



The First 2 Decades of WCRP and its Accomplishments



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JSC-WCRP – Member 1984-94; Chair 1988-94; Vice-Chair 1986-88
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WCRP 40th Anniversary Symposium
Session A: Celebrating 40 years of WCRP in Service to Society



WCRP - Building on earlier projects

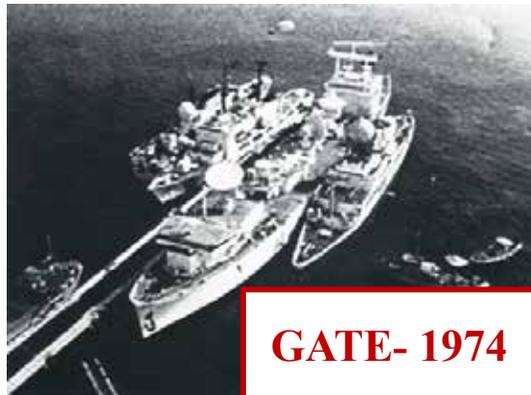


CO₂, O₃
Sputnik

Objectives: advancing the range of deterministic weather prediction, and understanding the physical basis of climate.
Weather Predictions - emphasis



BOMEX - 1969



GATE- 1974



**GWE-FGGE
- 1979**

GATE - “probably the largest and most complex international scientific experiment ever undertaken, ten nations—Brazil, Canada, France, Federal Republic of Germany, German Democratic Republic, Mexico, Netherlands, USA, UK and USSR—working in close collaboration, contributed 39 (40) specially equipped ships, 13 large research aircraft, several meteorological satellites and some 5,000 personnel to an intensive three-month study of weather systems in the tropical eastern Atlantic Ocean; in addition, some 50 countries in Africa and South America participated by making additional surface and upper-air observations”

1st World Climate Conference - 1979

International Policy Agenda

- 1972 – Creation of United Nations Environment Programme
- 1972 - Study of Man's Impact on Climate
- 1979 – First World Climate Conference – Geneva



World Climate Program - four major components dealing with scientific research, practical applications of climate information, climate data, and study of the impacts of climate on natural systems and human society. WMO - applications and data programs; UNEP - impacts; and the research component—the WCRP



World Climate Research Programme - to determine the predictability of climate; and to determine the effect of human activities on climate.

Co-Sponsored by WMO and ICSU



World Climate Research Programme - WCRP

Joint Scientific Committee

Appointed by WMO and ICSU – initially 12 members

Chair – elected by JSC members

- **Interdisciplinary – atmosphere-oceans-water-ice-land systems**
- **Focus on science that needs integrated, regional to global studies with extended time periods – “not all” climate science**
- **Bring together academic, government and other sectors**
 - **Meteorological – climate-weather, ..., oceanographic, space, hydrological, cryospheric and related academics and agencies**

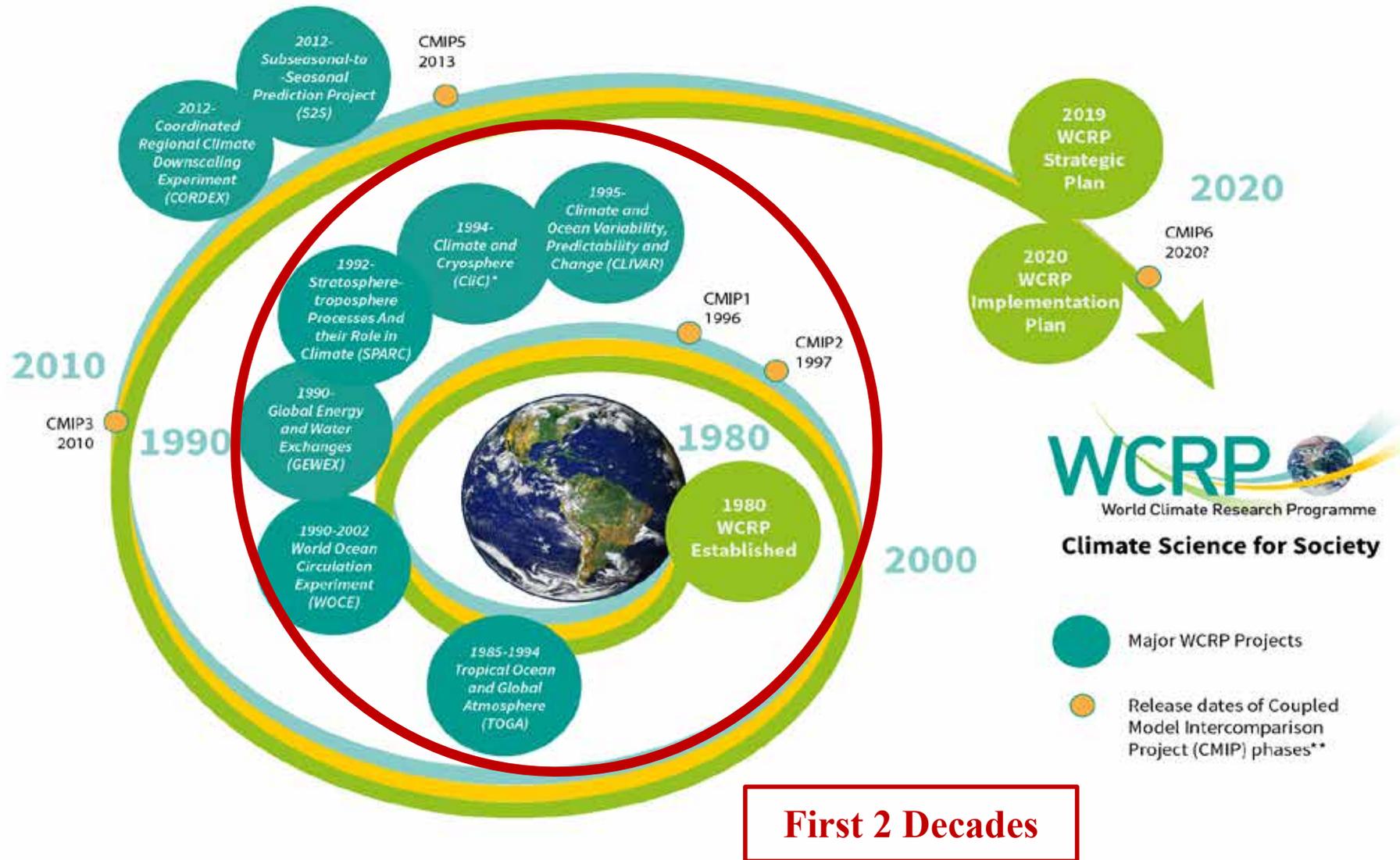


Bert Bolin, John Houghton (1982-84), Joseph Smagorinski (1980-81) and Pierre Morel : Bo Döös, Robert Stewart; John Mason (1985-88)

Gordon McBean, John Mason, Jim Baker, Pierre Morel



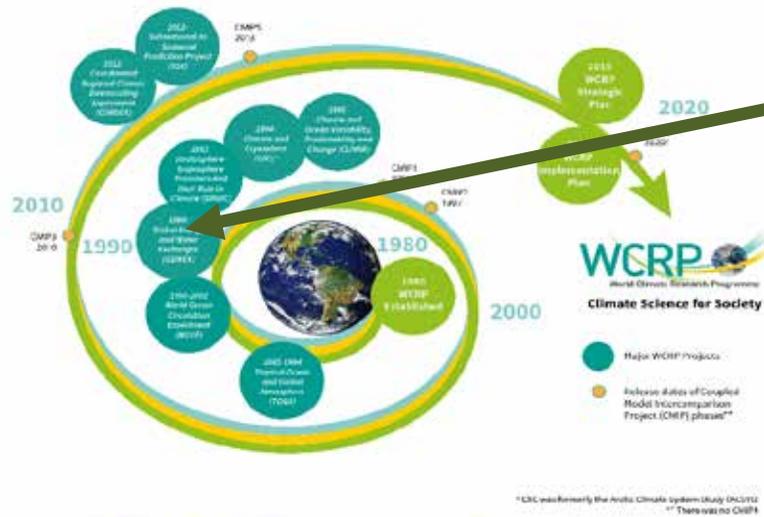
World Climate Research Programme - WCRP



* CLIC was formerly the Arctic Climate System Study (ACSYS)

** There was no CMIP4

World Climate Research Programme – GEWEX

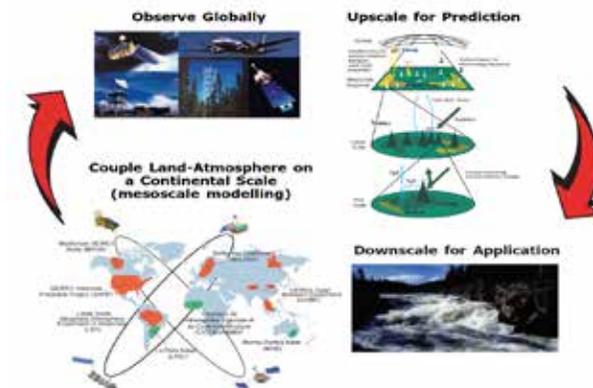


The Global Energy and Water cycle Exchanges (GEWEX) project (1990 -)

Recognizing the importance of energy and water cycles in climate system, formal planning started in 1987 with Study Group on the Global Energy and Water Cycle Experiment.

GEWEX Mission - To measure and predict global and regional energy and water variations, trends, and extremes, such as heat waves, floods, and droughts, through improved observations and modeling of land, atmosphere, and their interaction, thereby providing the scientific underpinnings of climate services.

Global Energy and Water Cycle Experiment



Governments and Environmental Interests

- 1985 - Villach, Austria Conferences
 - *“Many important economic and social decisions are being made today on long-term projects, all based on the assumption that past climatic data, without modification, are a reliable guide to the future. This is no longer a good assumption.”*
- 1987 - World Commission on Environment and Development
 - Sustainable Development
 - social, environmental-economic interactions- multidisciplinary
 - **SEE THE FUTURE** - prediction
- 1987 - Montreal Protocol on Ozone Layer
- 1987 – International Geosphere-Biosphere Programme - collaboration
- 1988: Conference- Changing Atmosphere: Implications for Global Security (Toronto Conference)
- 1988: IPCC (WMO & UNEP) created



1990: 2nd World Climate Conference, Geneva – IPCC

■ 1990: 2nd World Climate Conference, Geneva



■ Key agreement –

- stress the need for further scientific research on the causes and effects of climate change and recommend that this be done mainly through support of the World Climate Programme (WCP)

■ IPCC First Assessment Report - Summary for Policy Makers

- The required programme of research will require unprecedented international cooperation, with the WCRP and the IGBP both playing vital roles. These are large and complex endeavours that will require the involvement of all nations, particularly the developing countries. Implementation of existing and planned projects will require increased financial and human resources; ... include more members from developing countries.

• 1992 – Global Environmental Change START created 1992

■ 1992 - Global Climate Observing System – GCOS.

- WCC Conference Statement and Declaration – recommendation for urgent establishment of a global climate observing system.
- “*The then Chair of JSC-WCRP moved immediately*” to convene a meeting – hosted by UK Met Off. 1992 – GCOS formed. To work with WMO GOS, GAW + GOOS and GTOS.

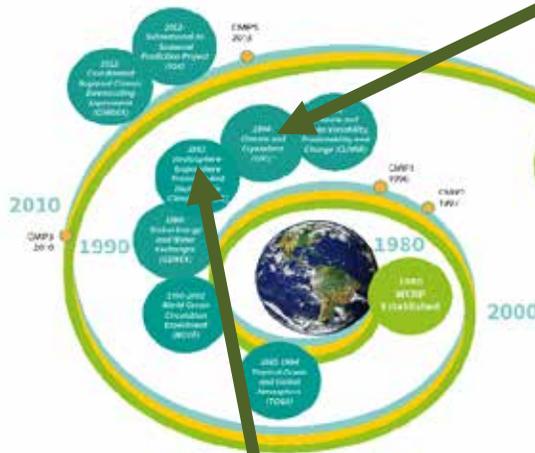


1993: IOC-UNESCO joins

World Meteorological Organization, the International Council of Scientific Unions and the Intergovernmental Oceanographic Commission

- **AGREE:**
- (1) That there should be a **single World Climate Research Programme**, sponsored jointly by the three organizations;
- (2) That the WCRP should have, as its **long-range objective, a better understanding of the climate system and the causes of climate variability and change**;
- (3) To invite and call upon all other appropriate national and international organizations, and the world community of scientists, to collaborate in this task;
- (4) To establish a **Joint WMO/IOC/ICSU Scientific Committee (JSC)**: to provide scientific guidance in all aspects of the World Climate Research Programme, and a Joint Planning Staff to assist the **JSC – expanded to 18**
- (5) To ensure that the administrative and financial arrangements provide for a large measure of flexibility to the JSC and to its supporting staff.

WCRP – ACSYS to CliC; SPARC



ACSYS-CliC – Arctic Climate System Study (ACSYS) – 1992 – Climate and the Cryosphere (CliC)

- Working Group on Sea Ice and Climate (1985 -92)
- 1992 – ACSYS created – foci: ocean circulation, sea-ice climate, Arctic atmosphere; hydrological cycle; modelling

Climate and Cryosphere (CliC),- 1994:

CliC encourages and promotes research into the cryosphere in order to improve understanding of the cryosphere and its interactions with the global climate system, and to enhance the ability to use parts of the cryosphere for detection of climate change.

Critical climate component

Stratosphere-troposphere Processes And their Role in Climate (SPARC) - 1992:

SPARC provides intellectual leadership to address key issues in atmospheric dynamics and predictability, chemistry and climate, and long-term records for climate understanding.

- Atmospheric dynamics and predictability:
- Chemistry and climate:
- Long-term records for climate understanding:

Climate Convention and Montreal Protocol

1995-7: UNFCCC – IPCC

- **IPCC Second Assessment Report (1996)**
- **UNFCCC CoP2 Geneva to CoP3 Kyoto**
- **Geneva Declaration – science of IPCC SAR good – no debate in Kyoto.**

The most urgent scientific problems requiring attention concern:

(i) the rate and magnitude of climate change and sea level rise:

- ... clouds and their radiative characteristics; • ...precipitation, evaporation and runoff; • ... ozone and aerosols;
- ... terrestrial and marine systems to climate change ...feedbacks; • ... ice sheets and glaciers ...; • ...human activities on emissions; • the **COUPLING BETWEEN THE ATMOSPHERE AND OCEAN, AND OCEAN CIRCULATION;**
- ...atmospheric concentrations of carbon dioxide and other greenhouse gases;

(ii) DETECTION AND ATTRIBUTION OF CLIMATE CHANGE: •

(iii) regional patterns of climate change:



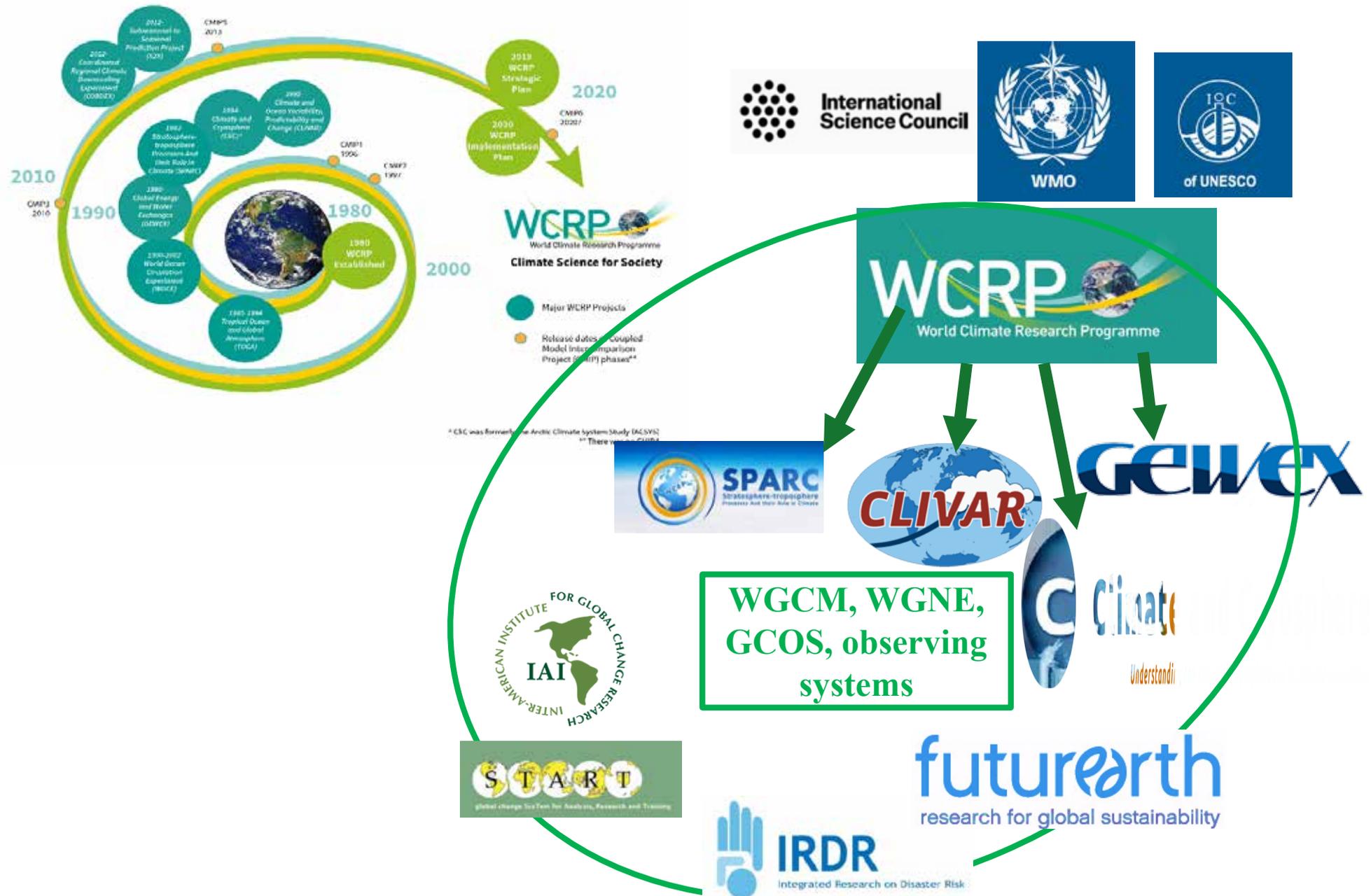
The research activities for each objective are strongly interconnected. Such research is and needs to be conducted by individual investigators in a variety of institutions, as well as by co-ordinated international efforts which pool national resources and talents in order to more efficiently engage in large-scale integrated field and modelling programmes to advance our understanding.

IPCC Detecting and Attributing Climate Change

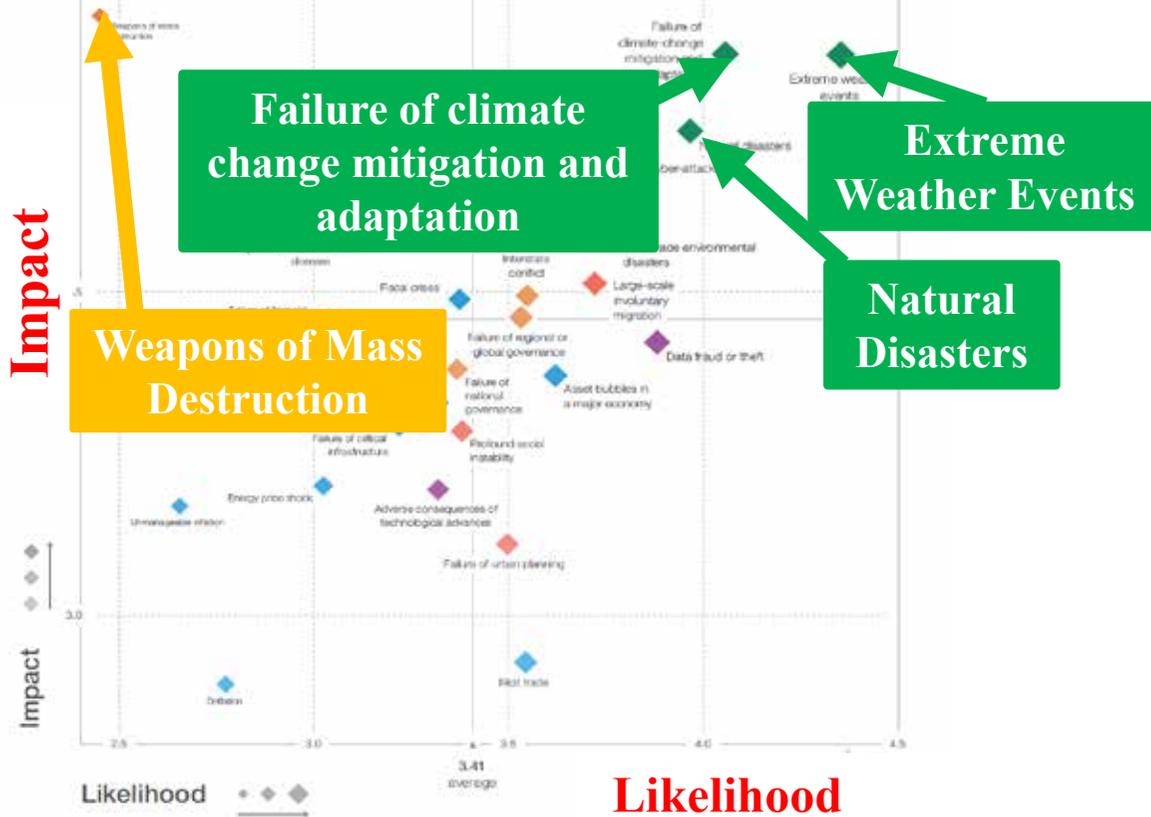
- FAR (1990): “... could be largely due to natural variability” “*The unequivocal detection of the enhanced greenhouse effect from observations is not likely for a decade or more, ...*”
- SAR (1995): “*The balance of evidence suggests that there is a discernible human influence on global climate*”
- CoP 2: Geneva Declaration – based on IPCC SAR
 - Science is good enough for action
- TAR (2001) “*There is new and stronger evidence that most of the warming observed over the last 50 years is attributable to human activities.*”
- AR4 (2007): “*Most of the observed increase in global average temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations.*”
- AR5 (2013-14) “*Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, sea level has risen, and the concentrations of greenhouse gases have increased.*”
This evidence for human influence has grown since AR4 (2007). IT IS EXTREMELY LIKELY THAT HUMAN INFLUENCE HAS BEEN THE DOMINANT CAUSE OF THE OBSERVED WARMING SINCE THE MID-20TH CENTURY.



World Climate Research Programme and Global Collaborators



World Economic Forum - Global Risks 2019




Very important for scientists to work together - globally addressing societal challenges - as global public good.

Knowledge Action Network on Emergent Risks and Extreme Events (Risk KAN)



A global risk is an uncertain event or condition that, if it occurs, can cause significant negative impact for several countries or industries within the next 10 years.
In terms of Impact and Likelihood.

WCRP - Science-based “seeing the future” and enabling effective and equitable societal responses.

GLOBAL AGENDA 2030

Actions across the Agenda need to be fully coordinated.

Integrated
Science to Policy

Roles of
Nations and
Scientists

Global
Agenda
Global
2030

Global
Science
Agenda

+++
Observing
systems,
Capacity
Enhancement ...



SENGAI
Réduction
des risques
de
catastrophe

