The role of WGNE in light of WMO Reform

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WCRP Joint Planning Staff

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WEATHER CLIMATE WATER
TEMPS CLIMAT EAU

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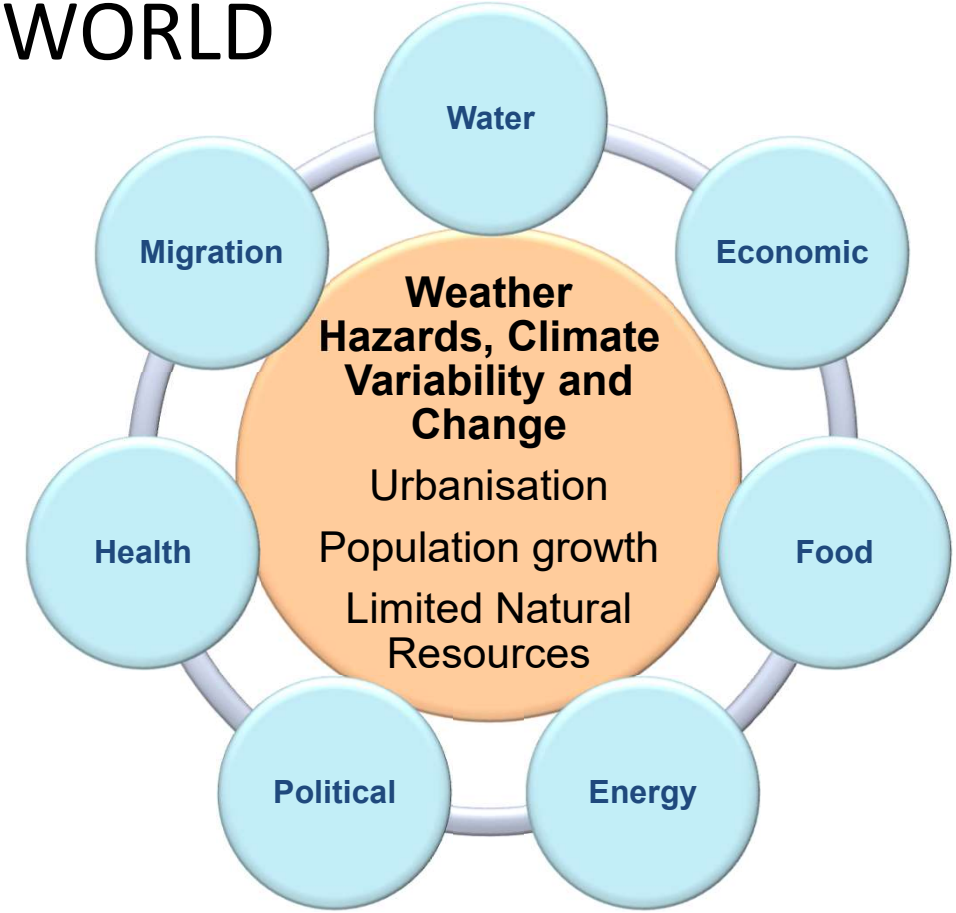
Organisation météorologique mondiale

21st CENTURY CHALLENGES IN AN INTERCONNECTED WORLD

Exposure to extreme weather and climate events threatens the sustainability of economic development and social welfare across the globe, and the securities on which we rely for our health and well-being.



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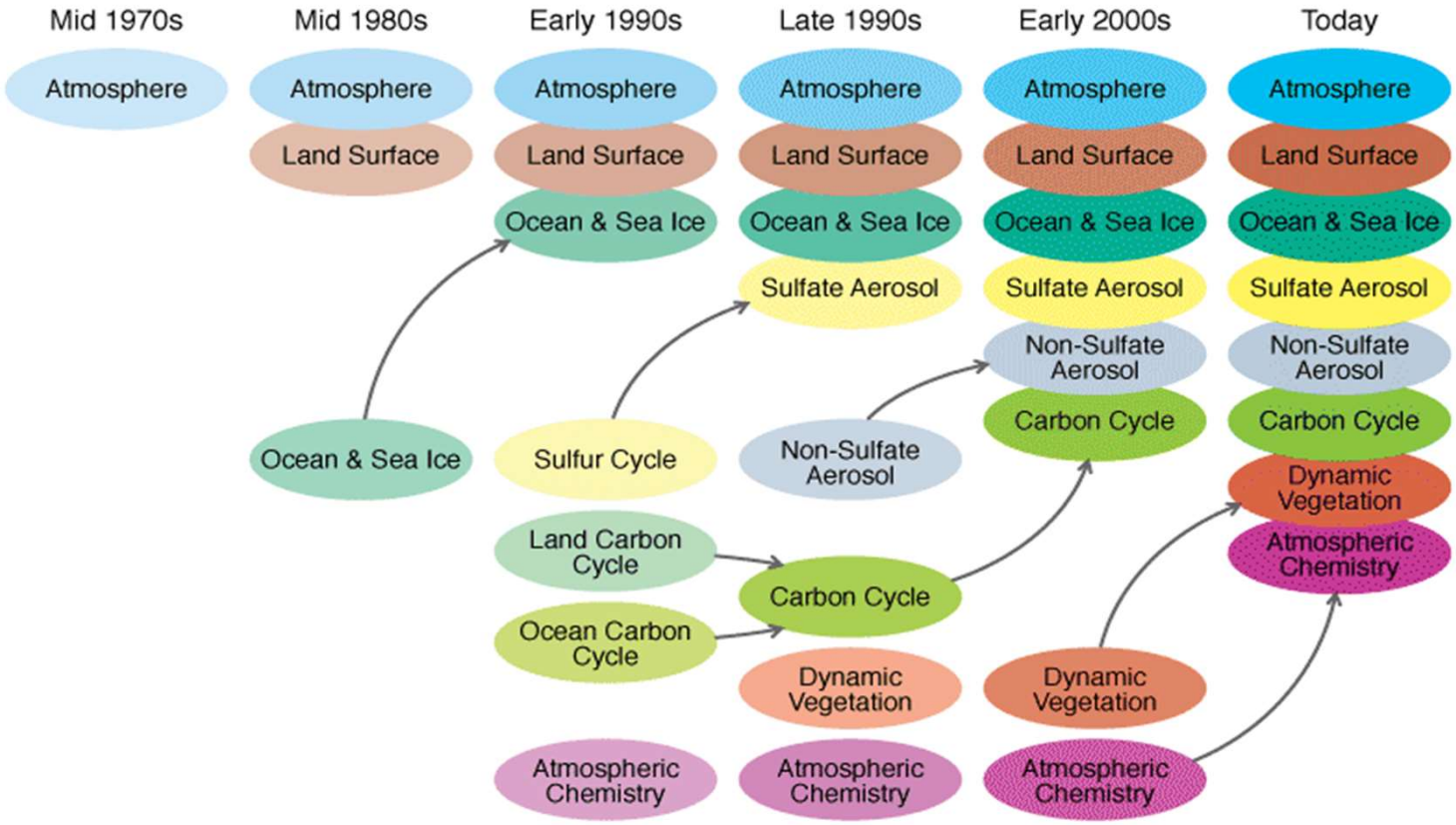
There is no logical scientific argument for separating the physical climate system from full Earth system science

Evolution of Climate Models to Earth System Models



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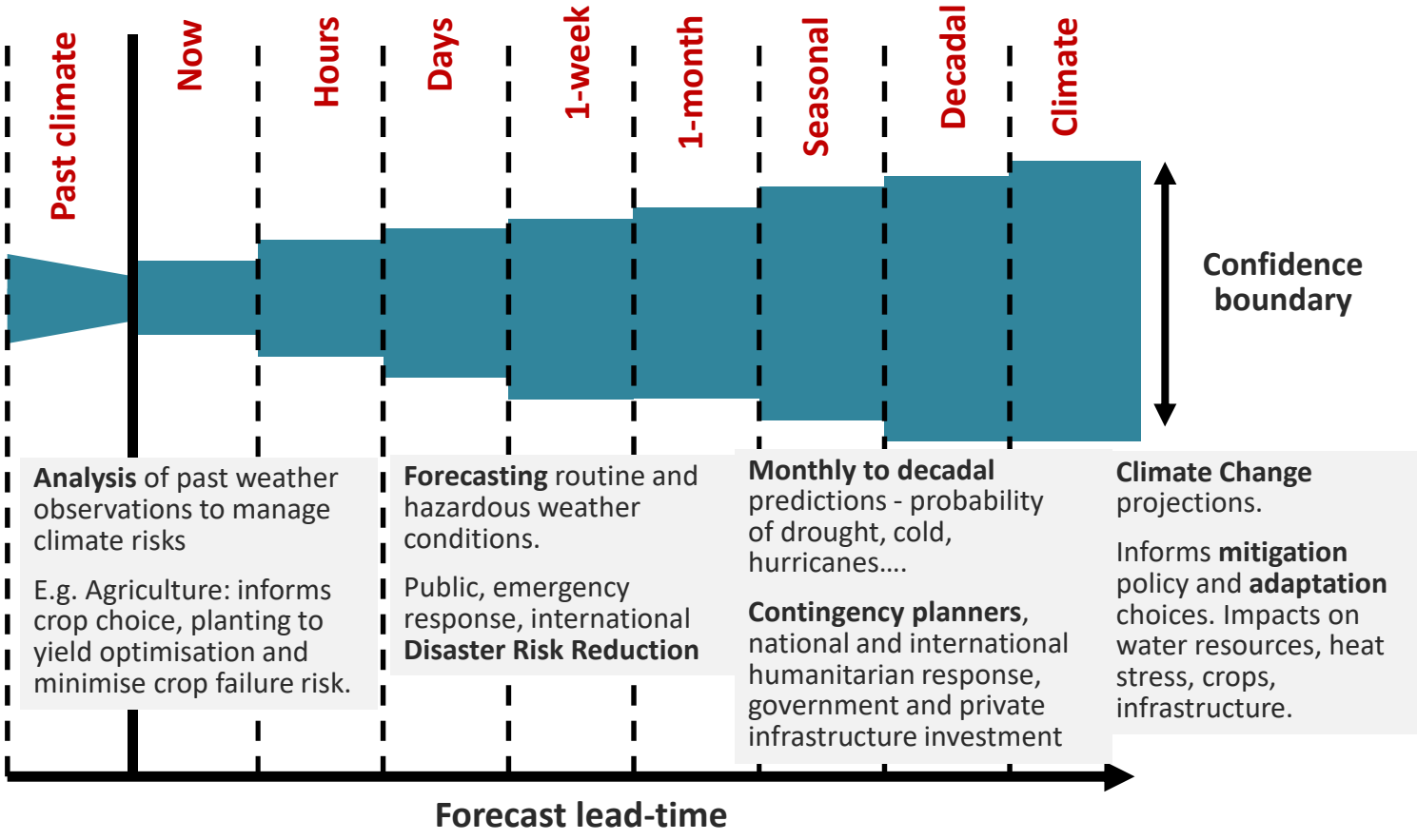
New Tools in the Toolbox:

Seamless Prediction Across Timescales



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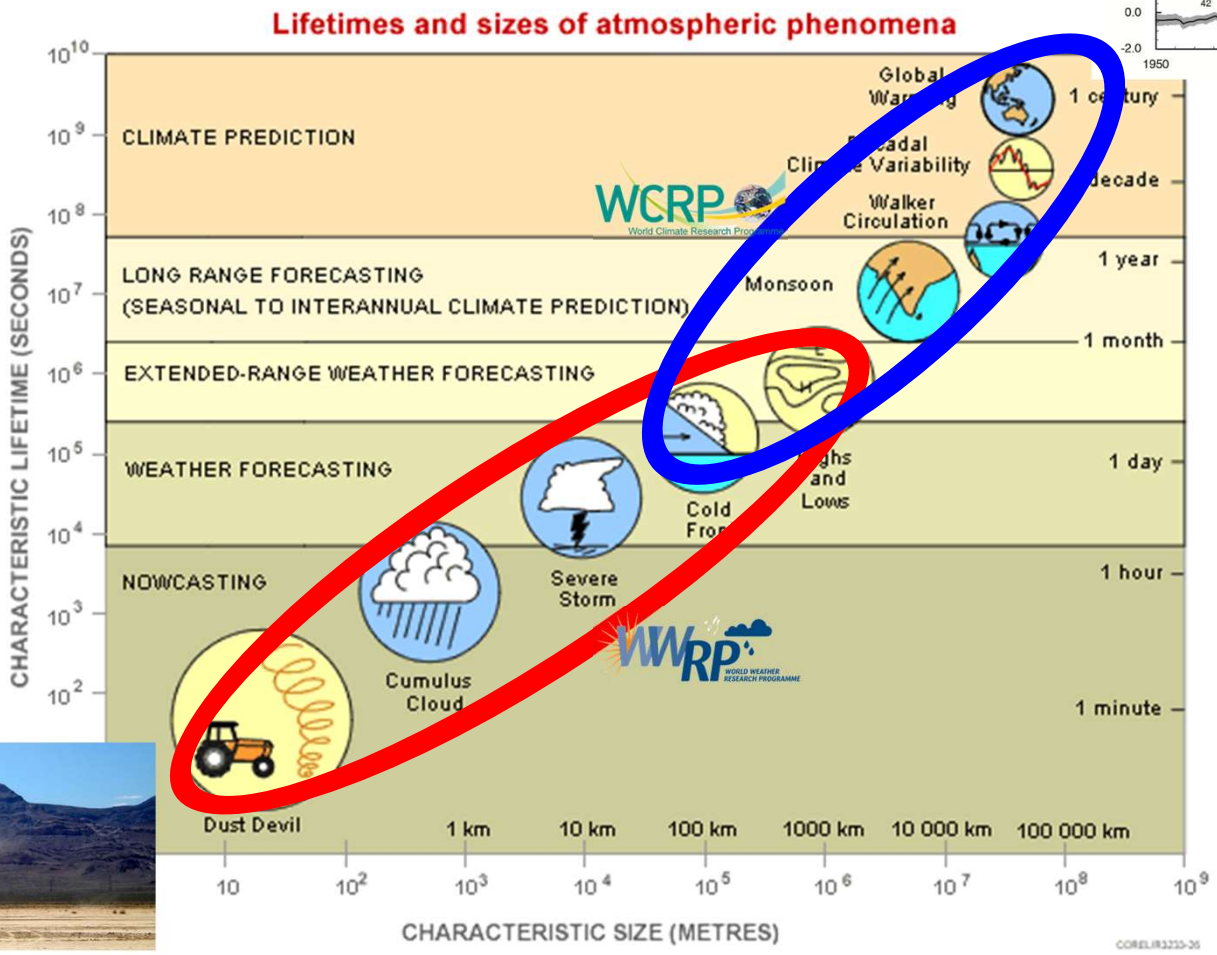
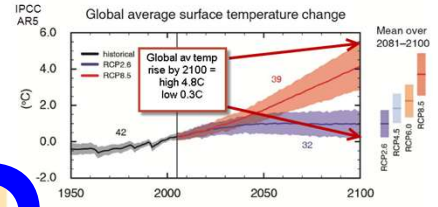
Weather and Climate Research





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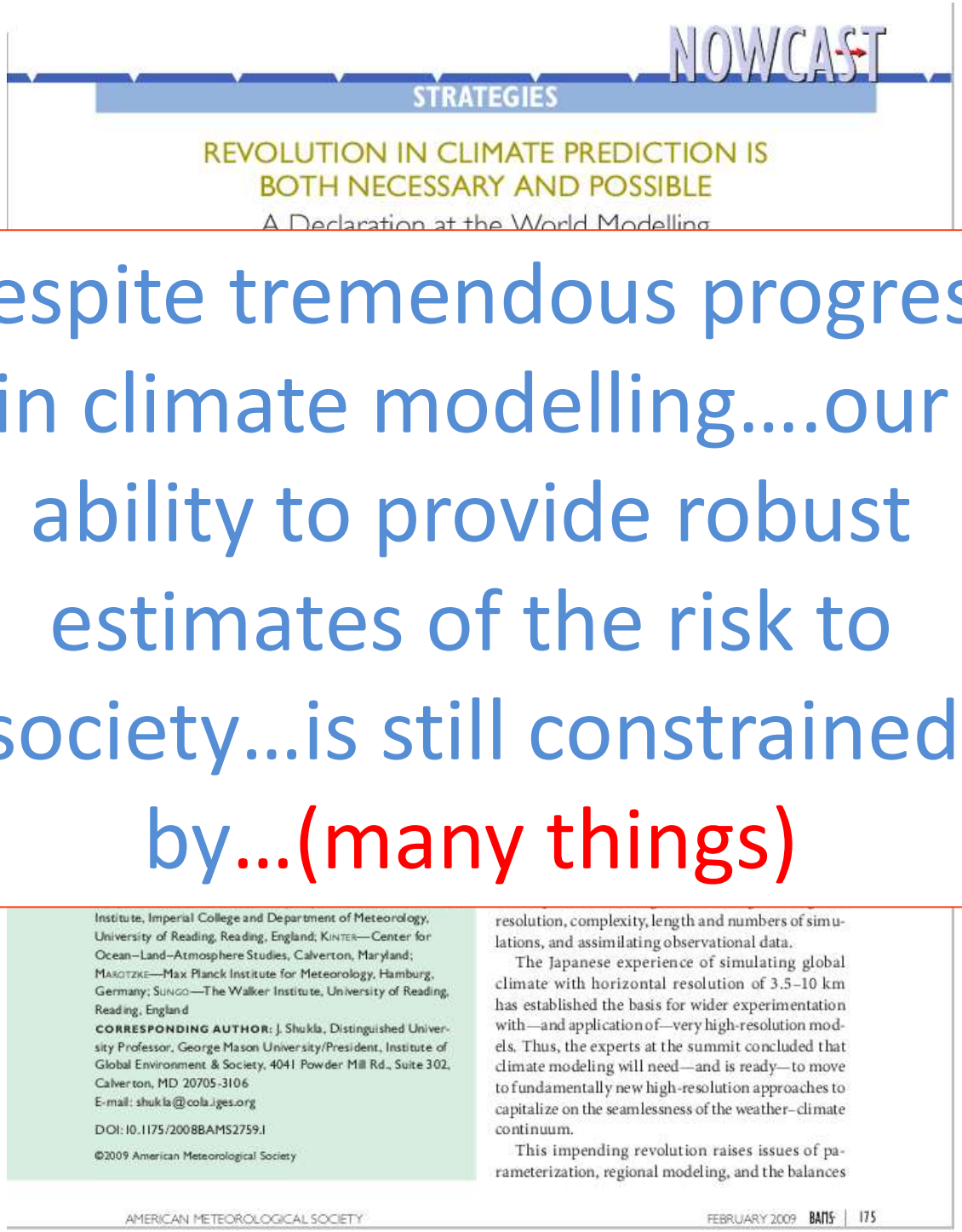

NOWCAST

STRATEGIES

REVOLUTION IN CLIMATE PREDICTION IS BOTH NECESSARY AND POSSIBLE

A Declaration at the World Modelling

Despite tremendous progress in climate modelling….our ability to provide robust estimates of the risk to society…is still constrained by…(many things)

Institute, Imperial College and Department of Meteorology, University of Reading, Reading, England; KINTER—Center for Ocean–Land–Atmosphere Studies, Calverton, Maryland; MARQTZKE—Max Planck Institute for Meteorology, Hamburg, Germany; SUNGO—The Walker Institute, University of Reading, Reading, England

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resolution, complexity, length and numbers of simulations, and assimilating observational data.

The Japanese experience of simulating global climate with horizontal resolution of 3.5–10 km has established the basis for wider experimentation with—and application of—very high-resolution models. Thus, the experts at the summit concluded that climate modeling will need—and is ready—to move to fundamentally new high-resolution approaches to capitalize on the seamlessness of the weather–climate continuum.

This impending revolution raises issues of parameterization, regional modeling, and the balances

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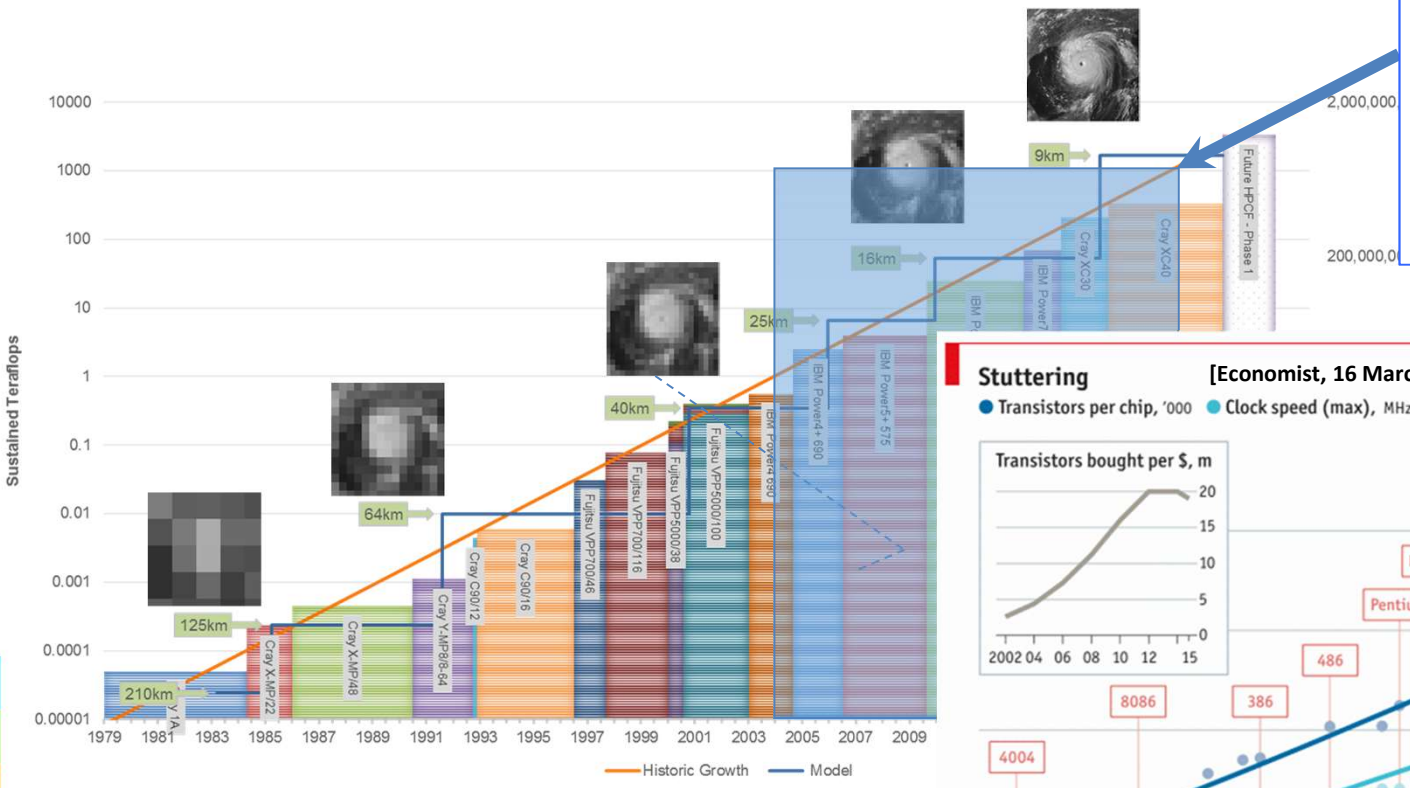
Exascale computing

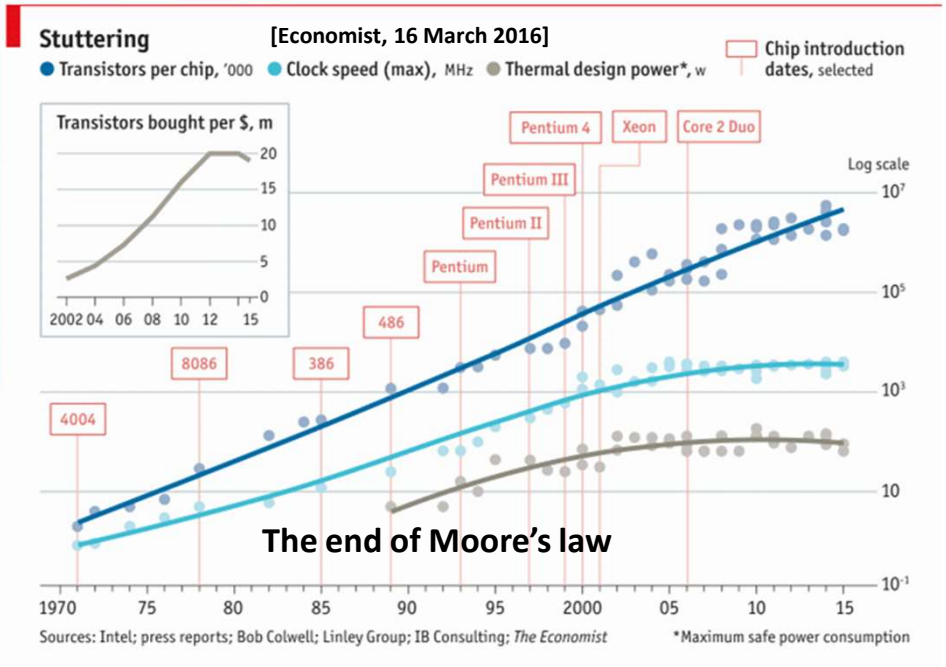
What does x1000 mean?

In the past:
x1000 = 15 years = 10^{15} scale
= 2 M€ electric power / year

In the future:
x1000 = ?? years = 10^{18} scale
= ?? M€ electric power / year

Codes are only 5% efficient!





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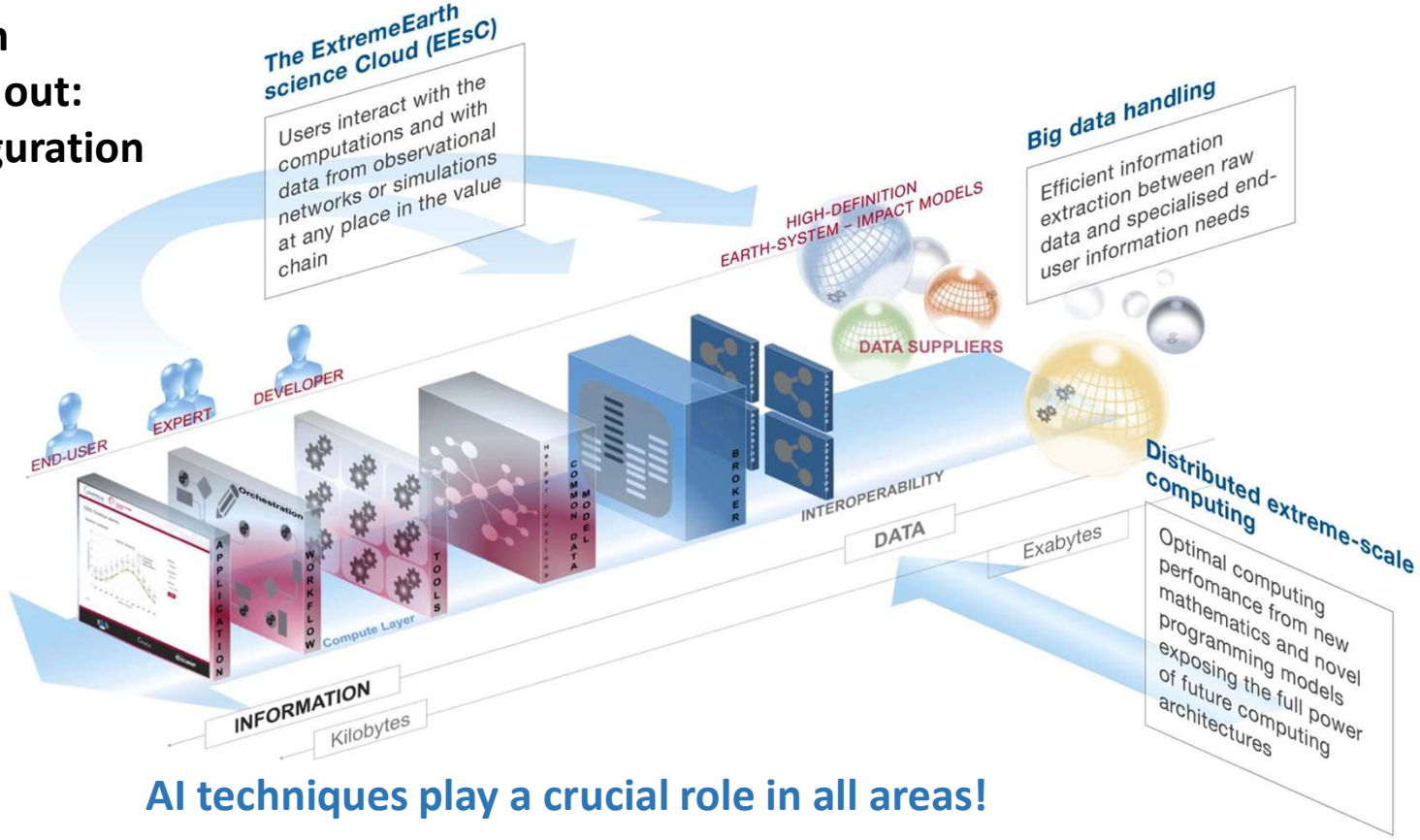
Machine learning

Convergence of Key Technologies through EEsC

The EEsC will turn workflows inside out: users drive configuration of models and observations



AI techniques play a crucial role in all areas!

ExtremeEarth

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… a new challenge – how will our (near) future (climate & weather) models look like?

- Why do we need *ExtremeEarth*?
- What is the scientific reasoning behind *ExtremeEarth*?
- What are the key technologies for realizing *ExtremeEarth*?
- How will *ExtremeEarth* produce socio-economic impact?
- What is the *ExtremeEarth* partnership?

www.extremeearth.eu

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Istituto Nazionale di Geofisica e Vulcanologia
Universiteit Utrecht
METEO FRANCE
UK Research and Innovation
ECMWF
European Commission
MAX-PLANCK-GESELLSCHAFT
UNIVERSITY OF OXFORD
JÜLICH FORSCHUNGSZENTRUM
ETH zürich
cnrs
cmcc Centro Euro-Mediterraneo sui Cambiamenti Climatici
eScience center
Deltares Enabling Delta Life
DTU
BSC Barcelona Supercomputing Center Centro Nacional de Supercomputación
Climate Centre
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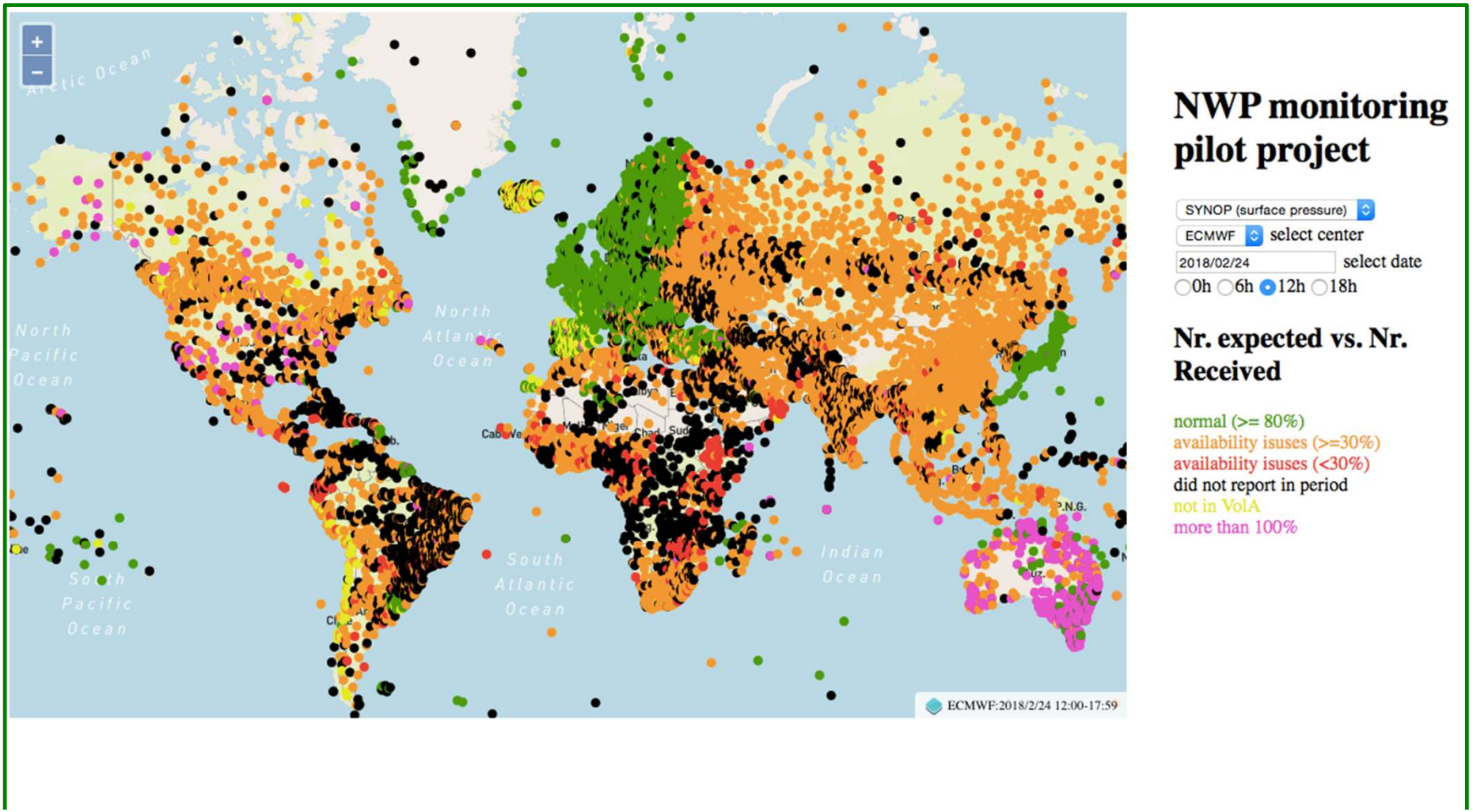
Global observing system enhanced

- Considerably enhanced observing network and delivery for global use => enhanced quality of forecasts worldwide
- Also e.g. radar and lightning detection data freely exchanged (Resolution 40)

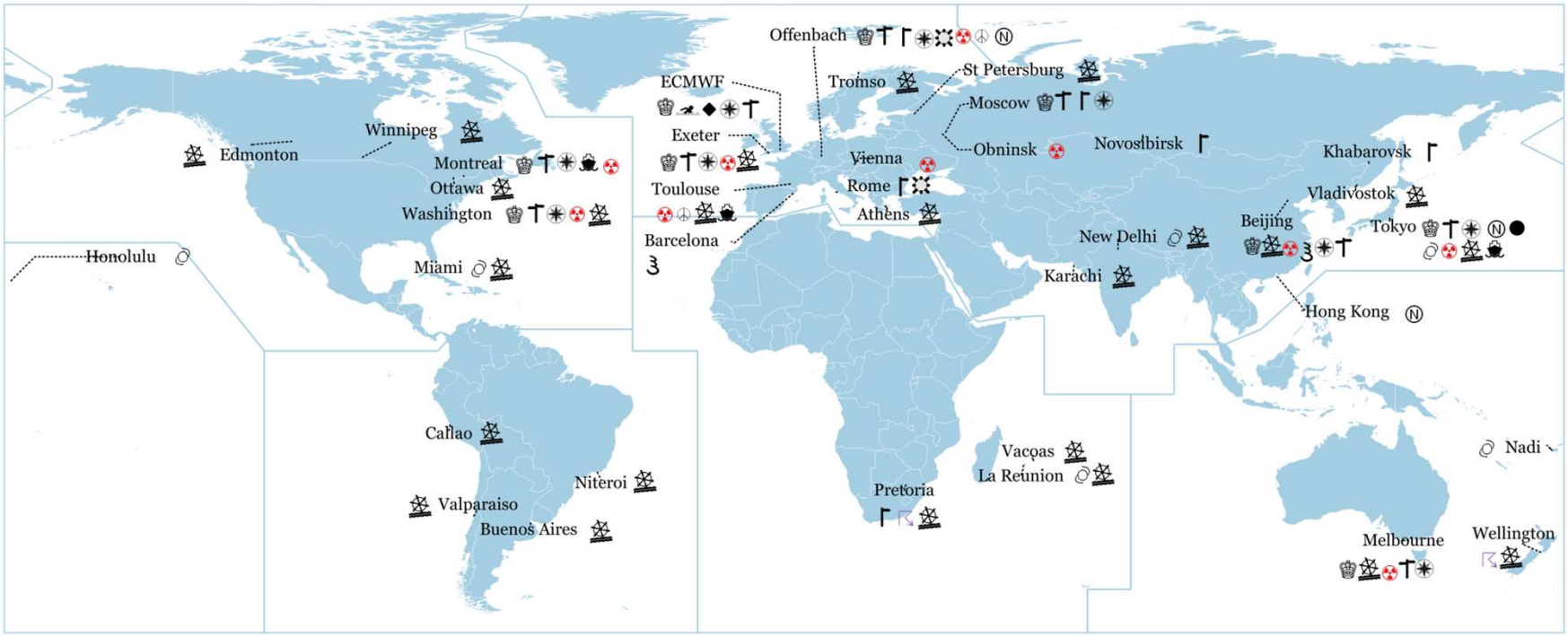


All WMO Members should have access to high quality forecast products

WMO Designated Global Data-processing and Forecasting System Centres

- Nowcasting and Weather Forecasting (upto 30 days)

Updated on 26 September 2018



Legend

- World Meteorological Centres (WMCs)* (9)
- RSMCs(NRT***) Lead Centre for Coordination of Wave Forecast (1)
- RSMCs(NRT***) Lead Centre for Coordination of EPS Verification (1)
- RSMCs(NRT***) Lead Centre for Coordination of DNV (1)
- RSMCs Numerical Ocean Wave Prediction (3)
- RSMCs Severe Weather Forecasting (2)
- RSMCs TC (6)
- RSMCs Marine Meteorological Services (24)
- RSMCs Nuclear Emergency Response** (10)
- RSMCs Non-Nuclear Emergency Response** (2)
- RSMCs Sand Dust (2)
- RSMCs Nowcasting (3)
- RSMCs Limited Area Ensemble NWP (2)
- RSMCs Global Ensemble NWP (9)
- RSMCs Limited Area Deterministic NWP (6)
- RSMCs Global Deterministic NWP (9)

* World Meteorological Centres are also Global Producing Centres for a) Deterministic Numerical Weather Prediction, b) Ensemble Numerical Weather Prediction, and c) Long-Range Forecasts.
** RSMC for nuclear and non-nuclear emergency response have Atmospheric Transport and Dispersion Modelling (ATDM) capabilities.
*** NRT stands for Non-Real-Time

CONSTITUENT BODIES REFORM (CBR)

1873

2050

WMO for the 21st Century

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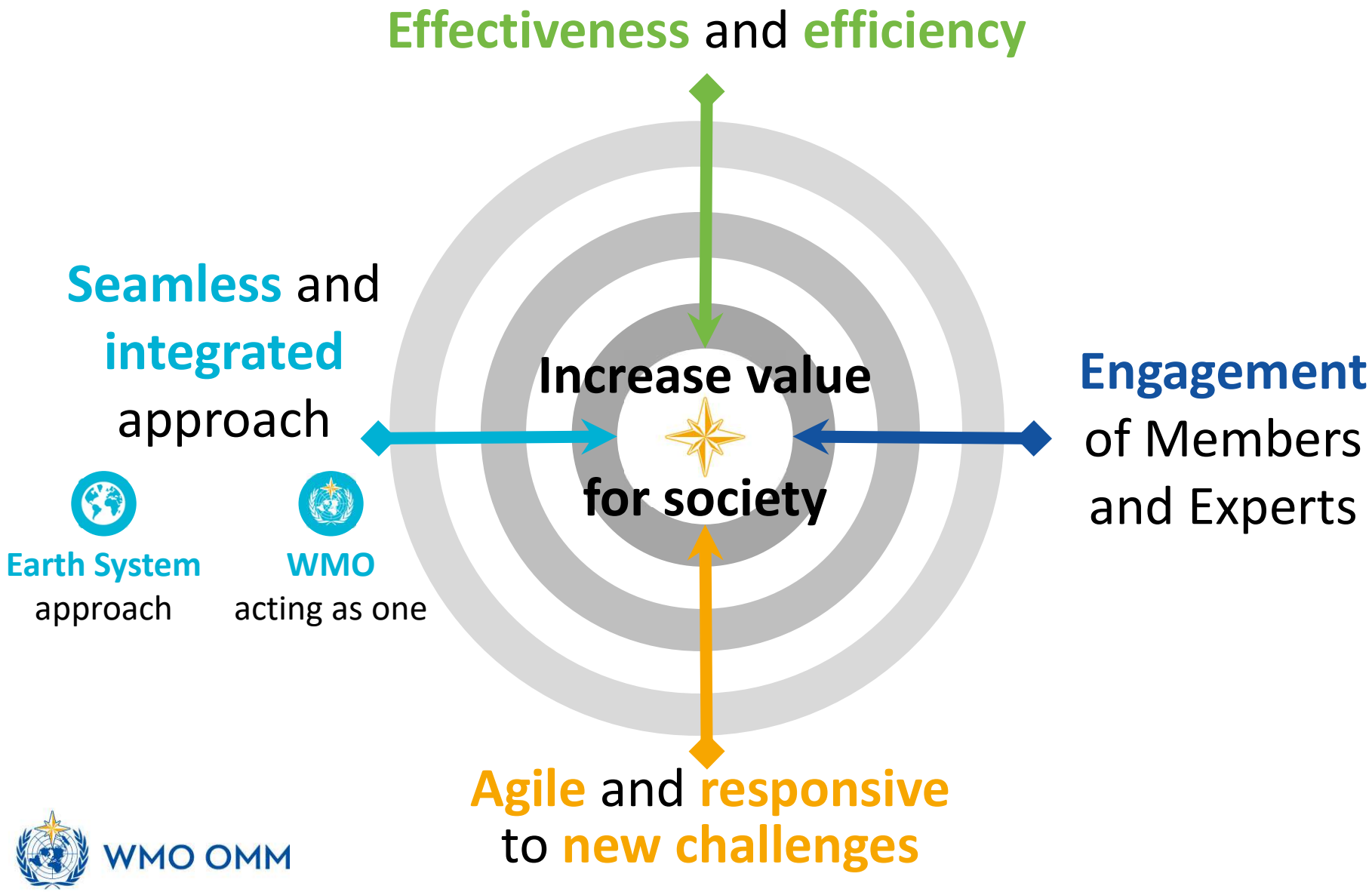
REFORM OBJECTIVES



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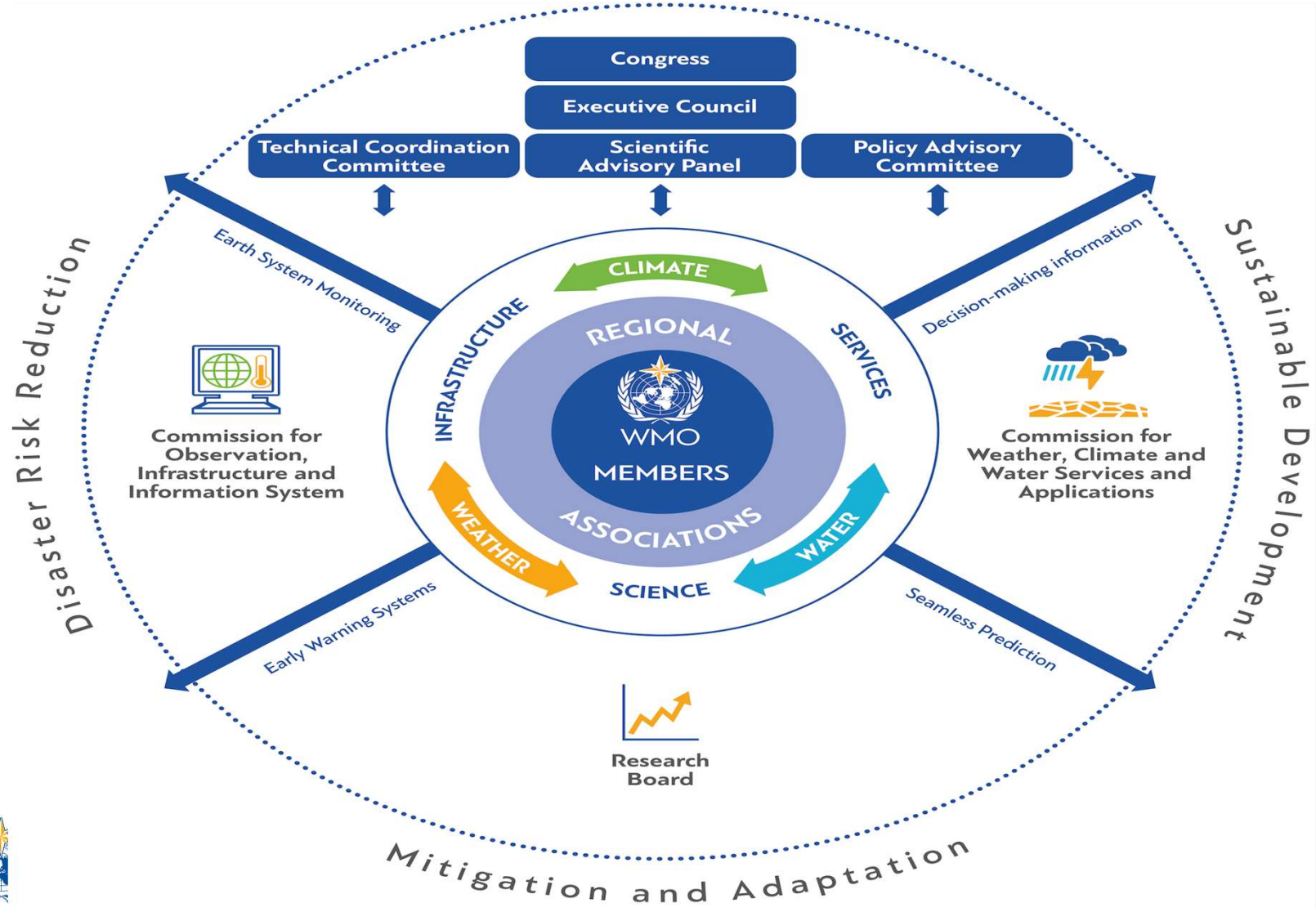
Future WMO: Integrated seamless Earth-system science and science for services approach



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Thank you
Merci

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WMO STRATEGIC PLAN 2020-30

VISION 2030

A world where **all nations**, especially the **most vulnerable**, are **more resilient** to the **socioeconomic impact** of **extreme weather, climate, water** and other **environmental events**, and **empowered** to boost their **sustainable development** through the **best possible weather, climate and water services**

OVERARCHING PRIORITIES

- Preparedness for, and reducing losses from hydrometeorological extremes
- Climate-smart decision-making to build resilience and adaptation to climate risk
- Socioeconomic value of weather, climate, hydrological and related environmental services

CORE VALUES

- **Accountability** for Results and **Transparency**
- **Collaboration** and **Partnership**
- **Inclusiveness** and **Diversity**

LONG-TERM GOALS

1 Services	2 Infrastructures	3 Science & Innovations	4 Member Services	5 Smart Organization
Better serve societal needs	**Enhance Earth system observations and predictions**	**Advance targeted research**	**Close the capacity gap**	**Strategic realignment of structure and programmes**

STRATEGIC OBJECTIVES

FOCUSED ON 2020-23

1 Services	2 Infrastructures	3 Science & Innovations	4 Member Services	5 Smart Organization
• Strengthen **national multi-hazard early warning/alert systems** • Broaden provision of **policy- and decision-supporting climate, water** and **weather services**	• Optimize observation data acquisition • Improve access to, exchange and management of **Earth system observation data and products** • Enable access and use of **numerical analysis and prediction products**	• Advance **scientific knowledge of the Earth system** • Enhance **science-for-service value chain** to improve predictive capabilities • Advance **policy-relevant science**	• Enable developing countries to **provide** and **utilize essential weather, climate, hydrological** and related **environmental services** • Develop and sustain **core competencies** and **expertise** • Scale up **partnerships**	• Optimize WMO **constituent body structure** • Streamline WMO **programmes** • Advance **equal, effective** and **inclusive participation**

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SUSTAINABLE DEVELOPMENT GOALS/WMO

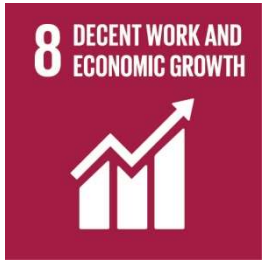
Weather resilience

Climate change & -services

Gender-sensitive services

Water resource management

Solar, wind & hydro use



Climate resilience

Big data, innovations

Air quality, heat waves, flooding

DRR, Adaptation, carbon & climate monitoring

Sea level rise, climate<->oceans

Climate change <->ecosystems

Climate driven conflicts

Resources for climate adaptation & DRR

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