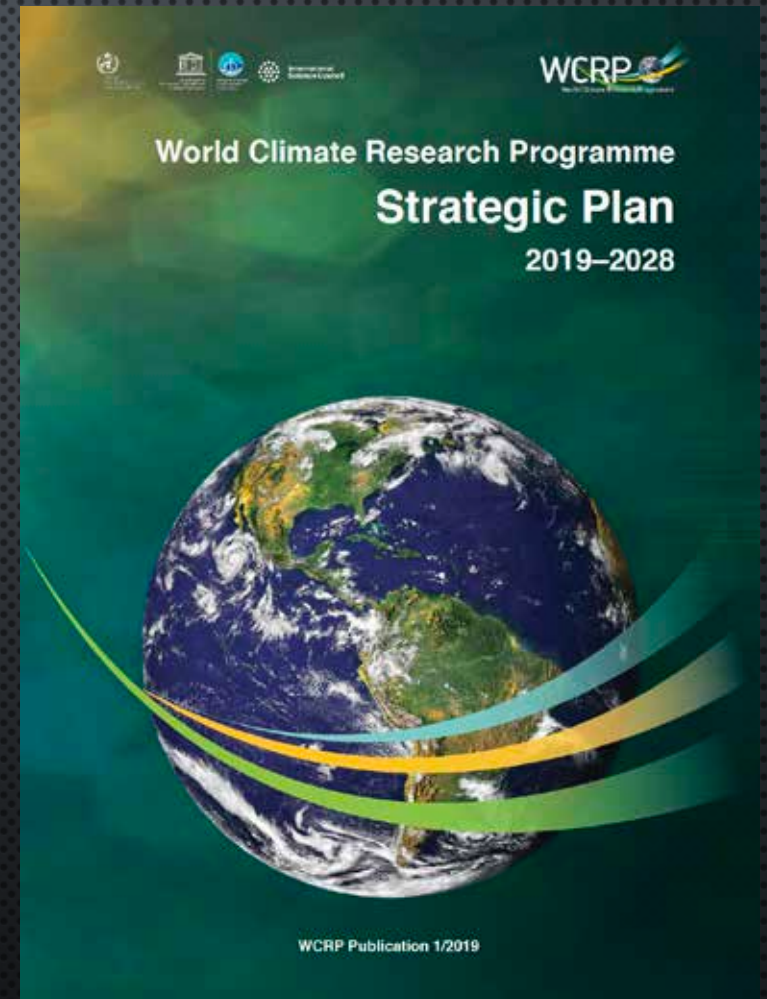


WCRP: CLIMATE SCIENCE IN SUPPORT OF SOCIETY

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THANKS TO JOCHEM MAROTZKE AND DETLEF STAMMER
AND MANY OTHERS FOR THEIR INPUT.



THE SOCIETAL CONTEXT

- **THE EMISSIONS OF GREENHOUSE GASES CONTINUE TO INCREASE:**
 - THE PARIS AGREEMENT SPECIFIES LEGALLY BINDING TARGETS (2⁰C AND, IF POSSIBLE, 1.5⁰C), BUT CURRENT NATIONAL CONTRIBUTIONS TO EMISSION REDUCTIONS POINT TO A WORLD **WARMING LARGER THAN 3⁰C**.
- **THE ROLE OF SCIENTIFIC KNOWLEDGE IN THE POLITICAL PROCESS:**
 - **LONG-TERM:** THE PARIS AGREEMENT WOULD NOT HAVE TAKEN PLACE WITHOUT INPUT FROM THE SCIENCE (ROLE OF WCRP). SEVERAL SCIENTIFIC QUESTIONS REGARDING THE LONG-TERM EVOLUTION OF THE EARTH SYSTEM REMAIN OPEN.
 - **SHORT-TERM:** SCIENTIFIC KNOWLEDGE REPRESENTS ONLY ONE INPUT AMONG MANY IN THE DECISION PROCESS. A LARGE NUMBER OF SCIENTIFIC QUESTIONS REMAIN OPEN.

THE WCRP CONTRIBUTION IN THE LAST DECADES

- THE EARTH IS **WARMING** AND WILL CONTINUE TO GET WARMER
- MOST OF THE WARMING IS CAUSED BY **HUMAN ACTIVITIES**.
- THE CONSEQUENCES WILL BE **GLOBAL** AND **REGIONAL**. THEY WILL BE **SEVERE**: POLAR MELTING, RISING SEA-LEVEL, MORE EXTREME EVENTS, IMPACTS ON THE BIOSPHERE AND ON THE ECONOMY.
- THUS: THE DECISION OF REDUCING EMISSIONS IS **NOT ROOTED IN THE LACK OF KNOWLEDGE**, BUT IN THE **POLITICAL PROCESS**.

In this context, what are the **questions** that the community should address?

What should be the **role of WCRP** in the next 10 years?

WHAT SCIENTIFIC KNOWLEDGE SHOULD BE PROVIDED BY WCRP TO SUPPORT THE POLITICAL PROCESS?

- QUESTION 1: HOW SENSITIVE IS CLIMATE TO GHG EMISSIONS, AND WHICH EMISSIONS ARE COMPATIBLE WITH THE PARIS'S TARGETS?
- WE NEED TO REDUCE THE UNCERTAINTY IN THE CLIMATE SENSITIVITY (2-5 °C).
- WE NEED TO BETTER UNDERSTAND THE EVOLVING FLUXES IN THE CARBON CYCLE: AND TO DETERMINE WHERE ANTHROPOGENIC CARBON GOES
- WE NEED TO BETTER ASSESS THE BUDGET OF SHORT-LIVED CLIMATE FORCERS SUCH AS METHANE AND OZONE?
- STRATEGIC PLAN: WCRP SHOULD ENABLE AN INTEGRATED AND FUNDAMENTAL UNDERSTANDING OF THE MULTI-SCALE PHYSICAL AND BIOGEOCHEMICAL PROCESSES THAT DETERMINE THE EVOLUTION OF CLIMATE AND HENCE OF THE SOCIO-ECONOMIC SYSTEM.

WHAT SCIENTIFIC KNOWLEDGE SHOULD BE PROVIDED BY WCRP TO SUPPORT THE POLITICAL PROCESS?

- QUESTION 2: HOW CAN WE BETTER MANAGE THE EFFECTS OF CLIMATE VARIABILITY AND SHORT-TERM CHANGES?
- HOW WILL CLIMATE CHANGE AFFECT WEATHER IN DIFFERENT REGIONS OF THE WORLD?
- HOW WILL CLIMATE CHANGE AND VARIABILITY AFFECT THE BIOSPHERE AND HYDROSPHERE INCLUDING FOOD PRODUCTIVITY?
- WHICH STRATEGY SHOULD WE DEVELOP TO MAKE RAPID PROGRESS IN OUR SKILLS TO PREDICT THE EVOLUTION OF THE EARTH SYSTEM ON SEASONAL TO DECADAL SCALES?
- STRATEGIC PLAN: WCRP SHOULD PUSH THE FRONTIERS OF PREDICTIONS FOR SUB-SEASONAL TO DECADAL TIMESCALES ACROSS THE DIFFERENT COMPONENTS OF THE CLIMATE/EARTH SYSTEM AT THE GLOBAL AND REGIONAL SCALES.

WHAT SCIENTIFIC KNOWLEDGE SHOULD BE PROVIDED BY WCRP TO SUPPORT THE POLITICAL PROCESS?

- QUESTION 3: WHAT WILL BE THE CONSEQUENCES OF A (PLAUSIBLE) WARMING LARGER THAN REQUIRED BY THE PARIS' AGREEMENTS (3, 5 OR 7°C)?
- HOW WILL A WORLD RESPOND TO A 5 °C WARMING?
- WHICH REGIONS OF THE WORLD ARE LIKELY TO BECOME INHABITABLE?
- WILL TIPPING POINT(S) BE CROSSED WITH IRREVERSIBLE AND DRAMATIC ENVIRONMENTAL AND ECONOMIC CONSEQUENCES?
- STRATEGIC PLAN: WCRP SHOULD FACILITATE THE DEVELOPMENT OF A NEW GENERATION OF COUPLED EARTH SYSTEM MODELS THAT EXPLICIT REPRESENT GLOBAL STORMS, DEEP CONVECTION OCEAN EDDIES AND LAND-ATMOSPHERE INTERACTIONS (1 KM) AND PROVIDE RELIABLE INFORMATION WITH RELIABLE REGIONAL PRECISION.

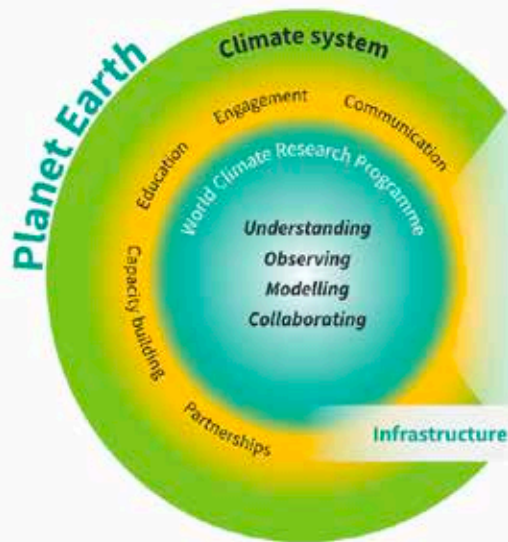
WCRP WILL SUPPORT THE DEVELOPMENT OF SOLUTIONS TO THE CLIMATE CRISIS

- CLIMATE CHANGE IS A GLOBAL PROBLEM, BUT THE SOLUTIONS REQUIRED INTEGRATED INFORMATION AT THE REGIONAL AND EVEN LOCAL SCALE.
- WCRP MUST ENGAGE WITH DIFFERENT COMMUNITIES, WHICH SHOULD USE RELIABLE SCIENTIFIC INFORMATION TOWARDS INTEGRATED SOLUTIONS TO THE CLIMATE CRISIS.
- THE SOLUTIONS ARE NOT ONLY A MATTER OF ENVIRONMENTAL POLICY. THEY INVOLVE ECONOMIC AND TECHNOLOGICAL ASPECTS (ENGINEERING) AS WELL AS INDIVIDUAL BEHAVIOR.
- WCRP SHOULD SHARE DECISION-RELEVANT INFORMATION AND KNOWLEDGE (TWO-WAY DIALOGUE) TO THESE DIFFERENT HETEROGENEOUS GROUPS INCLUDING CLIMATE SERVICES IN THEIR EFFORTS TO DEVELOP SOLUTIONS TO THE CLIMATE CRISIS.

THE PATH FORWARD FOR WCRP

1. WCRP must be at the **intellectual forefront** not only by facilitating existing initiatives but also by **proposing new and challenging studies** to be conducted in an international framework.
2. Scientific research has to support society and hence must **structure** itself to provide the **scientific knowledge to stakeholders**.
3. The solution to the climate crisis requires knowledge that goes **beyond the physical climate question**. The link between fundamental science and the response to the climate crisis requires an **Earth system approach**.
4. The coming decade will see an evolution towards **open- and citizen science** in most disciplines. WCRP must respond to this evolution, which will allow citizen to become actors in implementing solutions to the climate crisis.

THANK YOU AND HAPPY 40TH ANNIVERSARY TO WCRP!



- 1 **Fundamental understanding of the climate system**
- 2 **Prediction of the near-term evolution of the climate system**
- 3 **Long-term response of the climate system**
- 4 **Bridging climate science and society**

Interactions across spatial and temporal scales

WCRP Scientific Objectives

- 1
- 2
- 3
- 4

Fundamental understanding of the climate system
We will support and facilitate the advancement of sciences that enable an integrated and fundamental understanding of the climate, its variations and its changes, as part of a coupled physical, biogeochemical, and socio-economic system.

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

Long-term response of the climate system
We will quantify the responses, feedbacks, and uncertainties intrinsic to the changing climate system on longer (decadal to centennial) timescales.

Bridging climate science and society
We will support innovation in the generation of decision-relevant information and knowledge about the evolving Earth system.