

Accelerating “Science for Society”

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Dr. Nico Caltabiano (WCRP) and WWRP secretariat as well as Dr. Chris Davis (WWRP/SSC Chair) for input in this presentation. Also, some are taken from and based on the WWRP Symposium 2022 presentations by Guest Speakers.

Outline

- 1) Introduction
- 2) Background (current situation)
- 3) Proposed new WWRP Implementation Plan
- 4) WCRP new approach
- 5) Concluding remarks

Where we are

WWRP

Transition from WWRP Implementation Plan (2016-2023) to new one (2024-2027)



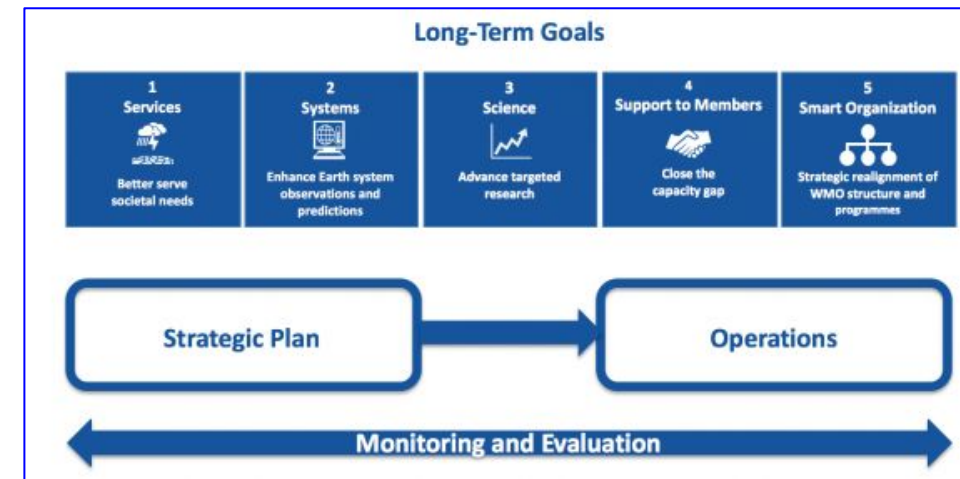
WCRP

Act in line with WCRP Strategic Plan (2019-2028)

Open Science Conference in Rwanda, Oct. 2023 (<https://wcrp-osc2023.org/>)

WMO

Act in line with WMO Strategic Plan (2020-2030) including Strategy 2024-2027



Background (Needs & Motivation)

- 1) WMO Strategy for 2024-2027 ; Long Term Goal 3 "Advance targeted research: Leveraging leadership in science to improve understanding of the Earth system for enhanced services"
 - ✓ Advance scientific knowledge of the Earth system
 - ✓ Enhance the science-for-service value cycle to improve predictive capabilities
 - ✓ Advance and contribute to policy-relevant science
- 2) UN Sustainable Development Goals (2015-2030)
- 3) UN Sendai Framework for Disaster Risk Reduction (2015-2030)
- 4) Task of WMO raised by the UN Secretary-General in 2022
Drawing up a blueprint to ensure that Early Warning System reach everyone within next 5-years
- 5) Regional reform of WMO

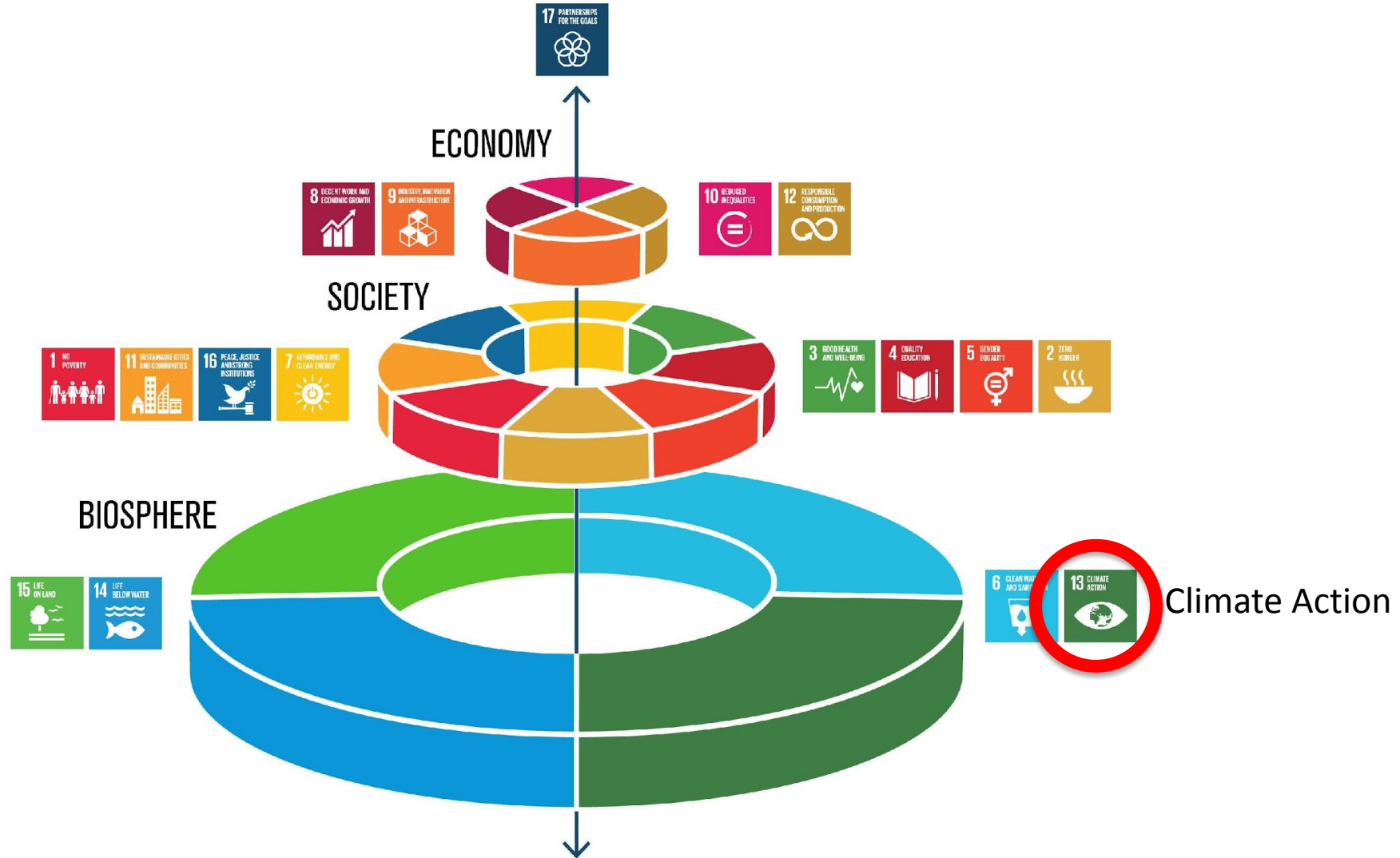
Urgent needs came from:

Extreme events in a changing climate

Timely and effective transfer of information to those who

need

The role of weather & climate research in SDGs



This figure is drawn to present a way of viewing the SDGs and how they are all linked to food by Stockholm Resilience Centre. <https://www.stockholmresilience.org/>

Current WWRP Structure

CORE PROJECTS

High-Impact Weather Project (HIWeather)

Improvement of high impact weather forecasts, their communication and utility on timescales from minutes to two weeks

Subseasonal to Seasonal Project (S2S)

Improve forecast skill and understanding of predictability on the subseasonal to seasonal timescales and promote uptake and exploitation by community

Polar Prediction Project (PPP)

Enable development of improved weather and environmental prediction services for polar regions on time scales from hours to seasons

Current RDP/FDP:

AvRDP Phase II
Paris Olympics 2024
TC dynamic Cones

WORKING GROUPS

Data Assimilation and Observing Systems

Nowcasting and Mesoscale Research

Joint Forecast Verification Research

Tropical Meteorology Research

Socio-economic Research Applications

Predictability, Dynamics and Ensemble Forecasting

Expert Team on Weather Modification

CROSS-CUTS

Working Group on Numerical Experimentation (joint across WMO)

WWRP 2016 - 4

Catalysing Innovation in Weather Science:

WWRP Implementation Plan 2016-2023



SOCIETAL CHALLENGES

High-Impact Weather
Water
Urbanization
New Technologies



WMO OMM



Proposed WWRP Umbrella Framing and Structure (2024-2027)

Framing and
guiding
principles

AWAR³E Advancing **W**eather **R**esearch to **R**educe **R**isk to Soci**E**ties

Ensure that people are **aware** of threats and mitigation actions

Be **aware** of all people and their needs

Make society **aware** of our science

Increase forecasters' and decision makers' **awareness** of appropriate tools and techniques

Ensure that researchers are **aware** of each other's work:

Projects to
provide
improvements

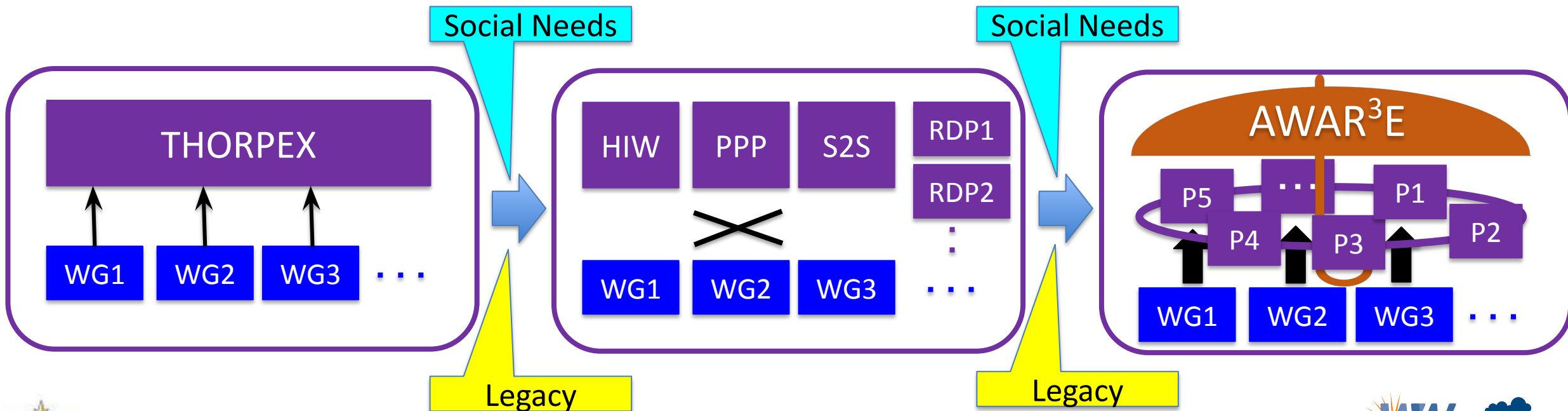
Projects (HIW, TC-PFP, AvRDP, Paris, and new Projects)

Expertise that
fuels projects

Working Groups and others: Reservoirs of Expertise and Innovation

WWRP Activity - Structure History

- 1998 Established
- 2003-2013 THORPEX (The Observing-system Research and Predictability EXperiment)
 - One big project with supporting WGs
- 2013-2023 Three Core Projects (HIW, PPP, S2S) and WGs/ET with RDPs/FDPs
- 2024-2027 Projects (RDP/FDP) under principle “AWAR³E” with contributions from WGs and with Partners



Projects in 2024 and beyond

- **Current Projects**

- High-Impact Weather Core Project (through 2024)
- Paris Olympics 2024 RDP (through 2024)
- Aviation-2 RDP (through 2025)
- Tropical Cyclones-Probabilistic Forecast Products (through 2025)

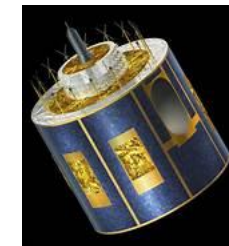
Note.

RDP ... Research and Development Project

FDP ... Forecast Demonstration Project

- **Proposed New Projects**

- Polar Research RDP (2024-2028)
- S2S prediction Application for agriculture and water resources RDP (2024-2028)
- Urban-scale Prediction RDP (2025-2029)
- Integrated Hydrology and Precipitation RDP (2024-2028)
- Satellite based nowcasting for Africa (FDP) (2023-2027) ... Partner project
- Public Engagement for Practitioners, Learners, and Educators (2023-2027)



Proposed Project: SAGE (S2S Applications for aGriculture and Environment)

Research Foci	<ul style="list-style-type: none">✓ Improving sub-seasonal to seasonal prediction with coupled atmosphere-ocean-land systems✓ Understanding sources of predictability✓ Improving on operational products and their use for agriculture, energy and water management
Partners (but not limited to)	WCRP/ESMO and GEWEX, SERCOM/SC-AGR (Agriculture) and SG-ENE (Energy), INFCOM/Joint ET on Earth Observing System Design and Evolution
Working Group or Expert Team	JWGFVR, PDEF, DAOS, SERA, TMR, HAP
Expected period	2024-2028

Scientific questions to be addressed by SAGE

- How to exploit S2S predictability limit to achieve skilful prediction up to 4 weeks and beyond?
- How to prioritize important processes (teleconnections, physical parametrizations, coupled data assimilation, model resolution, initialization, biases...) to get improved predictions?
- How to improve the skill with new observations and/or new strategy for incorporating observations?
- How S2S probabilistic products are being used and what is the prospect of being used in untapped areas in decision-making for region-specific extreme conditions in various sectors particularly water, agriculture and energy?
- What are the major research advances and products that have not been adequately incorporated in the operational practices? And how to treat feedbacks from the industry to science teams?
- What is needed to communicate inherent uncertainty in the prediction and how to facilitate users to interpret these uncertainties in their decision making?
- How to involve users in forecast verification, bias correction, calibration and uncertainty estimation for the optimization of S2S operational products?

Brief Summary of WWRP Symposium 2022 (from S2S Discussion)

Discussion basis

1) Proposed Implementation Plan

2) Input by Guest Speakers

“S2S Real-Time Pilot” by Dr. Joanne Robbins

“Applications in Australia” by Dr. Debbie Hudson

“Application for Energy” by Dr. Alberto Troccoli

“Agricultural water management” by Dr. Subimal Ghosh

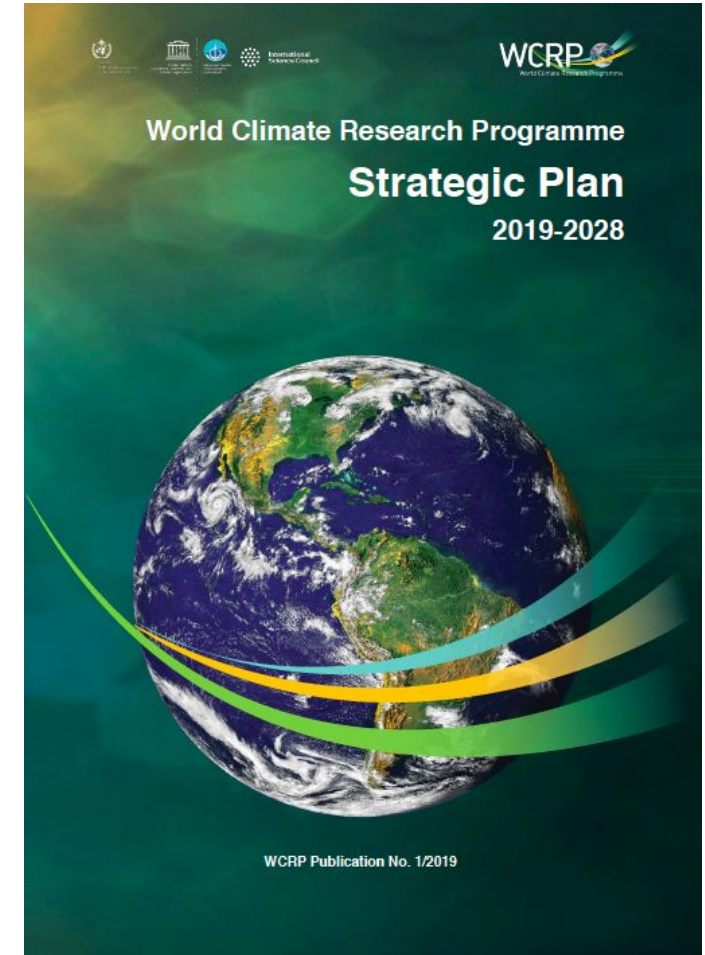
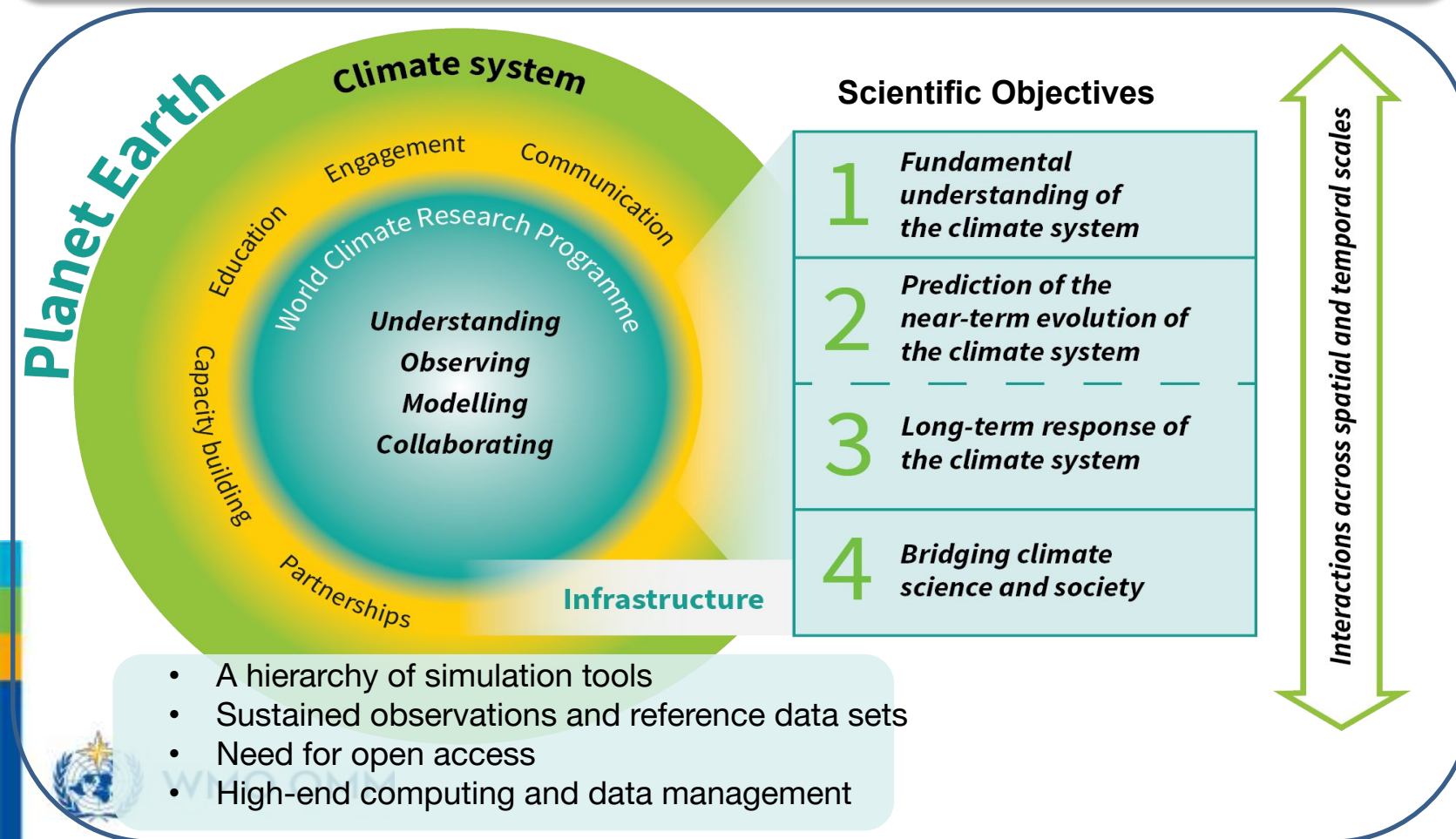
“Keys for Monsoon research” by Dr. Krishnan Raghavan

Key messages (some are not limited to S2S)

- ✓ Probabilistic information is a central component of prediction and how to share this with users is still a big challenge.
- ✓ Accurate forecast skill does not necessarily reflect the values of users.
- ✓ Both physical and social sciences need to be integrated from the **beginning**.
- ✓ Co-design, co-development, and co-evaluation.
- ✓ Include next generation leaders in SGs and WGs (e.g., YESS)

A new WCRP Strategic Plan for this decade

WCRP's Mission (*purpose*) is to coordinate and facilitate international climate research to develop, share and apply the climate knowledge that contributes to social well-being



www.wcrp-climate.org/wcrp-sp-overview

WCRP's New Structure

Joint Scientific Committee

WCRP Secretariat

Lighthouse Activities

International Offices

Core Projects and Research Communities

- Climate and Cryosphere (CliC)
- Global Energy and Water Exchanges (GEWEX)
- Climate and Ocean Variability, Predictability and Change (CLIVAR)
- Stratosphere-troposphere Processes And their Role in Climate (SPARC)
- Earth System Modelling and Observations (ESMO)
- Regional Information for Society (RIfS)

Ongoing Activities and Fora

- Fixed-term projects
- Conferences and workshops
- Reference datasets, evaluations and benchmarking
- Diversity and capacity building: ECRs, regions
- Rapid updates, syntheses, assessments, gap analysis
- Communications and outreach

ESMO: Vision and Goals

Overall coordination mechanism across **all model, data and observations activities** within WCRP

1. Research

- Seamless and value-chain approach
- Across Earth system components, disciplines, time and spatial scales
- Model systematic biases and development
- Observational requirements to monitor, understand and predict the climate system

2. Infrastructure

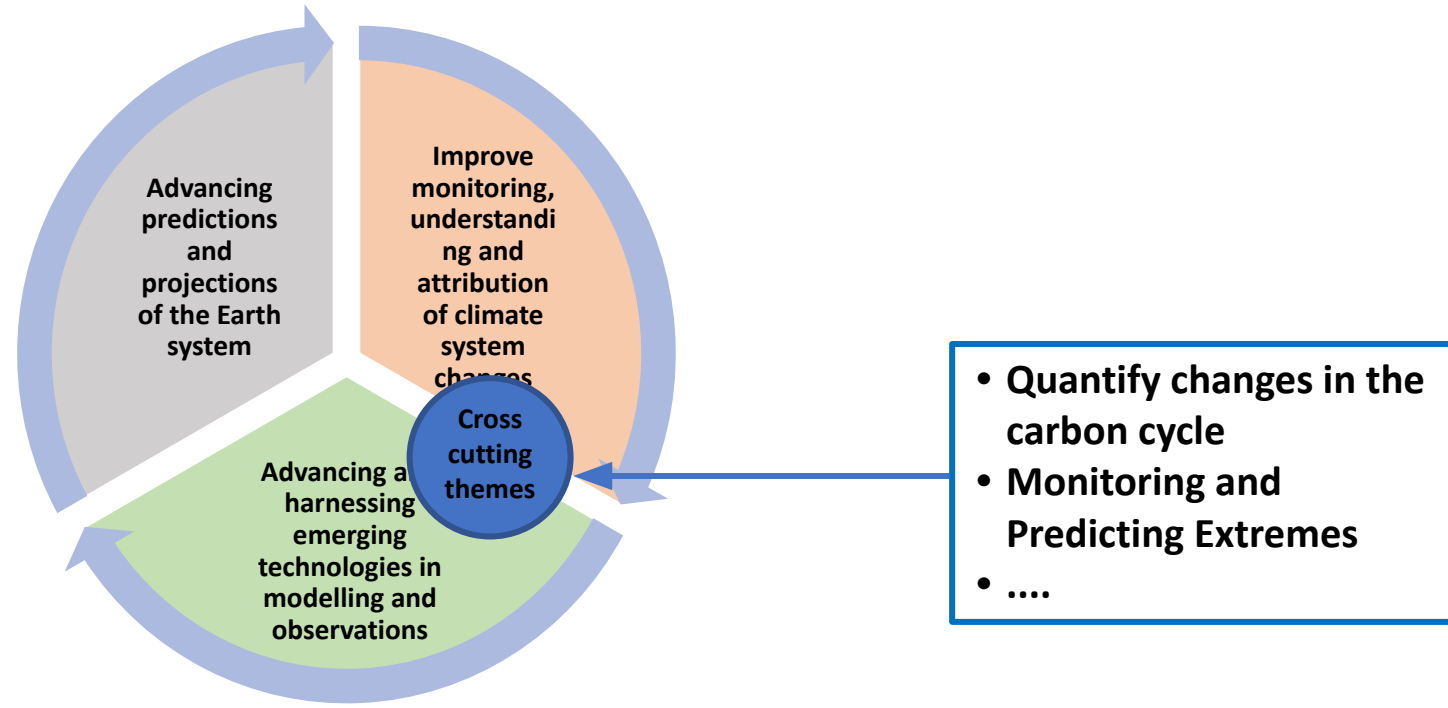
- Integrated modelling and data infrastructures, data policy, protocols and standards

4. Access and communication

- Share best practices, data, knowledge, opportunities
- Engagement, equal access and inclusion of the 'global south'
- Communication across WCRP constituencies, communities, partners, stakeholders

ESMO Objectives

- Three scientific objectives that will underpin and integrate the next decade of climate science modelling, data assimilation and observational activities
- Informed by the most pressing shortcomings in our ability of monitoring, predicting, and projecting the climate system from **days to centuries and from local to global spatial scales**
- Advance the core capabilities of the WCRP programme



- Recognise there is overlap with core projects, LHAs and work will continue where there is existing expertise
- ESMO focus on coordination of specific priority topics
- Themes where there is potential for strong collaboration across WCRP to obtain rapid results and benefits

ESMO: Evolving Structure

Cross-cutting Modelling Science

- Seamless ES modelling
- Multi-scale processes
- Process-based diagnostics
- Initialisation
- Global, regional and local climate change, extremes
- Km-scale modelling
- Urban environments

- Climate feedbacks
- ES model evaluation
- Modelling past climates (for re-analysis & uncertainty estimation)

Earth System Modelling

Earth System Assimilation

Coordination and knowledge transfer

Resolution

Weather

WGNE

S2S

DAOS

TIRA

Obs4MIPs

WGSIP

WGCM

CMIP/WIP

Earth Observations

New Obs Panel?

- Interface with external bodies
- Coordinate requirement across all WCRP

Multi-decadal

Complexity

Science on tools & methodologies: DA, ML,... ; Preparing for Exascale ; I/O & data handling; ... **Infrastructure needs:** Data governance ; diagnostic tools ; cloud – data access & distribution verification/validation/uncertainty quantification

WCRP Lighthouse Activities

Major and new scientific approaches, technologies, and institutional frameworks required to meet society's need for robust and actionable climate information

My Climate
Risk

Explaining and
Predicting Earth
System Change

Digital
Earths

Safe Landing
Climates

WCRP
Academy

WCRP Open Science Conference 2023 in Rwanda



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PROGRAM ▾

THE COMMITTEES ▾

OUR SPONSORS



WORLD CLIMATE
RESEARCH PROGRAMME
**OPEN SCIENCE
CONFERENCE**
23 - 27 OCT. 2023 | RWANDA

- ✓ Having OSC in Africa indicates the important meaning not only for Africa but also for any region.
- ✓ It is a good opportunity not only to present and share your knowledge, but also to express your thoughts on future direction and to learn regional/global needs.

WCRP Open Science Conference 2023
**ADVANCING CLIMATE SCIENCE
FOR A SUSTAINABLE FUTURE**



ITES



CALL FOR SIDE EVENTS



EARLY TO MID-CAREER RESEARCHER CORNER



NEWS & ANNOUNCEMENTS



WMO OMM



WCRP
World Climate Research Programme

Concluding Remarks/Messages

- ✓ WWRP has been discussing to develop a new Implementation Plan for 2024-2027, while WCRP has just stepped out into the next stage with their new strategic plan.
- ✓ Both look at the same social needs but from different aspects with each strong points. Seamless collaboration between two and with other partners are expected from the beginning.
- ✓ Slides shown today do not necessarily reflect the actual WWRP IP yet. But it contains some key messages. They are;
 - Two strong dimensions for the success of Application project: 1) Physical Science (improve forecast skill), and 2) Social science (User interaction, engagements).
 - Although sharing probabilistic products with users is still a challenge, co-design/co-development/co-evaluation will provide a clue to solve.
- ✓ Proposed Implementation Plan conveys disciplines but not contain details of targeted topics (such as agriculture, energy, water managements) and their methods, because it requires “co-design” (so any of you can contribute).
- ✓ S2S RTP will definitely contribute to a basis for the future S2S application project. Knowledge obtained through RTP should be properly and effectively shared.

This is easier and better to understand ???



IMPLEMENTATION PLAN 2024-2027

