

Climate Science for Society

World Climate Research Programme

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11th meeting of the Research Dialogue
20 June 2019, Bonn, Germany



International
Science Council



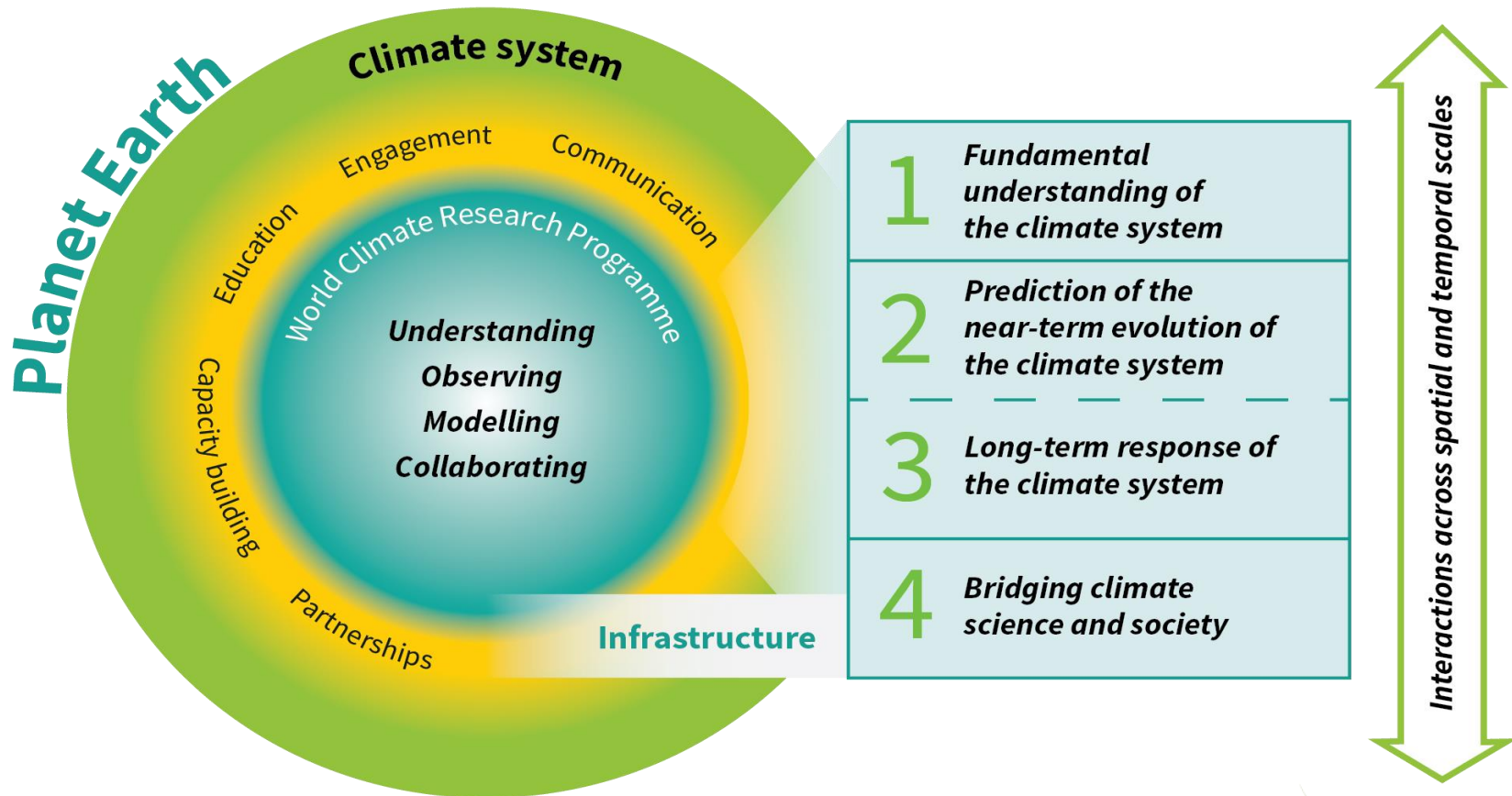
Major achievements in Research



WCRP Scientific Strategy 2019-2028

... toward a more resilient present and sustainable future for humankind...

<https://www.wcrp-climate.org/wcrp-sp>



Can we achieve the Paris target?

- Need to understand, assess, quantify and predict/project reservoirs and flows:

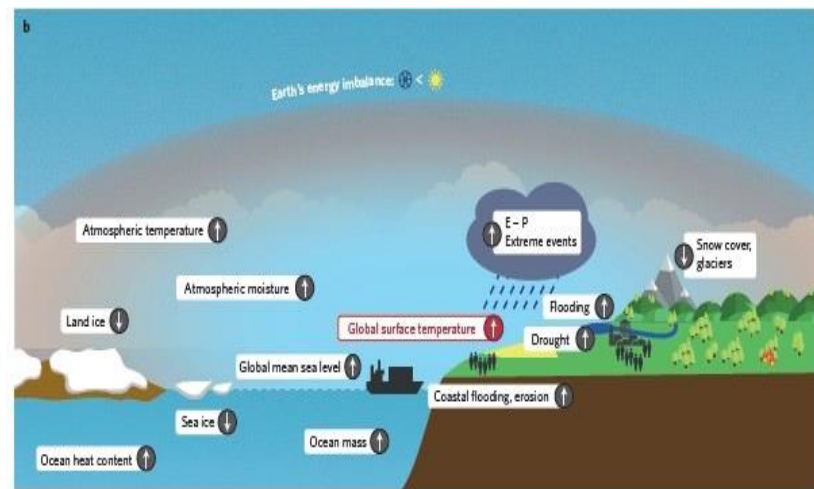
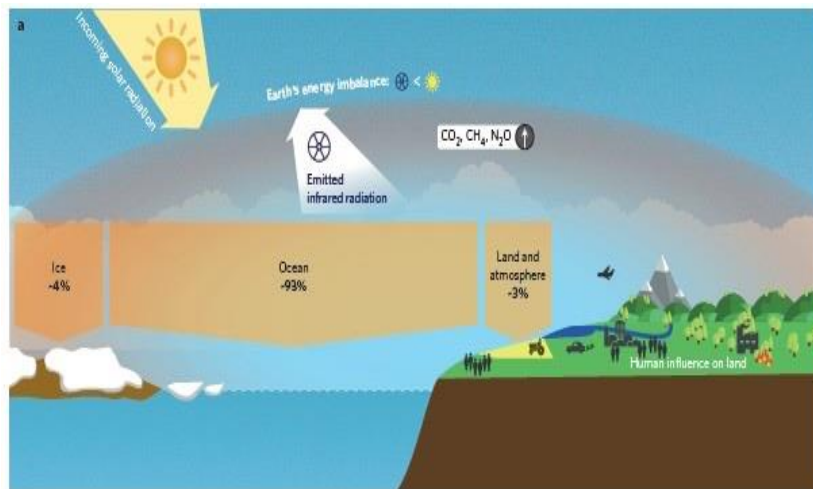
Where does the carbon go?

Where does the energy(heat) go?

...

- Closing the energy, water and carbon budgets within the Earth system is integral to **observing**, **assessing** and **simulating** climate change and variability, regionally and globally.

An integrated approach for climate indicators: Earth's Energy Imbalance



Absolute Value
Quantification
& uncertainty
assessment

Toward
sustained &
extended
global climate
observing
systems

Inventory
Toward improved
consistency for
global budget
constraint [Ocean,
Land, Cryosphere,
Atmosphere]

Assess
energy stored
in the Earth
system

Implications
Temporal and
spatial variation of
EEI & key forcing
processes

Global climate observations (in situ, remote sensing)

Reanalysis systems, Climate models



SPARC
Stratosphere-troposphere
Processes and their Role in Climate



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Can we achieve the Paris target?

- Need to understand, assess, quantify and predict/project reservoirs and flows:

Where does the carbon go?

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...

- Research on the effects and consequences of CO₂ removal and solar radiation management is critical for identifying promising approaches and avoiding unintended consequences.
(e.g. Carbon Dioxide Removal Model Intercomparison Project)
- **Climate knowledge/information as the foundation of policy setting:**
such as climate assessments based on CMIP outcomes.

Can we achieve the Paris target?

- Need to understand, assess, quantify and predict/project reservoirs

Key message:

Fundamental science is needed for the generation and delivery of decision-relevant information and knowledge, such as:

- State of the global climate
- Assessing and implementing global climate ambition
- Climate knowledge/information as the foundation of policy setting: such as climate assessments based on CMIP outcomes.

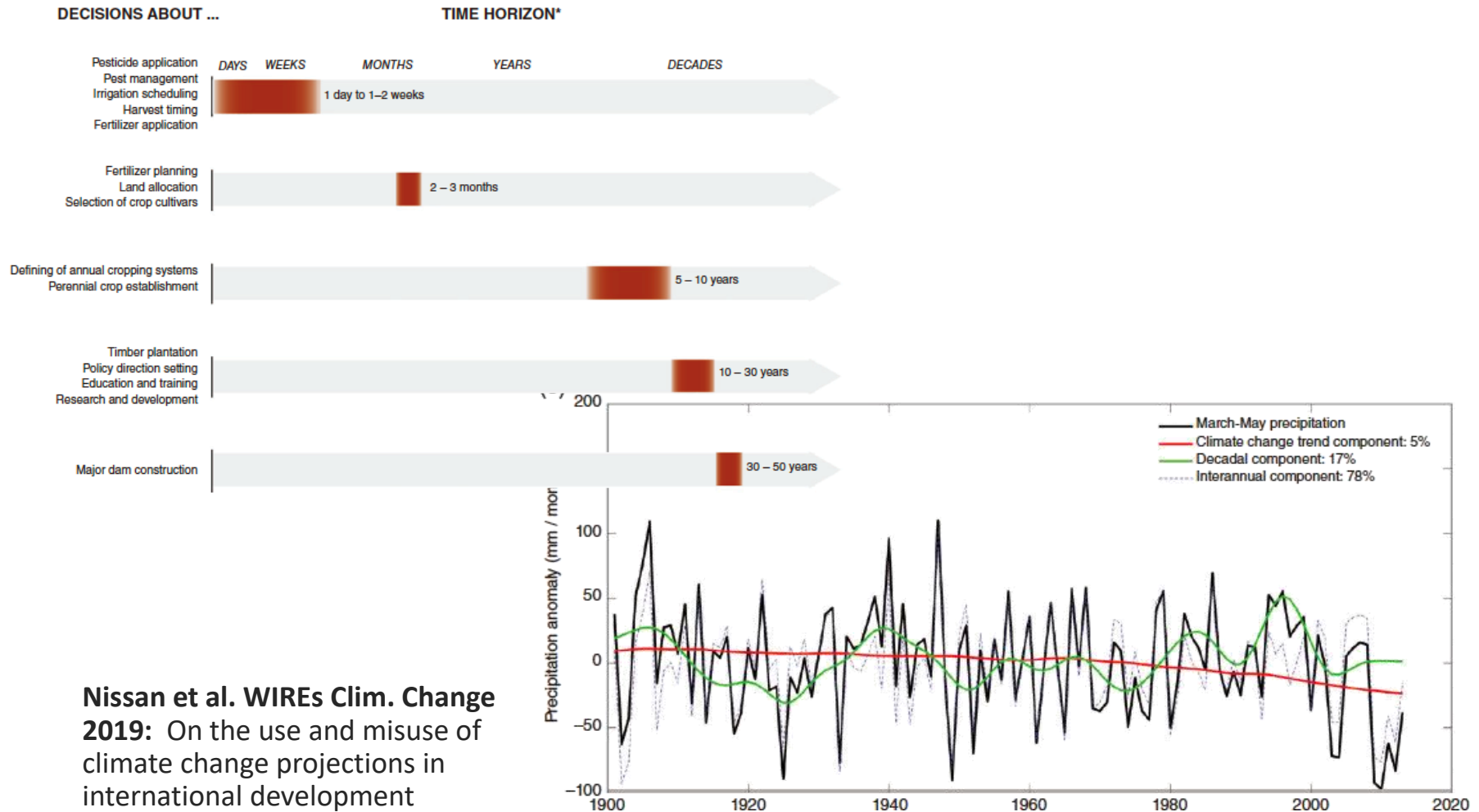
Climate, Changes, Impact & Resilience

Actionable climate information =

Salient and credible information on current and future states of climate, on required timescale and spatial range

- Determine the processes responsible for the existence of regional climate hotspots.
- Determine the potential for crossing thresholds and manifesting surprises.
- Translate extremes into risks.
- Systemic approach, compound events.
- Holistic approach: A long-term view is relevant to decision-making of now.

Climate, Changes, Impact & Resilience



Nissan et al. WIREs Clim. Change
2019: On the use and misuse of
climate change projections in
international development

Climate, Changes, Impact & Resilience

Key message:

Resilient society and sustainable future require collaborative efforts with multi-sectoral actors in all regions of the globe.

- Whole value chain for Research – Services – Decisions – Benefits
- Co-production of knowledge, co-design of solutions
- Connecting global to local scales for adaptation

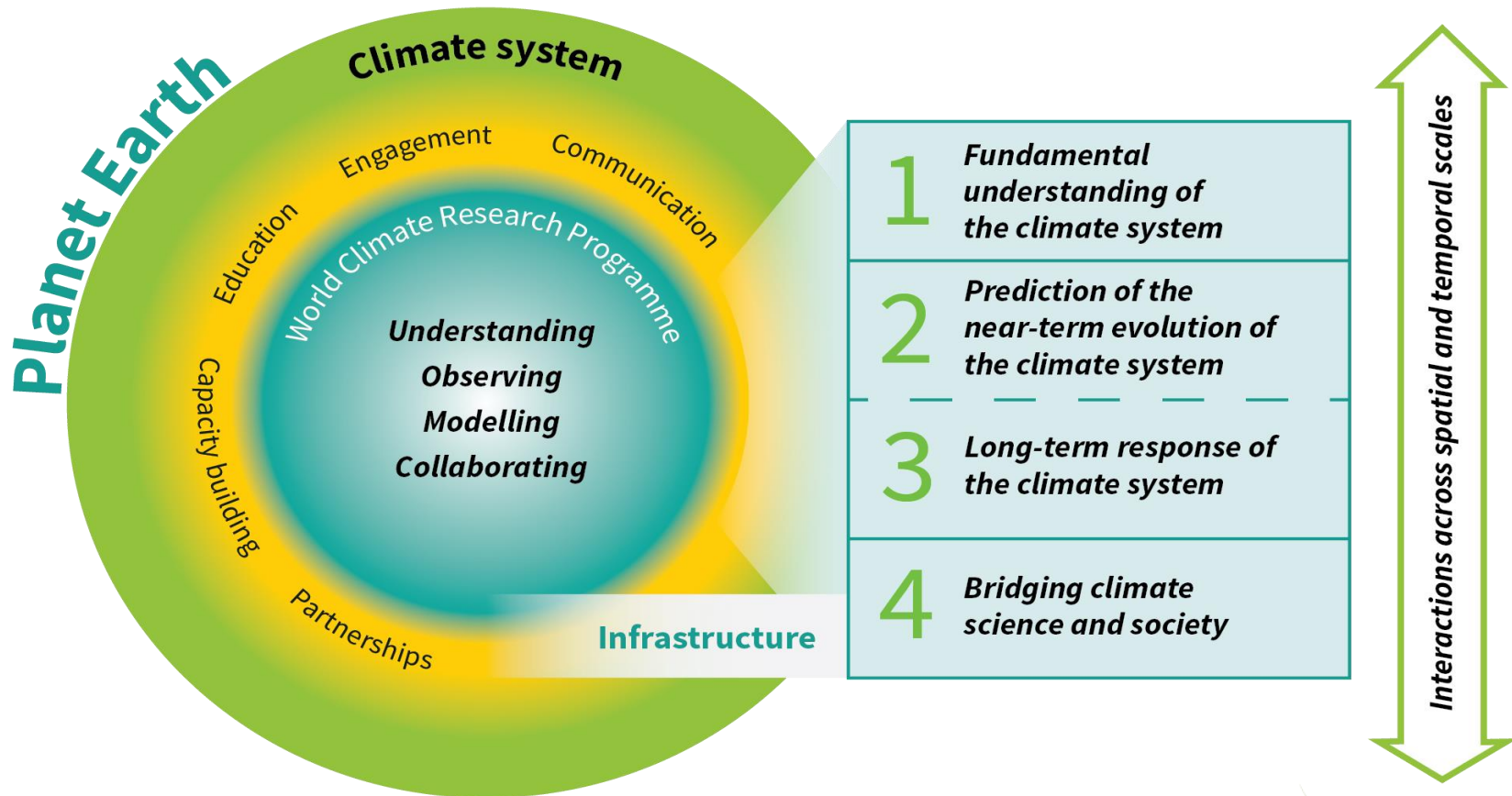
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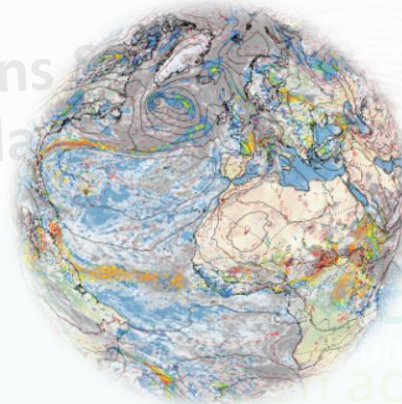
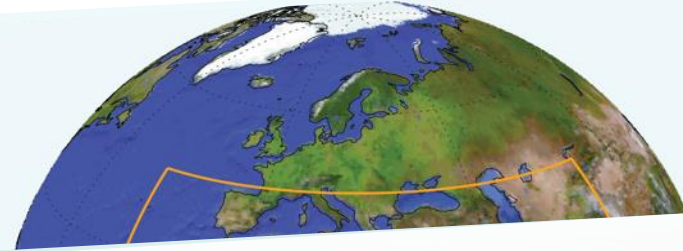
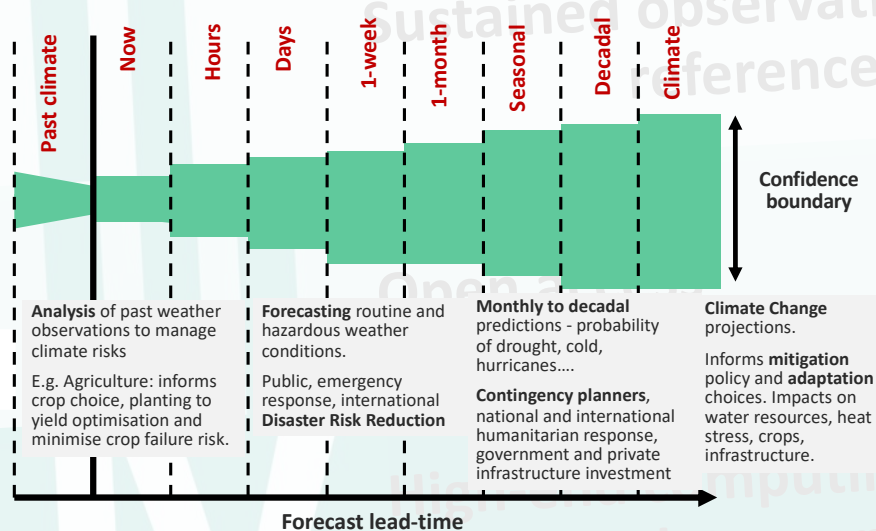
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Critical Infrastructure for Research

A hierarchy of simulation tools

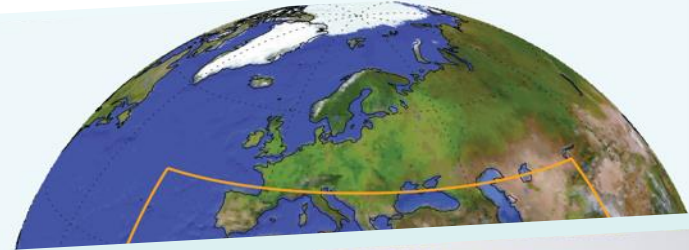


- **Seamless and unified simulation tools**
- **Innovative architecture**

Critical Infrastructure for Research

A hierarchy of
simulation tools

Sustained observations &
reference data sets



- Sustained and quality-controlled climate observation
- Well-coordinated field and space-based programs
- Multi-variate, multi-scale...

High-end computing &
data management

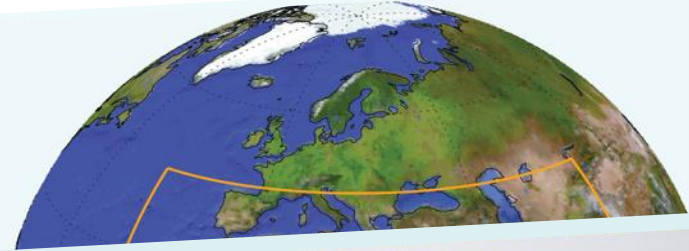
Critical Infrastructure for Research

A hierarchy of
simulation tools

Sustained observations &
reference data sets

Open access

- ... and interoperable, reliable data management



Critical Infrastructure for Research

A hierarchy of
simulation tools

Sustained observations &
reference data sets

Open access

High-end computing &
data management

- Exascale computing and cloud-based systems
- Big data, other computational advances
- ...

Critical Infrastructure for Research

A hierarchy of
simulation tools



Sustained observations &
reference data sets



Open access



High-end computing &
data management



Critical Infrastructure for Research

Key message:

Continuous support for fundamental climate research, and enabling infrastructure, is essential to link science to action.

- Consistent support for critical work e.g. CMIP
- Co-commitment and investment across nations, disciplines and societal sectors
- Embracing diversity, demanding equality, and building capacity for the future

