Copernicus Climate Change Service

Climateurope 2 - Venice - March 2024

Carlo Buontempo

C3S team and contractors

PROGRAMME OF THE EUROPEAN UNION

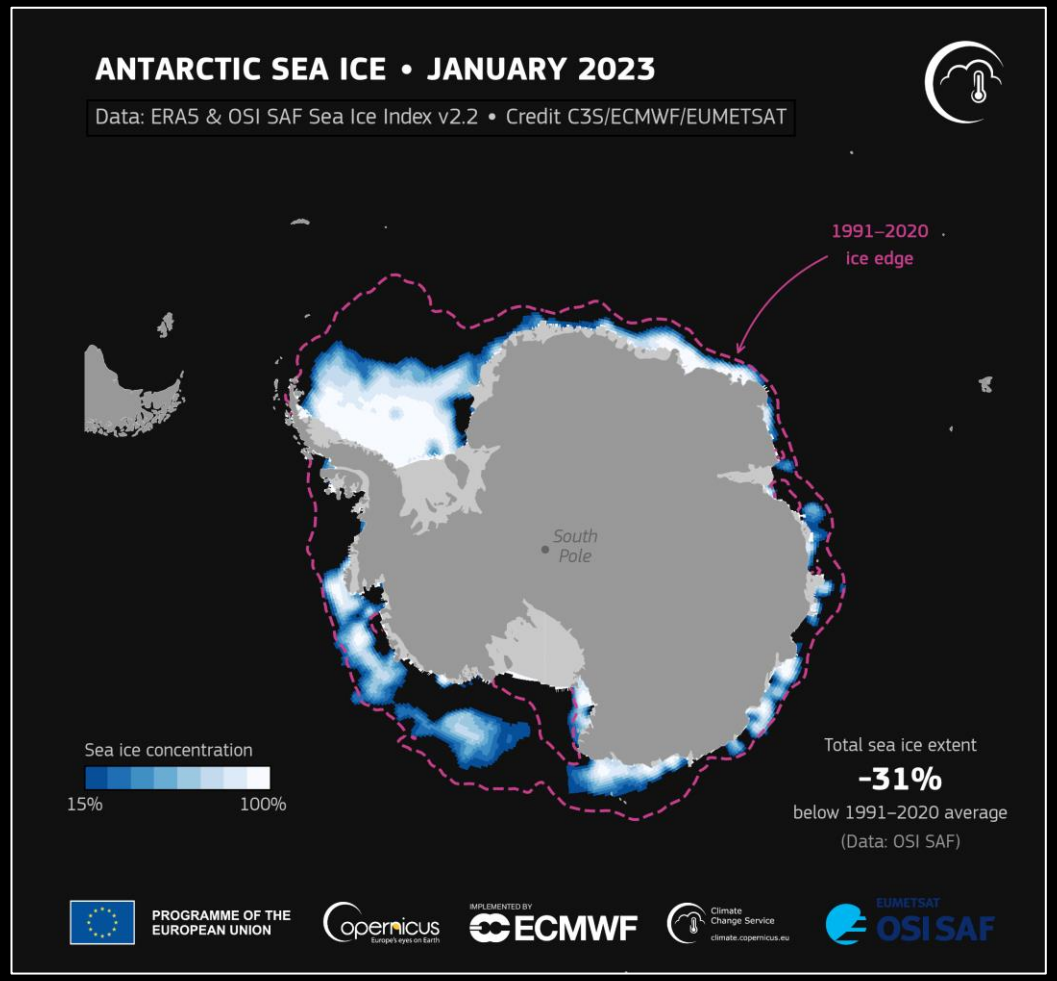
Copernicus Europe's eyes on Earth

IMPLEMENTED BY ECMWF

Climate Change Service
climate.copernicus.eu

Ocean domain

Consortium led by Mercator. Close cooperation with CMEMS, ESA-CCI and EUMETSAT
ECVs: Greenhouse Gases, Aerosols, Ozone



Monthly mean sea ice concentrations around Antarctica in 2023

Data: ERA5 (sea ice concentration), EUMETSAT OSI SAF Sea Ice Index v2.2 (sea ice extent anomaly).

Credit: C3S/ECMWF/EUMETSAT

ERA6 supported by a climate cycle

2023
48r1

NWP: ENS resolution increase
Daily ENS-Ext ensembles
Multi-layer snow scheme
Interactive Hybrid Linear Ozone
OOPS

Improved COMPO:
stratospheric chemistry

EFAS and GloFAS: new versions at 1.5km and 5km respectively

OpenIFS new release

48r2

ORAS6 ocean reanalysis

2024/2025
49r1

NWP: Improved surface
Updated land fields
Implementation of SPP
Higher resolution EDA

Improved COMPO:
prognostic stratospheric aerosol scheme

Hindcast reconfiguration (ENS and ENS-Ext)

49r2

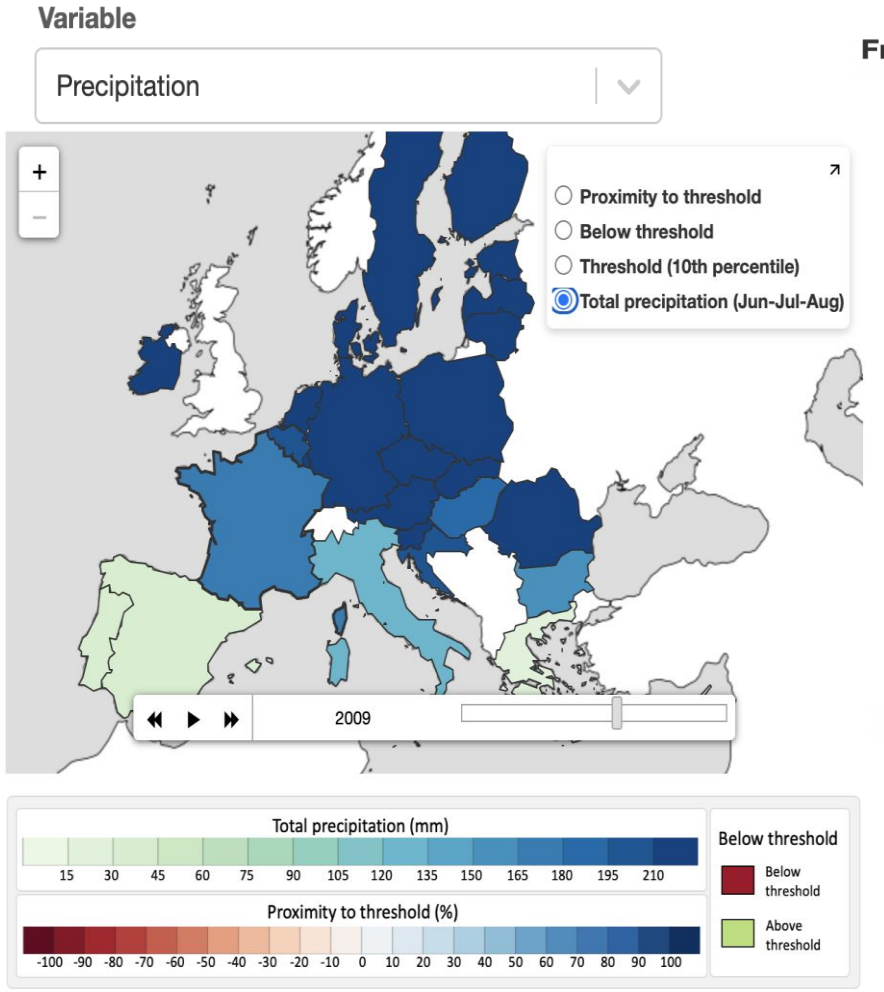
Reanalysis :
ERA6, EAC5

Seasonal forecast:
SEAS6

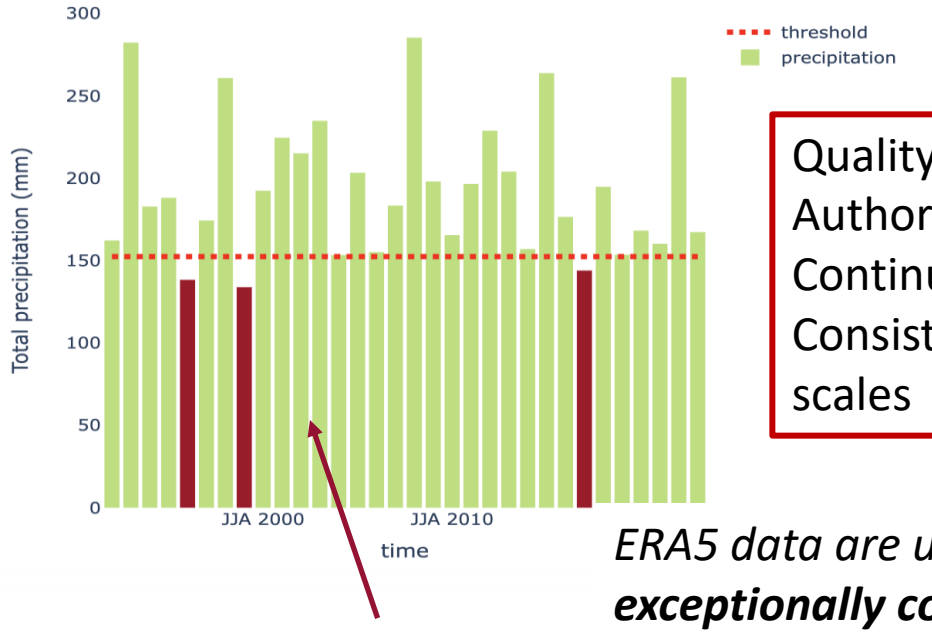
2025
50r1

NWP: New ocean and sea ice
Extending 4D-Var window
Higher 4D-Var resolution
…

Applications on Demand: a policy-driven example for DG-ENV



EU Directive 2016/2284 on the reduction of National Emissions of Certain atmospheric pollutants.
The Directive establishes the emission reduction commitments for the Member States.



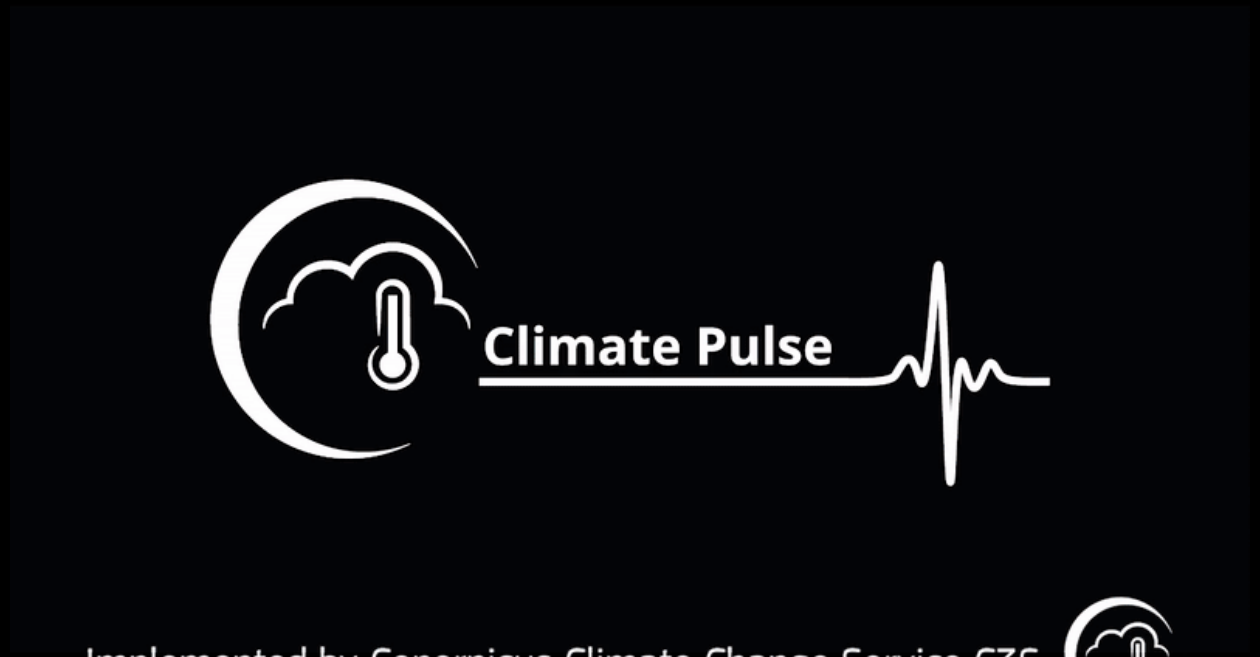
Red bars: Dry summer for the selected Member State

Quality controlled
Authoritative
Continuity with policy cycles
Consistent across spatial scales

ERA5 data are used to identify ***exceptionally cold winter*** *and* ***exceptionally dry summers****, when flexibility article 5.2 of the Directive may be applied.*

"The European State of the Climate Report of C3S is an invaluable resource for policy makers in Europe".

Belgian Minister for Climate, Zakia Khattabi


Climate Pulse
Implemented by Copernicus Climate Change Service C3S

The European Environment Agency's European Climate Risk Assessment (EUCRA)

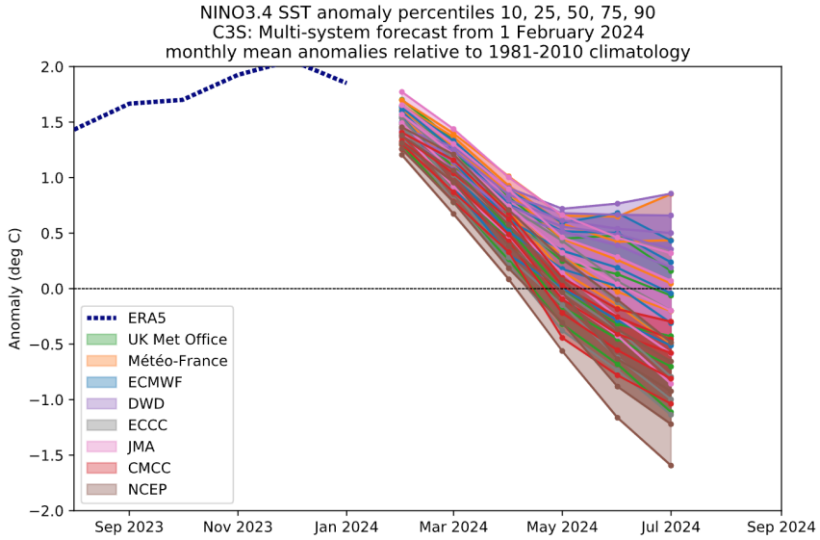
The EUCRA aims to provide a comprehensive assessment of current and future climate change impacts and risks related to the environment, economy and wider society in Europe

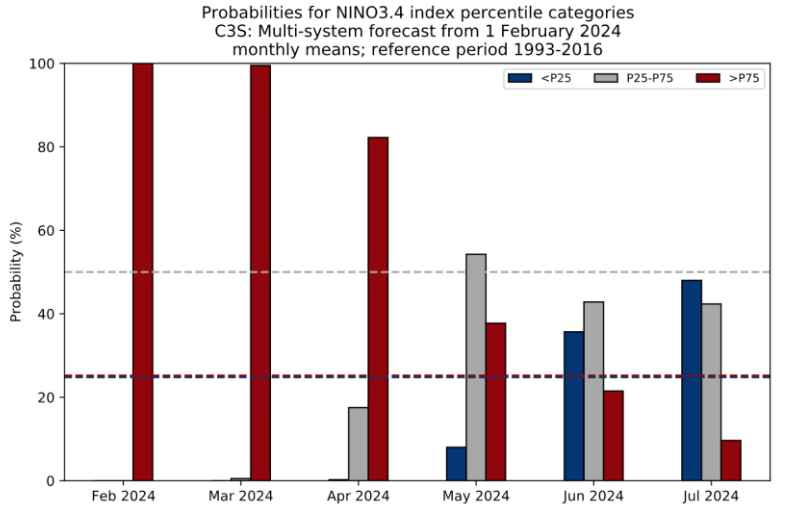
- Complements existing knowledge on climate-related hazards and risk
- Aims to provide added value for policy-making
- Executive summary published 11 March 2024
- Final report, interactive data viewer coming soon

How has C3S been involved?

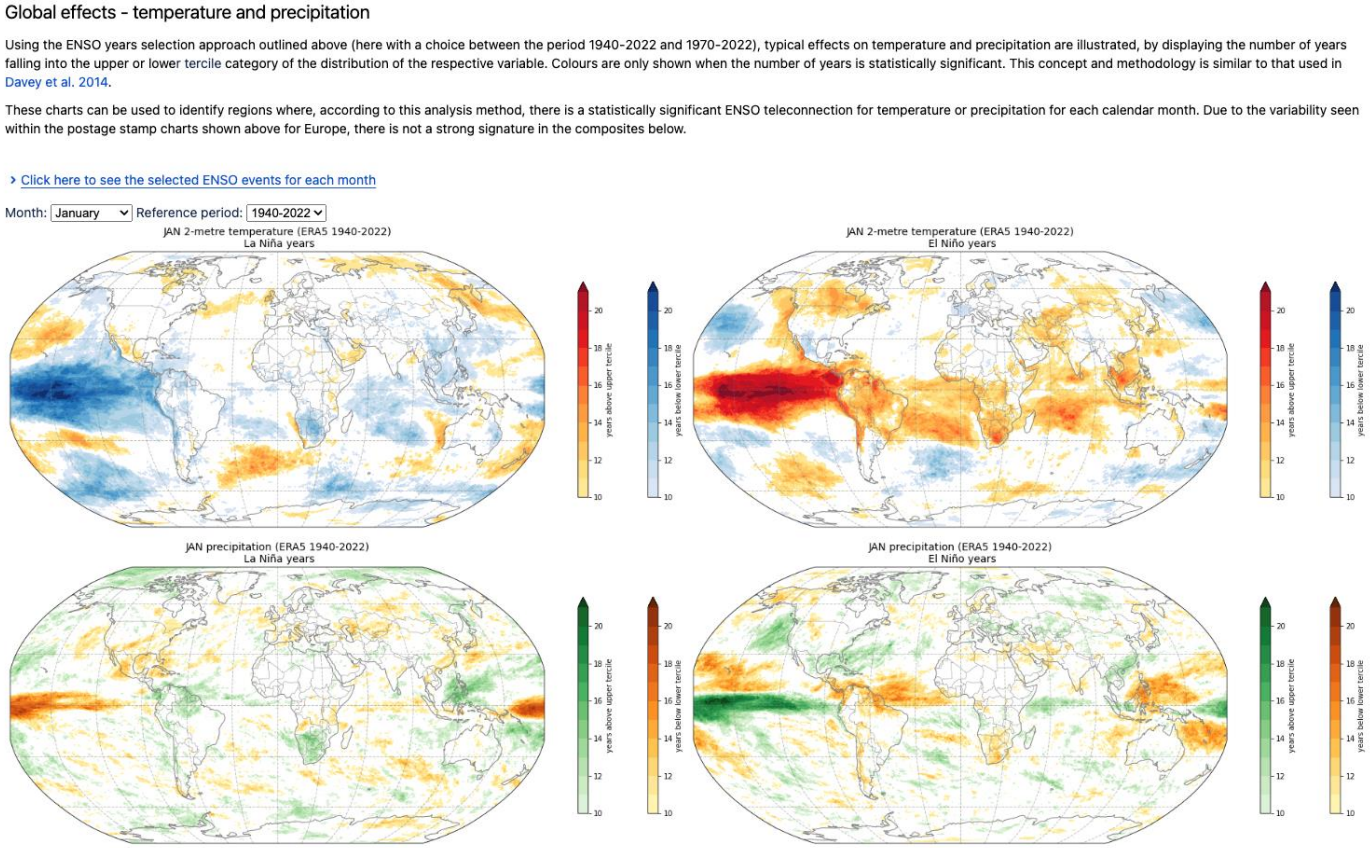
- Providing analysis and information based on C3S data, and from various C3S reports, bulletins and articles (e.g. ESOTC 2017-2022, monthly bulletins, web articles) on the evolution of key climate variables for Europe, and key events across Europe in recent years
- Climate impact drivers & how has Europe arrived at its present condition? (chapter 2, 'Europe in times of change and extremes)

NINO 3.4 February 2023





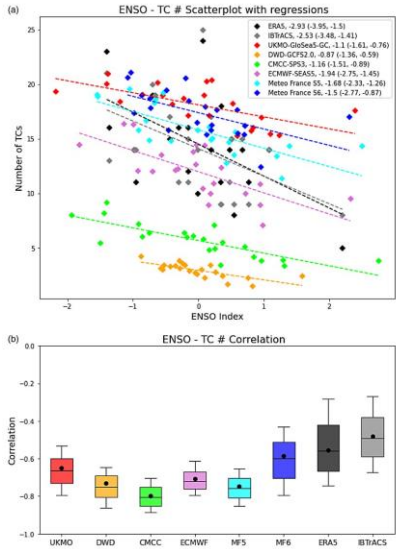
C3S multi-system forecasts



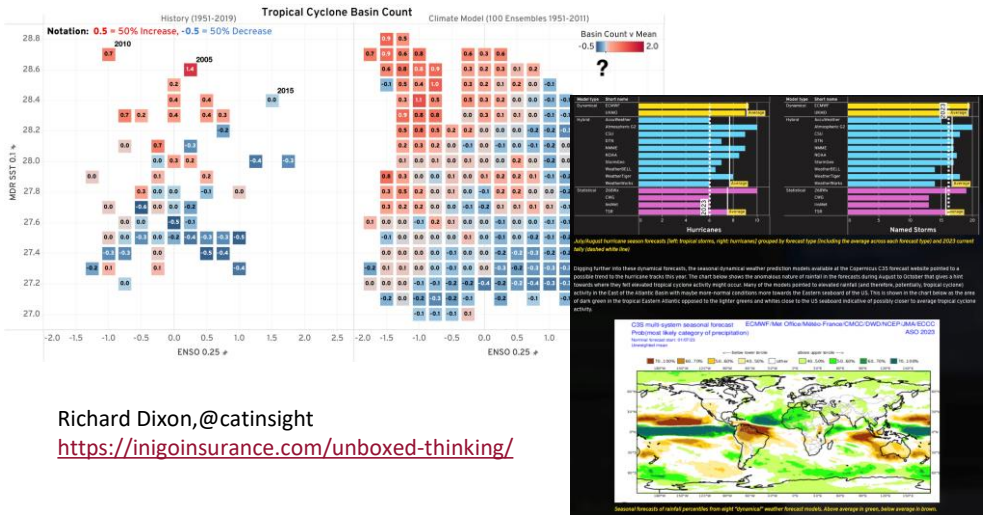
Investigation of ENSO teleconnections

https://confluence.ecmwf.int/display/COPSRV/ENSO+impacts+on+Europe

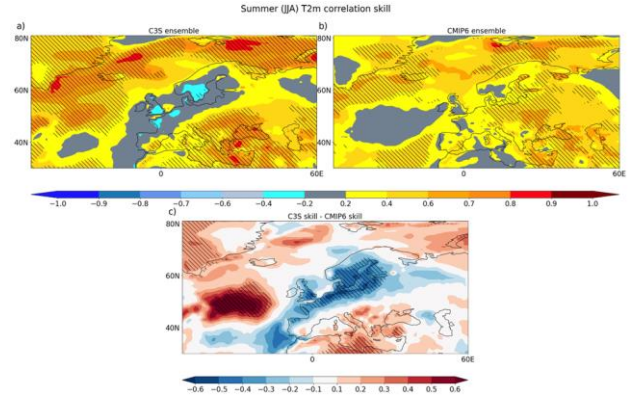
C3S seasonal predictions in user diagnostics



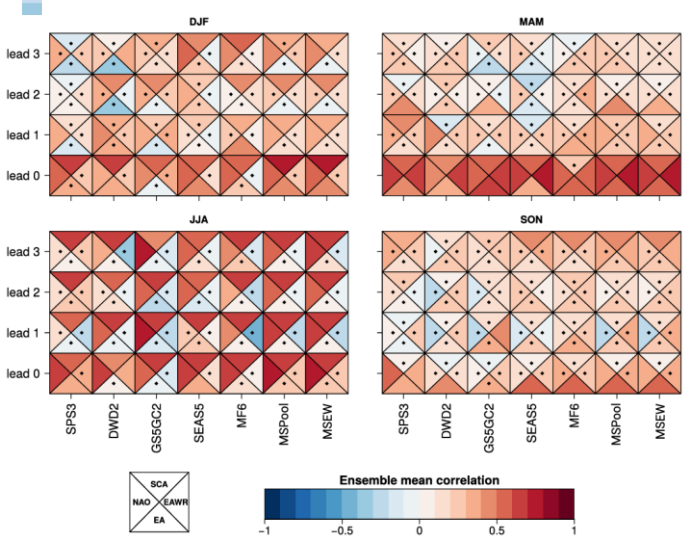
Robert Doane-Solomon, @robert_ds



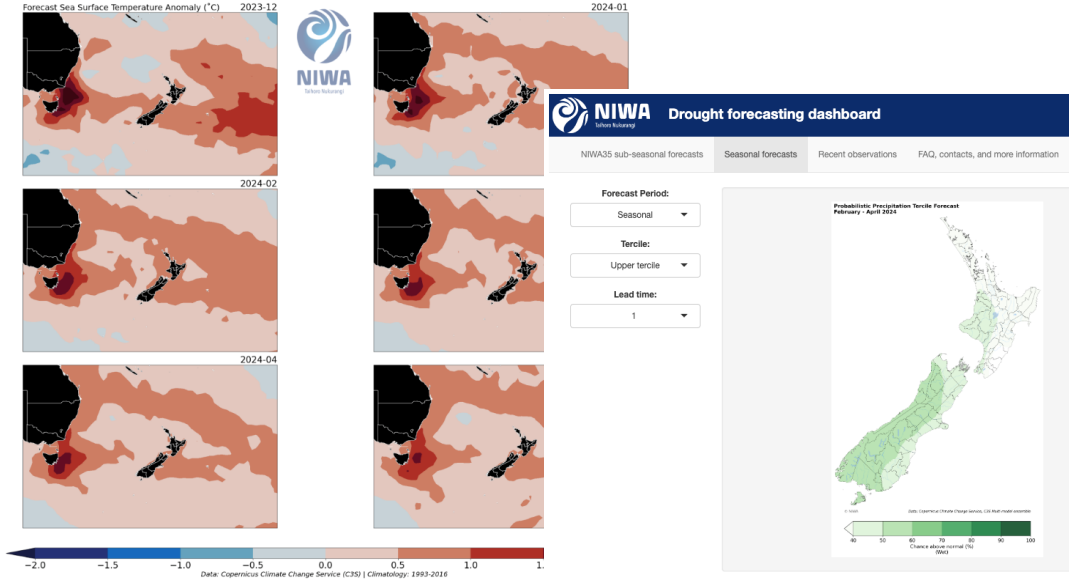
Richard Dixon,@catinsight
https://inigoinsurance.com/unboxed-thinking/



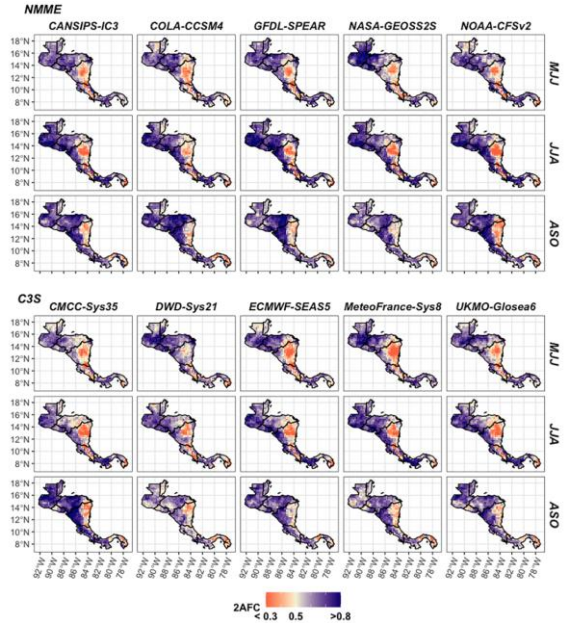
Matthew Patterson et al 2022 Environ. Res. Lett. 17 104033



Llorenç Lledó et al 2020 Environ. Res. Lett. 15 074009



https://niwa.co.nz/climate/



K Kowal, et al 2023. International Journal of Climatology,43(5), 2175–2199

Copernicus Interactive Climate Atlas

Mean temperature (°C) - CMIP6 - Change - Warming 2°C - Annual - rel. to 1850-1900

Mean temperature | CMIP6

Climatology and Changes | Global warming levels

1961-1990 1981-2010 1991-2020 2°C 4°C
1850-1900 1986-2005 1995-2014 1.5°C 3°C
PAST FUTURE

Quantity
Change

Season
Annual

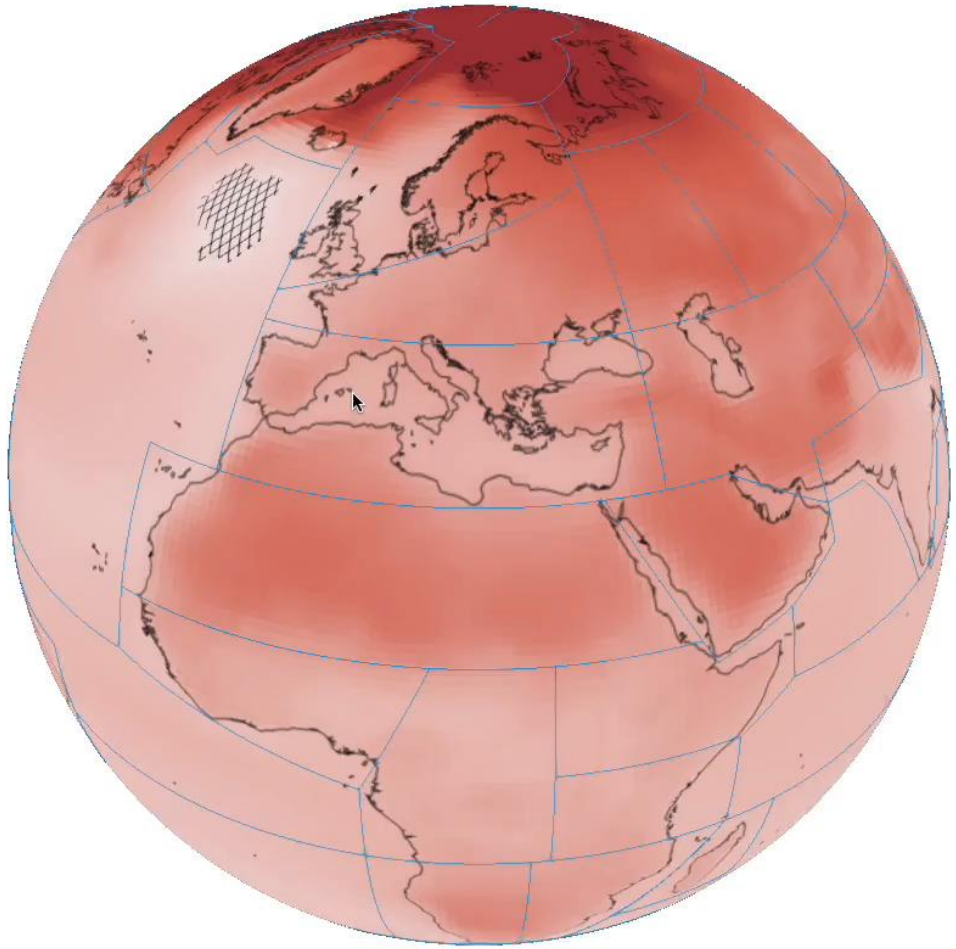
6 5 4 3 2 1 0 -1 -2 -3 -4 -5 -6

Units: °C

Robustness:
- Robust signal (original color)
- No change or no robust signal
- Conflicting signals

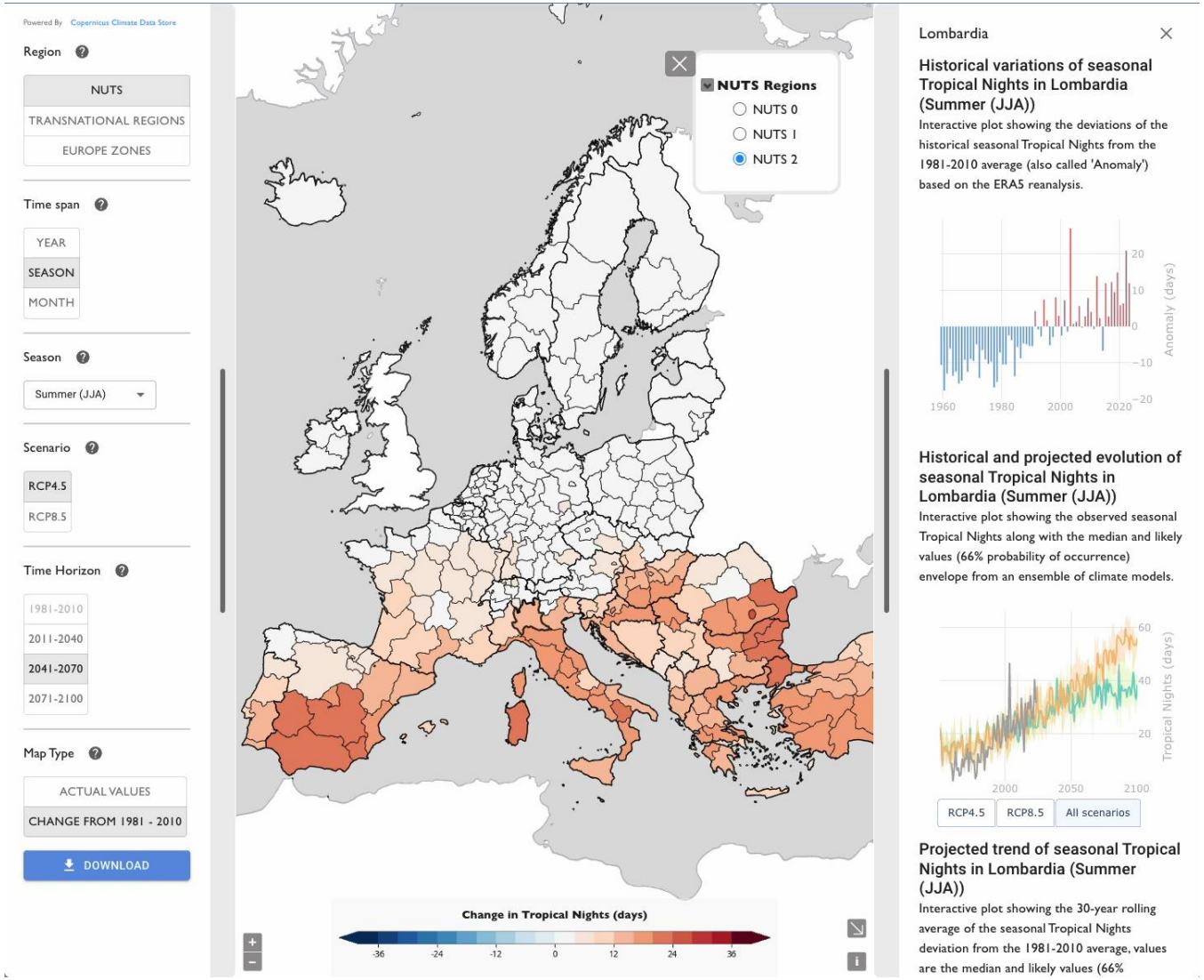
Palette | Autofit | Reset

AR6 Regions



About C3S | About the Atlas | Contact us | Privacy policy

Supporting European Institutions – The European Environment Agency



Based on the requirements of EEA, the European Climate Data Explorer (ECDE) allows exploration the C3S Climate Impact Indicators at the Pan European scale, down to EUROSTAT NUTS 2 (242 European regions)

The ECDE supports EEA's contribution to the Mission on Adaptation, and member states / regions climate adaptation planning

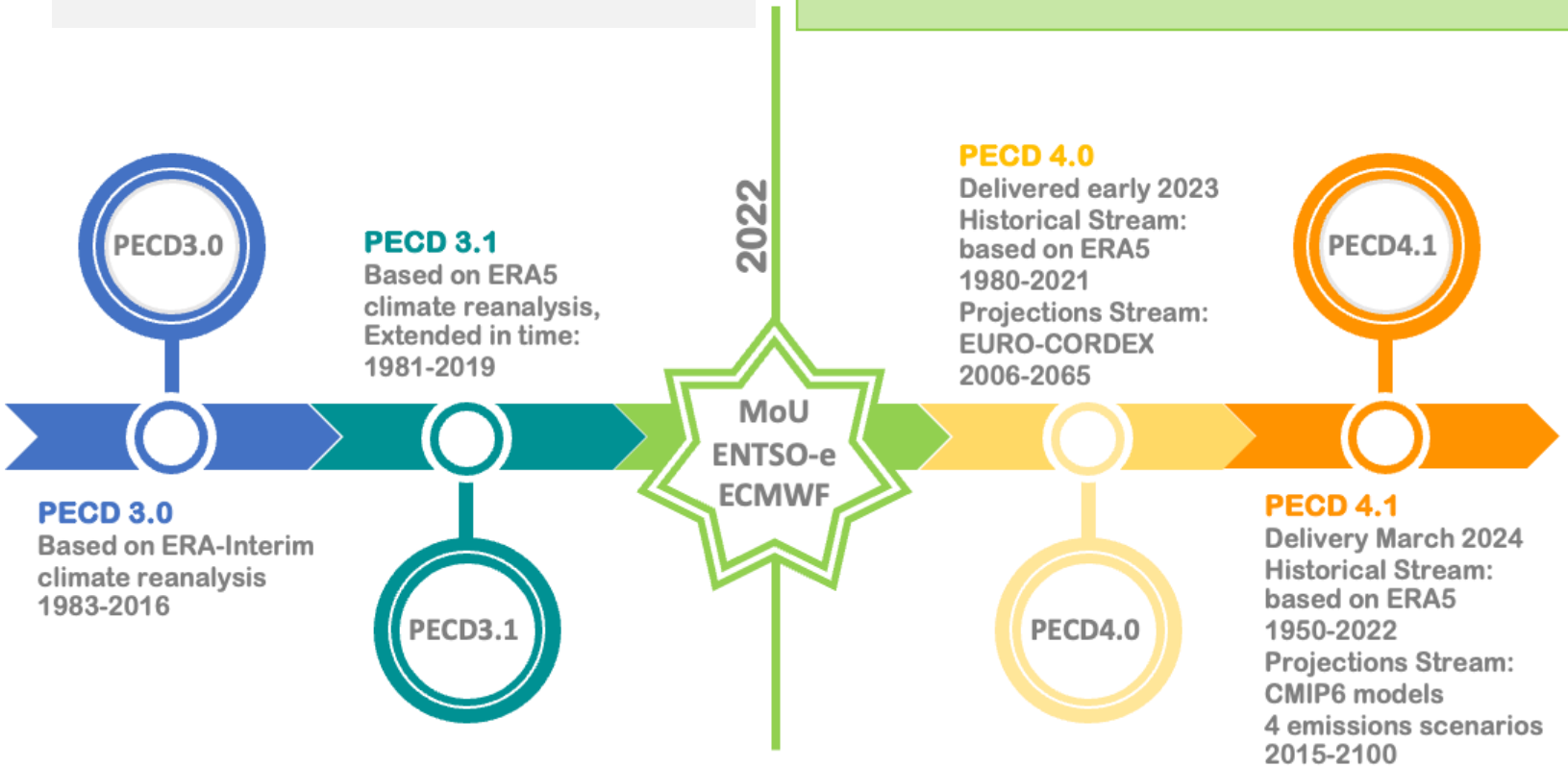
The ECDE provides:

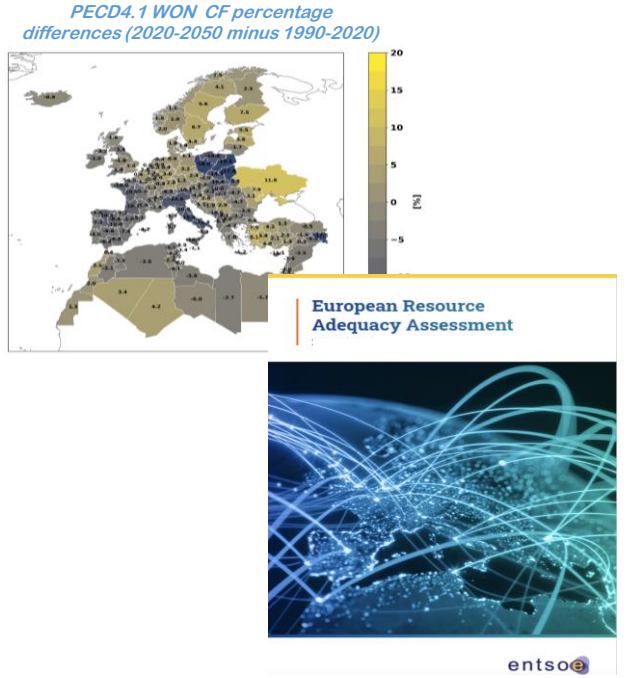
- Access to key climate hazard information derived from an ensemble of bias-adjusted EURO-CORDEX projections (updated when next gen of CORDEX available via CDS)
- 21 published indicators, with additional 16 added to v2 in Q2 2024
- Consistency in reference periods, future periods and emission scenarios across
- Information for Europe's transnational regions
- For most indicators, yearly updates - using C3S reanalyses to monitor climate hazards

Energy transition: supporting the European network of Transmission System Operators

Only **PAST CLIMATE** data was considered

C3S activity supporting ENTSO-E in the production of the Pan-European Climate Database (PECD), which includes **CLIMATE CHANGE** impacts on the power system.





Supporting the EIB Climate Risk Assessment for sustainable finance

Supporting Climate risk screening and assessments of investment projects

EIB Sector Sensitivity Matrix connecting Sectors & Subsectors to Climate Hazards

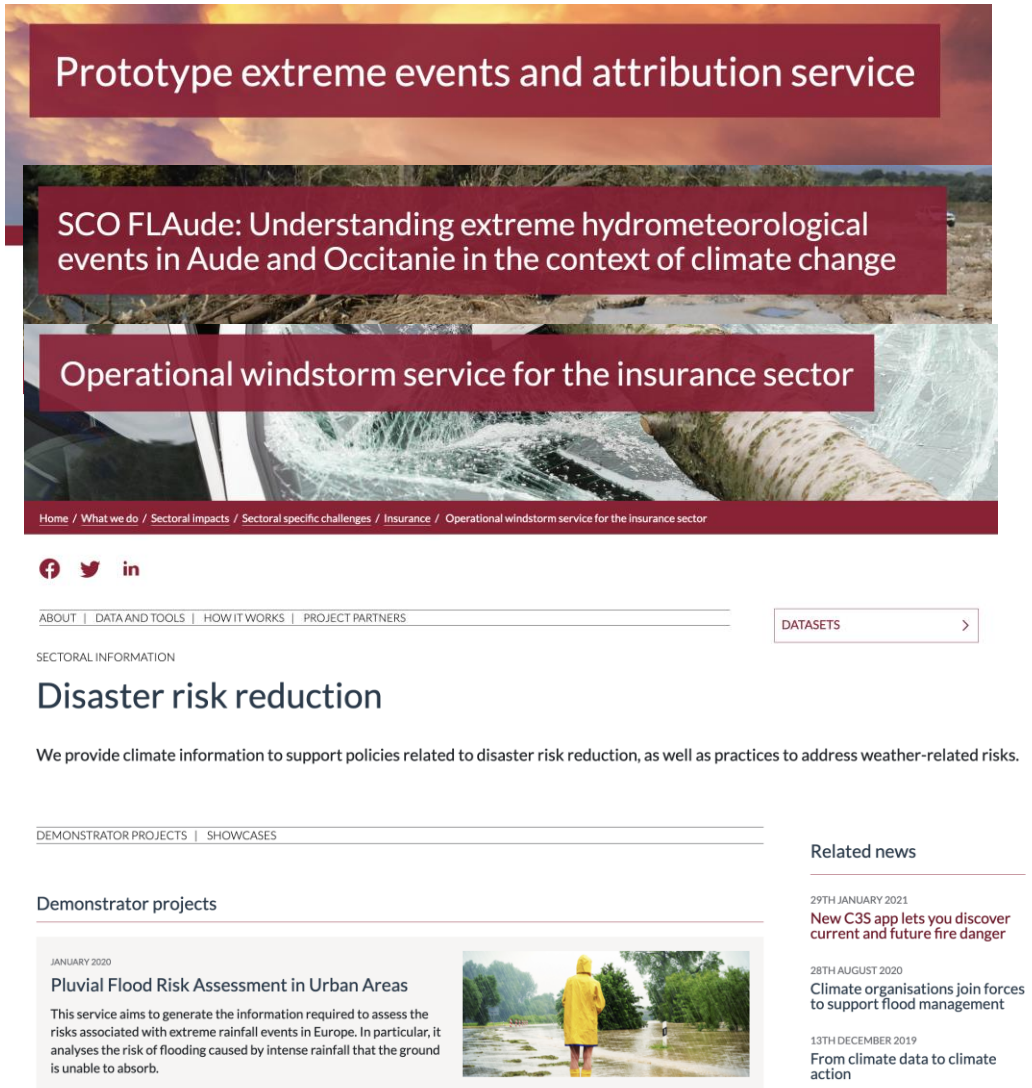
C3S-based Hazard Matrix connecting the Hazard to the Climate impact Indicators

EIB-C3S partnership to connect Sectors & Subsectors to Climate Impact Indicators and their evolution in time: current & under climate scenarios

EIB Climate Risk Assessment

in partnership with European Investment Bank

Operational attribution: modular access to information on extremes



Operational access to extreme event information including:

- Long term observed changes in extremes and their attribution
- Links to Extreme Forecast Index (or similar) information on upcoming extremes.
- Extended information on types of events in a changing climate (e.g. factsheets or similar)
- Extend number of tools for extreme event analysis
  - Consistency with climate projections
- NRT daily suite similar to the (extended/evolved) C3S monthly bulletin suite
- Fitness-for-purpose of data sets for extreme analysis
- Enhanced adoption of AI-based tools

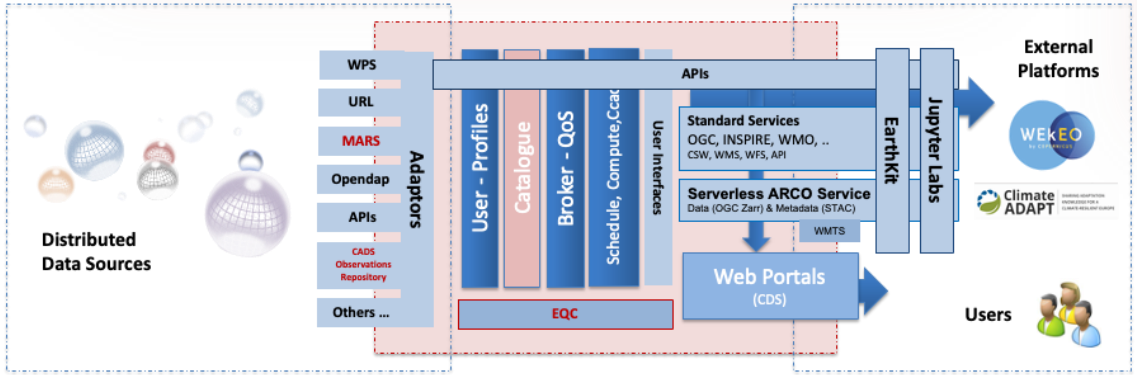
Climate Data Store

A fully modernized Climate Data Store soon to be released

Modernization will cover all multiple layers and components of the infrastructure (software and hardware)

Objectives

- Capitalize **experience, feedback and lessons learned.**
- Engage with a **broader user community.**
- Ensure compatibility with **state-of-the-art solutions**
- Embrace open-development approach for **traceability** and **collaboration**
- **Strengthen synergies** with related platforms (such as WEkEO) and projects



What's new

More **functional, standardized and accessible interfaces** (Web portal, APIs, Metadata - STAC, INSPIRE).

FAIRest catalogue of resources.

Prominent and fully integrated **Evaluation and Quality Control (EQC)** function.

Closer and broader access to **help**&**support** and **training material** facilitating user uptake.

Cloud oriented with **flexible deployment** and **high scalability** of components.

Analysis **R**eady, **C**loud **O**ptimized (ARCO) Data & Services

earthkit: open-source, anyone, anywhere set of tools.

Fully Managed **In-house Cloud Infrastructure provided by ECMWF-CCI** (**C**ommon **C**loud **I**nfrastructure)

Survey →call for actions

Joint Coordination Office

NCP Forum

National needs

(from the survey)

Needs collected through the User Interaction sessions

On-going C3S studies (e.g. regional reanalysis)

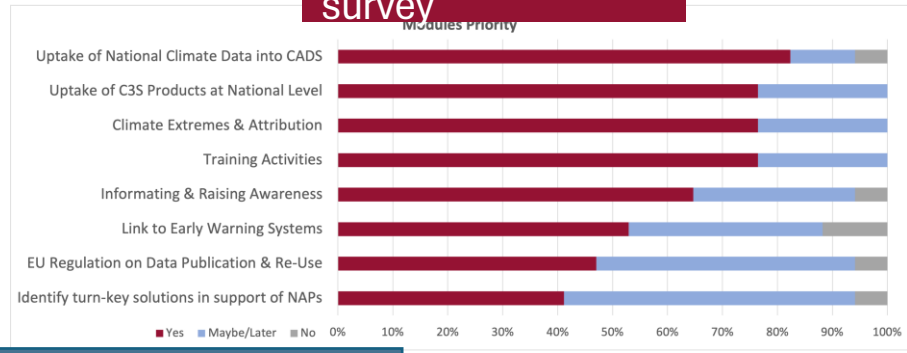
C3S strategic priorities

Topics Selection & calls preparation

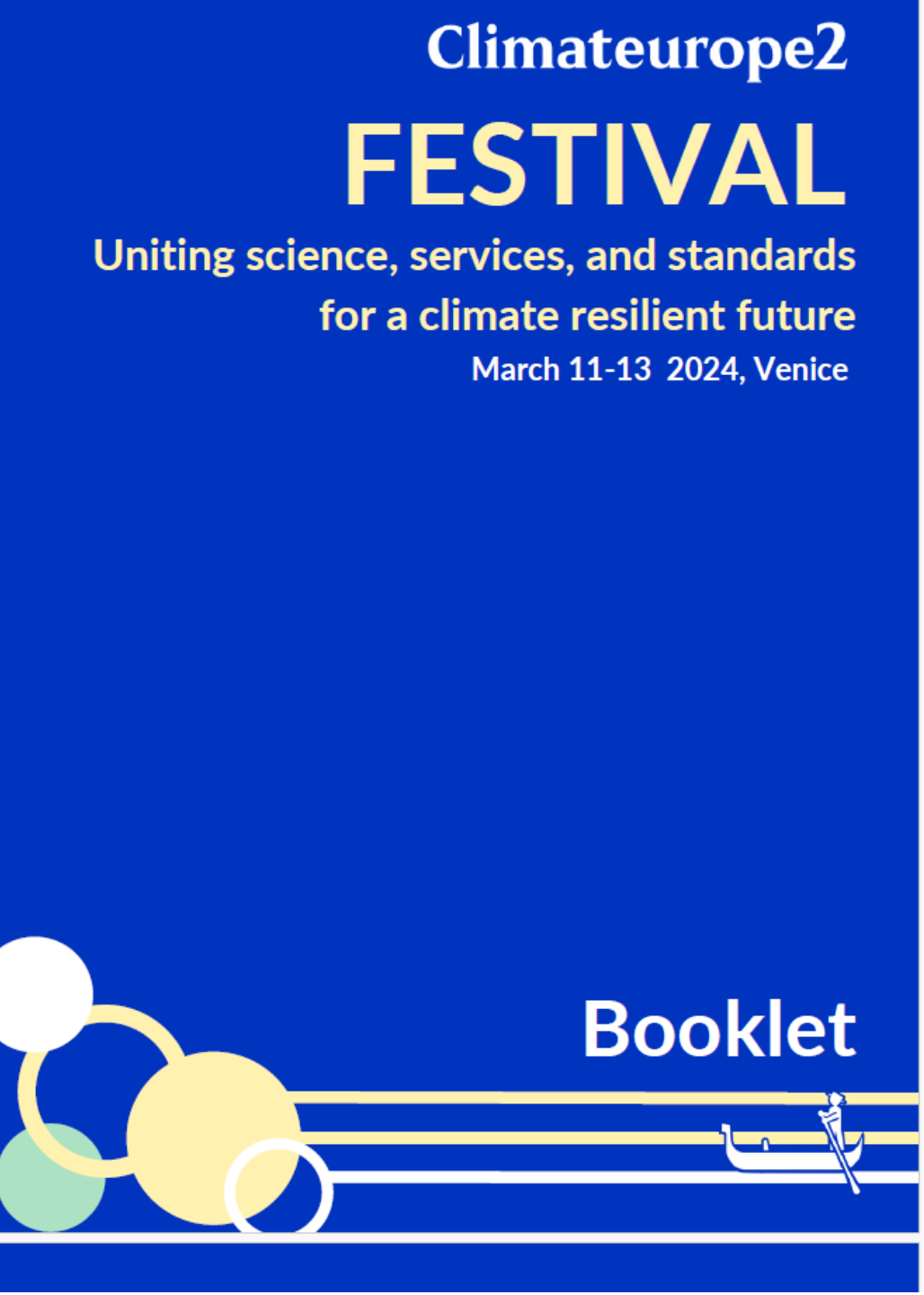
C3S National Collaboration Programme

- **1st call: 1.4 M€ -Q1 2024**
- **2nd call : 2.1 M€ - Q4 2024**
- **3rd call : 1.5 M€ - Q4 2025**

C3S countries survey



Create an engaged community of experts – NCP forum



ItaliaMeteo

Climate Services in Italy and the role of ItaliaMeteo

Carlo Cacciamani
Director of ItaliaMeteo

Climate services (CS)

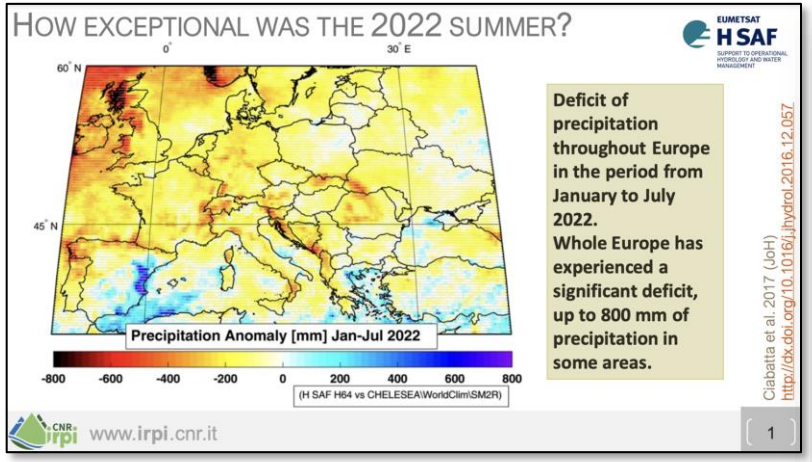
CS are the provision and use of climate data, information and knowledge to assist decision-making in climate-sensitive sectors to help society understand and respond to manage climate variability and change

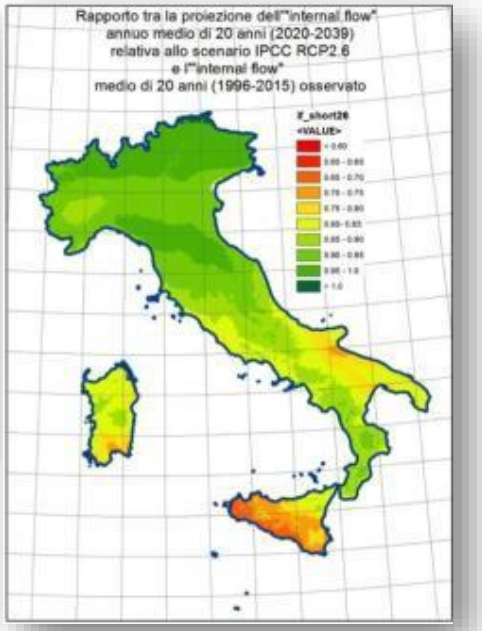
Application fields of CS in Italy

Urban and spatial planning (i.e. green management, heat waves)	**Civil Protection** (i.e. forest fire prevention, landslides, floods)	**Land, water & ecosystem management** (i.e. agriculture, drinking water, biodiversity)	**Population health**
Transport & infrastructures	**Energy production**	**Cultural heritage & Tourism**	**Finance & Insurance**

Operational CS in Italy

- ▷ Data/monitoring services (with all dataavailable on specific portals)
- ▷ Climate bulletins/reports
- ▷ Extended range prediction (monthly-seasonal) and Climate projections





Hydrological water budget and Renewable Water Resources (RWR) using ISPRA 1-km BIGBANG model and GCM outputs (IPCC AR5)

ItaliaMeteo

NATIONAL CLIMATE SERVICE NETWORK OF ITALY (NCSNI)

Description of available climate services, June 2020

Edited by Antonello Provenzale and Carlo Cacciamani

Outline

Operational CS in Italy: the status of the art

Many public and private institutions produce CS.

Major problem: weak coordination, duplication of efforts, fragmentation

Need of coordination in order to produce and delivery CS, developing new ones and overcoming the fragmentation present today

Operational CS in Italy: the role of ItaliaMeteo

- is the new national meteorological service structure
- has to increase the efficiency of the Italian meteorological system, to strength and rationalize activities in the sectors of meteorological, climatic and meteo-marine monitoring and forecasting, and to create new CS
- has to **coordinate and connect** what already exists, in terms of operational CS, developed by a wide network of Institution
- has to **capitalize the results** obtained from projects and initiatives already implemented and ongoing

Thank you

carlo.cacciamani@agenziaitaliameteo.it

Climateurope2 and climate services in Destination Earth

Francisco J. Doblas-Reyes

Climateurope2 Festival

Venice 11-13 March 2024

Climateurope2

Funded by the European Union

Climateurope2 objectives

Standardising

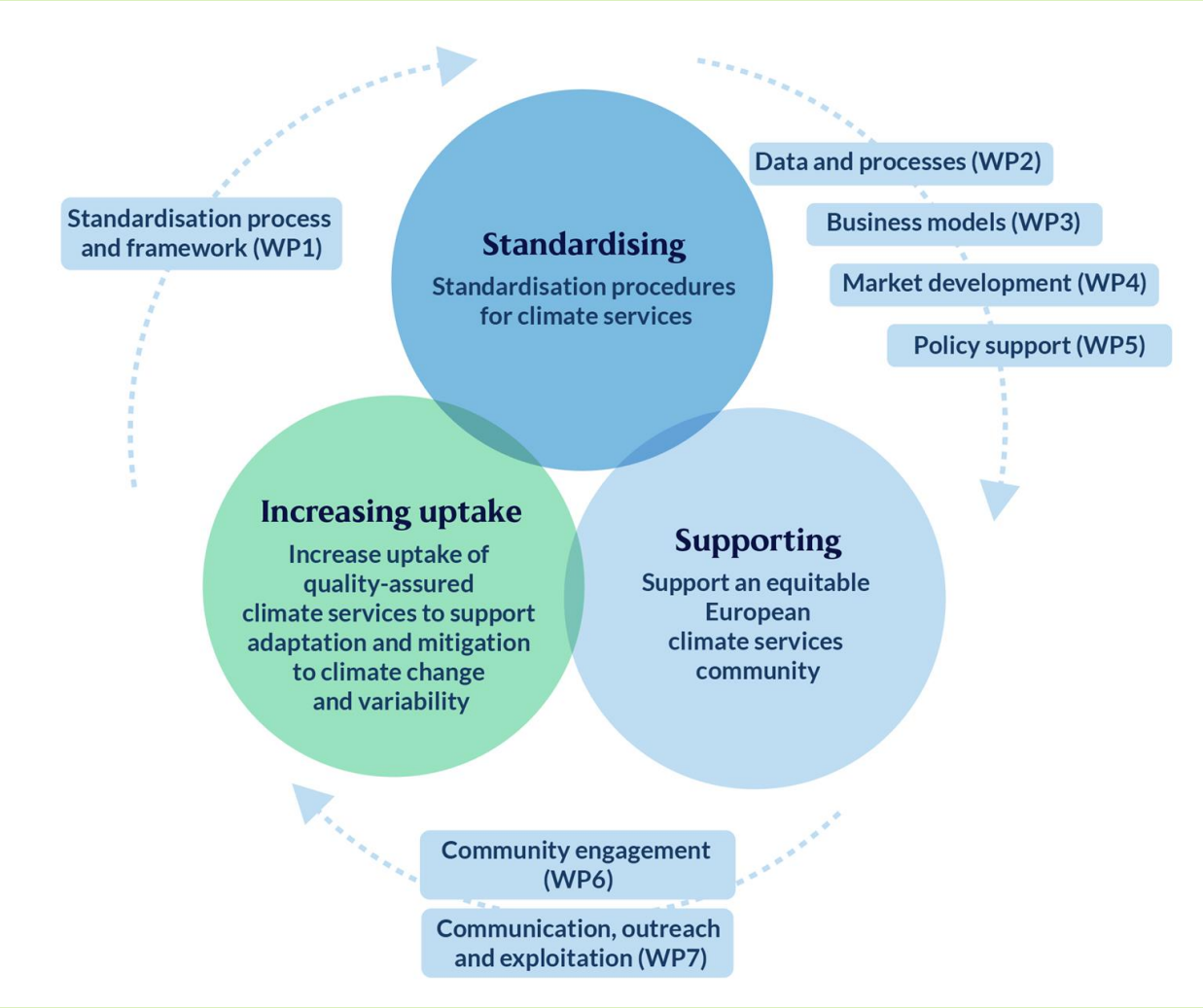
Development of standardisation procedures for climate services

Supporting

Support of an equitable European climate services community

Increasing uptake

Enhancement of the uptake of quality-assured climate services to support climate adaptation and mitigation



CSA Horizon Europe, Sep 2022-Feb 2027

Climateurope2

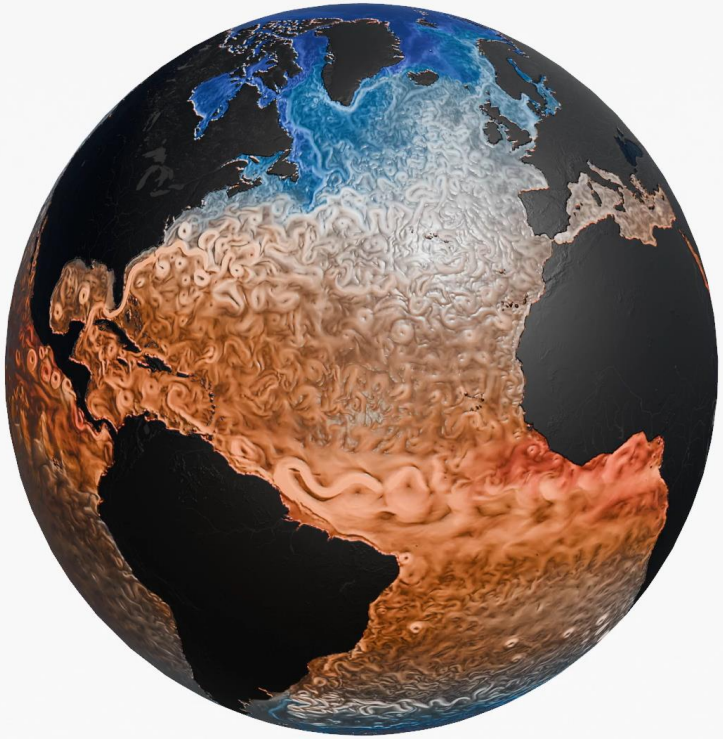
Funded by the European Union

CLIMATE ADAPTATION DIGITAL TWIN (CLIMATE DT)

Climate DT is a new type of climate information system funded by the Destination Earth programme that focuses on **assessing the impacts of climate change and different adaptation strategies** at local and regional levels with a global perspective using a strategy where **user requests drive the production chain**.

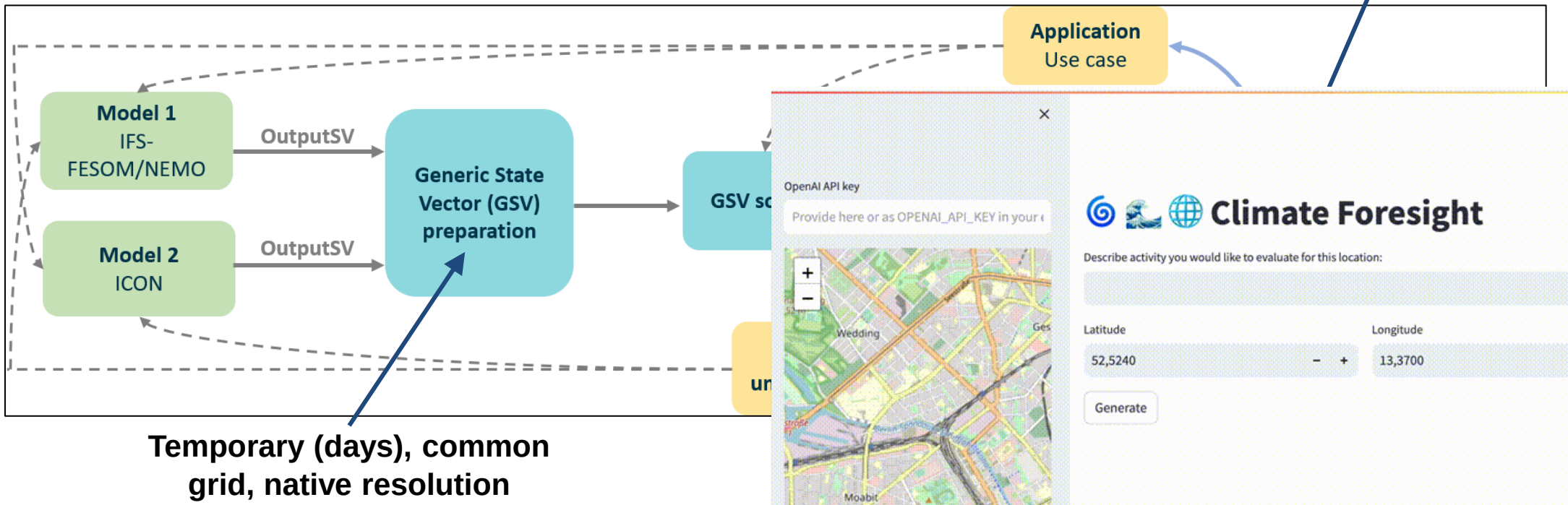
The Climate DT includes

- **Multi-model global climate simulations** at an unprecedented resolution
- **Quality assessment and uncertainty quantification**
- Deployment on **EuroHPC pre-exascale computers** (LUMI and MareNostrum5)
- Relevance of both **climatic and non-climatic drivers**
- **Integration of large amounts of relevant European R&D**



CLIMATE SIMULATION WORKFLOW: STREAMING

Permanent, lossy compression, interpolated



Temporary (days), common grid, native resolution

Streaming of model output in a standardized

- **Data consumers have access to the full**
- **Interactivity:** development to allow simula
- **Scalability**: new applications and requirem

ECMWF

Join the network

Climateurope2

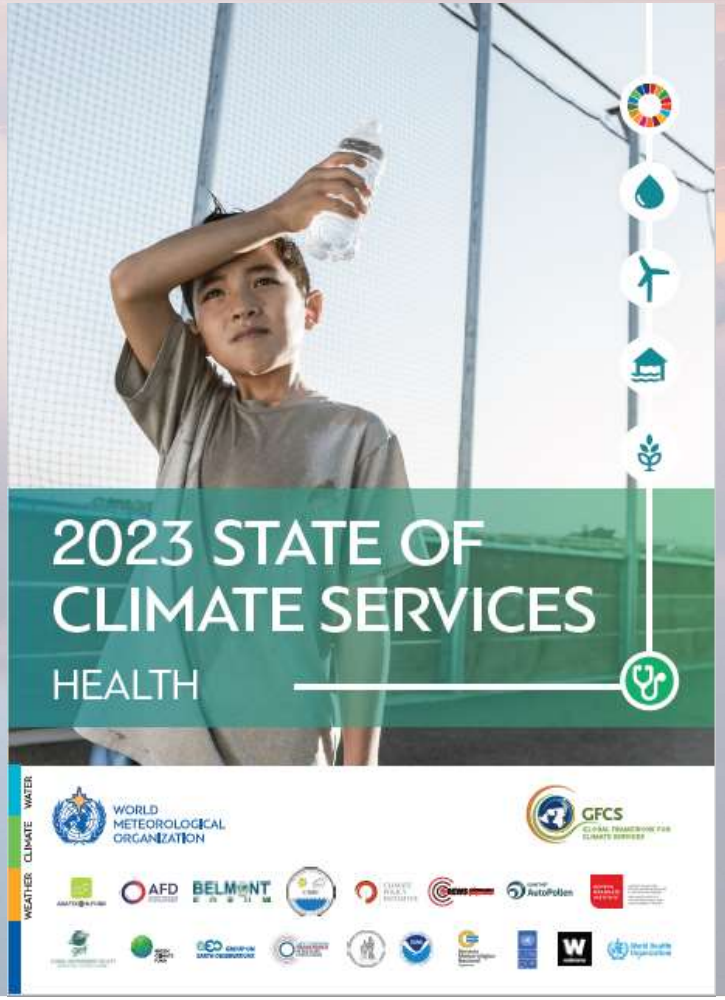
Funded by
the European Union

Global Overview - State of Climate Services

Veronica F. Grasso, Ph.D.
Scientific and Programme Officer and report Coordinator, WMO

WORLD METEOROLOGICAL ORGANIZATION

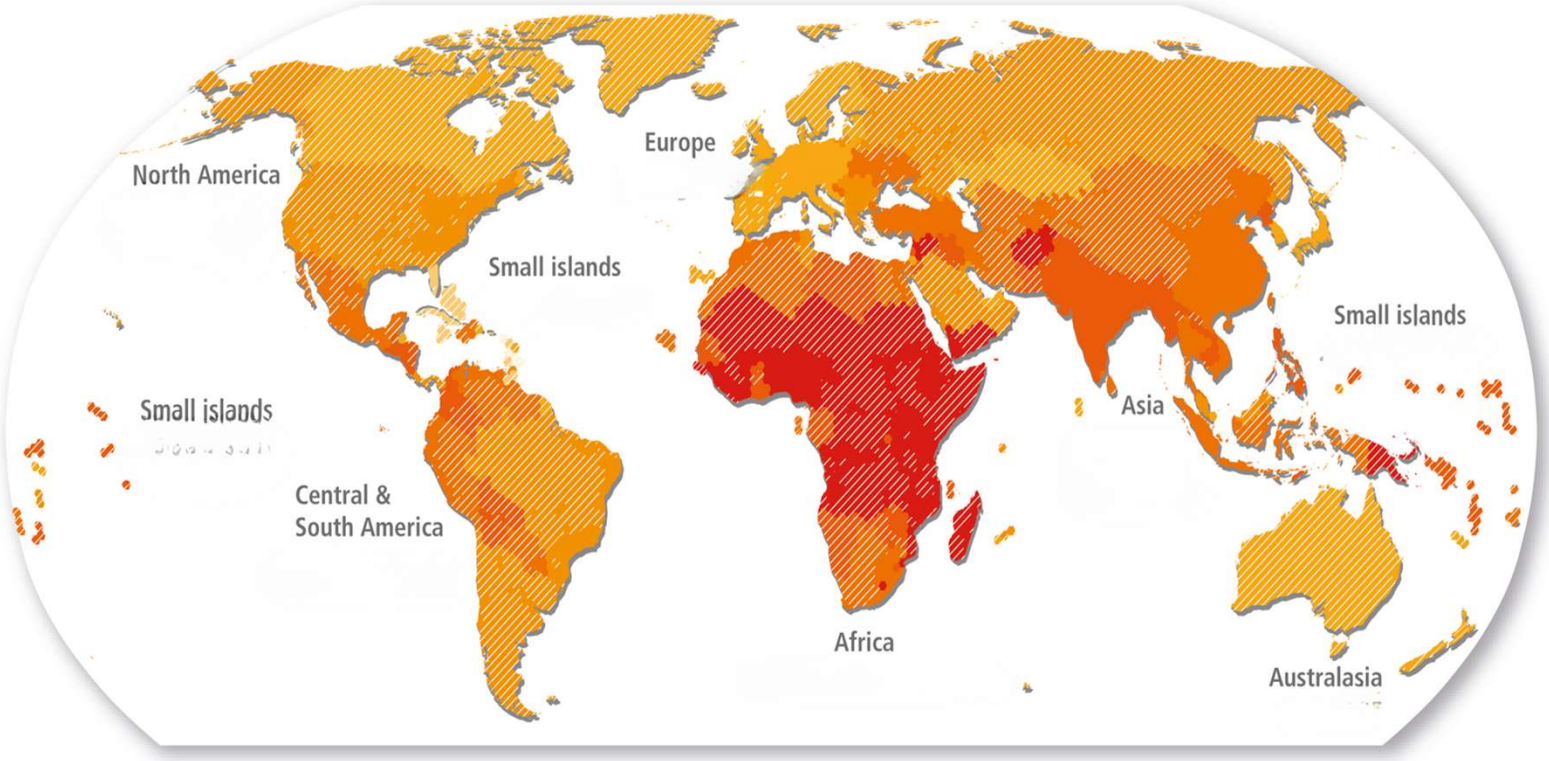
1873 2023 IMO-WMO



Climate change impacts are not experienced equally

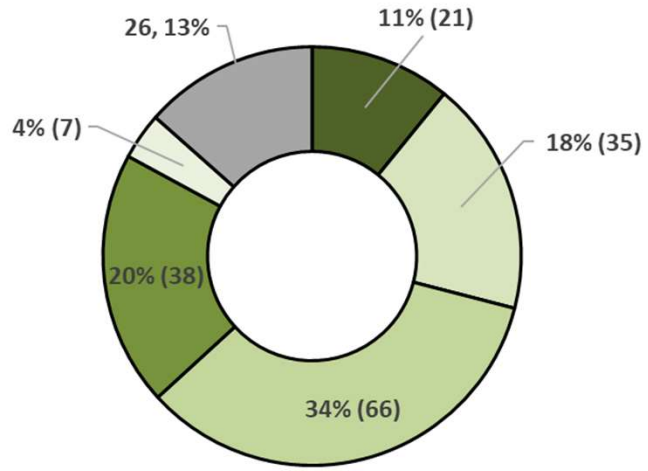
50% of future excess mortality from climate change is projected to occur in Africa.

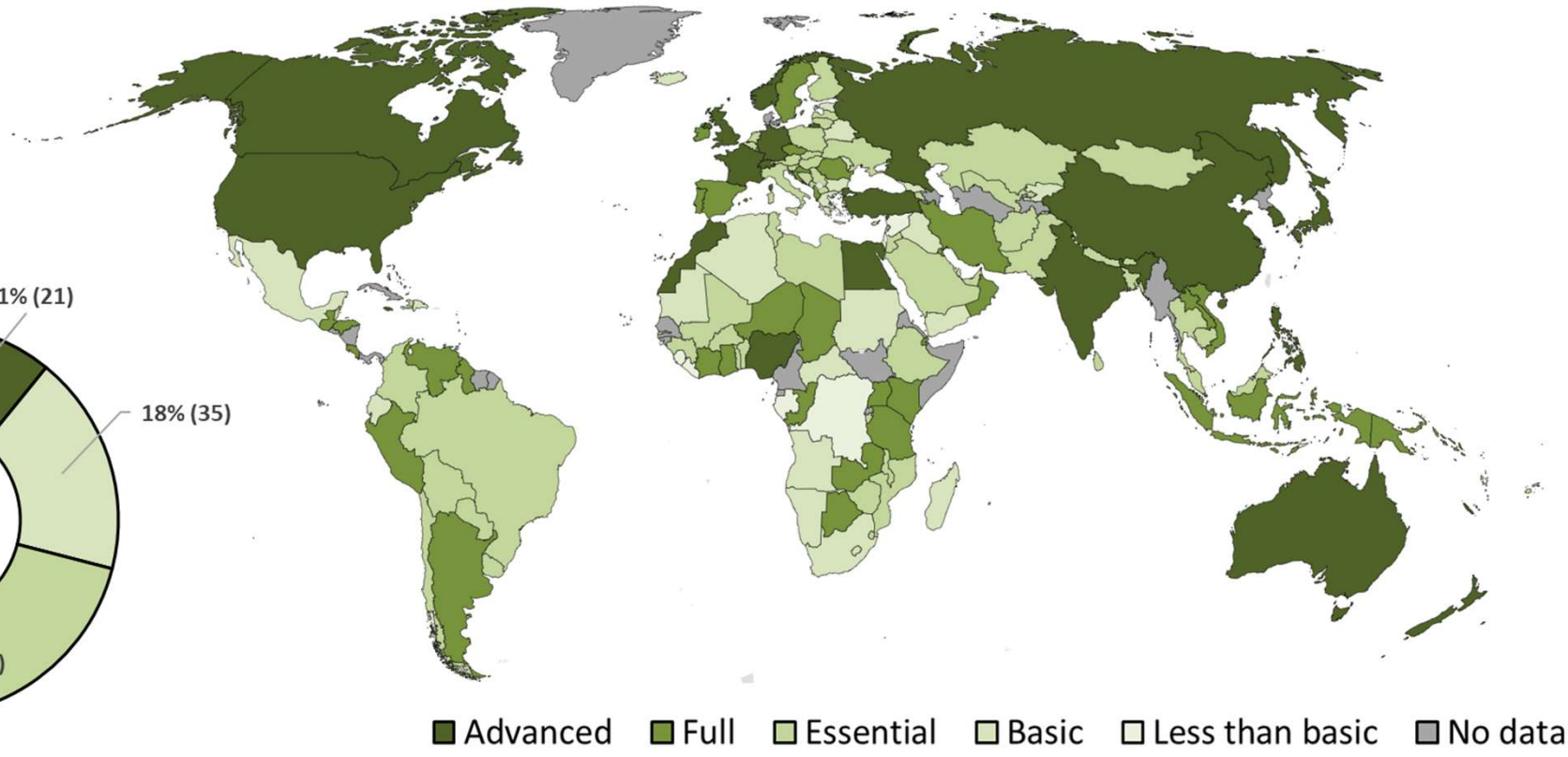
Observed human vulnerability to climate change is a key risk factor and differs globally



Climate Services Capacities

ONLY 31% of MetServices have full or advanced capacity to deliver tailored climate services.





There is immense untapped potential to apply climate services

For example, in the health sector:

74%

of MetServices provide climate data to the health sector

BUT

only 48%

of MetServices deliver tailored climate services for the health sector

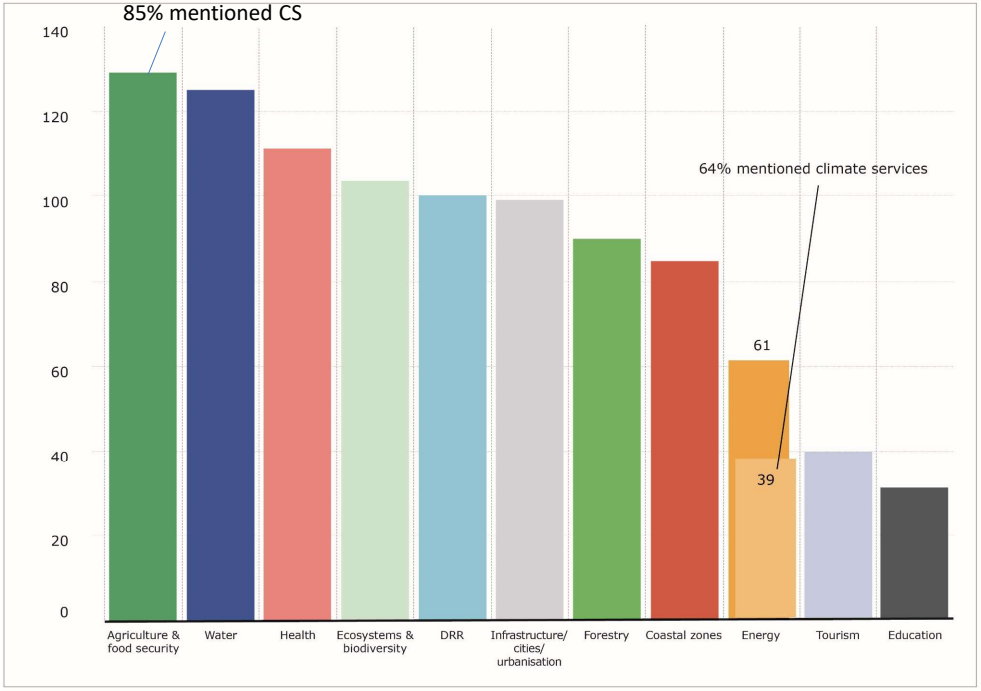
BUT

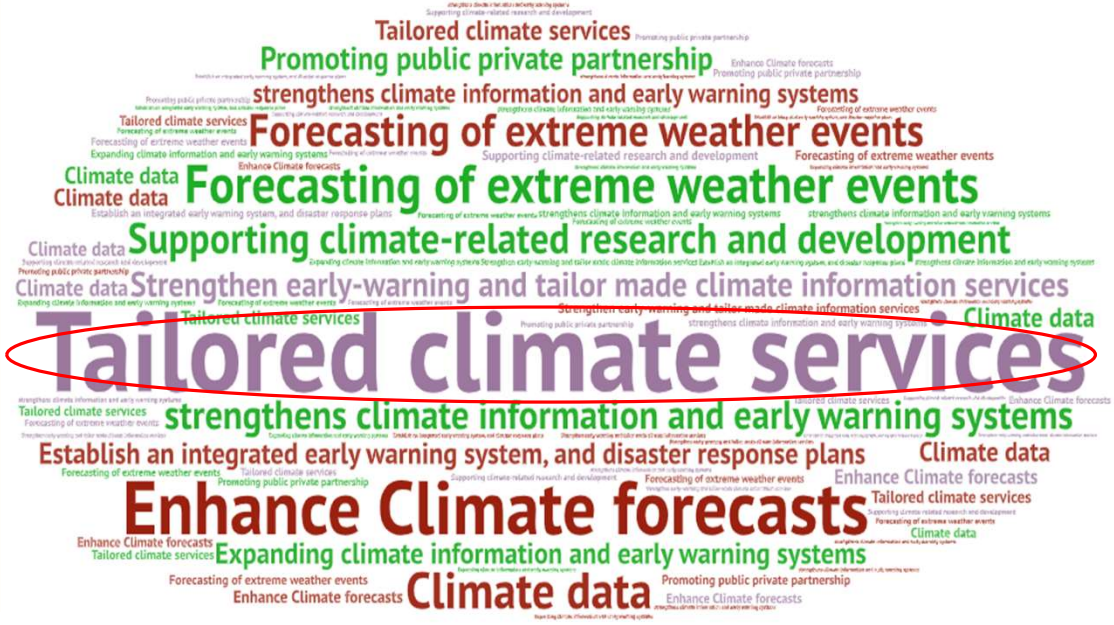
only 23%

of Ministries of Health use meteorological information in their health surveillance systems

WMO IMO-WMO

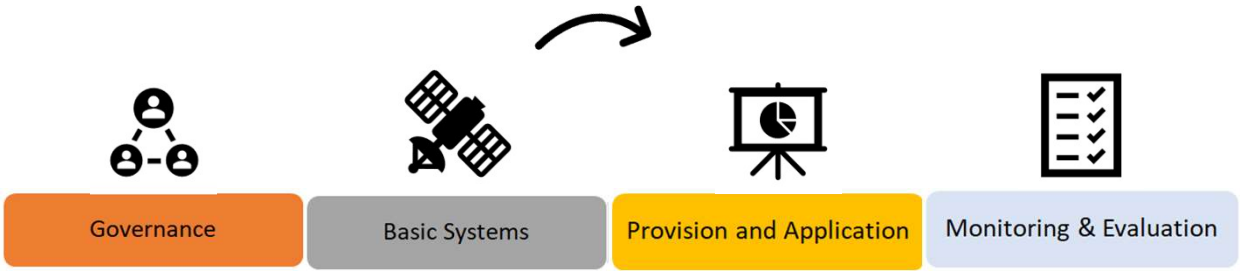
Demand for climate services





SOURCE: Nationally Determined Contributions

Where are the gaps? Climate Services Value Chain



- Observing Networks
- Data collection
- Data Management
- Monitoring
- Forecasting

* CD, UI are Cross cutting

Recommandations

Co-production

Improved Climate services capacities for tailored products that are sector specific

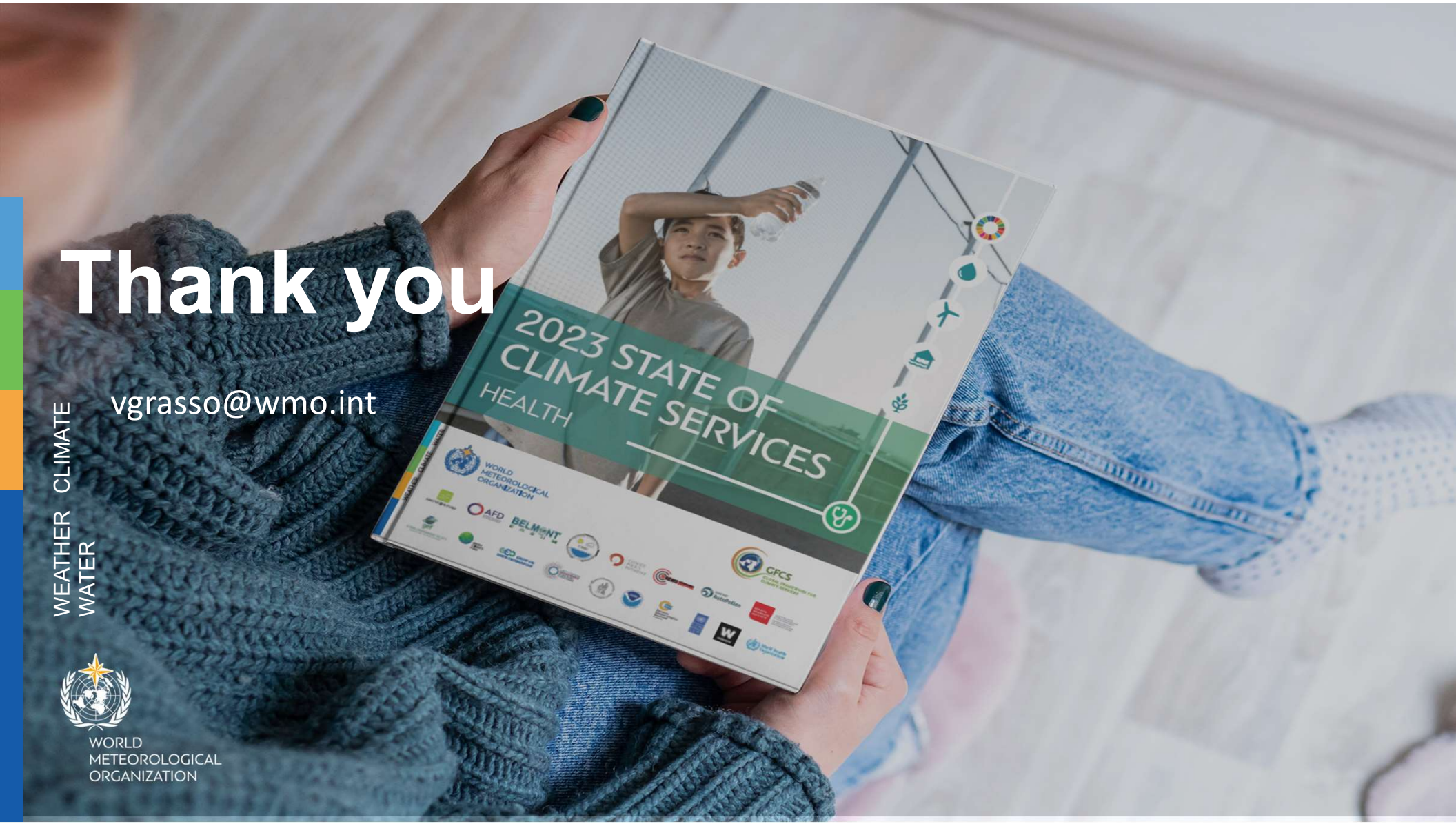
Improve collaboration between MetServices and sectors & National Frameworks for Climate Services

Thank you

vgrasso@wmo.int

WEATHER CLIMATE WATER

WORLD METEOROLOGICAL ORGANIZATION



GERICS
Climate Service Center
Germany
Eine Einrichtung des Helmholtz-Zentrums hereon

2024 +/- 15 Years of Climate Services…..

……from adaptation to climate resilient development

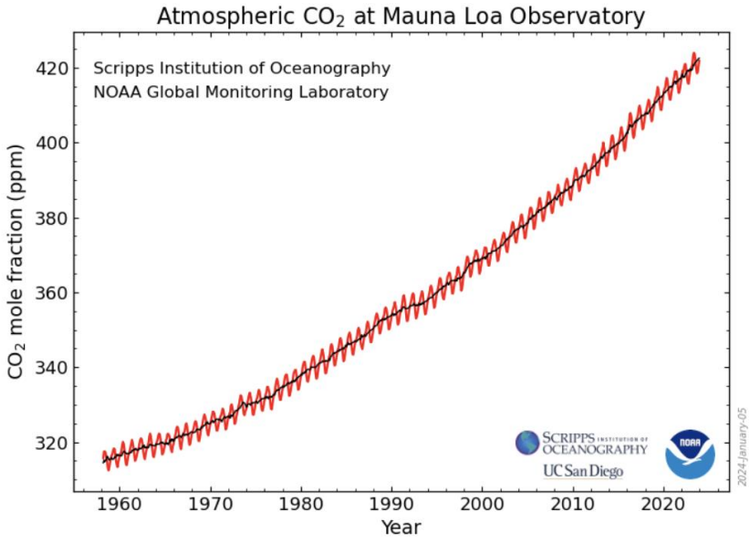
……from adaptation to CC to adapting to a sustainable life style…

Daniela Jacob

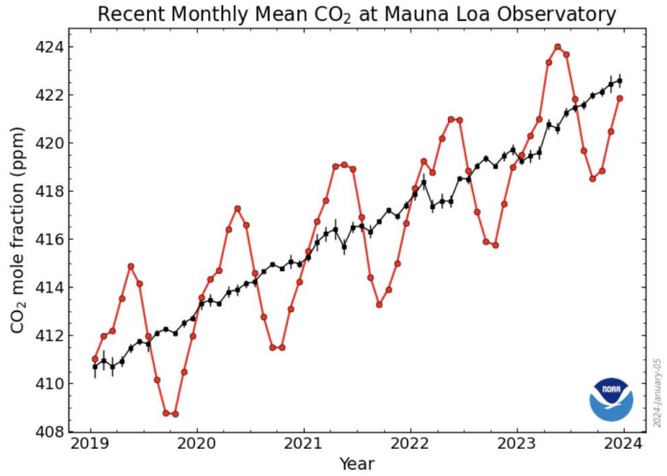
11.3.2024 | Climateurope2 Festival

CO_2 and methane concentrations in the atmosphere

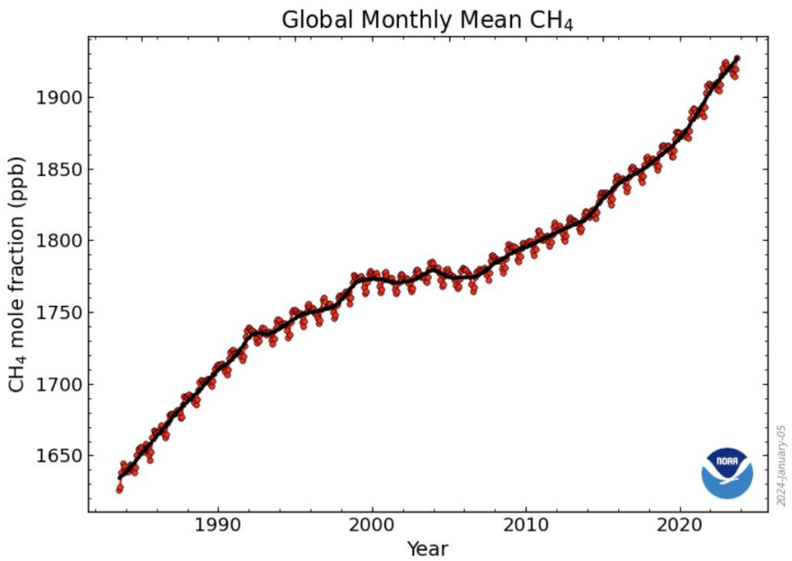
CO_2 in the atmosphere (1958-2021)



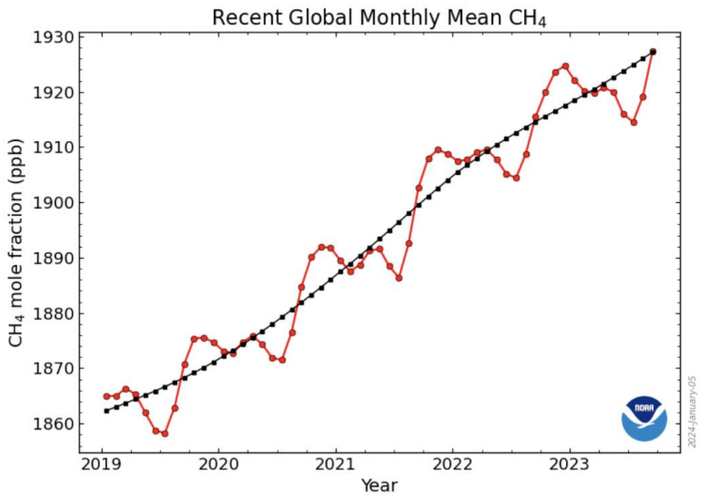
May 2023: 424 ppm



Methane in the atmosphere (1983-2021)



Sep. 2023: 1927 ppb

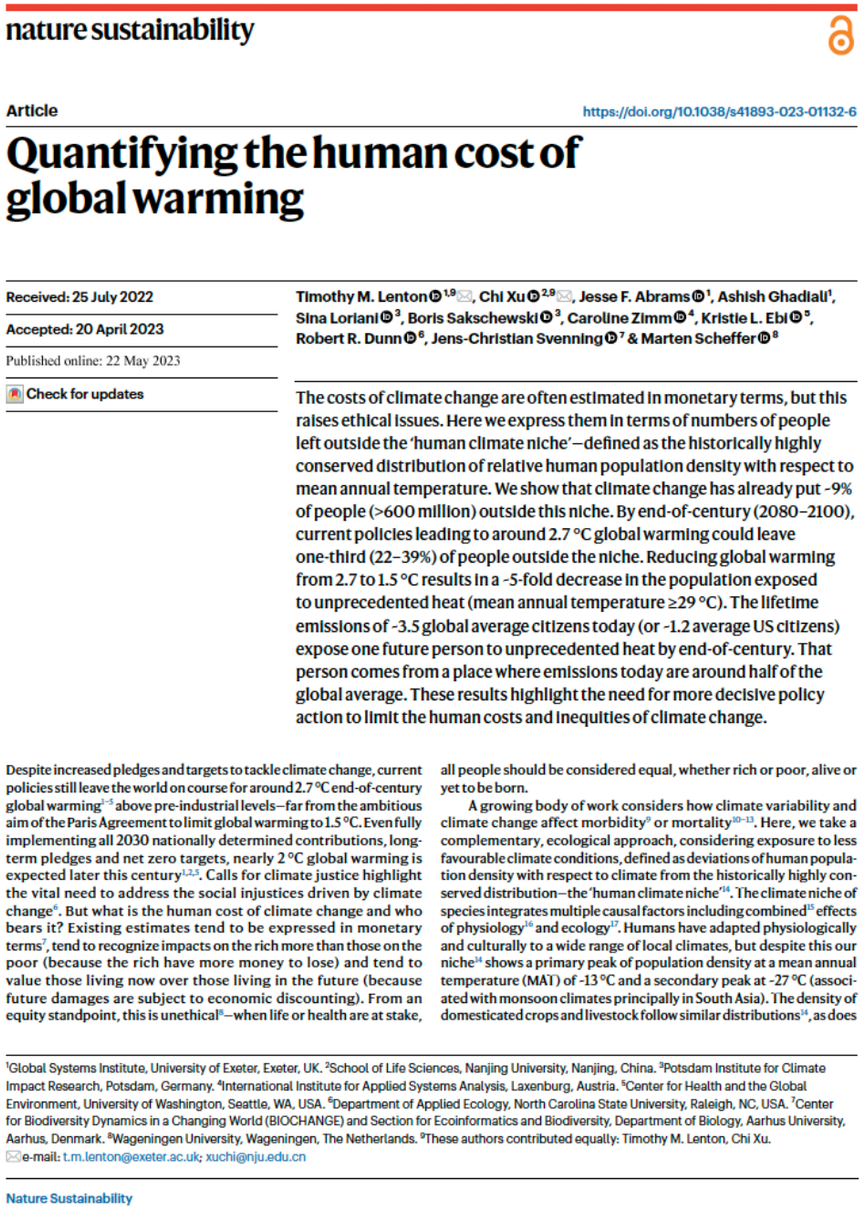


Global Monitoring Laboratory
Earth System Research Laboratories

Source: https://www.esrl.noaa.gov/gmd/ccgg/trends/mlo.html

Human cost of global warming

- „Climate change has already put ~9% of people (>600 million) outside the ‘human climate niche.“
- „By end-of-century (2080 - 2100), current policies leading to around 2.7 ° C global warming could leave one-third (22 - 39%) of people outside the niche.“
- „Reducing global warming from 2.7 to 1.5 ° C results in 1/5 of increase (4 to 8%) in the population exposed to unprecedented heat (mean annual temperature ≥ 29 ° C).
- The lifetime emissions of ~3.5 global average citizens today expose one future person to unprecedented heat by end-of-century.



nature sustainability

Article

https://doi.org/10.1038/s41893-023-01132-6

Quantifying the human cost of global warming

Received: 25 July 2022

Accepted: 20 April 2023

Published online: 22 May 2023

Check for updates

Timothy M. Lenton[1,9], Chi Xu[2,9], Jesse F. Abrams[1], Ashish Ghadiali[1], Sina Loriani[3], Boris Sakschewski[3], Caroline Zimm[4], Kristie L. Ebi[5], Robert R. Dunn[6], Jens-Christian Svenning[7] & Marten Scheffer[8]

The costs of climate change are often estimated in monetary terms, but this raises ethical issues. Here we express them in terms of numbers of people left outside the ‘human climate niche’—defined as the historically highly conserved distribution of relative human population density with respect to mean annual temperature. We show that climate change has already put ~9% of people (>600 million) outside this niche. By end-of-century (2080–2100), current policies leading to around 2.7 °C global warming could leave one-third (22–39%) of people outside the niche. Reducing global warming from 2.7 to 1.5 °C results in a ~5-fold decrease in the population exposed to unprecedented heat (mean annual temperature ≥29 °C). The lifetime emissions of ~3.5 global average citizens today (or ~1.2 average US citizens) expose one future person to unprecedented heat by end-of-century. That person comes from a place where emissions today are around half of the global average. These results highlight the need for more decisive policy action to limit the human costs and inequities of climate change.

Despite increased pledges and targets to tackle climate change, current policies still leave the world on course for around 2.7 °C end-of-century global warming[1–5] above pre-industrial levels—far from the ambitious aim of the Paris Agreement to limit global warming to 1.5 °C. Even fully implementing all 2030 nationally determined contributions, long-term pledges and net zero targets, nearly 2 °C global warming is expected later this century[1,2,5]. Calls for climate justice highlight the vital need to address the social injustices driven by climate change[6]. But what is the human cost of climate change and who bears it? Existing estimates tend to be expressed in monetary terms[7], tend to recognize impacts on the rich more than those on the poor (because the rich have more money to lose) and tend to value those living now over those living in the future (because future damages are subject to economic discounting). From an equity standpoint, this is unethical[8]—when life or health are at stake, all people should be considered equal, whether rich or poor, alive or yet to be born.

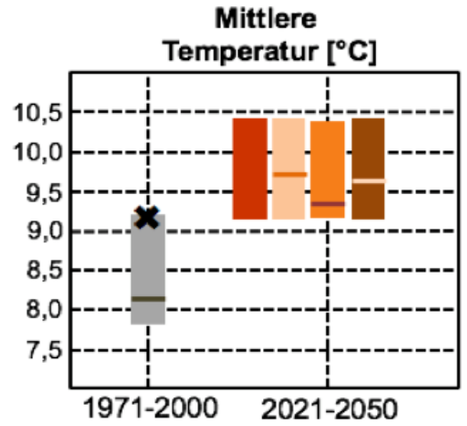
A growing body of work considers how climate variability and climate change affect morbidity[9] or mortality[10–13]. Here, we take a complementary, ecological approach, considering exposure to less favourable climate conditions, defined as deviations of human population density with respect to climate from the historically highly conserved distribution—the ‘human climate niche’[14]. The climate niche of species integrates multiple causal factors including combined[15] effects of physiology[16] and ecology[17]. Humans have adapted physiologically and culturally to a wide range of local climates, but despite this our niche[14] shows a primary peak of population density at a mean annual temperature (MAT) of ~13 °C and a secondary peak at ~27 °C (associated with monsoon climates principally in South Asia). The density of domesticated crops and livestock follow similar distributions[14], as does

[1]Global Systems Institute, University of Exeter, Exeter, UK. [2]School of Life Sciences, Nanjing University, Nanjing, China. [3]Potsdam Institute for Climate Impact Research, Potsdam, Germany. [4]International Institute for Applied Systems Analysis, Laxenburg, Austria. [5]Center for Health and the Global Environment, University of Washington, Seattle, WA, USA. [6]Department of Applied Ecology, North Carolina State University, Raleigh, NC, USA. [7]Center for Biodiversity Dynamics in a Changing World (BIOCHANGE) and Section for Ecoinformatics and Biodiversity, Department of Biology, Aarhus University, Aarhus, Denmark. [8]Wageningen University, Wageningen, The Netherlands. [9]These authors contributed equally: Timothy M. Lenton, Chi Xu.
e-mail: t.m.lenton@exeter.ac.uk; xuchi@nju.edu.cn

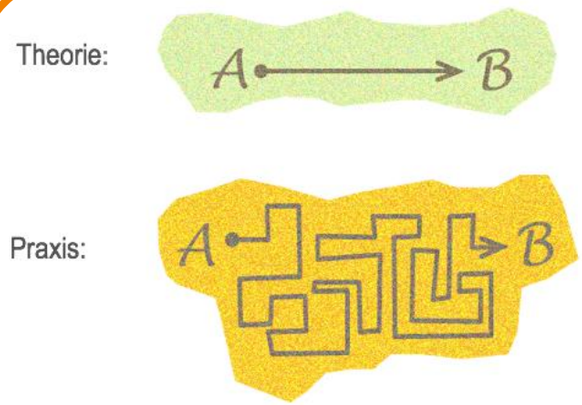
Nature Sustainability

Source: Lenton, T.M., Xu, C., Abrams, J.F. et al. Quantifying the human cost of global warming. Nat Sustain (2023)

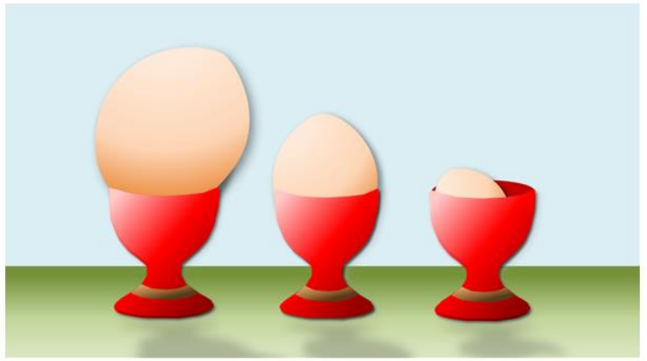
Climate Services - fundamental principles @GERICS in 2009ff



Current state of knowledge

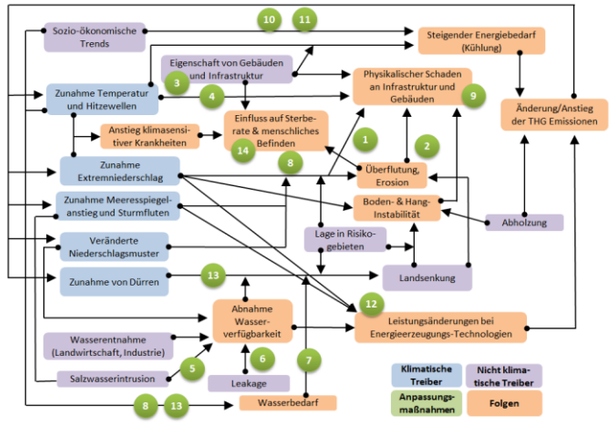


Practical applicability



Tailored solutions

Combined view of mitigation and adaptation

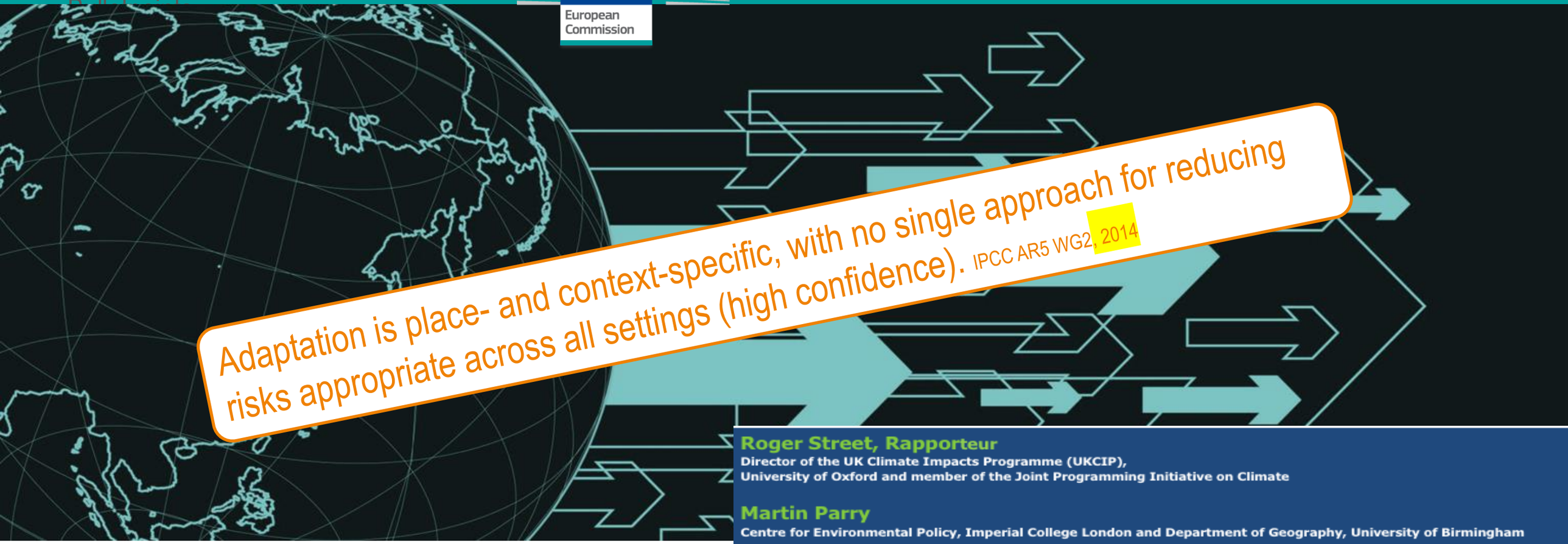


Holistic approach

A European Research and Innovation

Roadmap

for Climate Services



Adaptation is place- and context-specific, with no single approach for reducing risks appropriate across all settings (high confidence). IPCC AR5 WG2, 2014

Expert Group composition

...and Support- and Steering Groups with EU-representatives

Roger Street, Rapporteur
Director of the UK Climate Impacts Programme (UKCIP),
University of Oxford and member of the Joint Programming Initiative on Climate

Martin Parry
Centre for Environmental Policy, Imperial College London and Department of Geography, University of Birmingham

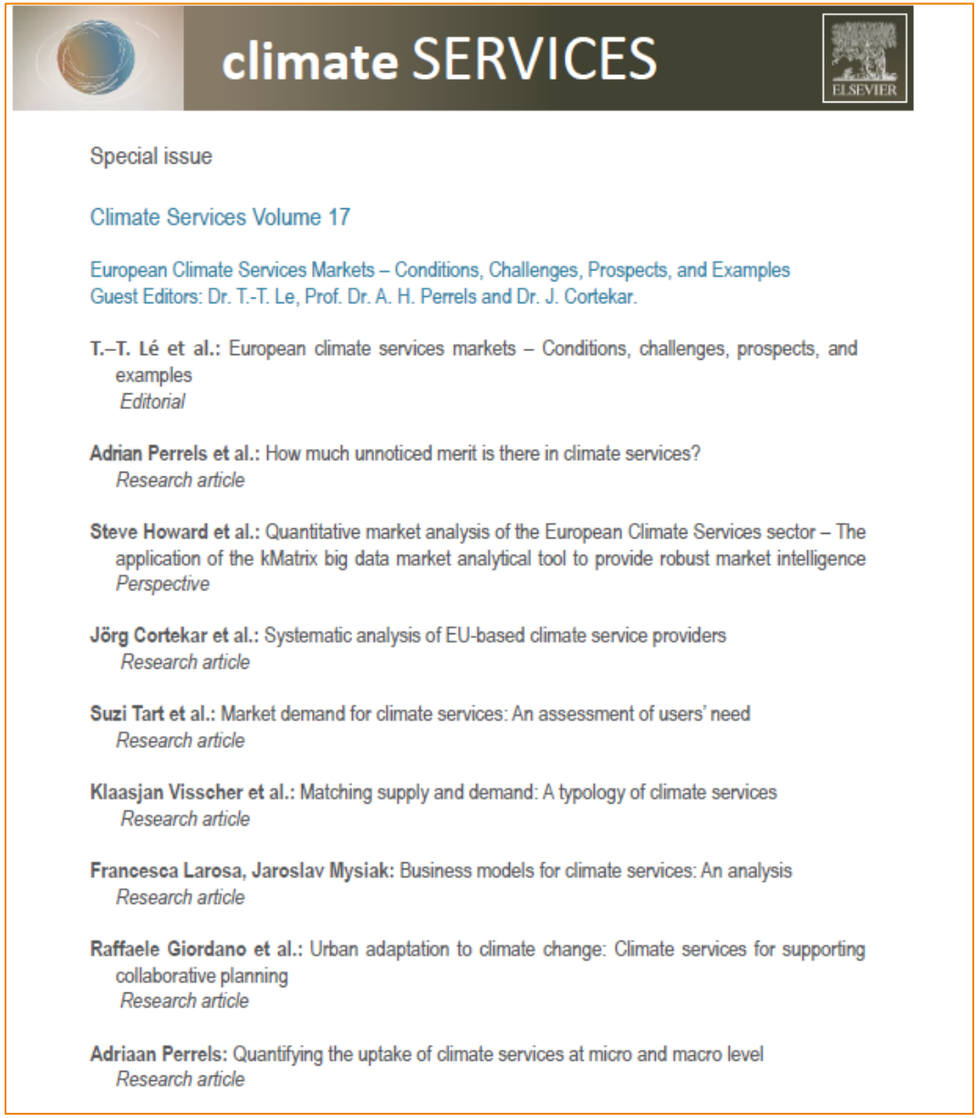
Jesse Scott,
Member of the Gas, Coal, and Power Markets team, International Energy Agency, Paris

Daniela Jacob,
Acting Director of the Climate Service Centre 2.0,
an independent establishment at the Helmholtz-Zentrum Geesthacht, Hamburg

Tania Runge,
Senior Policy Advisor, Copa-Cogeca secretariat
Chair of the Stakeholder Advisory Board of FACCE JPI

First journal dedicated exclusively to climate services

- Initiated by GERICS in 2015
- Chief Editor: Daniela Jacob
- Open access, publisher Elsevier
- Eighteen issues published so far, thereof 4 special issues
- Issues no. 19 in preparation
- Aimed at scientists and climate service practitioners
- Extended abstract summarises the practical implications



climate SERVICES

ELSEVIER

Special issue

Climate Services Volume 17

European Climate Services Markets – Conditions, Challenges, Prospects, and Examples
Guest Editors: Dr. T.-T. Le, Prof. Dr. A. H. Perrels and Dr. J. Cortekar.

T.–T. Lé et al.: European climate services markets – Conditions, challenges, prospects, and examples
Editorial

Adrian Perrels et al.: How much unnoticed merit is there in climate services?
Research article

Steve Howard et al.: Quantitative market analysis of the European Climate Services sector – The application of the kMatrix big data market analytical tool to provide robust market intelligence
Perspective

Jörg Cortekar et al.: Systematic analysis of EU-based climate service providers
Research article

Suzi Tart et al.: Market demand for climate services: An assessment of users' need
Research article

Klaasjan Visscher et al.: Matching supply and demand: A typology of climate services
Research article

Francesca Larosa, Jaroslav Mysiak: Business models for climate services: An analysis
Research article

Raffaele Giordano et al.: Urban adaptation to climate change: Climate services for supporting collaborative planning
Research article

Adriaan Perrels: Quantifying the uptake of climate services at micro and macro level
Research article

Climate Services today in 2024 …

- Climate Service Institutions
  - Public, private

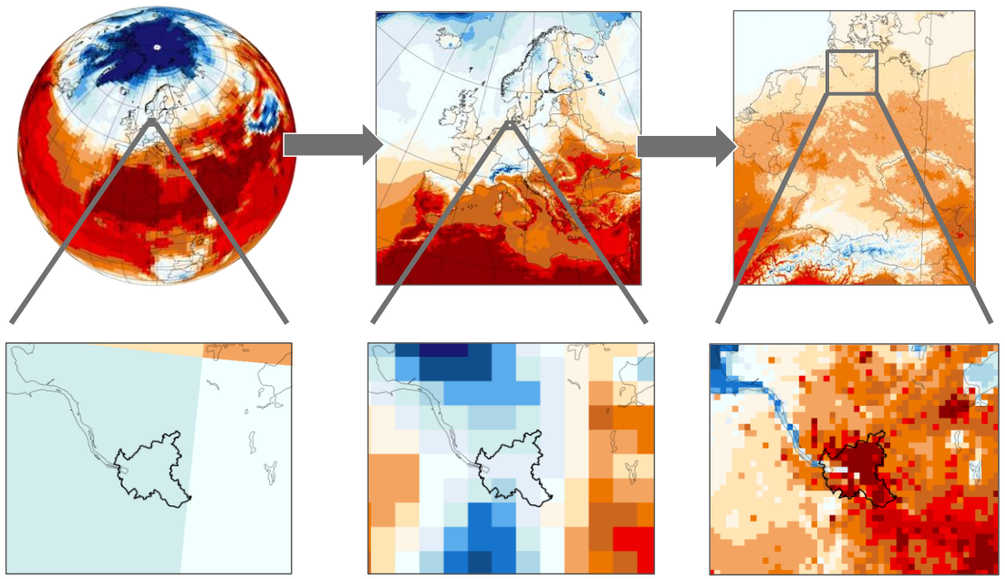
Type of climate services providers / purveyors	Cultural background
Extension of meteorological services	Meteorology / hydrology
Public climate services centres (not from meteorological services)	Multidisciplinary
Services offered by a university or a group of universities	Multidisciplinary, academic
Private business development	Multidisciplinary, business
Incorporation of climate information management in business consulting services	Economic, business, marketing

Climate Services today in 2024 …

- Climate Service institutions
  - Public, private
- Climate Service products
  - Data, figures, guidance

Large ensembles and high resolution

Grid Representation of local temperature (July2, 1995)



CMIP
~150 km

EURO-CORDEX
~12.5 km

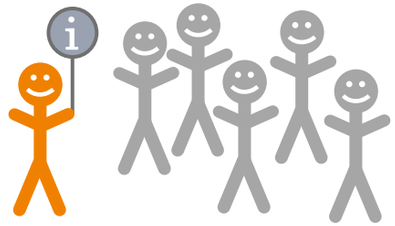
NUKLEUS
~3 km

Source: Kevin Sieck (GERICS)

Climate Services today in 2024 …

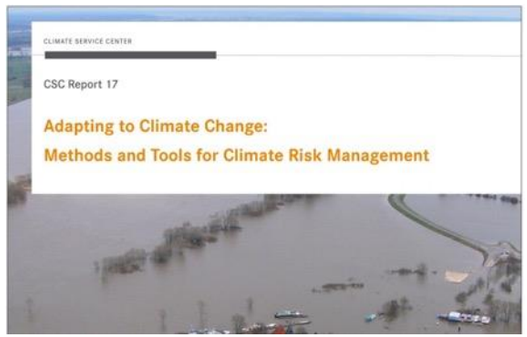
- Climate Service institutions
  - Public, private
- Climate Service products
  - Data, figures, guidance
- Sectorial and spatial coverage
  - Non-uniform, non seamless, fit for purpose
- Market development
  - Consultancies, PPP, costs

Levels of Interactions

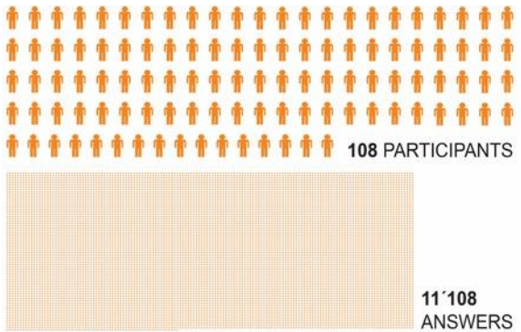
INFORMATION	CONSULTATION	DIALOGuE	PARTNERSHiPS
			
“HEAR US”	“TELL US”	“SPEAK WITH US”	“WORK WITH US”

INTENSITY OF PARTICIPATION

Adaptation Handbook
GERICS publication

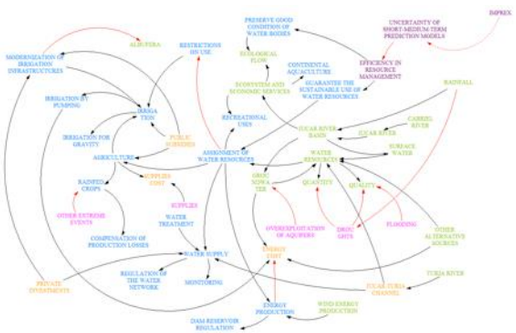


UseUClim
online-survey



Climate-Focus-Paper
demand-driven prototype

IMPREX
participatory modeling



own representation based on: UNEP (2005); Stauffacher, M. et al. (2008); Hewitt, C. D. et al. (2017)

Climateurope Festival

IDEA Climate information at your service

TOOLS

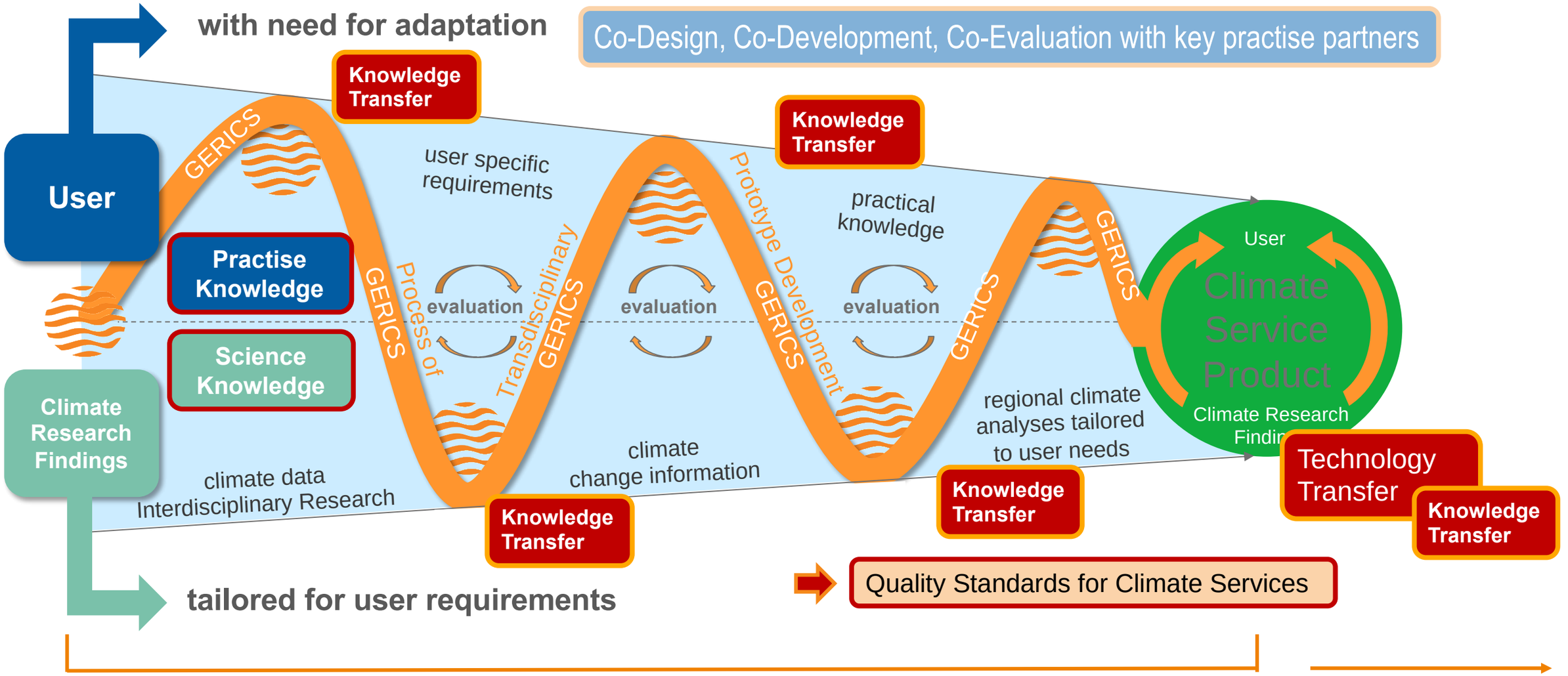
Speed networking

Games

Story telling

Round table

GERICS Co-Creation of climate products



Peer Seipold, Juliane Petersen, Diana Rechid (2021): Prototype Development and Transfer

Some Future Needs in 2024 and beyond ….

- More and faster connection to Innovation
  - For climate resilient development
  - → Adaptation to and mitigation of CC
- Stronger systemic approach
  - cross-sectoral, cross- disciplines
- Guiding principles for Quality assurance, liability clarified
  - Standards, Norms
- Worldwide Education and Capacity development
  - Universities, private consultancy, CS users
- Tailored communication strategies
  - Outreach to the public
  - Dialog and Co-design, Co-development

Earth Virtualization Engines

An ***international federation of centers of excellence*** to empower all people to respond to the immense and urgent challenges posed by climate change

To manage Earth in the Anthropocene, new tools, new institutions, and new forms of international cooperation will be required. Earth Virtualization Engines are proposed as international federation of centers of excellence to empower all people to respond to the immense and urgent challenges posed by climate change.

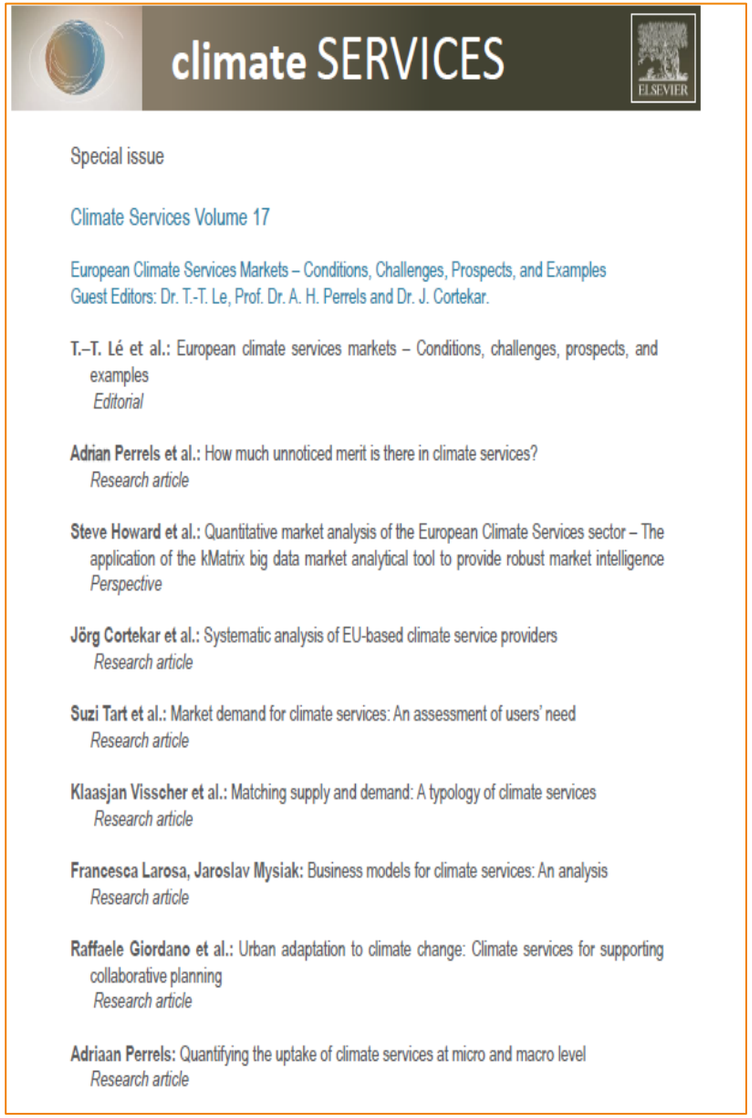
Source: Stevens et al., 2024

Earth Virtualization Engines scales well with the number of stakeholders

The engine and data layer require renewed scientific ambition and a public infrastructure.

First journal dedicated exclusively to climate services

- from 2024 onwards…..
- Chief Editor: Jaroslav Mysiak
- Open access, publisher Elsevier
- Aimed at scientists and climate service practitioners
- Extended abstract summarises the practical implications



climate SERVICES

ELSEVIER

Special issue

Climate Services Volume 17

European Climate Services Markets – Conditions, Challenges, Prospects, and Examples
Guest Editors: Dr. T.-T. Le, Prof. Dr. A. H. Perrels and Dr. J. Cortekar.

T.–T. Lé et al.: European climate services markets – Conditions, challenges, prospects, and examples
Editorial

Adrian Perrels et al.: How much unnoticed merit is there in climate services?
Research article

Steve Howard et al.: Quantitative market analysis of the European Climate Services sector – The application of the kMatrix big data market analytical tool to provide robust market intelligence
Perspective

Jörg Cortekar et al.: Systematic analysis of EU-based climate service providers
Research article

Suzi Tart et al.: Market demand for climate services: An assessment of users' need
Research article

Klaasjan Visscher et al.: Matching supply and demand: A typology of climate services
Research article

Francesca Larosa, Jaroslav Mysiak: Business models for climate services: An analysis
Research article

Raffaele Giordano et al.: Urban adaptation to climate change: Climate services for supporting collaborative planning
Research article

Adriaan Perrels: Quantifying the uptake of climate services at micro and macro level
Research article

Key insights from Climateurope2 annual synthesis report

Asun Lera St.Clair

Climateurope2 Festival

Venice 11-13 March 2024

Climateurope2

Funded by the European Union

Europe’s ambition to standardise climate services

Climateurope2
Funded by the European Union

1

The standardisation of climate services supports evidence-based resilience to climate impacts, green investments, and transformations to a sustainable future.

#SUSTAINABLE FUTURE

Climateurope2

Funded by
the European Union

2

Breaking down climate services into interrelated components enables the assessment of their quality, efficiency, and effectiveness, and to distinguish what should not be standardised.

#CLIMATE SERVICES COMPONENTS

Climateurope2

Funded by the European Union

Climate services components

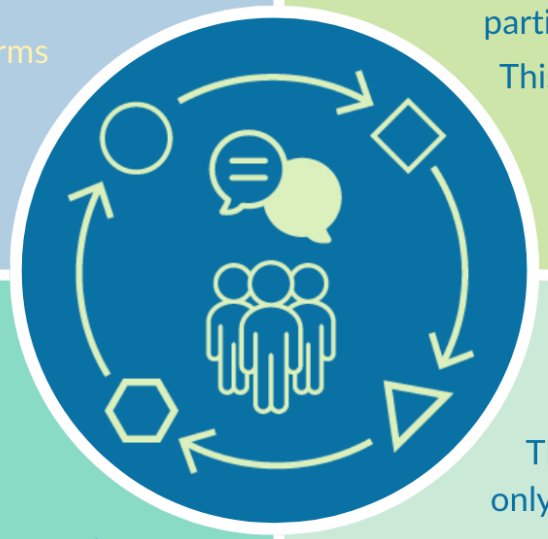
Decision context

The decision context refers to the kinds of decisions the climate service supports, including its geographical and political context.
This includes the policy structure and other forms of governance that require and enable climate services to develop.

Ecosystem of actors and co-production processes

This component identifies the different actors involved in (co)producing, evaluating, and taking up climate services, as well as the actors that might become relevant because of a particular decision context (see Decision context).

This component also addresses the co-production processes that are relevant for different actors and different stages of the climate service development process.



Delivery mode and evaluation

This component regards how a climate service is delivered, and how this delivery is evaluated at various steps. This should include the tailored aggregation and combination of data and processes to match the decision and context of the service client.

Knowledge systems

This component relates to climate data, but not only. Environmental, social, economic & technical, as well as engineering data and local knowledge to develop and implement local adaptation and mitigation strategies, are relevant here too, as well as all selection, evaluation and translation processes related to this data. Data accessibility, storage and stewardship would also fall under this component.

3

Climate services can be governed through both, formal standardisation processes and alternative institutional mechanisms.

#CLIMATE SERVICES GOVERNANCE

Climateurope2

Funded by the European Union

4

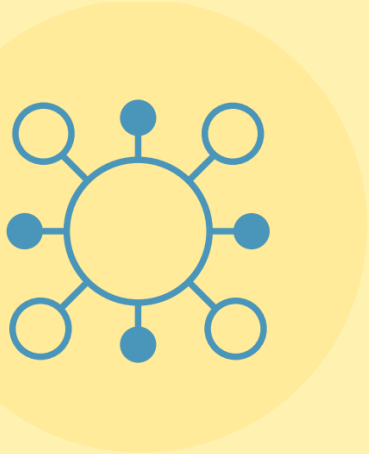
Climate services shall demonstrate to be user-focused, science-based, transparent, collaborative, timely, accessible, sustainable, and equitable.

#BENCHMARKING

Climateurope2

Funded by the European Union

5



Climate services fitness for purpose require multidisciplinary, transdisciplinary, and multi-faceted competencies, including domain knowledge.

#MULTIPLE COMPETENCIES

Climateurope2

Funded by the European Union

6

Climate data-related guidance documents are available, although often incomplete and driven by providers rather than users.

#DATA AND INFORMATION

Climateurope2

Funded by the European Union

7

The supply side of the climate services market is growing, yet there is lack of clarity on best practices and the suitability of the services offered.

#GROWING MARKET

Climateurope2

Funded by
the European Union

8

Broadening the climate services community through contextualised engagement with stakeholders will advance services' uptake and quality.

#COMMUNITY

Climateurope2

Funded by the European Union

9

Europe should aim to place equity at the centre of standardisation processes, the resulting standards, and the climate service community.

#EQUITY

Climateurope2

Funded by the European Union

This is where we are

Funded by the European Union

Climateurope2

Funded by
the European Union