

# WCRP Science and Implementation Plan First Edition

Draft V 5

24 June 2022

## Version Control

<b>Version</b>	<b>Date</b>	<b>Author</b>	<b>Comments</b>
V0	August 25	Helen Cleugh	Outline only, using content from JSC-42 Slide
V1	Sept 23	Cleugh/Stammer	Incorporating Detlef's edits – see Comment log below Note content not yet populated. Content currently are ideas for scope and key points.
V2	Oct 18-Nov 12	Sparrow ++	Filling in gaps etc., though still requires significant work
V3.1 to V3.6	January 13 - 31 2022	Cleugh and Stammer	Drafting the first full version of the text: Revised Sections 1 & 2; Added content to Sections 4, 5 plus 6
V4	Feb 7-23rd	Sparrow + Van der Wel + Caltabiano + Palanisamy + Balino + Cao	Text updated, removed various duplication in the text and restructured outline.
V4.2 to 4.3	March 28 – April 1	Helen and Detlef	Revising in response to feedback from Jens along with improvements from both to Sections 1 and; 4, 5 and 6.
V4.4	April 1	Detlef	Final edits from Detlef; accepted and revised by Helen. NB – we may delete the numbering of sub-sections in the final version. Left here for now to make navigation easier.
V4.5	April 26	Secretariat	Additional edits
V5	May 12	Martin, Maria, Secretariat	Consolidation of Maria, Martin and Secretariat edits
V5.1, 5.2	May 17	Helen	General edit and tidy to address comments from Maria and Martin, Mike. Substantive changes to Sections 5 (Governance) and 6.
V5.3	June 5	Mike	Went through Helen's latest draft. Made changes when appropriate. Highlighted in yellow anything that I thought Detlef might want to check.
V5.4	June 16	Helen	Cleaned a few remaining "track changes". This is the basis for the "to be shared" version; which takes out comments (Comments remain in this V5.4)
V5.5	June 17-24	Mike, Helen & Detlef	Final tidy of version to be shared, renamed as V5.5

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## Preface

When the World Climate Research Programme (WCRP) was established in 1980, it aimed to address the overarching questions (i) how have humans influenced the climate, and (ii) to what extent the global climate can be predicted. Answering these questions required understanding the interactions and feedbacks between the components of the Earth system, including the key physical, biological, and chemical processes. It also required the development of climate observing systems, as well as climate models and additional tools that realistically simulated the global climate system. Insights gained by WCRP unambiguously point to the fact that our climate is changing, and that these changes observed since the mid-20th century are largely due to human activities.

Today, especially since the twenty-first session of the Conference of the Parties (COP21) held in Paris in 2015, and the United Nations 2030 Agenda for Sustainable Development adopted in 2015, the setting for WCRP's climate research has changed fundamentally from the aforementioned initial research goals and is now oriented not only toward addressing basic scientific understanding, such as the causes and evolution of climate change, but also toward identifying associated impacts and finding solutions as part of mitigation and adaptation strategies. As before, WCRP establishes fundamental scientific knowledge about the climate system and how it is changing. However, WCRP now collaborates more closely with other research programs to also develop the knowledge and information required by society to tackle future challenges related to anthropogenic climate change and the climate dimension of sustainable development. WCRP's future work will be based on even closer cooperation and collaboration between natural and social scientists, civil society, and political leadership at every level to deliver knowledge in support of solutions.

WCRP's Strategic Plan 2019 - 2028 articulates these new challenges and requirements by defining a vision and mission that reflects the new WCRP and by setting priorities in terms of four Scientific Objectives. In a second step, this Science and Implementation Plan describes these science priorities along with WCRP's new structure and operational information developed to support them. In this way, it is intended to document the implementation of the WCRP Strategic Plan, as well as providing a guide to the operation of WCRP. It is intended to be a dynamic document that can be periodically updated and thus remains relevant for the decade ahead.

We would like to thank all who contributed to the preparation of this plan. We also acknowledge the continuous support of the World Meteorological Organization, the Intergovernmental Oceanographic Commission of UNESCO, and the International Science Council, as WCRP's enduring and committed co-sponsors.

Detlef Stammer, JSC Chair

Helen Cleugh, JSC Vice-Chair

## 1. Introduction

The World Climate Research Programme (WCRP) was established in 1980 by the United Nations to advance climate research with the specific charge to (i) investigate how humans have influenced the climate and (ii) to what extent the global climate can be predicted. It is sponsored by three parent organizations, notably the World Meteorological Organization (WMO), the International Science Council (ISC), and the Intergovernmental Oceanographic Commission (IOC) of the United National Educational, Scientific, and Cultural Organization (UNESCO).

WCRP's leadership role is to ensure that the global, regional, and national climate research communities create the enduring, rigorous, and scientific foundation required to meet the demand for robust and useful climate information. It does this by coordinating and facilitating international climate research to develop, share, and enable the application of climate knowledge that contributes to societal well-being. Through international coordination, WCRP pursues frontier scientific questions related to the climate system that are too large and too complex to be tackled by a single nation, agency, institution, or scientific discipline. In doing so, WCRP brings together scientists from around the world, at all stages of their careers, to advance our understanding of the multi-scale dynamic interactions between components of the climate system and external forcing, as well as addressing and studying the role of humans on climate. WCRP also works with nations and funding agencies to ensure that required resources are mobilized.

Over its lifetime, WCRP has made enormous contributions to advance climate science. A significant improvement of our understanding of the coupled climate system goes back to WCRP's internationally coordinated efforts in establishing a comprehensive observing system and building increasingly complete and accurate climate modelling tools capable of delivering climate change projections that extend beyond the 21st century, considering various greenhouse gas emission scenarios. Understanding climate processes and quantifying climate variability required the establishment of various core research projects dealing with the atmosphere, the ocean, the cryosphere, and land surface processes, as well as all their interactions (see Section 3.1). At the same time, seasonal, multi-year and regional prediction capabilities had to be developed in close collaboration with the weather and oceanographic communities. Largely through WCRP's efforts, it is now possible to monitor, simulate and project global climate and to provide climate information for use by governments for policy making, decision-making, and in support of a wide range of practical end-user applications. WCRP provided the information that led to the unequivocal agreement by the

Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment human activities have led to a warming of the Earth’s climate by 1.07°C (2010 – 2019 compared to 1850 – 1900, through the release of climatically active constituents (mostly fossil CO<sub>2</sub>).

At the 21<sup>st</sup> Conference of Parties (COP21) in 2015, governments around the world accepted the scientific evidence that human activities affected the climate system and that society needed to act to limit the associated warming to 2°C or less. The 2015 Paris Agreement, which identified the need for climate mitigation and adaptation solutions, also meant that climate research needed to evolve to address these broad societal needs and challenges as well as creating fundamental knowledge and understanding. Moreover, the World Climate Conference-3 (WCC-3) made the leap to put climate science in the service of society. The focus on “climate prediction and information for decision-making” enabled the Conference to identify critical components of a [Global Framework for Climate Services](#), where WCRP plays an important research and development role.

The [WCRP Strategic Plan \(2019 – 2028\)](#) recognizes the need to ensure that WCRP will provide the science, knowledge and understanding needed to target and provide answers to frontier problems – such as disaster risk reduction, climate change adaptation, mitigation, and intervention strategies. Anthropogenic climate change already brings significant challenges and risks that affect almost all aspects of life on Earth. Droughts, heavy rain and flooding, heatwaves, extreme fire weather, and coastal inundation are just a few examples of what is already occurring and where amplified risks and impacts in the future will threaten achieving many of the [Sustainable Development Goals \(SDGs\)](#).

### **Our Vision**

A world that uses sound, relevant, and timely climate science to ensure a more resilient present and sustainable future for humankind.

### **Our Mission**

The World Climate Research Programme (WCRP) coordinates and facilitates international climate research to develop, share, and apply the climate knowledge that contributes to societal well-being.

WCRP’s Strategic Plan broadly defines four overarching Scientific Objectives (Figure 1) that guide WCRP’s climate science until at least 2028. These objectives reflect the most pressing contemporary climate knowledge needs, as well as the core science and capability that are needed to anticipate and prepare for the challenges that society cannot yet foresee:

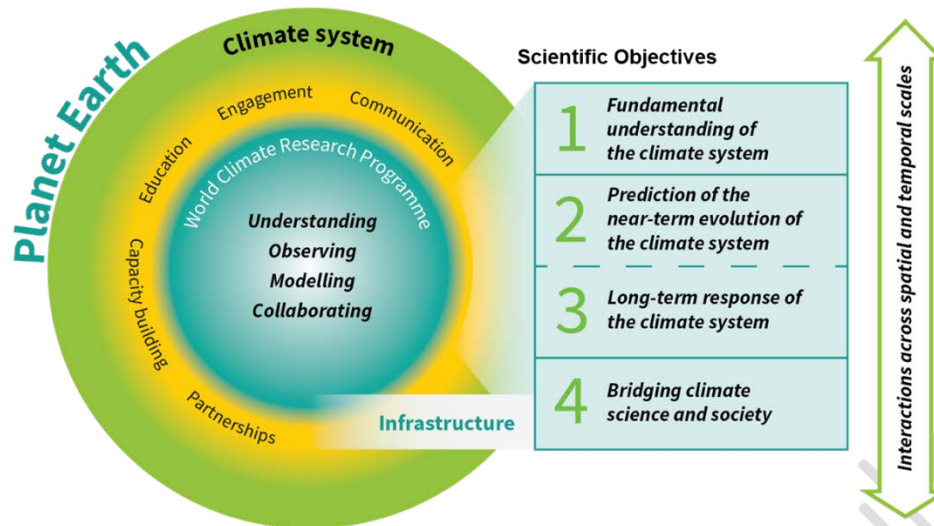


Figure 1: The four Scientific Objectives as outlined in the WCRP Strategic Plan 2019-2028

**Objective 1: Fundamental understanding of the climate system:** support and facilitate the advancement of sciences enabling an integrated and fundamental understanding of the climate, its variations, and its changes, as part of a coupled physical, biogeochemical, and socio-economic system.

**Objective 2: Prediction of the near-term evolution of the climate system:** push the frontiers of climate predictions and quantify the associated uncertainties for sub-seasonal to decadal time scales across all climate system components.

**Objective 3: Long-term response of the climate system:** quantify the responses, feedbacks, and associated uncertainties intrinsic to the changing climate system on decadal to centennial timescales.

**Objective 4: Bridging climate science and society:** support innovation in the generation of decision-relevant information and knowledge about the evolving Earth system.

Through these Scientific Objectives, WCRP will make fundamental and significant contributions to humankind's ability to understand and predict climate change and its impacts. Climate research is evolving rapidly to better understand and predict climate variability at time scales ranging from a few weeks to a few years. In this context, WCRP's role is to continue to facilitate the international coordination of climate research that is needed to support a more resilient society. A new generation of scientists working across different disciplines and working in a diverse and inclusive environment will be crucial for the success of this endeavor, because these societal challenges cannot be effectively addressed by physical climate scientists alone. Solutions to address the causes and impacts of climate change in the future

must be based on a collaborative dialogue between WCRP and its partners, bringing together natural and social scientists, civil society, and political leadership at every level.

Since the publication of the WCRP Strategic Plan, the WCRP community has focused on its implementation by bringing it to life, i.e., identifying the research priorities needed to guide the new science, promoting technologies and institutional frameworks needed to achieve the vision; and establishing new science programs and a structure that better supports our new goals, science objectives and priorities – i.e. is more “fit-for-purpose”, as well as agile and flexible so that WCRP can respond to emerging priorities and challenges. WCRP also critically reviewed and refined ongoing and existing science activities; and is ensuring ongoing consultation and engagement across WCRP’s research community, allied research partners and user communities.

This **Science and Implementation Plan** documents these key implementation elements, viz:

- Research priorities that guide the science we do – to advance knowledge (discovery), provide societally-relevant information, and inform public policy
- A new structure to support WCRP’s Vision, Mission, and strategic goals
- Partnerships with allied research programs and funding agencies – these are the partners with whom the WCRP needs to collaborate and, where appropriate, co-design research programs
- New science activities, as well as ongoing research programs
- Operational elements: governance; financial plans, communication, coordination and engagement principles and plans; capability (people and infrastructure) plans.
- Success measures, milestones, and timelines.

This current version of WCRP’s Science and Implementation Plan (the First Edition) is intended to cover the period of the Strategic Plan i.e., to the end of 2028 but is also intended to be a living document that will be revised and updated as necessary. The following sections provide further details on each of the elements listed above.

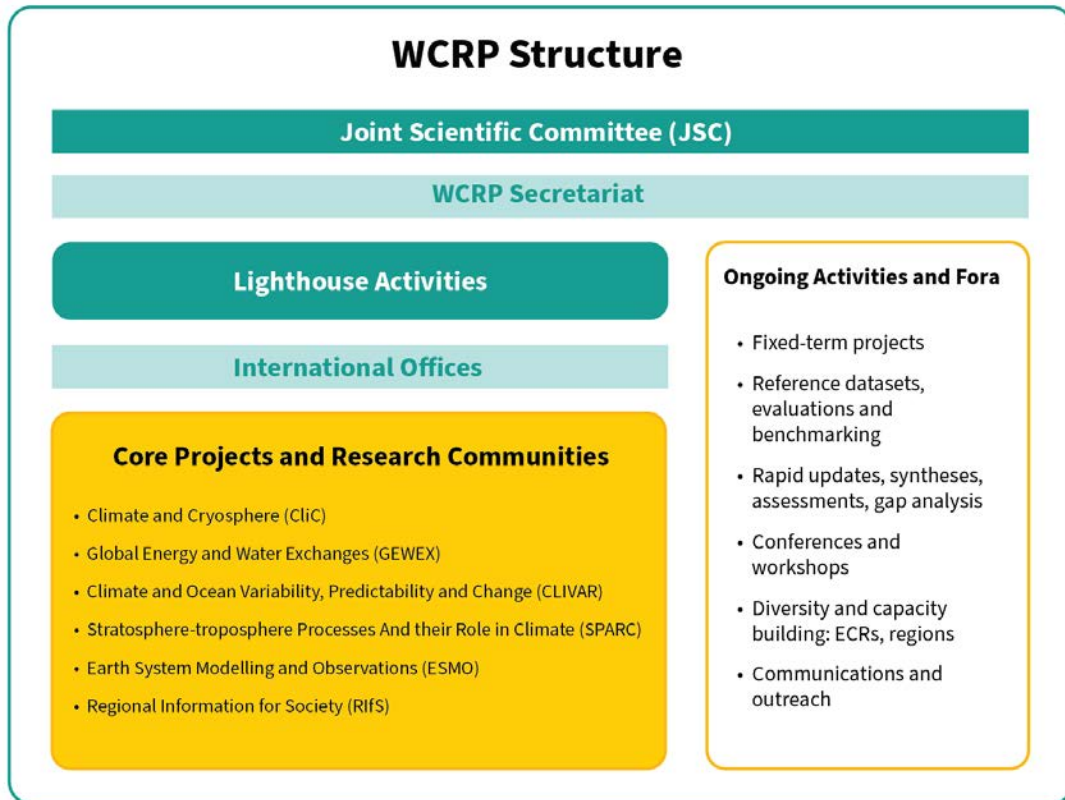
## 2. Implementing WCRP’s Strategy

Implementation, i.e., addressing WCRP’s Scientific Objectives and delivering the Strategic Plan, will rely on the WCRP community working together to facilitate collaboration and to advance understanding, observations, analyses, and modelling. WCRP’s research spans a range of spatial and temporal scales and depends on robust infrastructure to deliver its outcomes. Two overarching priorities serve to underpin these Scientific Objectives and guide the definition and implementation of science priorities for the WCRP:



- 1) **Foster and deliver the scientific advances and future technologies**, to advance understanding of the multi-scale dynamics of Earth's climate system; and to quantify climate risks and opportunities. This priority is consistent with, and aligned to, several of the Scientific Objectives in the WCRP Strategic Plan, and reflects that there are still significant, fundamental knowledge gaps. Furthermore, WCRP's stakeholders are asking for climate information that helps quantify risks associated with a changing climate.
- 2) **Develop new institutional and scientific approaches**, to co-produce cross-disciplinary regional to local climate information for decision support and adaptation; and to inform and evaluate mitigation strategies based on the latest and best quality climate science – alongside other sciences and technologies.

Implementation also requires the development of a new “fit-for-purpose” structure to effectively support and enable WCRP's Scientific Objectives, as well as WCRP's need to address new challenges and to develop new opportunities. Through a process of external review, and internal workshopping, the WCRP community built upon earlier structures, just as WCRP's scientific objectives and priorities have evolved, guided by the need to stay as simple as possible and to remain agile and nimble. The resulting new structure of WCRP is shown in Figure 2. The transition to this new structure required the phase-out of certain activities (such as the Grand Challenges and the Councils) and developing new elements to reflect new and ongoing scientific challenges.



*Figure 2: New WCRP Structure*

The major elements of the WCRP structure are:

1. *Joint Scientific Committee:* The Joint Scientific Committee (JSC) is the highest-level committee of WCRP, responsible for overseeing and steering all science and organization aspects of WCRP. “Joint” refers to the fact that the WCRP has three sponsors: WMO, ISC, and IOC-UNESCO.
2. *Core Projects:* These are long-term activities within WCRP that are dedicated to specific aspects of climate science as specified in their terms of reference. They are the foundation of WCRP and are home to the scientific communities – across oceans, cryosphere, land, and atmospheric science domains; process studies, modelling and observations; and regional climate information. While meeting WCRP’s research priorities requires these discipline-based communities to work together to advance multi-disciplinary research, these communities also need a home where their capabilities are nurtured and sustained. The Core Projects are the organizational elements that support climate science capabilities and research communities; develop and deliver important foundational knowledge and understanding; and foster scientific discovery as well as applications.

3. *Lighthouse Activities*: Lighthouse Activities are key activities where progress is urgently needed, drawing upon capabilities from across WCRP, and in accordance with approved science plans. They are major experiments, high-level projects, or infrastructure building blocks that are critically important for addressing WCRP's research (implementation) priorities and its Scientific Objectives. The Lighthouse Activities are intended to be bold and ambitious, large-scale projects, established to make rapid progress towards achieving an urgent scientific goal and are where much of the multi-disciplinary research will be done – drawing on the capabilities across WCRP's communities.
4. *Short-term projects*: To be agile and flexible WCRP needs to be able to quickly develop new projects that address an emerging need or opportunity and have a relatively short (1-3 years) lifetime. Examples may include rapid updates, assessments, gap analyses and other areas of research or application requiring a fast turnaround or response. These are referred to generally as “short-term projects”. Such projects are always strongly connected to the WCRP Core Projects and other activities.
5. The *WCRP Secretariat*: Primarily located at WMO Headquarters in Geneva, with a growing number of secondments outside of WMO, the Secretariat supports the Joint Scientific Committee as well as WCRP's Core Projects, Lighthouse Activities, other research activities and groups.
6. The *WCRP International (Project) Offices* provide a critically important role in coordinating WCRP's work and activities across the organizational elements. They work closely with the WCRP Secretariat.

Section 5 describes the governance aspects associated with these elements, i.e. their organization; roles and responsibilities; reporting lines; and modes of operation.

### 3. WCRP's Science: Goals and Priorities

*New content to be developed by Core Projects and Lighthouse Activities using a template provided.*

#### 3.1 Core Projects

*[To be included]*

#### 3.2 Lighthouse Activities

*[to be included]*

#### 3.3 Short-term Projects

As described in Section 2, WCRP uses short-term projects (typical lifetime of 1–3 years) to address emerging scientific needs or opportunities. As an example, currently (June 2022) there are several “Tiger Teams” tasked with assessing the role that WCRP should play in three key science areas of critical and growing importance:

- How are the **cycles and budgets of heat, water vapour and carbon dioxide** changing and why? The Task Team will produce a strategy as to how research into the coupled energy, water and carbon cycles, across all time scales and across the land, atmosphere and ocean domains of the Earth system, can be best coordinated and facilitated as a cross-cutting theme across the WCRP.
- **Climate intervention** (formerly referred to as geoengineering), especially carbon dioxide removal (CDR, the removal and long-term sequestration of CO<sub>2</sub> from the atmosphere to reduce global warming) and solar climate intervention (SCI, the purposeful management of incoming solar radiation to counter greenhouse gas induced global warming). This Task Team will assess what current research is being done on the efficacy, feasibility, benefits and risks of climate intervention, within and external to WCRP; what value WCRP can add to this research – including filling research gaps; and identifying and engaging with key partners.
- Research needed to improve our ability to **predict, assess and attribute changes in precipitation around the world in response to human activities**, ideally through an international experiment coordinated and led by WCRP leveraging off the US Global Change Research Program's planned **Global Precipitation Experiment (GPEX)**.

WCRP will continue to offer the flexibility to have such short-term activities as they are needed.

## 4. Partnerships

WCRP works with international and national partner organizations that also have a focus on climate – these might be allied research programs, national agencies, and stakeholders who use WCRP’s research outputs. These partners may contribute services, information, solutions and/or funds into WCRP activities. The overarching objectives of this partner network are to improved understanding of the climate system, climate change and the interactions between climate, society, and the environment. Jointly they work toward finding answers as to how to achieve the United Nation’s Sustainable Development Goals (SDGs).

### 4.1 Co-sponsor Interactions

WCRP works closely with activities across WMO’s Science and Innovation department, with a focus on advancing fundamental science, enhancing the science for services value cycle, and advancing policy relevant science. WCRP is represented on WMO’s Research Board. With the World Weather Research Programme, WWRP, it cooperates on [Subseasonal to Seasonal Prediction Project](#) (S2S) and [Monsoon](#) activities. With the Global Atmosphere Watch (GAW), WCRP works on e.g., the Ozone Assessments as well as foci such as urban climates.

WCRP actively cooperates with [IOC-UNESCO](#) on various climate-ocean cross-cutting research activities. Specifically, the CLIVAR Core Project has been contributing to the scientific design and implementation of the regional and global ocean observing systems as well as the synthesis/reanalysis of global ocean, atmosphere and coupled climate information that are all relevant to one of IOC’s objectives. Several other WCRP activities also have ocean components that are all relevant to IOC.

WCRP works with several ISC activities and involves joint activities with IUGG (International Union of Geodesy and Geophysics) and three of their associations: the International Association of Hydrological Sciences (IAHS), the International Association of Meteorology and Atmospheric Sciences (IAMAS) and the International Association for the Physical Sciences of the Oceans (IAPSO). Moreover, the Special Committee on Oceanic Research (SCOR) and the Scientific Committee on Antarctic Research (SCAR) support some joint activities. ISC provides the linkages to the national Academies or research funding bodies.

### 4.2 Global Climate Observations

Research observations are essential for monitoring and understanding climate variability, for documenting trends, and for initializing models for climate prediction. WCRP’s key partnerships with respect to climate observations involves the Global Climate Observing System (GCOS) and the Global Ocean Observing System (GOOS) who advocate the implementation of a sustained climate observing system, including support for quality-assured

observations. A collaboration with the Committee on Earth Observation Satellites ([CEOS](#)) is concerned with climate observations from space, involving many international space agencies such as National Aeronautics and Space Administration (NASA) and European Space Agency (ESA).

#### 4.3 Sustainability Research

Future Earth is a global network of scientists collaborating for a more sustainable planet. WCRP cooperates with many of [Future Earth's](#) Global Research Projects, Knowledge Action Networks, and other Future Earth activities to address climate problems together in an interdisciplinary way. For example, WCRP collaborates with the PAGES, AIMS, SOLAS, IMBER, ILEAPS, IGAC and GCP Global Research Projects and is involved in both the Risk and Ocean Knowledge Action Networks. A high-level [cooperation agreement](#) was signed in 2021 and both organizations are working together on several other activities, e.g., the [10 New Insights in Climate Science](#) (10NICS).

#### 4.4 Regional and National Partnerships

WCRP cooperates with National Agencies, and National Academies from around the world. As an example, WCRP has a long-standing partnership with the US Global Change Research Program where WCRP activities contribute directly to achieving several of their identified research goals.

Working directly with funders and funding agencies is critical to jointly ensure the coordinated funding of key science. The Belmont Forum is a partnership of funding organizations, international science councils, and regional consortia committed to the advancement of transdisciplinary science. It focuses on international transdisciplinary research providing knowledge for understanding, mitigating and adapting to global environmental change. Many other funding groups focus on regions such as the Inter-American Institute for Global Change Research (IAI).

#### 4.5 Policy Fora

WCRP produces climate change knowledge and information that underpin the work of the IPCC, as well as the Stratospheric Ozone Depletion Scientific Assessments carried out by WMO and the United Nations Environment Programme (UNEP). WCRP regularly informs the United Nations Framework Convention on Climate Change (UNFCCC) and its subsidiary bodies on the scientific issues related to climate change (SBSTA). It also provides significant input to a variety of other policy fora on climate issues, such as the Arctic Council, the Antarctic Treaty, the UN Convention on the Law of the Sea, the Sendai Framework for Disaster Risk Reduction, and multilateral environmental conventions.

#### 4.6 Strengthening Climate Science Capacity around the World

A goal of WCRP is to foster climate scientific capacity in all nations of the world to address challenges and opportunities resulting from climate variability and change at the regional and global levels. To this end WCRP collaborates with the [START](#) (SysTem for Analysis, Research and Training), a program to make the knowledge and the tools of climate predictions available to scientists from developing countries. It also, via the WCRP Academy partners with a number of activities such as the [WMO Global Campus](#).

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## 5. WCRP Governance

Governance can be defined as the “framework of authority and accountability that defines and controls the outputs, outcomes and benefits” from WCRP. This governance framework includes WCRP’s organizational elements shown in Figure 2 - the way they are organized, and the roles, responsibilities and membership of these organizational elements.

Governance also includes those systems, processes and policies that enable WCRP to adapt to the dynamic nature of climate science and to work effectively across WCRP’s community of researchers, partners and stakeholders. A clear and easily perceived governance helps to build trust with WCRP’s community and partners while enabling them to effectively navigate and work with the program.

All these aspects of governance are needed for WCRP to achieve its goals, to evolve and adapt, and ensure that WCRP continues to be relevant, credible and trusted.

Section 5.1 describes WCRP’s key governance principles, systems and processes - including approaches to ensure diversity, inclusion, representation and transparency. Section 5.2 describes WCRP’s organizational elements along with the relevant information about organization, membership, roles and responsibilities. Aspects of communication, coordination, and engagement relevant to this Science and Implementation Plan, which are also key to effective governance, are covered in Section 6.

### 5.1 Governance Principles and Systems

WCRP is committed to the following, inter-dependent, principles across all aspects of its operation and decision-making: i) transparency, consultation and effective communication, especially in sharing information and decision-making; ii) the need for inclusion, diversity and equity (across career stage, gender, culture, discipline and geography) in its activities and leadership groups; iii) cooperation, coordination and collaboration with partners, allied disciplines and stakeholders; and iv) clarity – i.e. that purpose, structure, roles and responsibilities, etc. are all publicly available and clearly explained (i.e. accessible).

These principles have guided the transition to this new WCRP and led to significant revisions of many aspects of WCRP’s governance, including the structure and activities described in Sections 2 and 3. They mean, for example, that directions and guidance from the Joint Scientific Committee have been formed following inclusive consultation and are then clearly and openly communicated. The following describes those systems, processes and policies that have been, or are being, established to enable these principles to be manifested across



all aspects of WCRP's operation, leadership and decision-making. Some details are explained further in Section 5.2.

a) **Transparency, consultation and effective communication:**

- A **Communication Plan** that identifies principles, approaches and priority actions to ensure timely and effective sharing of information and WCRP decisions, both internally and externally. This Plan (see Section 6 and Figure 3) includes guidelines and expectations governing meetings (reporting and frequency); communication modalities; code of conduct, and induction of new WCRP community members.
- All formal **WCRP meetings** are publicly advertised, including whether attendance is open or by invitation only. All such meetings will provide a meeting report that includes a summary of the discussions, decisions made, and actions required (with a timeline). This includes the annual meeting of WCRP's Joint Scientific Committee, where decisions on budgets, membership, and other strategic aspects are made.
- **Consultation**, within the WCRP community and externally with partners and stakeholders, is a commitment that WCRP have made and sustained throughout the drafting and implementation of WCRP's Strategic Plan. More a value than a process or policy, it is manifested through regular formal meetings, effective communication and, where appropriate, informal meetings with the Chairs of the Joint Scientific Committee and core WCRP activities.
- Clearly defined **purpose, roles and responsibilities** of the formal organizational elements (these were described in Sections 2 and 3), which include guidelines and expectations about how decisions about membership and leadership are made along with meeting frequency and modalities. All membership and leadership appointments are advised to WCRP's community via email, newsletters and relevant meeting reports (as per the Communication Plan).
- Establish and support **WCRP Secretariat and International Project Offices**, to provide internal coordination and communication between the organizational elements of WCRP (see Section 5.2). Importantly, they support workshops and activities that span groups and disciplines across WCRP, and externally.
- Appointment of **Liaisons** between WCRP's overarching Joint Scientific Committee and each of the Core Projects. These are referred to as "JSC Liaisons" (see Table 1 below), who provide advice and guidance and ensure there is a pathway linking WCRP's highest-level leadership with these core WCRP activities.
- Encourage all WCRP's core activities to utilise **ex-officio membership** to strengthen the integration and facilitate communication, between these activities.

b) **Inclusion, diversity and equity:** WCRP is very cognizant of the importance of being inclusive and building diversity across career stage, gender, culture, discipline and geography in its activities as well as its scientific and strategic leadership. WCRP's Joint Scientific Committee are implementing several new initiatives within this Science and Implementation Plan to address this, including:

- **Setting expectations and targets to strengthen diversity.** This includes directly nominating or appointing individuals where needed. Additional initiatives, such as mentoring and shadowing arrangements, are under consideration to strengthen diversity – especially in those places where WCRP has long struggled to meet these diversity goals – and strengthen our succession planning for both subject matter experts and leadership roles.
- **Encouraging membership term extensions** by exception only, so that more members of WCRP's community are given the opportunity to lead and participate in the organization of the Programme and there is a renewal of ideas and expertise.
- **Leveraging WCRP's successful initiatives to build stronger engagement** across the WCRP community – for example, capacity development through the WCRP Academy (one of the Lighthouse Activities); engagement with a more diverse group of researchers through the Climate Research Forums (Section 6.3); and strong affirmative actions across all WCRP's core activities.
- The WCRP Secretariat continually **monitors diversity information** for WCRP's activities, membership and leadership groups.

c) **Cooperation, coordination and collaboration:** This is fundamental to WCRP's mission, to *“coordinate and facilitate international climate research to develop, share, and apply the climate knowledge that contributes to societal well-being”*. A key element of WCRP's Strategic Plan is to strengthen our connection with partners, allied disciplines and stakeholders, to achieve the four Scientific Objectives (Figure 1) - including bridging climate science and society.

It requires WCRP's climate research to be well coordinated and, where needed, jointly undertaken between the core activities described in Section 3. An informal WCRP Leadership Team has been formed to facilitate this coordination, communication, and collaboration across WCRP and to enhance integration and synergies (see Table 1 for a complete description).

In this Science and Implementation Plan, WCRP is also prioritizing its connection with our key Partners who are described in Section 4. As described there, this includes developing

informal and formal cooperation agreements with other research agencies and programs; agreeing to work jointly on critical issues (such as with Future Earth projects and knowledge action networks and the US Global Change Research Program).

- d) **Clarity:** This refers to ensuring that the purpose, structure, roles and responsibilities etc. for all WCRP core activities and groups are clearly defined, accessible and available. The Communication Plan (Section 6 and Figure 3) includes several actions and tasks to enact this principle.

## 5.2 WCRP Organization

Each of WCRP's organizational elements that were presented in Section 2, including their governance and operation, is described here. This information, along with the sub-structures (working groups, teams, panels) and additional relevant information, is summarized in Table 1. All acronyms are collated in Appendix 1.

### a) Joint Scientific Committee

The Chair of the Joint Scientific Committee is accountable to the co-sponsors for all WCRP actions. The Chair is supported by a Vice-Chair and three Officers, and all positions (Chair, Vice-Chair and Officers) are elected by the appointed members of the Joint Scientific Committee. The tenure for each of these positions (Chair, Vice-Chair and Officers) is two years and can be renewed with approval from WCRP's co-sponsors.

The Joint Scientific Committee has up to 18 members. This includes the Chair, Vice Chair and Officers. They are selected and appointed following an open self-nomination process overseen by the JSC and WCRP Secretariat with final approval by WCRP's three co-sponsors. Each member serves an initial term of four years that can be renewed by an additional two years upon approval from WCRP's co-sponsors. Membership of the Joint Scientific Committee includes scientists from a wide range of disciplines, from the natural and social sciences, and strives for regional, age, career stage and disciplinary diversity.

The Joint Scientific Committee operates through annual meetings involving the chairs of WCRP's activities, partners, and other invited experts as needed. These annual meetings involve representatives from all WCRP activities as well as from co-sponsors, partners, and funding agencies. The public part of each meeting is typically accompanied by a closed session where financial and confidential matters are discussed, and relevant decisions made. The Joint Scientific Committee's annual meetings are supplemented by more frequent meetings as needed. The Chair, Vice Chair and Officers meet more frequently as required.

### b) Core Projects

Core Projects facilitate and coordinate climate research in accordance with their strategic goals and science plans developed by their Scientific Steering Group (or equivalent), led by two or more co-chairs. The Joint Scientific Committee approves the membership of the Core Project's Scientific Steering Groups on the advice and recommendation from the Core Project co-chairs following a public call for self-nominations.

The Scientific Steering Groups for each Core Project are accountable to the Joint Scientific Committee and therefore are required to report at their annual meetings.

The Core Projects have, and will continue to, evolve as the scientific needs and opportunities change but they are intended to be enduring. Each Core Project develops a strategy for its science directions and research plans – this is the primary responsibility of the Scientific Steering Group. These plans can also include the organization of observing system components, model infrastructure or other infrastructure aspects. The Scientific Steering Group is also responsible for organizing interactions with other Core Projects, Lighthouse Activities, partner organizations, and interactions with stakeholders.

Core Projects often have several sub-elements such as working groups, research foci or other activities. These are organized by, and are accountable to, the over-arching Steering Group.

Each Core Project is supported by an International Project Office, which is hosted and funded by voluntarily contributions by nations or research agencies. These International Project Offices support all Core Project activities and are also responsible for outreach. Organizationally, they are sub-elements of the WCRP Secretariat and support the Secretariat in providing coordination across WCRP.

### c) Lighthouse Activities

The Lighthouse Activities facilitate and coordinate their respective climate research in accordance with their strategic goals and science plans developed by an overarching Scientific Steering Group, or equivalent, which is led by two or more co-chairs. The Joint Scientific Committee approve the science plans of the Lighthouse Activities, appoint their co-chairs, and approve and appoint the membership of their respective Steering Groups (or equivalent) following a public call for self-nominations.

The Lighthouse Activities work closely with the Core Projects to co-develop and co-deliver outputs that address critical and urgent climate research that requires a specific focus, new technologies, infrastructure and governance. For this reason, Lighthouse Activities are expected to have a limited life time (from a few years up to a decade).

Each Lighthouse Activity is required to develop a strategy for its science directions and research plans. This is the responsibility of the Scientific Steering Group (or equivalent), who are also responsible for organizing interactions with other elements of WCRP along with external partner organizations and stakeholders. Below their respective Steering Groups, Lighthouse Activities can have several sub-elements such as working groups, research foci or other short-term activities.

The Lighthouse Activities are accountable to the Joint Scientific Committee, and report to them via their respective co-chairs at the annual JSC meeting.

They are supported directly by the WCRP Secretariat or secondments. WCRP Support Units enable these secondments or similar approaches to deploy support staff who are hosted and funded voluntarily through individual nations or research programs. This support encompasses administration, communication and outreach, coordination and collaborative activities including workshops.

#### d) Supporting Structures and Organization

WCRP's support structure comprises a central WCRP Secretariat located in Geneva augmented by the International Project Offices, secondments and WCRP Support Units located around the world.

The purpose of the central WCRP Secretariat is to work with the Joint Scientific Committee in developing and implementing WCRP. This includes coordination and communication across all organizational elements and liaising with the International Project Offices. WCRP Secretariat accountability is to the Joint Scientific Committee and WMO (or host institution); all other entities are accountable to the WCRP Leadership and relevant host institutions and funding agencies.

All support structures facilitate communication, collaborations, and engagements, internal and external to WCRP – including webpages, news, and announcement; provide scientific and logistic support of events (meetings, workshops, webinars, etc.) and to the production of publications and reports; and operational support (including administration, mailing and membership lists, financial budgets etc.). They proactively support coordination and integration “horizontally” between the WCRP elements.

Both International Project Offices and WCRP Support Units are financed by WCRP's co-sponsors, or by individual nations or research organizations on a voluntary and often time limited basis (see Section 7 for details). Appointments should be decided and approved jointly by the WCRP Leadership and relevant host institutions.

#### e) Membership Guidelines and Rules

WCRP's guidelines and rules governing the selection of chairs and membership of these organizational elements were updated in 2022. They explicitly include WCRP's expectations of diversity for each of the high-level steering committees and expand on the nature of these roles. These are provided in Appendix 2.

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Table 1: Summary of the organizational elements presented in Figure 2 and described in Section 5.2. Note: a) Unless otherwise indicated all committee members undertake these roles voluntarily i.e., they are not paid roles. b) See Table 2 for accountability and reporting lines.

Organizational Element	Leadership	Purpose (including Terms of Reference (ToRs) if relevant)	Sub-structures (Working Groups, Teams or Panels)	Additional relevant Information
<b>Joint Scientific Committee (JSC)</b>	Chair Vice Chair and three Officers	<ul style="list-style-type: none"> <li>Leading and steering the science direction of WCRP.</li> <li>Representing WCRP to Co-Sponsors.</li> <li>ToRs specified in Co-Sponsors Agreement.</li> </ul>	<p>JSC Liaisons are appointed for each Core Project.</p> <p>Fixed term Working Groups and Task Teams can be created as needed, with ToRs, and report to JSC<sup>1</sup>.</p>	<p>a) 18 members for a 4-year term with a 2-year term extension possible, and further extensions by exception.</p> <p>b) JSC Chair, Vice Chair and Officers voted in by JSC members; approved by co-sponsors.</p>
<b>WCRP Secretariat</b> (formerly JPS)  <i>Remunerated, i.e. paid positions.</i>	Head of WCRP Secretariat	Provides Secretariat support to the JSC and WCRP, and other organizational elements, and liaises with the IPOs. Core role in coordination across WCRP.	N/A	<p>a) Centralised Secretariat hosted within WMO's World Climate Research Division.</p> <p>b) Geneva-based staff are WMO employees.</p> <p>c) Staff outside Geneva managed by host institutions. See also WCRP Support Units (below).</p>
<b>Core Projects</b>  <i>Internal structures within ESMO and RfS are being developed.</i>	Co-Chairs (Scientific Steering Group, SSG)	<p>Facilitates and coordinates science in accordance with strategic goals and science plans of the Core Project developed by the SSG.</p> <p>ToRs are the approved science plans and projects.</p>	Working Groups and Panels are created by the SSG, who approve and appoint the leads, members, and science plans - refer to each Core Project for details.	<p>a) SSG Membership approved and appointed by JSC.</p> <p>b) RfS includes CORDEX, a major project to advance and coordinate the science and application of regional climate downscaling, and the Extremes Platform.</p> <p>c) ESMO includes the Working Group on Coupled Modelling, which oversees CMIP.</p>
<b>Lighthouse Activities (LHAs)</b>	Co-Chairs (Scientific Steering Group, SSG)	Focus on new and major projects where progress is urgently needed. They integrate and draw upon capabilities from across WCRP.	Working Groups and other sub-structures are created by the SSG, who approve and appoint the leads, members, and science plans	<p>a) Co-Chairs are appointed from across WCRP family, considering gender, geography, expertise.</p> <p>b) Science Plan Team members were nominated from, and so represent, the Core Projects.</p>

<sup>1</sup> An example is the Climate Research Forums, which ran from 2020 – 2022. Regional Focal Points, for each region around the world, were nominated and tasked with developing and delivering these regional consultation events. ToRs are available from JSC41, and their future place in the new WCRP will be discussed and agreed at JSC43.

Organizational Element	Leadership	Purpose (including Terms of Reference (ToRs) if relevant)	Sub-structures (Working Groups, Teams or Panels)	Additional relevant Information
<b>International Project Offices (IPOs)</b> <i>Remunerated, i.e. paid, positions</i>	Executive Director	Under the Executive Director, provide an effective “executive / operational arm” to the SSG and associated sub-structures of the Core Projects and Lighthouse Activities.	N/A	<ul style="list-style-type: none"> <li>a) IPO Directors formally report to host institution; activity reporting to SSG Co-Chairs and funders.</li> <li>b) IPOs support “horizontal” coordination across WCRP, in liaison with WCRP Secretariat.</li> <li>c) CORDEX, CMIP and S2S are also supported by an IPO.</li> </ul>
<b>WCRP Support Units (WSUs)</b>  <i>Still under development</i>	TBD	Support Lighthouse Activities and other WCRP core activities such as: <ul style="list-style-type: none"> <li>• Facilitating communication, collaboration and engagement, internal and external to WCRP – including webpages, news and announcements.</li> <li>• Scientific and logistic support of events (meetings, workshops, webinars, etc) and production of publications and reports.</li> <li>• Operational support, including administration, mailing and membership lists, financial budgets etc.</li> </ul>	N/A	<ul style="list-style-type: none"> <li>a) Attached to, and work closely with, the WCRP Secretariat.</li> <li>b) Staff will be seconded from external organizations (including WCRP’s co-sponsors or partners) and reside either within their host organizations or in Geneva.</li> </ul>
<b>Ongoing Activities and Forums</b>	Defined and established by the JSC as needed	To fulfil a clearly defined goal, as described in ToRs. Fixed term and sponsored by the JSC and/or Core Projects and/or Lighthouse Activities.	N/A	These are sponsored by one or more organizational elements of WCRP; they report to the relevant sponsoring element(s) and thence to the JSC.
<b>WCRP Leadership Team</b>	<ul style="list-style-type: none"> <li>a) Not a formal organizational element, this is the community comprising WCRP’s leadership, i.e., the JSC, Co-Chairs of the Core Projects and Lighthouse Activities, and Directors of the Support Units (WCRP Secretariat, IPOs, WSUs).</li> <li>b) Primary purpose is to facilitate coordination, communication, and collaboration across WCRP and to enhance integration and synergies.</li> <li>c) Example activities include Science coordination and integration; Catalysing and fostering collaborative activities; Information sharing, e.g., new scientific developments and advances that are relevant and critical to WCRP; Advising JSC on strategic issues and ideas for innovative and effective solutions to potential and actual issues.</li> <li>d) Meet several times throughout each calendar year (approximately 3-4 times, depending on issues and need).</li> </ul>			



Table 2: Reporting and accountabilities – see also Table 1.

Organizational Element	Accountability	Reporting
Joint Scientific Committee (JSC)	JSC Chair: Co-Sponsors	JSC Chair and Vice Chair: Co-Sponsors; JSC; WCRP activities; Partners and Funding Agencies
WCRP Secretariat	<ul style="list-style-type: none"> <li>• JSC</li> <li>• Host Institution</li> <li>• Activities can be under the direction of a JSC member.</li> </ul>	<ul style="list-style-type: none"> <li>• Head is under the direction of JSC Chair and supervised by the WMO Director of Science and Innovation / Chief Scientist.</li> <li>• Secretariat staff report to Head formally.</li> </ul>
Core Projects	<ul style="list-style-type: none"> <li>• Co-Chairs: JSC.</li> <li>• Core Project activities: SSG and Co-Chairs</li> <li>• JSC approve SSG membership, Science Plans.</li> </ul>	<ul style="list-style-type: none"> <li>• CPs report to JSC via the SSG Co-Chairs.</li> <li>• SSG Members (and sub-committee leads) report to SSG Co-Chairs.</li> <li>• JSC to be notified of key outputs, discoveries and advances.</li> </ul>
Lighthouse Activities [LHAs]	<ul style="list-style-type: none"> <li>• Co-Chairs: JSC.</li> <li>• Projects and tasks: Lighthouse Activity Co-Chairs</li> <li>• JSC approve Co-Chairs, Science / Business Plans.</li> </ul>	<ul style="list-style-type: none"> <li>• Lighthouse Activities report to JSC, via the Co-Chairs.</li> <li>• JSC to be notified of key outputs, discoveries and advances.</li> <li>• Teams / groups within Lighthouse Activity report to Co-Chairs.</li> </ul>
International Project Offices [IPOs]	<ul style="list-style-type: none"> <li>• Host Institution and funding agency.</li> <li>• Work closely with SSG Co-Chairs and WCRP Secretariat.</li> </ul>	<ul style="list-style-type: none"> <li>• Directors formally report to their host institution.</li> <li>• Work closely with the respective SSG Co-Chairs and WCRP Secretariat.</li> </ul>
WCRP Support Units [WSUs]	<ul style="list-style-type: none"> <li>• Host Institution and funding agency</li> <li>• Work closely with WCRP Secretariat and designated activity chairs e.g. Lighthouse Activity Co-Chairs.</li> </ul>	Still under development.
Ongoing Activities and Fora	Defined in ToRs for activity.	These are sponsored by one of the organizational elements, and so report to sponsoring element(s) and the JSC.

## 6. Communication, Coordination and Engagement

Communication, coordination, and engagement are key to how members of the WCRP community work together, and how WCRP collaborates and co-designs science with partners. They are needed to build the connections and facilitate collaboration between people and projects. They are also key for WCRP's role as the authoritative voice of climate science to broader society.

### 6.1 Communication and Coordination

Effective communication is key to how WCRP operates. It is the basis for the flow and exchange of information; engagement with and transparency to our community; collaboration, co-design and co-production; and an understanding and awareness of WCRP's science. Effective internal communication is needed both "*horizontally*" across WCRP's organizational elements and "*vertically*" between the hierarchy of committees and working groups. WCRP also needs to effectively communicate externally with its sponsors and funders and with partner programs.

WCRP's key communication goals, enabled by the Communications Plan are to:

- Create communication products that are clear, concise, well-targeted, and, where possible, that contain a single message or ask.
- Build a foundational "infrastructure" of tools and platforms that are widely used, and that people are familiar with.
- Continually assess and review tools and products to ensure they meet ongoing needs and adopt current technologies and best practice approaches.
- Take a community approach, with a commitment to open access (i.e., publicly available to all), transparency, consistency, and inclusive and accessible language.

In this Science and Implementation Plan, these are being enabled by the governance structures, processes, systems and policies (Section 5) and a Communication Action Plan, which is summarized in Figure 3. The WCRP Secretariat provide the necessary and expert support all aspects of WCRP's communication (and coordination), including implementing this Plan.

## Brief Communication Action Plan (2020 – 2023)

### A. In the near-term

- Production of priority WCRP communications material.
- Develop digital technologies for more effective and efficient internal and external communications. This includes tools (e.g., GitHub, Wikis, Tickets etc), collaboration (such as Microsoft Teams, Slack etc) and video conference platforms to support projects, meetings, workshops, and conferences); and communication modes (newsletters, webinars etc).
- Deliver a short guide to the WCRP’s internal organization.
- Convene regular WCRP Leadership meetings to enhance communication, engagement and coordination across WCRP.
- Develop and implement guidelines for in-person and virtual meetings to ensure that WCRP is actively reducing its carbon footprint and demonstrating its commitment to sustainability (see also Section 7).
- Provide support as needed for the 2023 WCRP Open Science Conference.

### B. In the medium term

- Develop a WCRP Code of Conduct and WCRP induction / onboarding package and protocols.
- Translate WCRP material into various UN languages and prepare to develop multilingual versions of key WCRP communications and presentations.
- Develop a web-based “network map” that describes the WCRP organization – primarily for the WCRP community.
- Develop a database of the WCRP community, and their expertise and research interests, collated from workshops and similar fora. Use this to build future

*Figure 3: Overview of current Communication Action Plan, agreed at JSC42*

## 6.2 Engagement

Engagement with the WCRP community of researchers and practitioners, allied partner programs, and sponsors and funders, is an important part of WCRP’s mission. Engagement occurs through WCRP’s core scientific activities and is coordinated by the WCRP Secretariat, International Project Offices and WCRP Support Units. It is manifested as conferences,

workshops, panels, and discussion groups as well as projects and other scientific activities. Higher-level strategic engagement with sponsors, partners and funders is led by the JSC Chair. WCRP engages with early to mid-career researchers through several early career networks, including the Young Earth System Scientist (YESS) network, which itself has over 2000 members. YESS strives “*to help shape the future of Earth system science, by fostering international and transdisciplinary leaders of tomorrow who pioneer the development and delivery of research and knowledge, which provide solutions to benefit society, towards a more equitable and sustainable future*”, with a focus on ECRs working in the interdisciplinary field of Earth system sciences, including social and natural scientists. By collaborating with early career networks, WCRP leadership and core activities ensure that ECRs are entrained in WCRP activities and have a say in WCRP’s strategic planning.

In 2019, WCRP initiated a series of regionally based online Forums, called [Climate Research Forums](#) (CRFs), in response to feedback that WCRP’s broader scientific community were not that familiar with the new strategy and initiatives being developed as part of the Science and Implementation Plan. The first round of Climate Research Forums, whose focus was explaining the new WCRP structure and science goals, is now complete. Further regional consultations using this CRF format will be undertaken based on a regular assessment of WCRP’s needs for tailored engagement in the regions.

### 6.3 Capacity Building and Education

WCRP leads many capacity-building exercises, often carried out by the Core Projects and in partnership with others. These might be for Early Career Scientists (see Section 6.2) or focused on particular regions of the world and are usually on a specific topic. The new WCRP Academy (Section 3.2) will be a key activity going forward, with its overarching objective to determine the requirements for climate research education and build enabling mechanisms.

## 7. Financial Support and Investment

All three co-sponsors support WCRP intellectually as well as financially. The intellectual sponsorship a very important element for WCRP’s performance and international acceptance and implies that WCRP’s Strategic Plan and research priorities are consistent with, and embedded in, the plans of the three co-sponsors.

Generally, WCRP identifies new challenges in climate research and coordinates their implementation on an international level. This science is then supported on a national level through national research funding calls often launched in consultation with the WCRP leadership. WCRP’s coordination work is supported financially through direct contributions from its co-sponsors, indirect contributions provided by member-organizations of WCRP’s co-sponsors as voluntary contributions, as well as voluntary contributions from individual nations. Moreover, funding for all WCRP science activities is ultimately provided through national funding streams, i.e., national funding agencies and national academies, partly organized under ISC’s remit. This national science support provides the foundation for the climate research coordinated and carries WCRP’s research priorities forward. It is generated in response to national calls for research often launched in consultation with the WCRP leadership. Also provided through national voluntary support are funds to support WCRP international project offices (IPOs). Accordingly, understanding WCRP’s support structure requires consideration of all support streams together, including direct and indirect support.

As Table 3 shows, in the 2015 – 2018 triennium the national support of WCRP’s IPOs accounted for 54% of WCRP’s income, while just over 40% was sourced from WMO. From 2020 – 2021 (inclusive), WMO’s share dropped to 22%, while the national contributions to the IPOs grew to 63%, and support from ISC and IOC affiliated bodies grew to 15% of WCRP’s income.

*Table 3: Financial contributions to WCRP’s contribution work by source*

<b>2015 – 2018 (total):</b>	<b>2020+2021 (total):</b>
41 % from WMO	22 % from WMO
6 % from ISC and IOC	15 % from ISC and IOC
54 % IPOs	63 % IPOs

Beyond a purely monetary consideration, WCRP’s expenditure and coordination work also includes significant “non-cash” contributions from involvement and service across the scientific

community. This amounts to well over 5000 scientists involved in the JSC, WCRP's core activities as well as workshops and regional forums.

In the following we summarize WCRP's present income streams and explain the different categories of ongoing expenditures. This will be done in terms of

- i. WCRP Secretariat located in Geneva
- ii. International Project Offices distributed around the world
- iii. WCRP's Science Coordination effort

### 7.1 WCRP Secretariat

The general functions of the Secretariat for the WCRP are described earlier. The financial support for running the WCRP Secretariat at WMO in Geneva is provided primarily by WMO, covering a significant portion of Geneva-based staff salaries as well as some of the operational costs. Presently four personnel are located in Geneva; they are expected to also support WMO related activities within the WMO system. Additional personnel are seconded to the WCRP Secretariat by national institutions and are located elsewhere. For example, in 2022 - 2023 two positions are supported, by Institut [Pierre Simon Laplace](#) (IPSL) in Paris and by the Bjerknes Centre in Norway.

### 7.2 International Project Offices

In terms of the WCRP structure, IPOs and WCRP Support Units are "satellites" of the WCRP Secretariat (Figure 10). These IPOs support WCRP's core-projects and core activities. This includes additional Project Offices supporting WCRP's service-oriented "flagship" projects; CORDEX, S2S, the joint (with WWRP) International Monsoons Project Office and, since 2022, CMIP. In total, the financial support for the IPOs is around 4 million CHF. This financial investment is expected to increase in the future. As an example, at the time of writing, two more IPOs are anticipated in support of the two new Core Projects, Earth System Modeling and Observational (ESMO) and Regional Information for Societies (RIfS). Moreover, additional project and coordination support is also envisioned for WCRP's new Lighthouse activities.

Funding to support the IPOs is sourced from voluntary contributions from individual nations, primarily via research institutions or national academies (ISC members). These funds are used to cover expenditure incurred through salary costs, IPO operations (including printing, computing etc.) and travel of IPO staff members. The GEWEX IPO is supported by NASA, while multi-agency funds support the US CLIVAR office, both in the United States. The

CLIVAR IPO likewise receives financial support from the First Institute of Oceanography in Qingdao, China, and the joint Monsoons Office from the Indian Institute of Tropical Meteorology (IITM) in Pune, India. CMIP efforts are supported especially through funding from the US Department of Energy (DOE), while the European Space Agency (ESA) host the new CMIP IPO. The SPARC IPO is supported through funding from the German Aerospace Center (DLR), while the CliC IPO is financially supported through the University of Bergen and additional funding from other agencies (proposal currently under review). A Subseasonal-to-Seasonal (S2S) Project Office is hosted by the Korean Meteorological Organization (KMA) and the APEC Climate Center (APCC) in Busan, Korea, and a CORDEX Office at Swedish Meteorological and Hydrological Institute (SHMI) in Norrköping, Sweden.

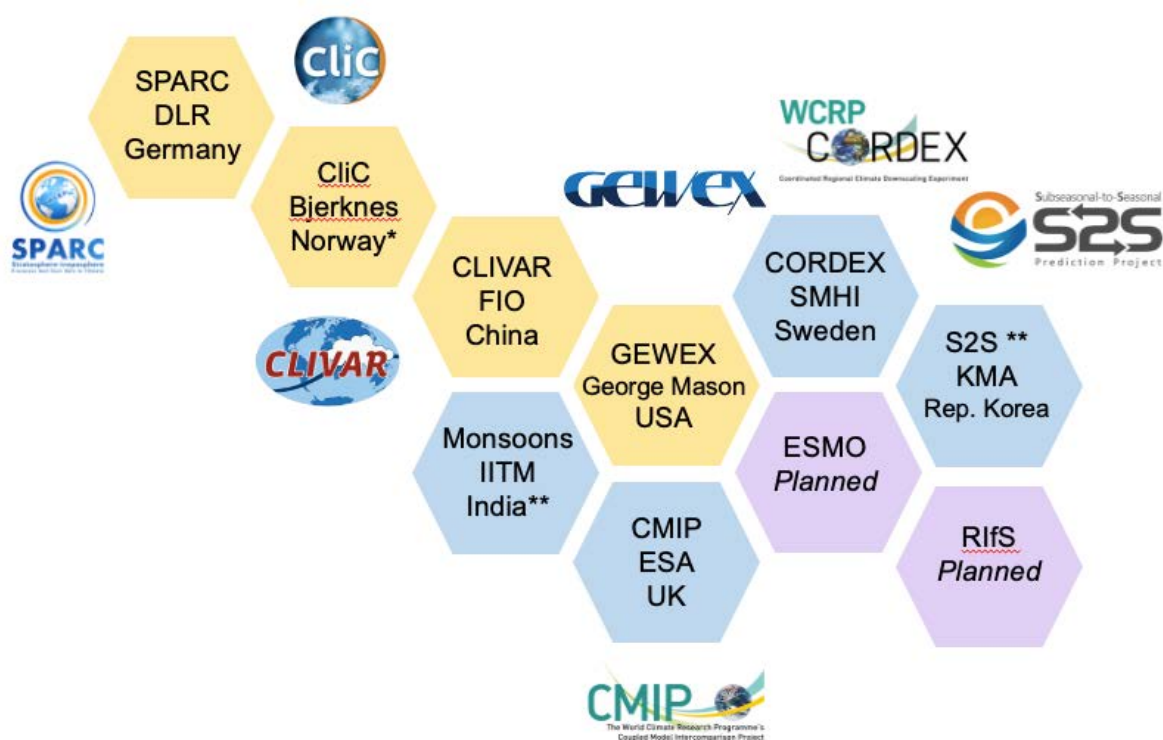


Figure 10: Current WCRP International Project Office (\*Possible new office in USA (TBC), \*\* Joint office with WWRP)

### 7.3 International Coordination

Funds received to support WCRP’s international coordination efforts flow primarily through the Joint Climate Research Fund (JCRF), an independent trust fund held by WMO on behalf of the three co-sponsors of WCRP. Support for international coordination activities, and some operational costs for the WCRP Secretariat, is provided to this fund (with additional trust funds set up as needed e.g., for the US GCRP grant). This involves financial contributions by WMO and, directly or indirectly, the other two co-sponsors. However, the largest proportion of these

contributions come from the National Academies of Sciences, i.e., ISC Members. Over the past decades, WCRP has received significant financial support via this route on an annual basis to enable scientific activities and developments.

In the past, most voluntary national funds were used to support travel, to bring together WCRP scientists engaged in various core activities. In 2020, COVID-19 hit, interrupting all in-person operations, and forcing WCRP (as every other organization) to move its operations online. This particularly affected the many meetings and workshops that would have occurred, as is appropriate and necessary given WCRP's important facilitation and coordination role. As we move ahead with the implementation of the new WCRP, we anticipate a substantial impact on WCRP's operations post COVID-19 in that many meetings and workshops will be held virtually thereby saving on travel and logistics support. This aligns with WCRP's goal to reduce its carbon footprint and will free up voluntary financial contributions to pursue new avenues of WCRP's international coordination by setting new goals. We also envisage substantially different models for both fundraising and expenditure of national contributions. At the same time, needs for appropriate communications, coordination and research infrastructure support will continue.

In the future, a strategic investment approach will be developed in consultation with national agencies, regarding national science support, and the WCRP family regarding its priorities for the post-COVID19 spending and investment strategy. Many of the respective details still need to be worked out as part of the ongoing implementation of the new WCRP. Some early examples of such strategic investments could include:

1. Advancing Science and Technology

- a. Support for rapid updates, syntheses, assessments, and gap analyses.  
Assessments will be used to provide answers to critical questions, as in the example in 2020 of the landmark publication on climate sensitivity. This includes coordination support as well as entraining leading scientists from around the world and across all relevant disciplines.
- b. New approaches for science support, e.g., by initiating new pilot studies, field campaigns / experiments and modelling studies. This can include, for example, working together with space agencies to develop new instrumentation; conducting targeted observational campaigns; developing new modelling capabilities and supporting the generation of new data and information (this could also include reference datasets for benchmarking).
- c. Guidance for, and/or development of, new technologies and infrastructure.



2. Science Partnerships, Coordination and Collaboration
  - a. Annual planning meetings and Workshops to identify and prioritize new frontiers of climate science. This activity includes interactions with national funding agencies.
  - b. Support to build linkages between Lighthouse Activities and Core Projects, including developing bespoke and effective infrastructure platforms to support collaboration and communication.
3. Inclusion and Capacity Building
  - a. Running Summer schools, conference, training workshops etc. A particular focus would be early career scientists, and the Global South; for example, through targeted Fellowships for researchers from developing countries to support the initiating and maintaining of activities in their own countries.
  - b. Leadership development, and succession planning, activities.
  - c. Specific events focussed on/in the Global South
4. Communication, Engagement and Outreach
  - a. Developing and providing information to WCRP stakeholders and the public, e.g., production of educational and informative videos and documentary series.
  - b. Regular community events and conferences, possibly in cooperation with existing organizations such as AGU or AMS in the US, and similar organizations in other nations and regions, highlighting WCRP's science and new frontiers.

These strategic investments would require funds for operating and travel costs, as well as fixed-term salary support – for example through hire of consultants and contractors.

## 8. Timelines and Measures of Success

### 8.1 Timelines and Milestones

To track if WCRP is being successful in its strategy and implementation we need to be able to lay out a timeline and series of milestones as well as any “measures of success” such as Key Performance Indicators.

### 8.2 Measures of Success

- High-level WCRP Steering groups are more diverse in terms of gender and geopolitical participation i.e. a single gender should not dominate the membership by more than 60%, and at least one third of all members should be resident in countries not designated as high-income economies
- All Core Projects and Lighthouse Activities to have IPOs or other support by the end of 2023
- Successful WCRP Open Science Conference held by end of 2023, with outcomes feeding into future implementation priorities
- Stable and ideally increased human and monetary resources for the program
- WCRP visibility amongst climate scientists as well as recognition of its role in society
- JSC and WCRP family requested to add items here as they occur to them and these can be discussed and incorporated as appropriate

Appendix 1: Frequently used Acronyms linked to the WCRP's organization [incomplete]

<b>Acronym</b>	<b>Title</b>	<b>Comment (as relevant)</b>
WCRP	World Climate Research Programme	
JSC	Joint Scientific Committee	
CPs	Core Projects	
CliC	Climate and Cryosphere CP	
CLIVAR	Climate and Ocean Variability, Predictability and Change CP	
GEWEX	Global Energy and Water Exchanges CP	
SPARC	Stratosphere – troposphere Processes and their Role in Climate CP	
ESMO	Earth System Modelling and Observation CP	
RIFS	Regional Information for Society CP	
LHA	Lighthouse Activity	
EPESC	Explaining and Predicting Earth System Change LHA	
MCR	My Climate Risk LHA	
SLC	Safe Landing Climates LHA	
DE	Digital Earths LHA	
IPO	International Project Office (supporting CPs)	
WSU	WCRP Support Unit	
CRF	Climate Research Forums	
WMO	World Meteorological Organization	
IOC	Intergovernmental Oceanographic Commission of UNESCO	
ISC	International Science Council	
FE	Future Earth	
IPCC	Intergovernmental Panel on Climate Change	
ECRs	Early Career Researchers	

## Appendix 2: Membership Guidelines and Rules

To be included when formally approved by JSC

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