Ocean Observing System (IndOOS) Resource Forum. An international field programme CINDY2011 (Cooperative Indian Ocean experiment on intraseasonal variability in the Year 2011), with U.S. participation through the program DYNAMO, and several other projects, took place in the central equatorial Indian Ocean in late 2011–early 2012 to collect *in situ* observations to advance understanding of the Madden–Julian Oscillation (MJO) initiation and improve MJO prediction. Subsequently, a symposium on MJO prediction was held 10 January 2013. Further, in July 2013 the second ‘International Symposium on Boundary Current dynamics’ will be held in Li Jiang, Yun Nan, China, to be followed by a joint session of CLIVAR Pacific and Indian Ocean panels. Joint sessions and activities of scientists studying the Indian and Pacific Oceans are warranted by strong interactions within the ocean, as was confirmed, for example, by a very successful CLIVAR/WCRP Workshop on Decadal and Multi-decadal Variability in Pacific and Indian Ocean held in Qingdao, China, in September 2012. The Scientific Steering Group (SSG) encourages the Pacific panel’s planned connectivity with the IOC Regional Secretariat for the Sub-Commission for the Western Pacific (WESTPAC).

In the Pacific Ocean, improvements of observing, indexing, modelling and prediction of ENSO remain the focus. The third Workshop on the Evaluation of ENSO Processes in Climate Models was held in Hobart, Australia in January 2013. A vast array of observing experiments is continuing in this basin, including the large-scale Southwest Pacific Ocean and Climate Circulation Experiment (SPICE) and its sub-experiments; field work on the origins of Kuroshio and Mindanao currents; and continuing development and maintenance of the TAO/TRITON ENSO observing system that includes the eastern part of the Indian Ocean. The 7th Session of the CLIVAR Pacific Panel took place in Noumea, New Caledonia, in April 2012.

A significant number of coordinated research, field experiments, and sustained observations are going on in the Atlantic Ocean. They are coordinated by the CLIVAR Atlantic Panel, which held its 12th meeting in September 2012 in Kiel, Germany, including a joint session with the 17th Meeting of the Prediction and Research Moored Array in the Atlantic (PIRATA) SSG. The scope of oceanographic research in the Atlantic Ocean is large and includes subregional activities in the tropical, eastern, southern, and northern basins that have differing foci such as the Atlantic meridional overturning circulation and Atlantic Multidecadal Oscillation. At present, this region exhibits the highest potential in terms of possible decadal climate predictability.

The 8th Session of the CLIVAR/CliC/Scientific Committee on Antarctic Research (SCAR) Southern Ocean Panel took place in February 2013 in Hobart, Australia. This regional community is actively developing the Southern Ocean Observing System, a new international initiative, which was inaugurated in August 2011, to coordinate and expand efforts to collect and disseminate sustained observations. The research foci in the Southern ocean include ice sheet–ice shelf–ocean interaction, eddies in Southern Ocean, coordinated development of biogeochemical observations and modelling, variability of the Antarctic Circumpolar Current System, and Antarctic Bottom Water Mass formation. The Southern Ocean upwelling system may become a focus of the CLIVAR grand challenge on upwelling. As reported in the recent 2013 update of the SCAR Antarctic Climate Change and Environment Report, this region keeps posing difficult questions to climate science. For example, one of the most rapidly warming regions in the world is around the Siple Region of West Antarctica and, at the same time, the Southern Ocean sea-ice extent reached its observed maximum in 2012 with an overall positive multidecadal trend of approximately 1.3% per decade.

This issue is the main area of research by the Antarctic Sea-Ice Processes and Climate (ASPeCt), a group sponsored by CliC and SCAR, which had its most recent meeting in July 2012, in Portland, USA, and is preparing a review paper on Antarctic sea ice.

With diminishing multi-year sea-ice in the Arctic Ocean, WCRP has been engaged in the research on the reason(s) for significant underestimation of the rate of sea-ice reduction in the Coupled Model Intercomparison Project 3 (CMIP3) experiments, which were used in the analysis of the IPCC AR4 in 2007. These efforts are aimed at improved representation of sea-ice processes in climate models and their exploitation in ensemble climate projections of CMIP5 experiments to be analyzed in AR5. This work will continue in the future through the WCRP Climate and Cryosphere (CliC) project, which will support the development of the WCRP Polar Climate Predictability Initiative and the Grand Science Challenge “Cryosphere in a changing climate”. The CliC project is embarking on a series of activities focused on the Polar Regions including a series of seminars and workshops on the role of sea ice to be conducted with the sponsorship of the Norwegian Research Council. This series of workshops builds on the efforts of the CliC Arctic Sea-Ice Working Group, which had its recent meeting in Boulder, USA, on 31 October–1 November 2011. A very successful topical workshop entitled “Earth Observation and Cryosphere Science” was organized in partnership with the European Space Agency (ESA), and the European Geosciences Union (EGU) in Frascati, Italy, in November 2012. A paper describing the way forward for cryospheric observations from space, based on the outcomes of this workshop, was prepared and published in the open access online journal “The Cryosphere”.

Support to decision-making, adaptation, planning, and climate risk management

Climate research enabled by WCRP is intended to provide science-based information for decision-makers. Towards this objective, WCRP coordinated the development of the Research, Modelling, and Prediction Annex to the Implementation Plan of the Global Framework for Climate Services. This Annex describes the research objectives and planned activities in support of the GFCS near-term priorities of fresh water reserves management, health, agriculture and food security, and disaster risk reduction.

WCRP, in partnership with other Global Environmental Change programs, regularly informs the intergovernmental process, particularly the Conferences of Parties (CoP) of the United Nations Framework Convention on Climate Change and its Subsidiary Body on Scientific and Technological Advice (SBSTA). The recent briefings at the CoP-18 in November 2012 in Doha, Qatar, were on the role of cryosphere in climate and provision of climate services. A report for the research dialogue with policymakers was also prepared for the upcoming SBSTA-36 (June 2013) in Bonn, Germany. WCRP is also developing cooperation with the emerging Programme of Research on Climate Change Vulnerability, Impacts and Adaptation (PROVIA).

WCRP has been supporting the development of several recent publications on extreme climate events. Research on their attribution and prediction is a major focus of the WCRP and its Grand Science Challenge. The Expert Team on Climate Change Detection and Indices (ETCCDI), jointly sponsored by CLIVAR, WMO and JCOMM, provides international coordination for objective measurement and characterization of climate variability and change in form of indices that can be used by practitioners and decision makers. ETCCDI will contribute to implementation of the activities under the Grand Science Challenge of climate extremes and is engaged in facilitating data sharing with appropriate national and international agencies. CLIVAR has also decided to form a limited lifetime working group under the CLIVAR GSOP Panel that would initiate development of sub-surface ocean indices. This work will be conducted in cooperation with the Working Group on Ocean Model Development (WGOMD) and ETCCDI.

Capacity development

Capacity development is a high priority focus for WCRP. In 2012, WCRP developed its strategy for capacity development, education, training, and outreach. To implement the priorities identified in its

strategy, WCRP is sponsoring active engagement of many early career scientists in all of its sponsored activities, with particular emphasis on scientists from least-developed and developing countries, to facilitate growth of the diverse future workforce needed to meet the increasingly complex scientific challenges in the future. Through strategic partnerships with WCRP sponsors (WMO, IOC, and ICSU) and sister organizations such as the START (Global Change System for Analysis, Research and Training), APN (Asia-Pacific Network for Global Change Research), and IAI (Inter-American Institute for Global Change Research), WCRP is currently undertaking a wide range of education, training and capacity development activities. About 300 students and early career scientists were supported by WCRP to attend its meetings in 2011/12, and in 2012 more than 30 early career scientists participated in 13 regional WCRP workshops. For example, in March 2012 WCRP sponsored a meeting in Jakarta, Indonesia, aimed at developing an effective monitoring programme for the Indonesian Throughflow. The workshop brought together scientists from around the world with Indonesian oceanographers from different institutions to develop a joint plan to monitor and improve our understanding of this critical link between the Pacific and Indian Oceans.

Recognizing the pressing need to narrow the large gap that currently exists between decision-makers and climate researchers, WCRP is organizing a series of regional projects, conferences, capacity development and training activities focussing on the role of science in climate services and risk management. The first one, on 15-18 October 2013, in Arusha, Tanzania, will be on the State of the African Climate System. It will be followed by a similar forum in Latin America in February 2014 in Montevideo, Uruguay. Likewise, a joint WCRP-IPCC-EU International Conference on Regional Climate will be held 4-7 November 2013 in Brussels, Belgium. This event aims to showcase the main outcomes of IPCC AR5 WGI, report the key scientific results for the first phase of CORDEX, and identify the future research priorities. A major conference “Climate Research and Earth Observations from Space: Climate Information for Decision Making” is being planned in partnership with the European Meteorological Satellite (EUMETSAT), European Commission (EC), major international and national space agencies, and observations coordination programmes in Darmstadt, Germany, in October 2014.

Cooperating with IOC on Transboundary Water Assessment

WCRP is a partner with IOC in the Transboundary Water Assessment Project whose overall objective is to develop methodologies to help the Global Environmental Facility (GEF) in setting priorities for their activities and to catalyze a partnership for conducting such a global assessment on a regular basis. WCRP's role is to facilitate access to data sets of future projections of various global marine variables that will be merged with socio-economic data to produce indices of stress and vulnerability of human and natural systems. The ultimate goal is to produce a metric- and mapping-based assessment transforming existing scientific data and projections for the open ocean into stakeholder-relevant information for several themes of relevance such as sea-level rise, coral bleaching, and ocean acidification.

IOC sponsorship and financial support to WCRP

Since 2005 and until 2010, IOC contributed US\$ 125 000 annually to the Joint Climate Research Fund, from which the WCRP international research and capacity development activities are funded. Noting the importance of the WCRP activities for the IOC lead within UNESCO on the Inter-sectoral Platform on Climate Change and UNESCO's joint lead with the WMO on the "Knowledge Base" within of the UN system-wide response to climate change, the World Meteorological Congress (Geneva, Switzerland, May–June 2011) at its 16th session noted the decision of the IOC Assembly at its 25th session (2009) regarding the level of IOC sponsorship of WCRP (IOC-XXV/3; item 4.4.1.1, para. 345) and expressed the hope that the IOC contribution in the future could increase to a level similar to that of WMO.

In 2011 the IOC Assembly at its 26th session “... *recognized that climate change is one of the most important problems the global community is now facing. The Assembly stressed the importance of research programmes in complementing ocean observation programmes and in understanding the*

role of oceans in climate change. The Assembly also stressed the need to give high priority to WCRP and reaffirmed IOC's commitment to continue as a co-sponsor of the WCRP at a level of US\$ 125,000 per annum, ideally through Regular Programme budget. The Assembly stressed its view that reducing the IOC financial support to WCRP for the next biennium would send a confusing message to co-sponsors, would be inconsistent with the IOC's current position, and could weaken the IOC's influence on a strong oceanic component of WCRP". (IOC-XXVI/3, item 6.3, para. 173)

WCRP confirms its strong unconditional commitment to continue actively supporting IOC in fulfilling IOC's mission and developing its vision for the future. The Joint Planning Staff of WCRP and the International Project Offices of WCRP Core Projects acknowledge IOC sponsorship and support in all their publications and reports. The greater visibility of the WCRP sponsorship by IOC is also facilitated through many of key WCRP meetings that take place at IOC of UNESCO. WCRP depends on active engagement and sustained support of IOC for maintaining its current standing among the international research community and for carrying out its priority research on the role of the ocean in climate.