Word Climate Research Programme

Update on Strategy, Implementation and JSC40

WGSIP21 Session
Michel Rixen
29-31 May 2019
INM, Moscow, Russia

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Intergovernmental Oceanographic Commission
International Science Council
WCRP World Climate Research Programme

WCRP's mission….

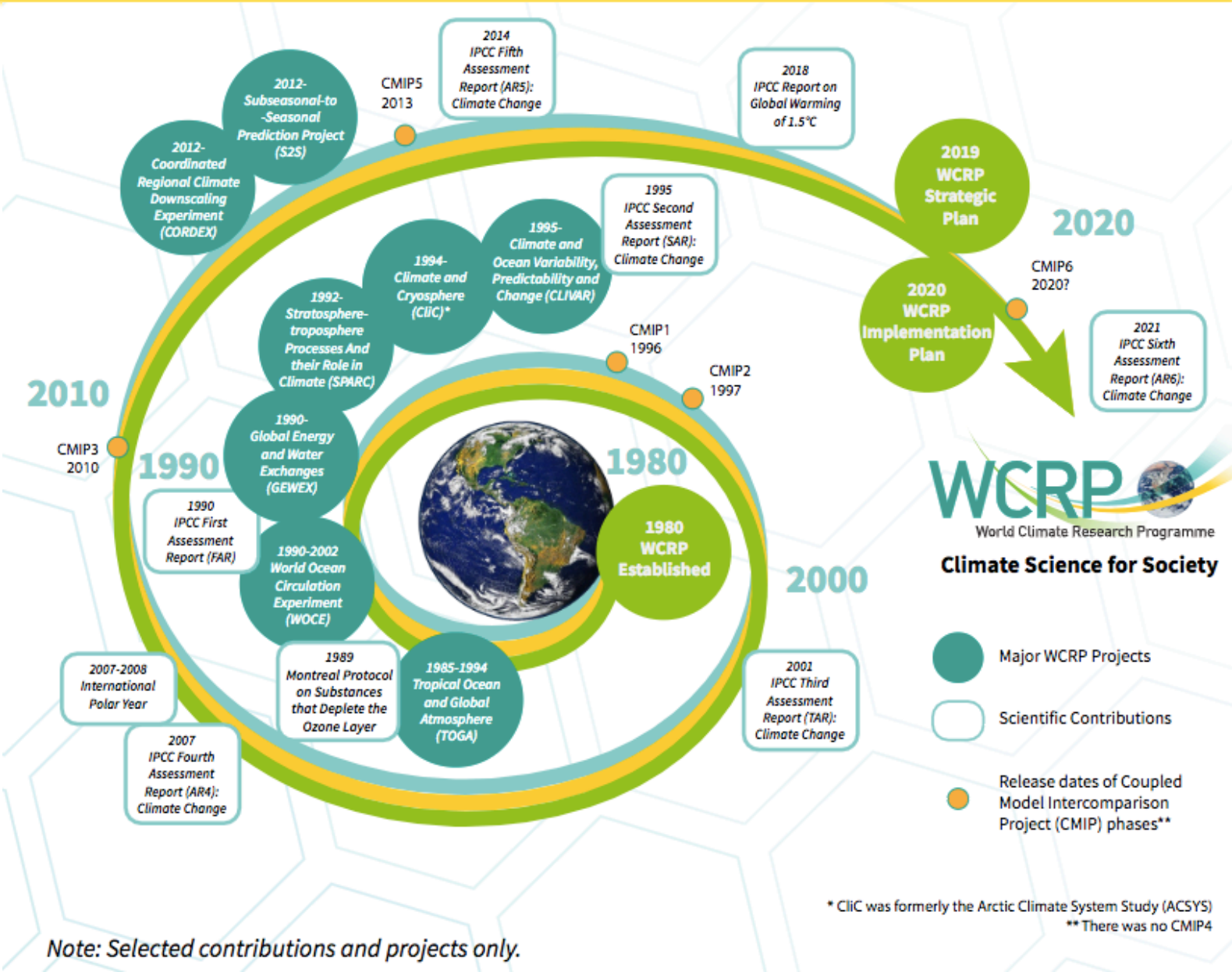
... is to facilitate analysis and prediction of Earth system variability and change for use in an increasing range of practical applications of direct relevance, benefit and value to society.

The two overarching objectives of WCRP are:

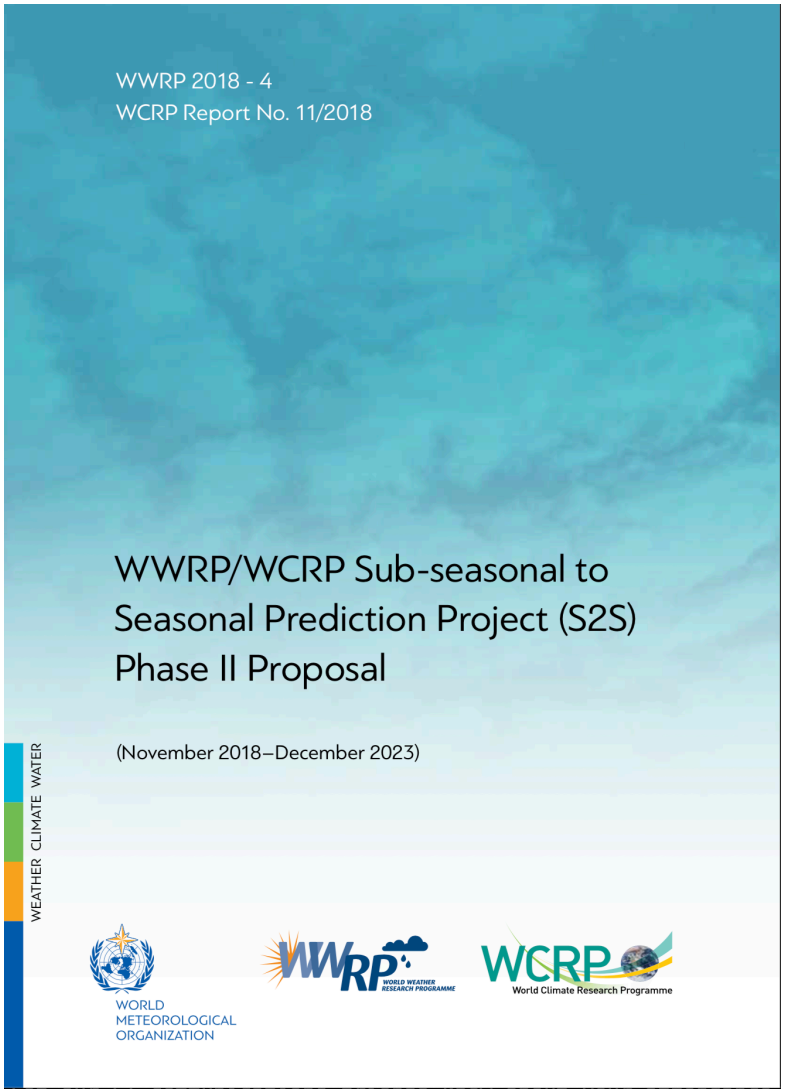
to determine the predictability of climate

to determine the effect of human activities on climate

WCRP History and Milestones



S2S Phase 2 plans



- **S2S Database enhancement** – ocean variables, more surface variables 4xdaily, additional models (eg IMD)

- **New research foci** (sub-projects) – **MJO** prediction and teleconnections; roles of **Ocean and sea ice**, **Land surface, Stratosphere, Atmospheric composition** and **Ensemble generation**.

- **Enhancing operational infrastructure, user applications** & real-time pilot experiment

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CMIP

Coupled Model Intercomparison Project

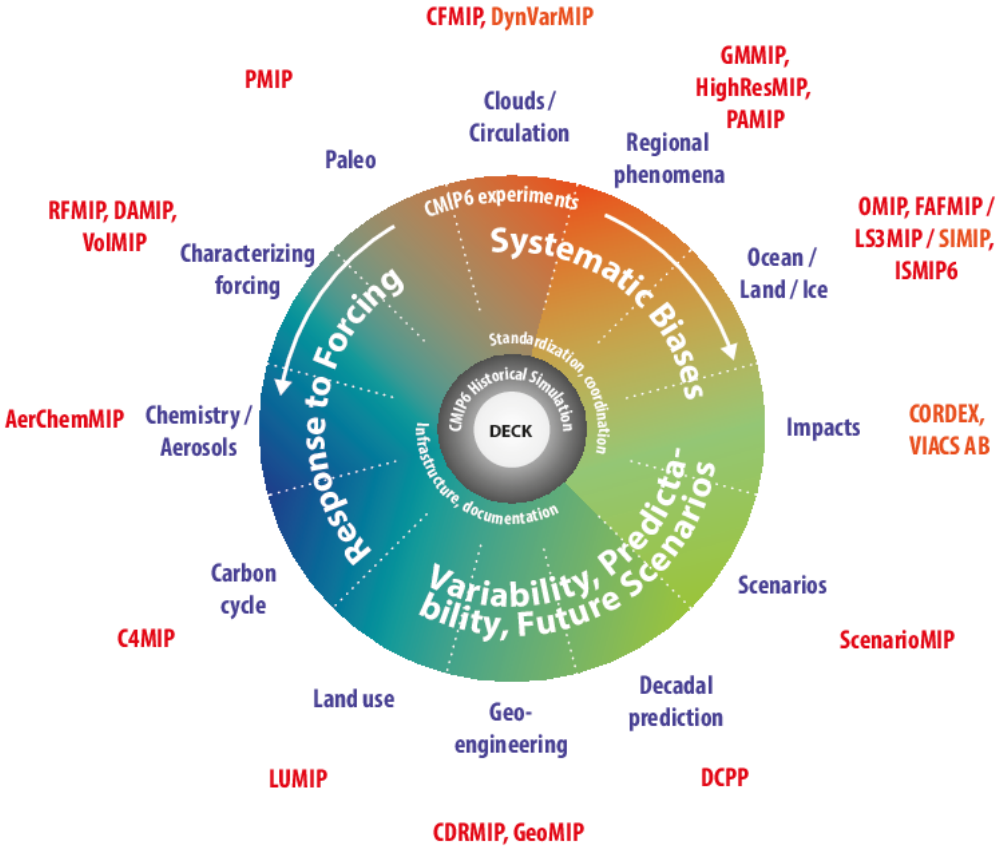
CMIP is a project of WCRP's Working Group on Coupled Modeling (WGCM)

CMIP has led to an improved understanding of past, present and future climate change and variability in a multi-model framework

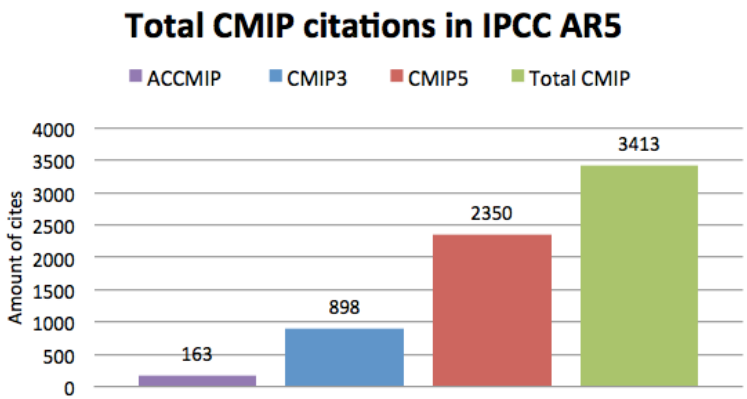
CMIP defines common experiment protocols, forcings and output

23 CMIP6-Endorsed MIPs

Diagnostic MIPs



Eyring et al., GMD, 2016



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2015: A landmark Year

PARIS2015
UN CLIMATE CHANGE CONFERENCE
COP21·CMP11

UN World Conference on
Disaster Risk Reduction
2015 Sendai Japan

- Over 190 countries signed up to reduce emissions, with the target to stay within a 2ºC world.
- 15-year agreement for the substantial reduction of disaster risk and losses in lives, livelihoods and health.
- 2030 agenda with 17 goals to end poverty and hunger, improve health and education, making cities more sustainable, combating climate change, and protecting oceans and forests.

Understanding and Quantifying Weather and Climate Risk are at the Core of these Actions

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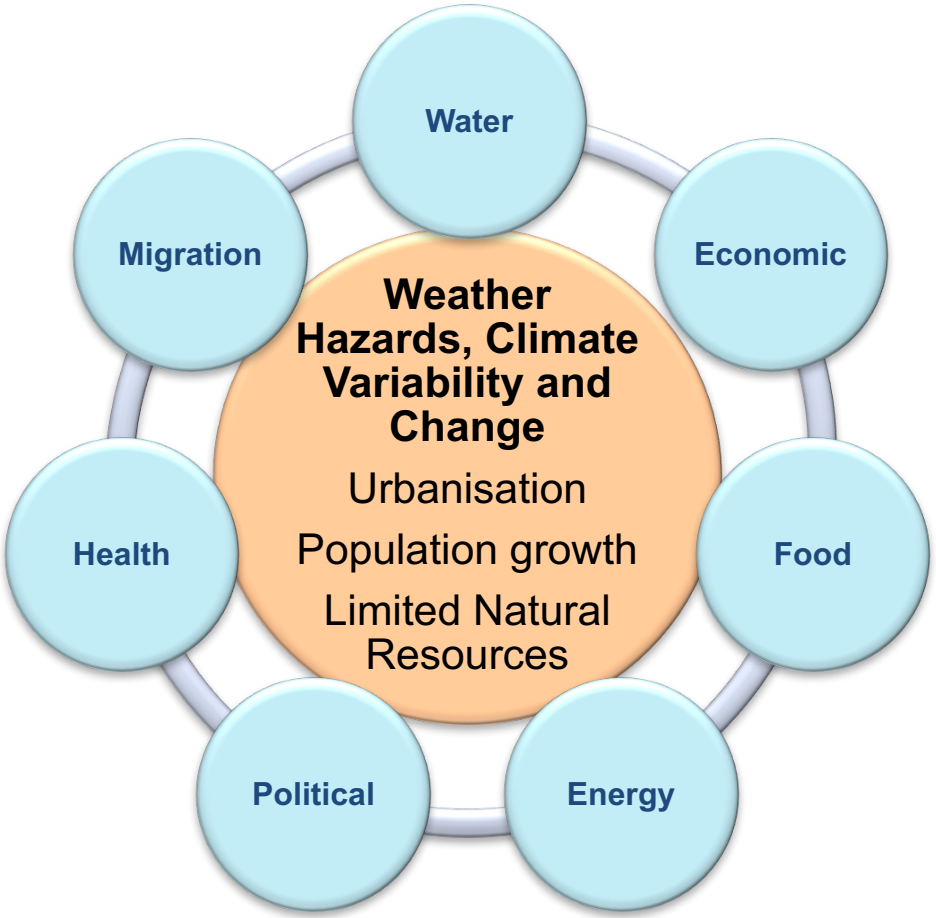
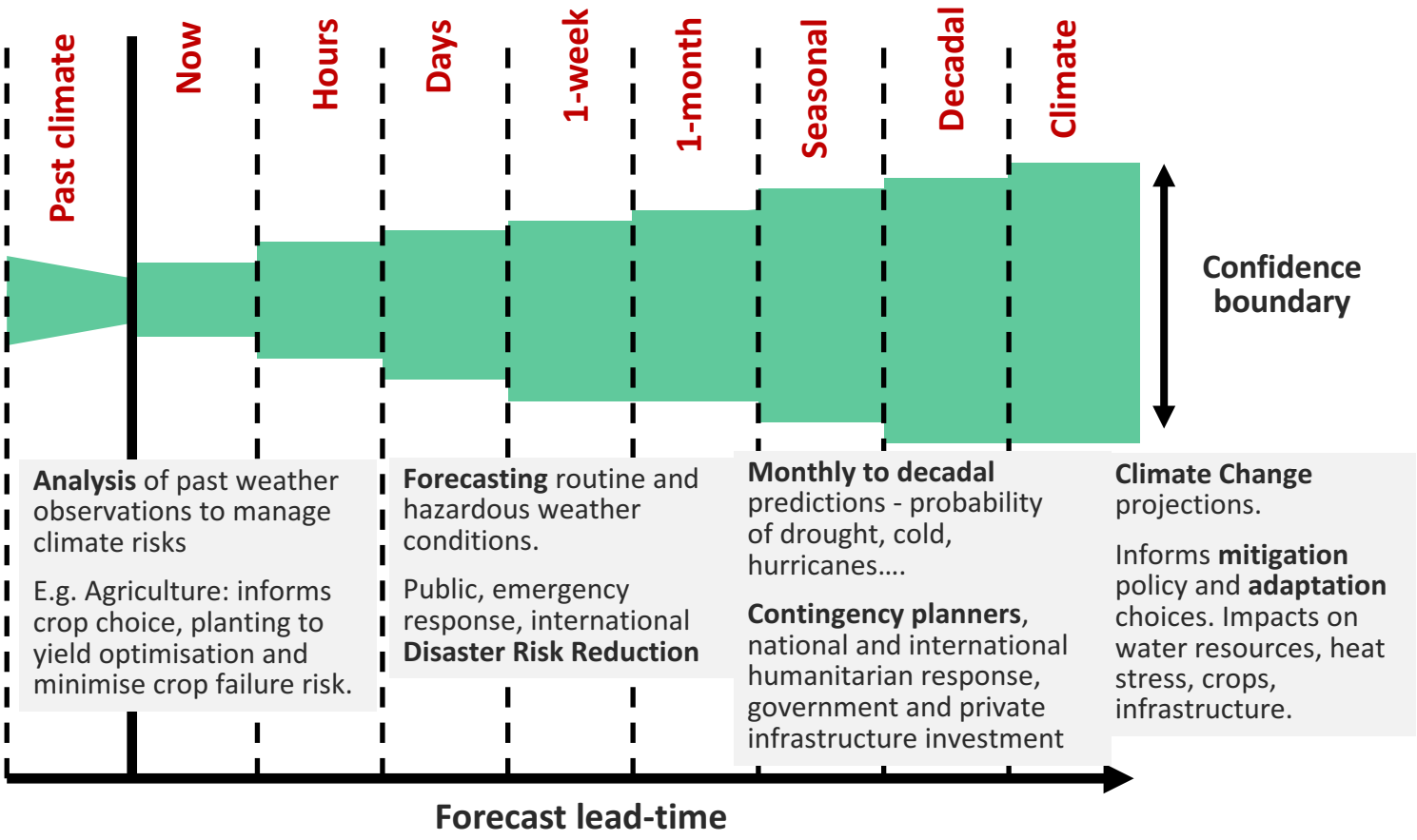
21st Century challenges in an interconnected world

Exposure to extreme weather and climate events threatens sustainability of economic development and social welfare across the globe



New Tools : Seamless Prediction Across Timescales



Analysis of past weather observations to manage climate risks

E.g. Agriculture: informs crop choice, planting to yield optimisation and minimise crop failure risk.

Forecasting routine and hazardous weather conditions.

Public, emergency response, international **Disaster Risk Reduction**

Monthly to decadal predictions - probability of drought, cold, hurricanes….

Contingency planners, national and international humanitarian response, government and private infrastructure investment

Climate Change projections.

Informs **mitigation** policy and **adaptation** choices. Impacts on water resources, heat stress, crops, infrastructure.

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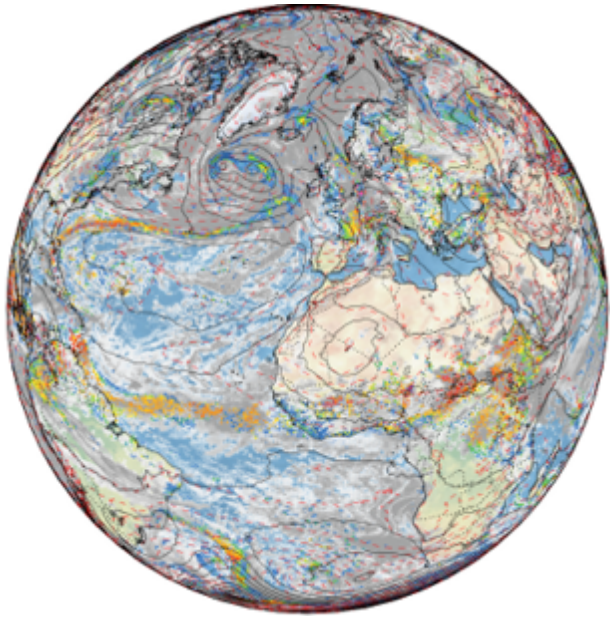
New Tools : Seamless Prediction Across Space scales



N x Global predictions at ~10km with lead times of days to years:

Synoptic drivers

<N x Regional predictions at <1km with lead times of hours to years:

Local meteorology

Probability of local hazards:

Impact Scenarios & Narratives

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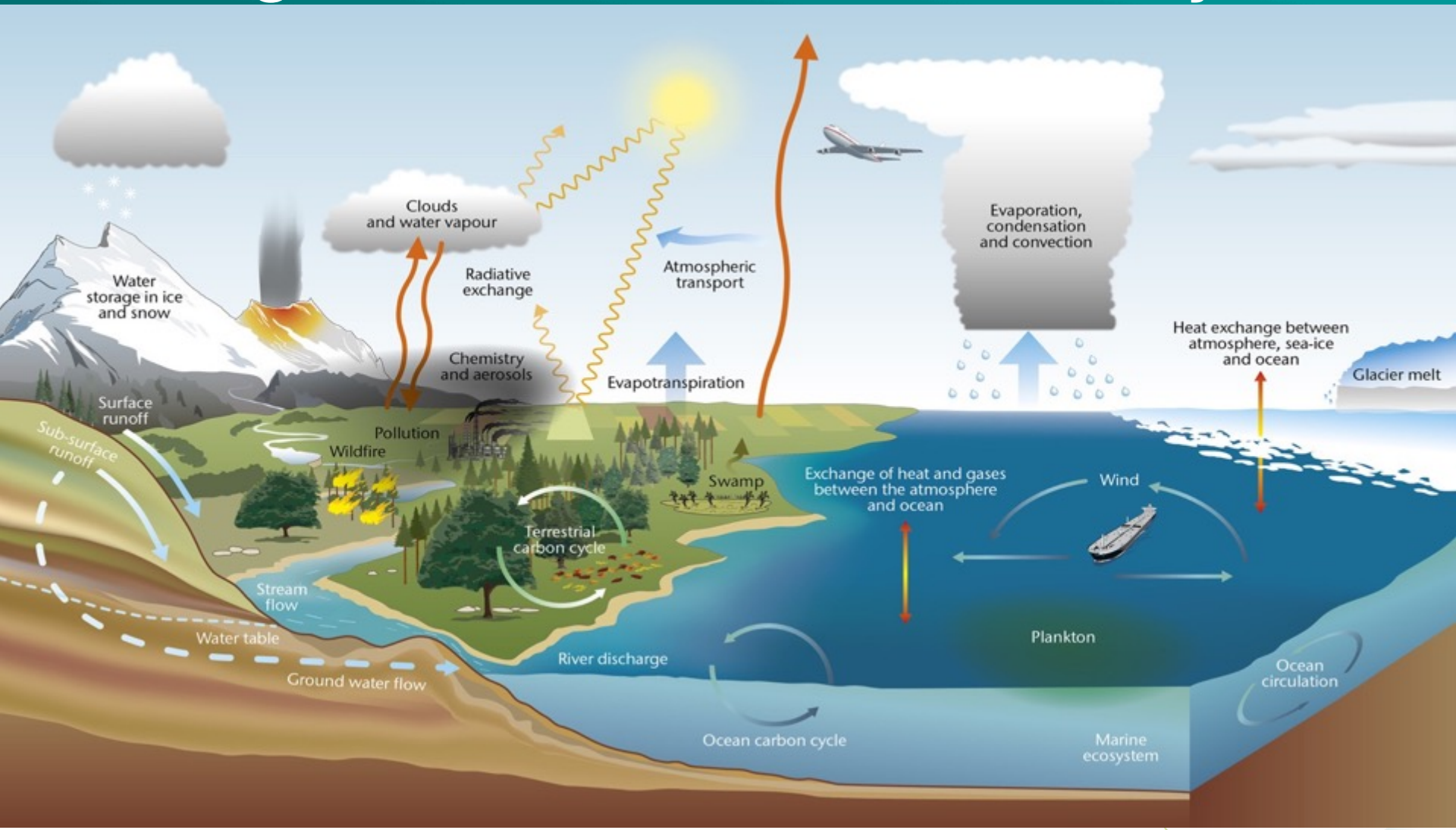
Taking a holistic view of the Earth System



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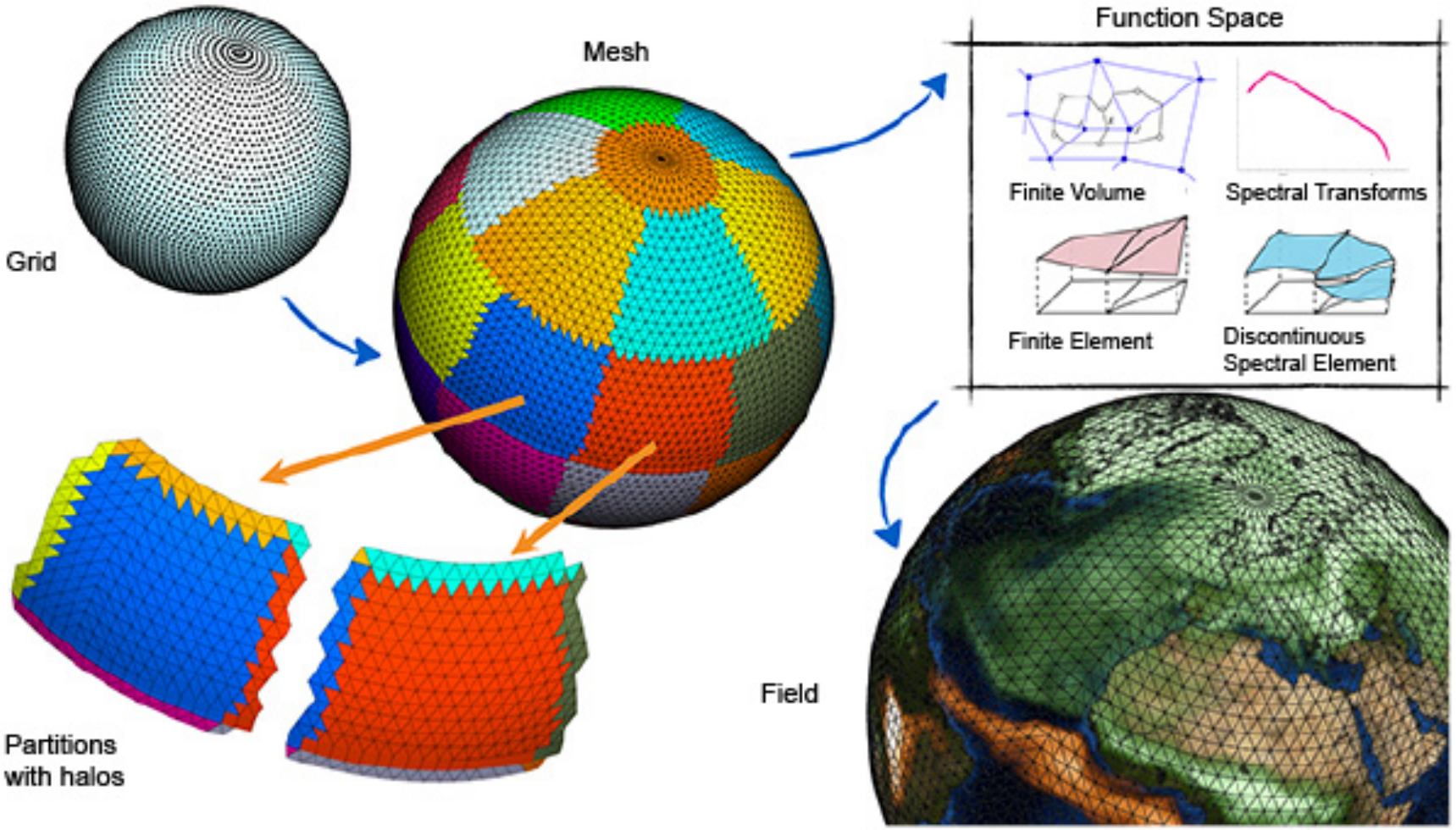
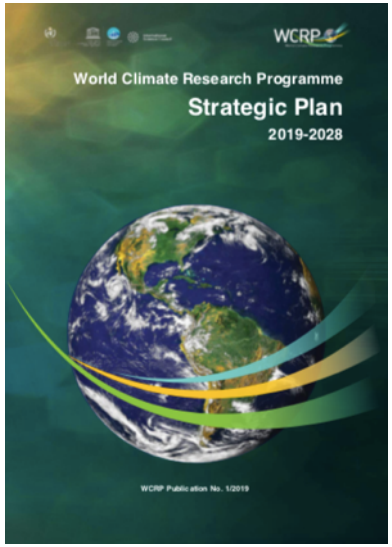
Next Generation Codes, Exascale Computing

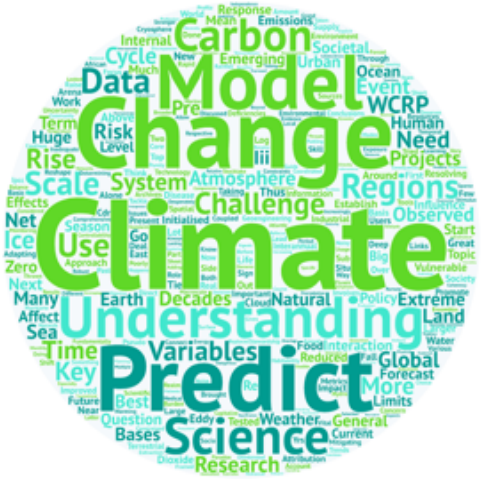


Courtesy: ECMWF

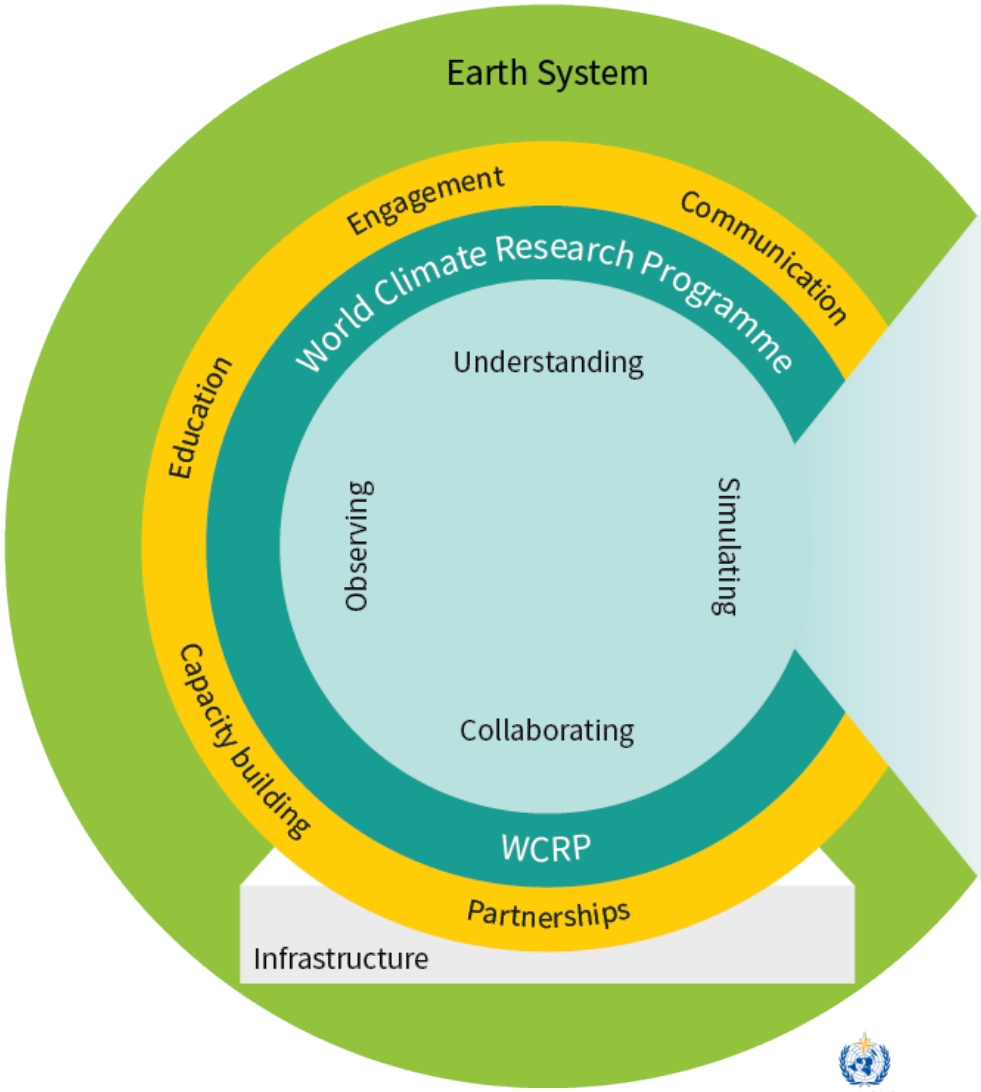
WCRP Strategic Plan

- WCRP is developing a new Strategic Plan, covering a 10-year time horizon (2019-2029)
- Takes into account the outcomes of the co-sponsors review (finalized in June 2018)
- Importance of bedrock science, seamless approach (time, space, ESM, R-O) and links to services and policy emphasised
- Accompanying Implementation Plan under development





WCRP Strategic Plan



WCRP Overarching Science Objective Themes

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

Interactions across spatial and temporal scales

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WCRP Strategic Plan

Objective 1

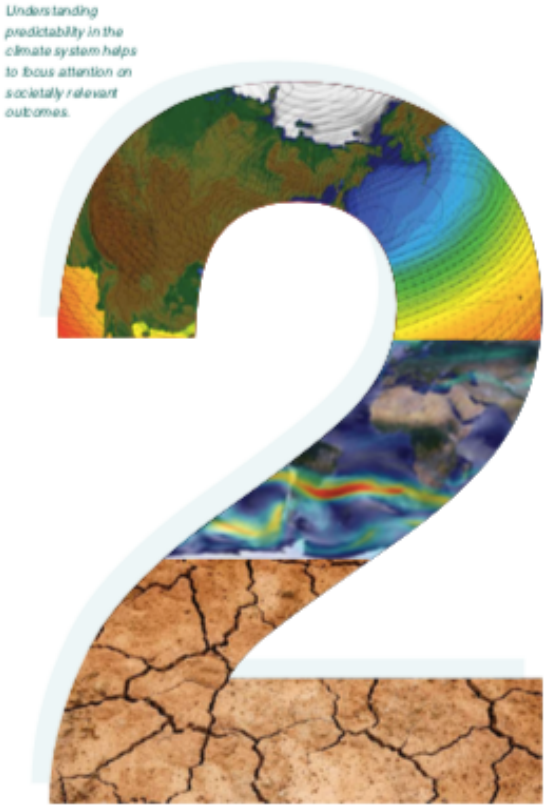
Advancement of sciences that enable an integrated and fundamental understanding of the climate, its variations and its changes, as part of a coupled physical, biogeochemical, and socio-economic system.

Emphases:

- Climate dynamics: past and future global and regional changes in oceanic and atmospheric circulations
- Reservoirs and flows: radiative, hydrologic, cryospheric and biogeochemical changes on energy, water, carbon, and other climate-relevant compounds

WCRP Strategic Plan

Objective 2



Frontiers of predictions and quantify the associated uncertainties for sub- seasonal to decadal time scales across all climate system components.

Emphases:

- Simulation capabilities of component systems and their coupling. Deterministic, statistical and machine learning approaches. Data assimilation and ensemble generation
- Predicting extreme events: regional climate hotspots and potential for crossing thresholds. Interactions between fact and slow extremes

WCRP Strategic Plan

Objective 3

Quantify the responses, feedbacks and uncertainties intrinsic to the changing climate system on longer timescales.

Emphasis:

- Earth system models. Development and integration. Representation of complex interactions between aquifers, vegetation and soil carbon, between permafrost, glaciers, and ice-sheets. Dynamical and statistical downscaling

WCRP Strategic Plan

Objective 4

Innovation in the generation of decision-relevant information and knowledge about the evolving Earth system.

Emphasis:
Interactions with social systems: Social processes and emergent behaviour in the Earth System. Interactions and feedbacks between climatic and socioeconomic systems
Engaging with society: Actionable climate information, scientific assessments, educational approaches and public communication strategies.

WCRP Strategic Plan

Critical Infrastructures

I. A hierarchy of simulation tools
II. Observations for process understanding
III. Sustained observations
IV. High-end computing and data management

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WCRP Strategic Plan

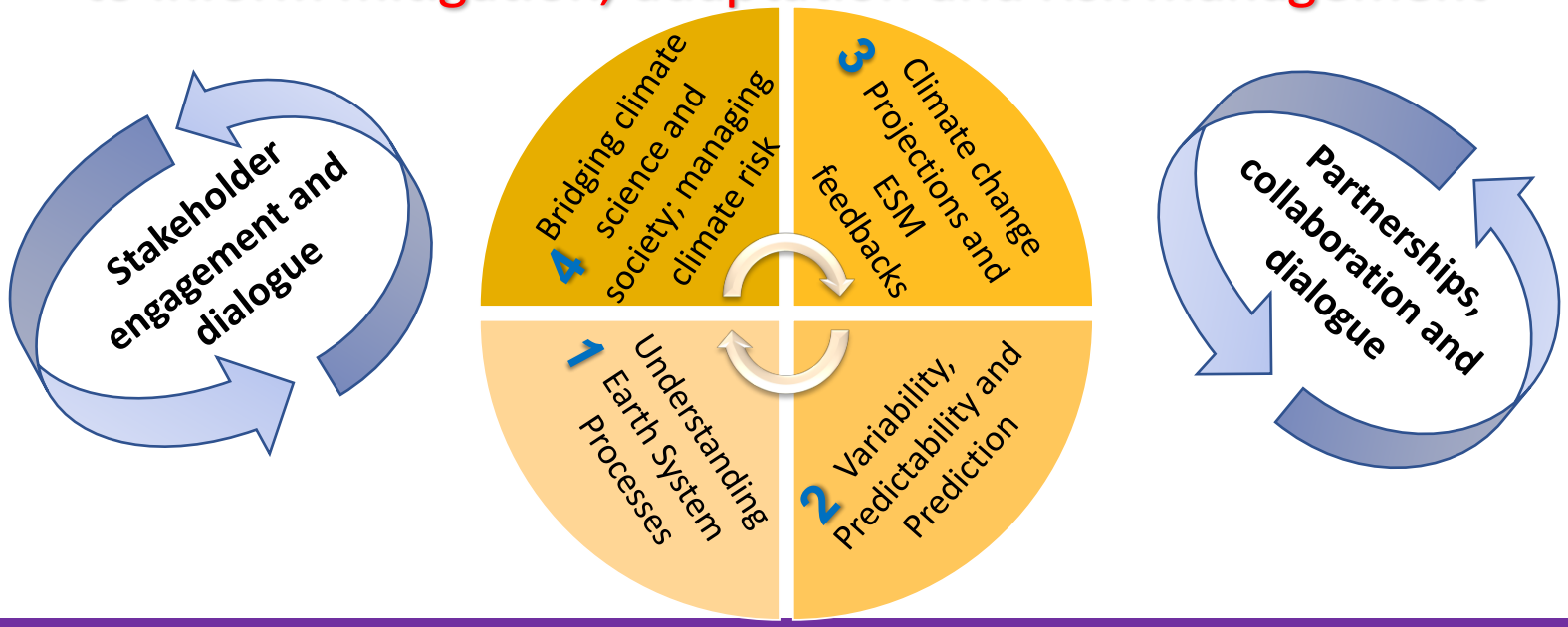
Timeline

• SWOT Analysis	Sep -Nov 2017
• Writing of Initial Strategic Plan Draft	Nov 2017 - Feb 2018
• WCRP Strategic Plan Writing Retreat, IOC Paris	Feb 2018
• WCRP Community Consultation	March 2018
• JSC-39, Nanjing	Apr 2018
• Public Consultation	1 June – 31 Aug 2018
• Town Hall at AGU to promote new Strategy	Dec 2018
• Final approval of SP by Sponsors pending	June 2019
• … feeding into IP pre-JSC40 and JSC40 meetings	


https://www.wcrp-climate.org/wcrp-sp-progress

WCRP Mission: Societally-relevant knowledge and information to inform mitigation, adaptation and risk management

[Partnerships] Links to sustained observing systems (e.g. GCOS)



[Partnerships] Coordinated Model Experiments and Assessments | Production | Evaluation

Science Questions: Relevance, Innovation, Discovery, Integration

Function: Integration across Earth System (Local to Regional to Global)

Earth System Model Development| Observing system innovation and evaluation| Model – Data fusion
Fora and services for Capacity development, Education, Community building

Function: Infrastructure

Simulation tools| Seamless data| Sustained obs.| High-end comp.; data storage & management|
Platforms for open access, data sharing, collaboration

Climate System Elements

Function: Enduring capability and Link to science communities

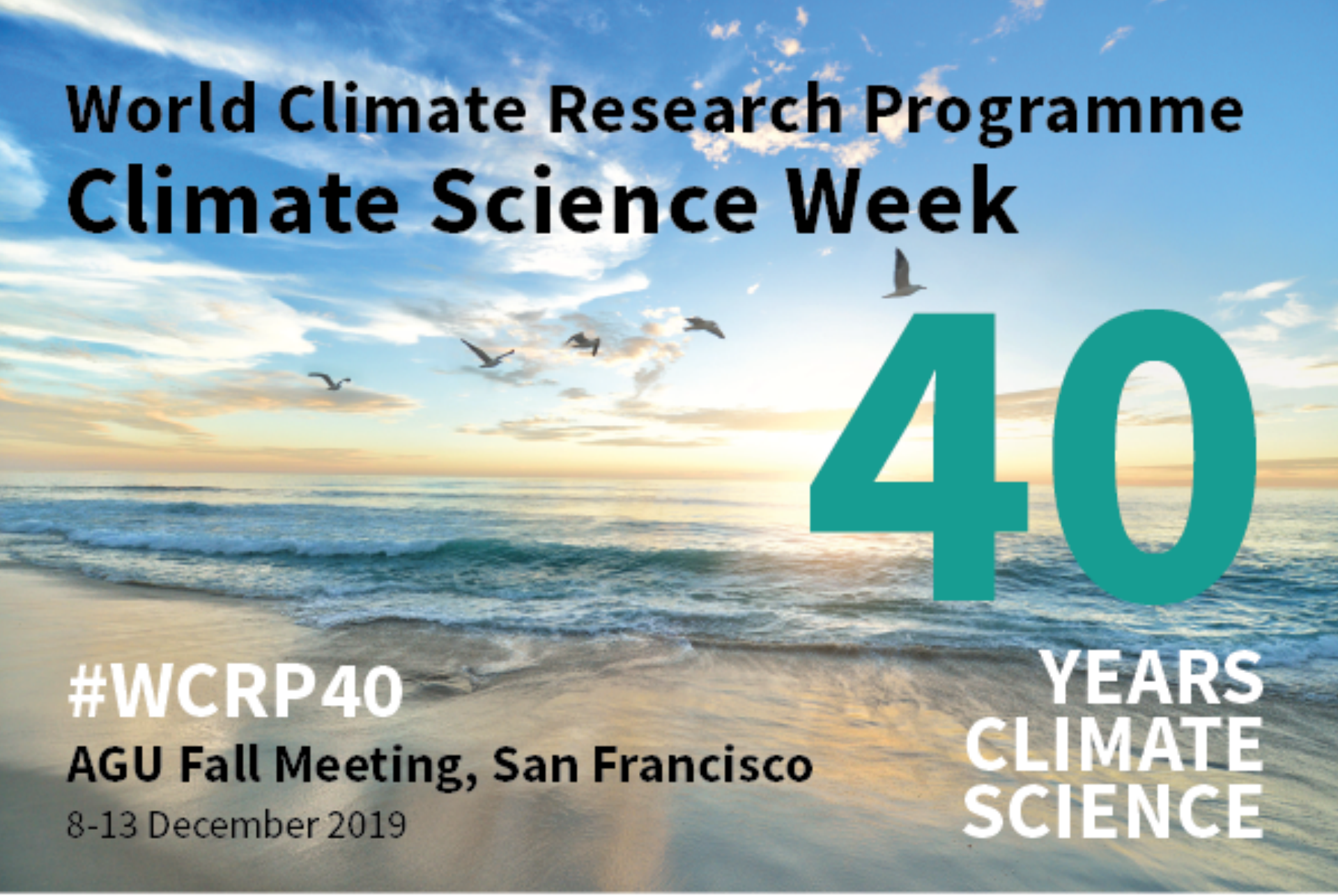
Water, Energy, Composition, Dynamics, (Biosphere)
Ocean, Atmosphere, Cryosphere, Land

Global and Regional

Implementation Timeline - early draft

Transition starts now, with JSC-40

1. **Now to April 2020 (JSC-41):**
   - Refine science questions and conceptual framework
   - Refine key elements for delivery and engagement
   - Science, funding and infrastructure needs
2. **Q1 2021 (Jan-Feb) – pre JSC 42**
   - An “elements” Workshop
3. **Now to April 2022 (JSC-43): 3 years to evolve, specifically ...**
   - Consultation
   - Development of a structure and governance
   - Completion of Implementation Plan
   - WCRP commitment to Core Projects and Project Offices
   - Initiation of new, joint activities
   - Nurture and leverage partnerships for mutually beneficial outcomes



www.wcrp-climate.org/wcrp-agu2019

WCRP - 40 Years Anniversary

- **Celebrate the success** of 40 years of working together around the globe to understand the climate system and to determine the human influence on the climate system.
- **Respond to the changing world around us** and show how WCRP is well prepared to evolve and respond to new challenges and growing needs for climate science, information, innovation and solutions.
- **Solidify existing and grow new partnerships** with key "users" of climate science, with partners to deliver the science and with sponsors and funders on resource mobilization.
- **Socialize the new Framework of WCRP implementation** and enhance and advance implementation actions co-development of new activities with our partners and community.

AGU Fall Meeting Week

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WCRP 40 World Climate Research Programme #WCRP40

Overview

December 2019

Sunday 8	Monday 9	Tuesday 10	Wednesday 11	Thursday 12	Friday 13
WCRP 40th Anniversary Symposium	**WCRP Science Sessions and Workshops** All AGU Fall Meeting science session and workshop proposals can be co-branded as being part of the WCRP Climate Science Week during the submission process. Co-branded sessions and workshops will have greater exposure through WCRP advertising and will be linked through the AGU mobile app. **WCRP Town Halls** A number of town halls are currently being developed aligned to WCRP science objectives.				WCRP Union Session*

WCRP-AGU partnership

- WCRP-AGU Memorandum of Understanding to secure broad WCRP-AGU collaboration: TBC
  - 40th anniversary celebration (Sun) – *75$ (35$ ECR) fee*
    - High level addresses, Keynotes, Testimonials, Looking ahead
  - 4 Town Halls on 4 SP Objectives (Mon-Thur)
    - Panel discussion
    - Will involve leadership of our WCRP entities and partners where appropriate (see recent email to JSC and Chairs & Directors)
  - 1Union Session (Fri)
    - Engage broad science community
    - Highlight the work with partners
    - Mention past successes and focus on the future
    - Consultation on Framework of WCRP implementation

Ongoing Planning Process

- WCRP participated in AGU Fall Programme Committee (Jens H. attended 2-3 May meeting)
- 30 identified co-sponsored ‘WCRP’ sessions submitted – possible connections to other AGU sections analyzed
- ECR event under development with YESS and other networks planned for Sat
- Abstract submission by early June - deadline August
- Meeting schedule to be finalized early September.

CONSTITUENT BODIES REFORM (CBR)

1873

2050

WMO for the 21st Century

WMO OMM

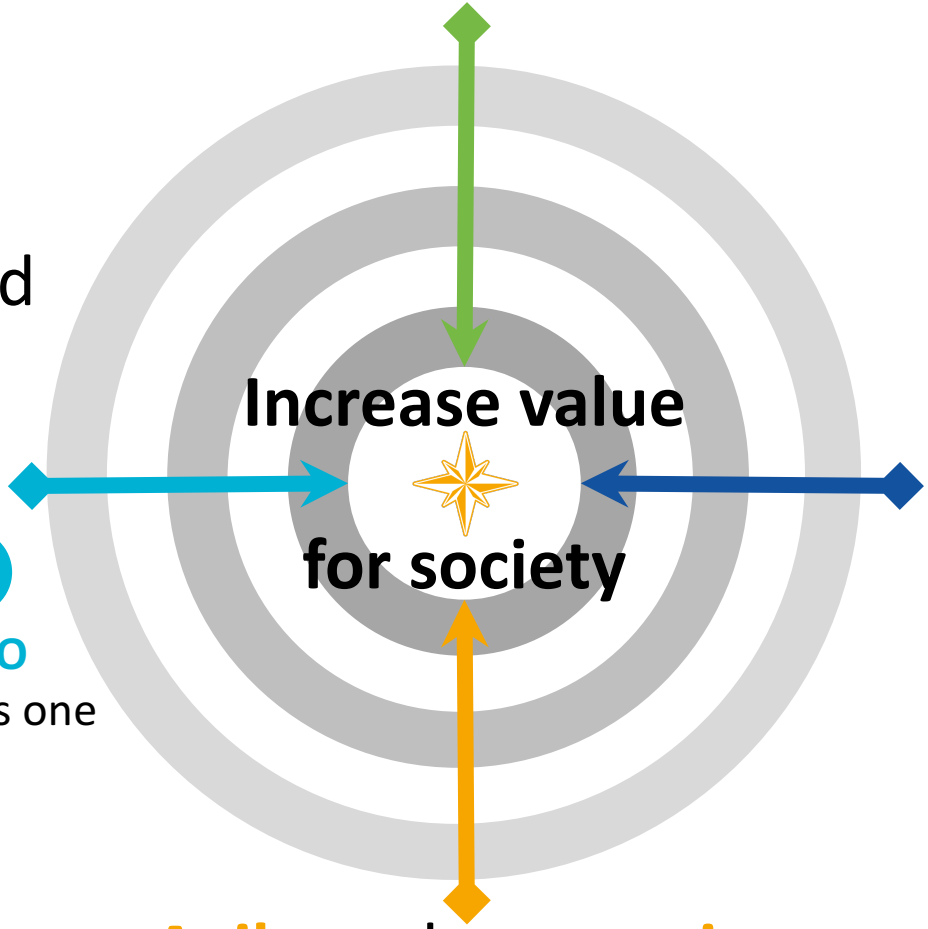
REFORM OBJECTIVES

Effectiveness and **efficiency**

Seamless and **integrated** approach

Earth System approach

WMO acting as one

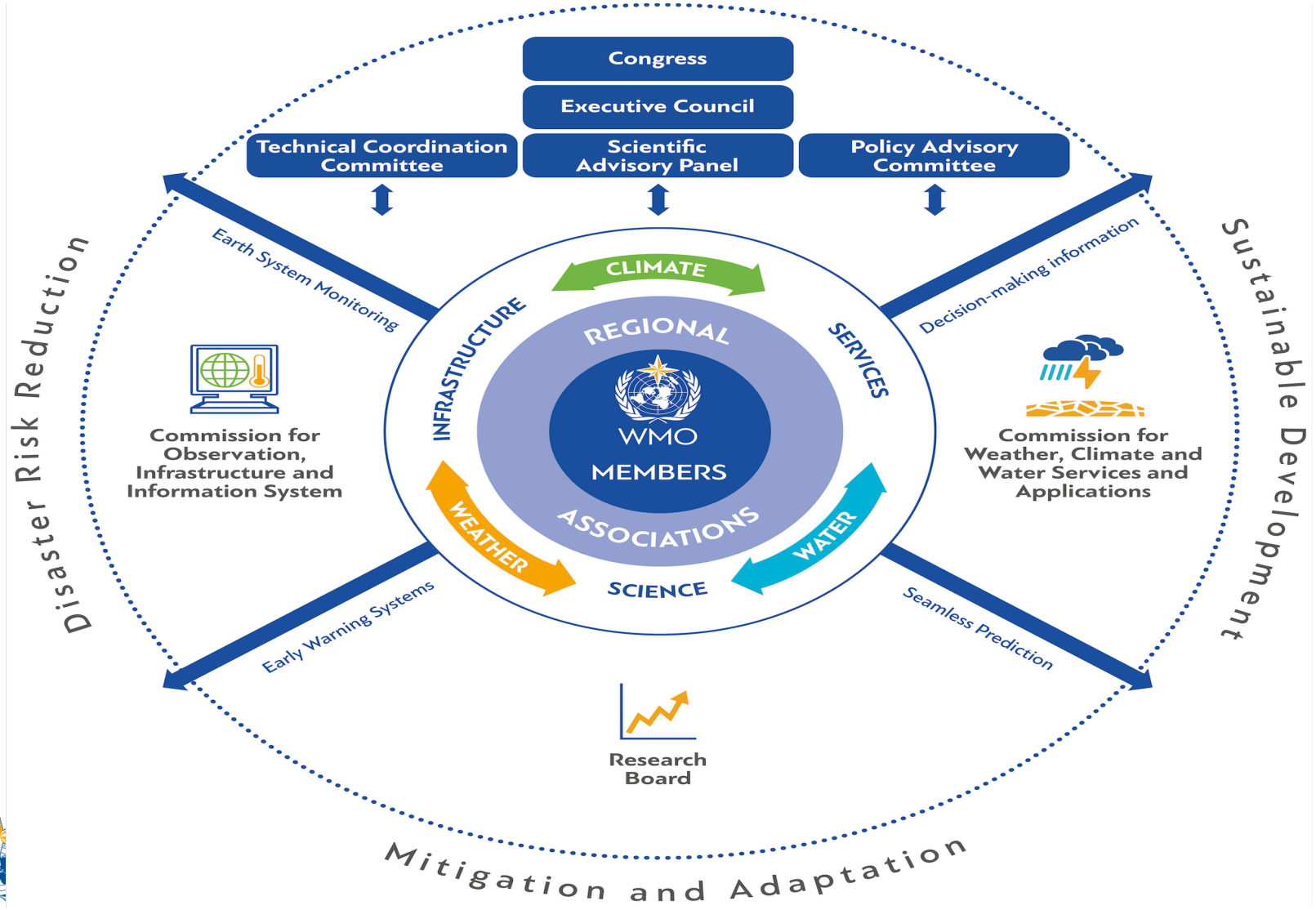


Engagement of Members and Experts

Agile and **responsive** to **new challenges**

WMO OMM

Future WMO: Integrated seamless Earth-system science and science for services approach




Thank You
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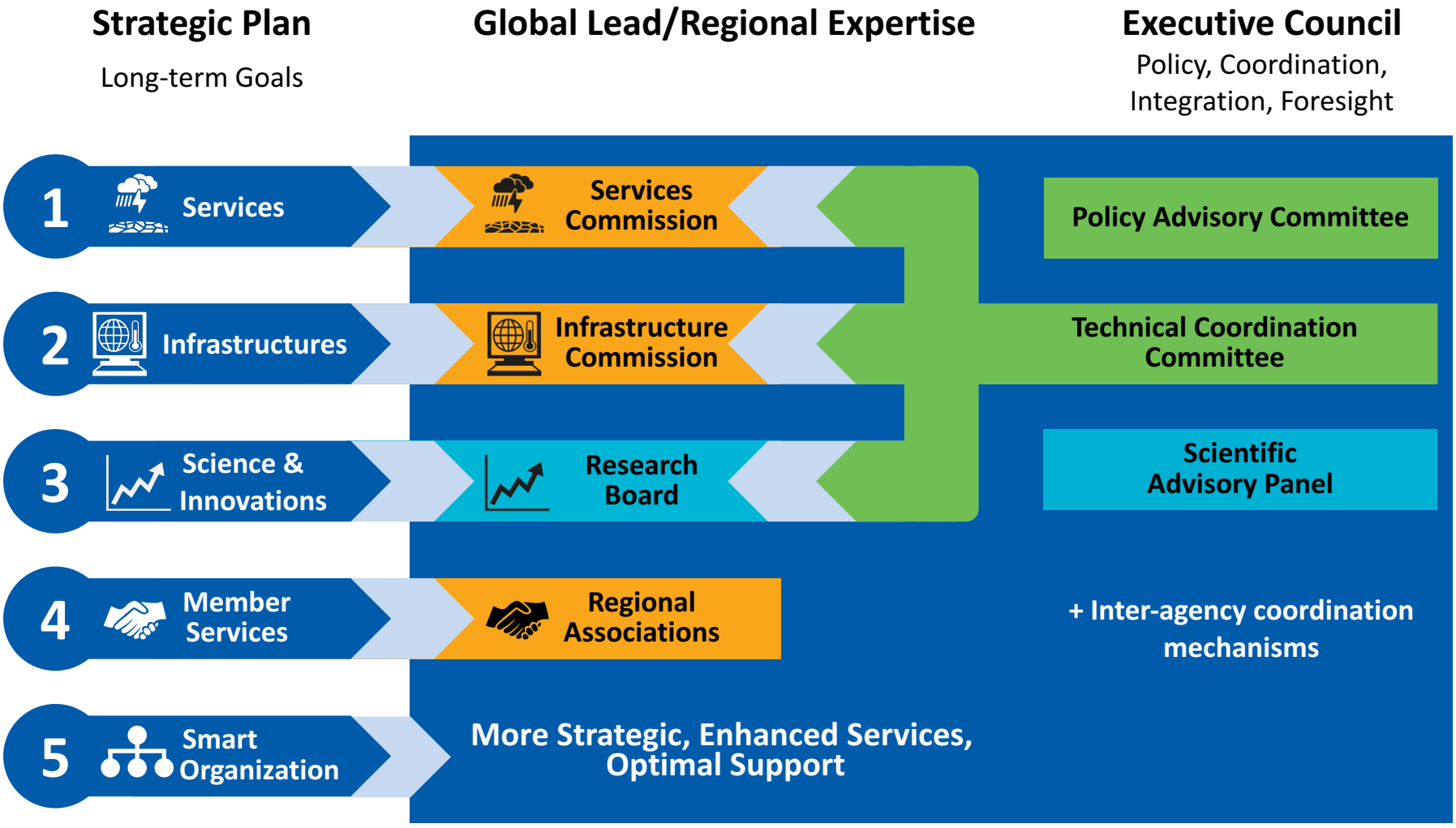
ALIGNMENT OF WMO STRUCTURE



WMO OMM

- Established by EC-70
- EC-70 Recommendations to Congress (intergovernmental)
- EC-70 Recommendations to Congress for new science bodies (non-intergovernmental)

ENHANCED COLLABORATION WITH PARTNERS

WMO

Joint bodies
Working arrangements
Programmes/Projects

THE WORLD BANK

GREEN CLIMATE FUND

ICAO

Food and Agriculture Organization of the United Nations

World Health Organization

WFP
World Food Programme

UNESCO

IOC

More interaction and collaboration with partners from all relevant areas, e.g.:

Key Science Questions DRAFT V2

1. Combining first 3 questions:
   - Revisiting aggregation and scaling; processes on molecular scale?
   - Process understanding and parameterization
   - Aggregation and scaling - long-term simulations
2. Society's needs for prediction: what needs to be done to improve it?
3. Climate sensitivity: both the fundamental science and communicating the uncertainty
4. Geoengineering: assess impact of any response action; prediction and attribution
5. Prediction, attribution and evolution of Extremes
6. Reservoir changes (heat/carbon/water)
7. Regional hotspots (e.g. what happens in high latitudes, Pacific Islands?)
8. Interaction of climate with overall development trends, including urbanization
9. Impact of different forcings (aerosols)
10. Model/data fusion and new/disruptive technology
11. Effect of humans e.g. land use change

A Process for Refining Science Questions

Identifying and refining science questions via consultation with others:

- Science Plans of Core Projects
- Horizon scanning done by Partners (IPCC) and aligned Projects/Groups (e.g. SCAR)
- Other Gaps and needs assessments – Academies et al
- Consultation and co-design with Partners

A Draft Framework (V2) for Implementing the WCRP Strategic Plan

This draft version has an internal WCRP focus

We will add an external landscape view, plus the Implementation Plan will have a section on Engagement

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