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Climate Service Center
Germany
Eine Einrichtung des Helmholtz-Zentrums hereon

Climate services for our critical decade of climate action

Daniela Jacob

09.09.2025 | Tyndall

IPCC report AR6 – Synthesis report

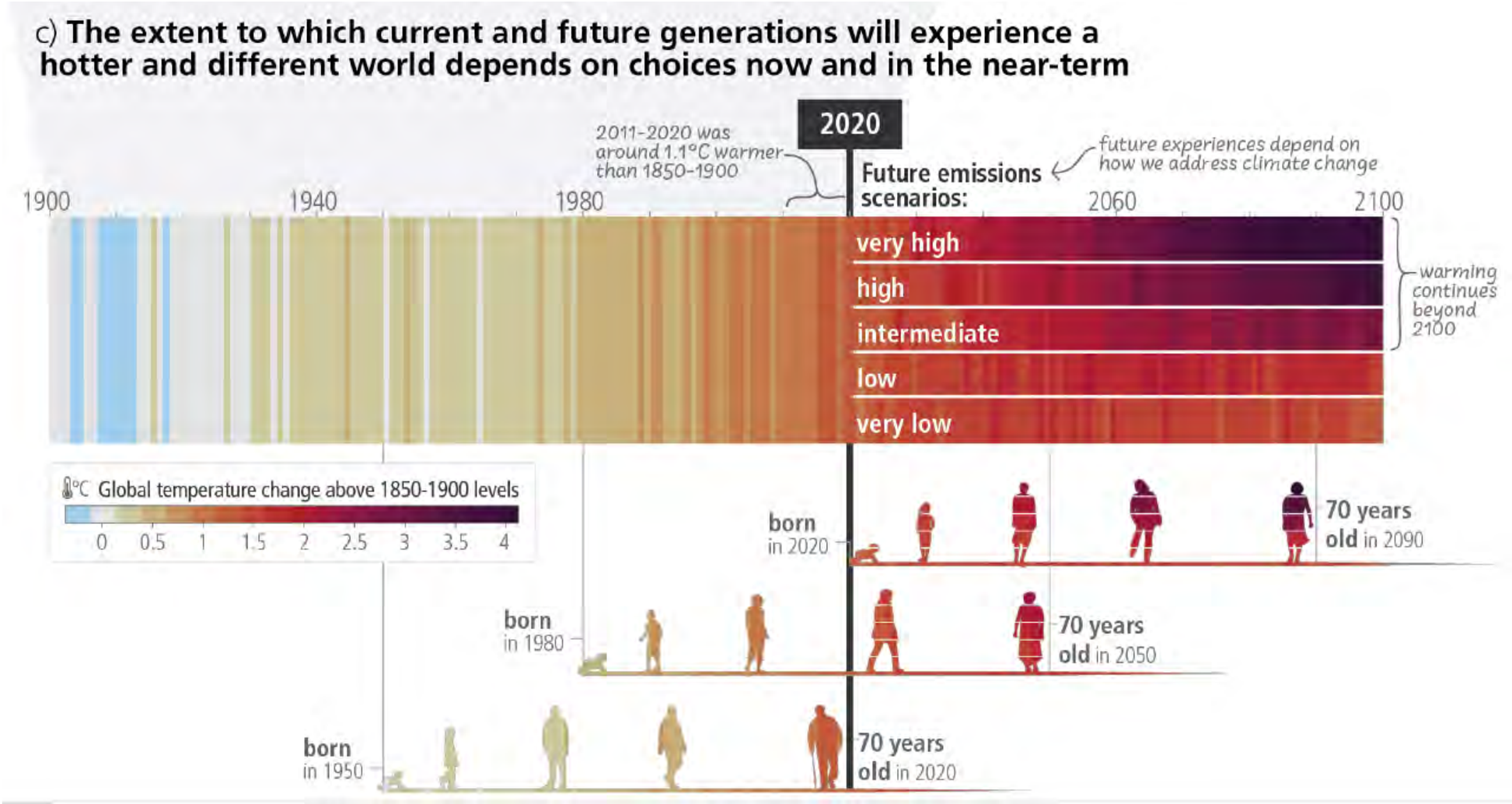

Figure SPM.1: (c) Observed (1900–2020) and projected (2021–2100) changes in global surface temperature (relative to 1850–1900), which are linked to changes in climate conditions and impacts, illustrate how the climate has already changed and will change along the lifespan of three representative generations (born in 1950, 1980 and 2020).

Source: https://www.ipcc.ch/report/ar6/syr/figures/

IPCC report AR6 WG II

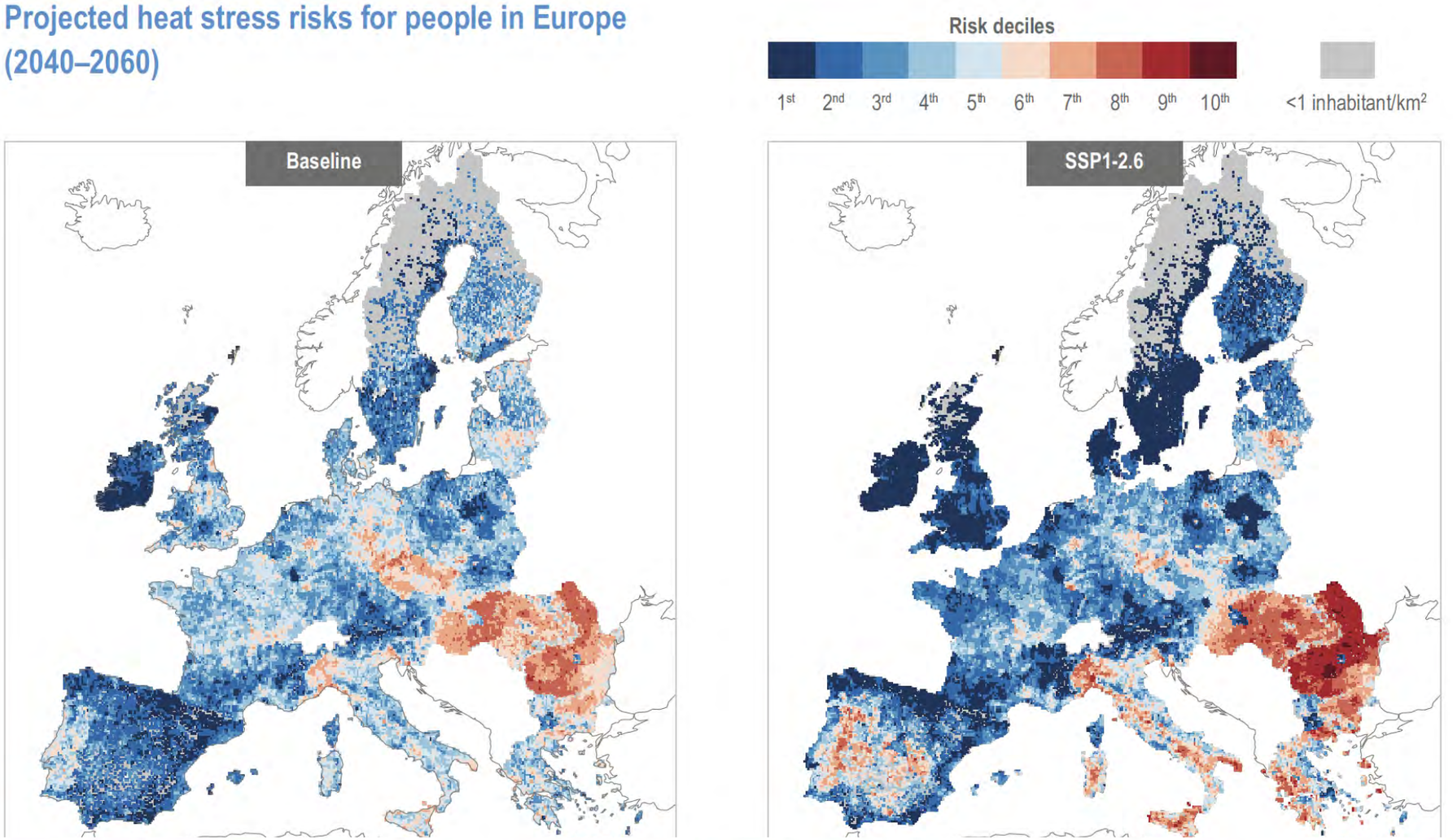

Figure 13.22 | Scenario matrix for multi-model median heat stress risks for the baseline 1986–2005, and different SSP–RCP combinations for the period 2040–2060. The SSPs are extended for Europe (EU28+). Heat stress risk is calculated by geometrical aggregation of the hazard (heatwave days), population vulnerability and exposure. Risk values are normalised using a z-score rescaling with a factor-10 shift. Details of the methodology are provided by Rohat et al. (2019).

Source: https://www.ipcc.ch/report/ar6/wg2/

IPCC report AR6 WG II

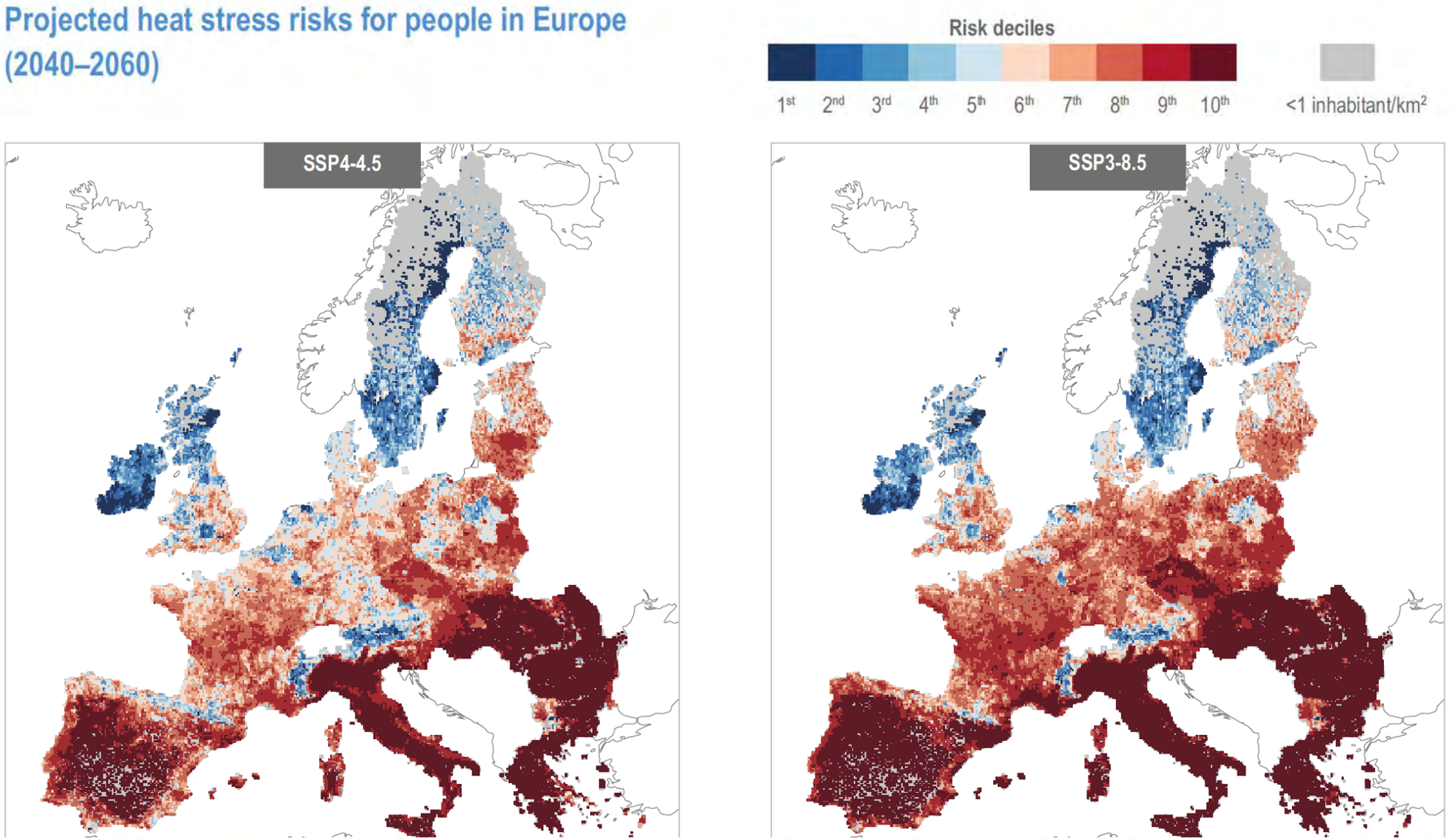

Figure 13.22 | Scenario matrix for multi-model median heat stress risks for the baseline 1986–2005, and different SSP–RCP combinations for the period 2040–2060. The SSPs are extended for Europe (EU28+). Heat stress risk is calculated by geometrical aggregation of the hazard (heatwave days), population vulnerability and exposure. Risk values are normalised using a z-score rescaling with a factor-10 shift. Details of the methodology are provided by Rohat et al. (2019).

Source: https://www.ipcc.ch/report/ar6/wg2/

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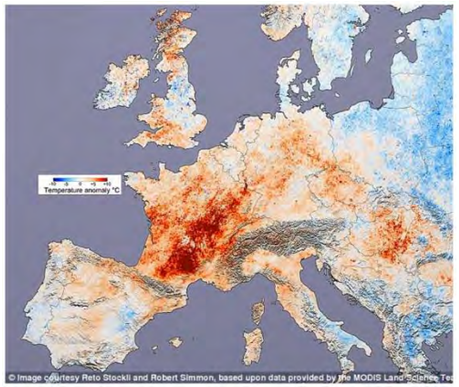
Feb. 1953 North Sea Flood

Feb. 1962 Hamburg Flood

Aug. 1992 Hurricane Andrew, USA

Aug. 2003 Heatwave, Europe

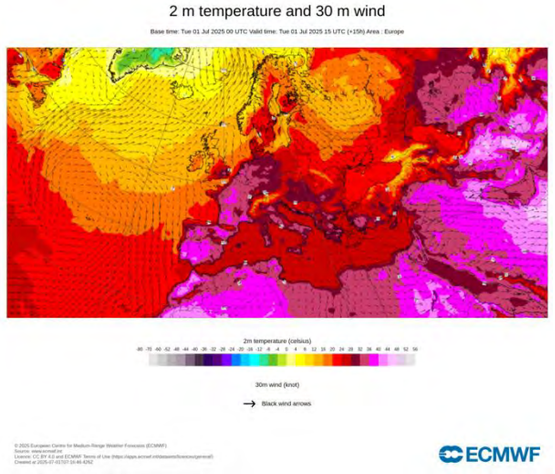


Aug. 2005 Hurricane Katrina, USA

Jul. 2021 Flood West Europe

Jul. 2024 Flood Valencia, Spain

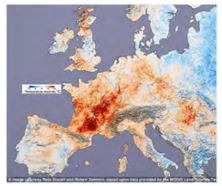
Jun./Jul. 2025 Heatwave, Europe



https://www.nzz.ch/panorama/niederlande-vor-70-jahren-starben-in-der-sturmflut-1800-menschen-ld.1723741

https://de.wikipedia.org/wiki/Sturmflut_1962#/media/Datei:Hamburg_Sturmflut_005.jpg

https://www.nytimes.com/2016/10/07/us/hurricane-matthew-andrew-florida.html

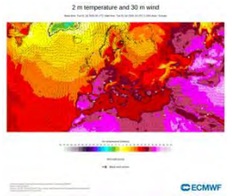


Reto Stockli and Robert Simmon, based upon data provided by the MODIS Land Science Team, https://visibleearth.nasa.gov/images/3714/european-heat-wave#:~:text=In%20July%202003%2C%20Europe%20experienced,the%20MODIS%20Land%20Science%20Team.

https://www.vox.com/2015/8/23/9191907/hurricane-katrina

https://www.wikiwand.com/de/articles/Hochwasser_in_West-_und_Mitteleuropa_2021

2024-11-02 Voluntaris per netejar camí de Sedaví 05.jpg https://en.wikipedia.org/wiki/2024_Spanish_floods#/media/File:2024-11-02_Voluntaris_per_netejar_camí_de_Sedaví_05.jpg



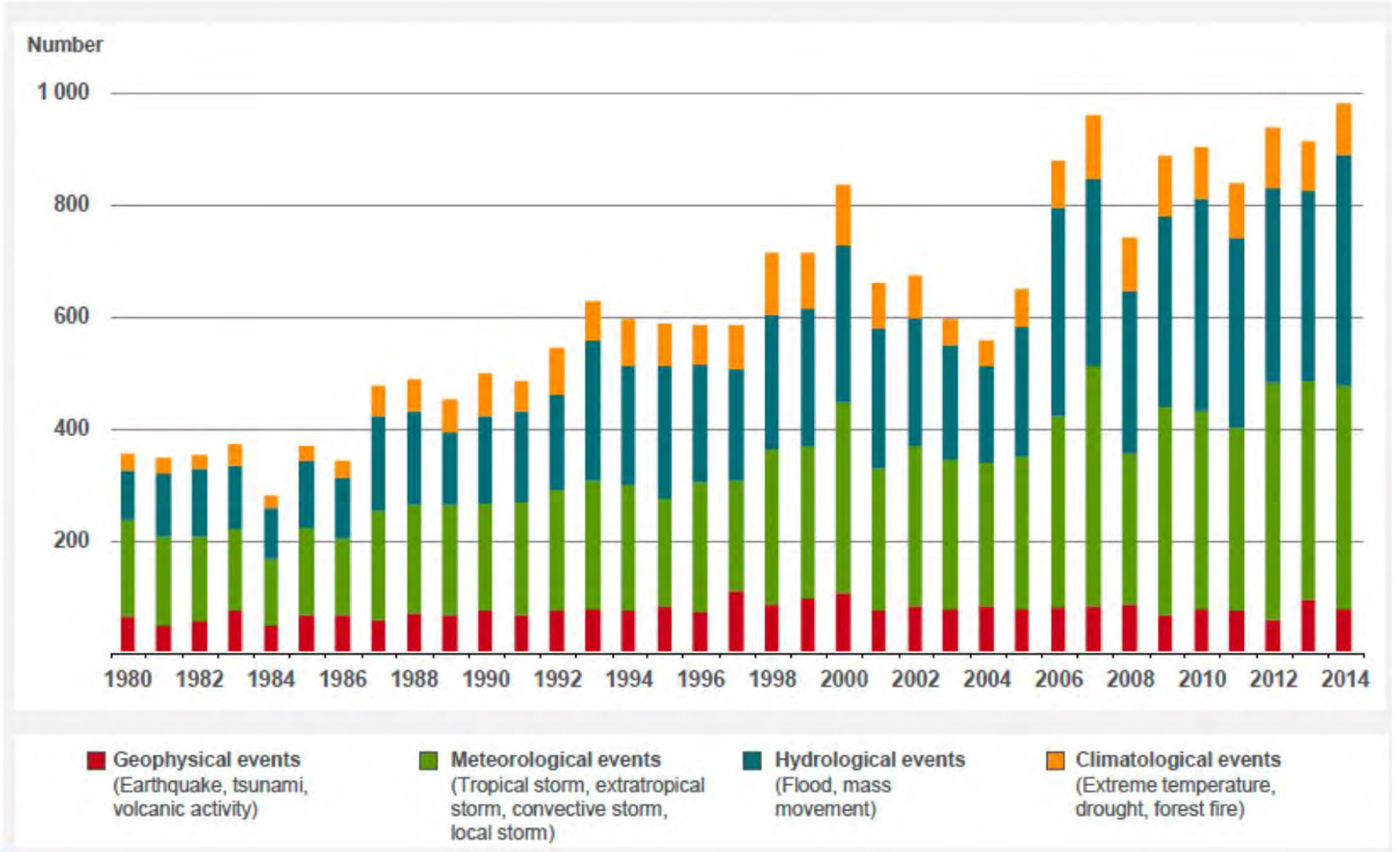
https://wmo.int/media/news/extreme-heat-grips-europe

NatCatSERVICE

Loss events worldwide 1980 – 2014

Number of events

Munich RE



Heat/cold

Hydrological

Wind

Geophysical

Source: Munich Re, NatCatSERVICE

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

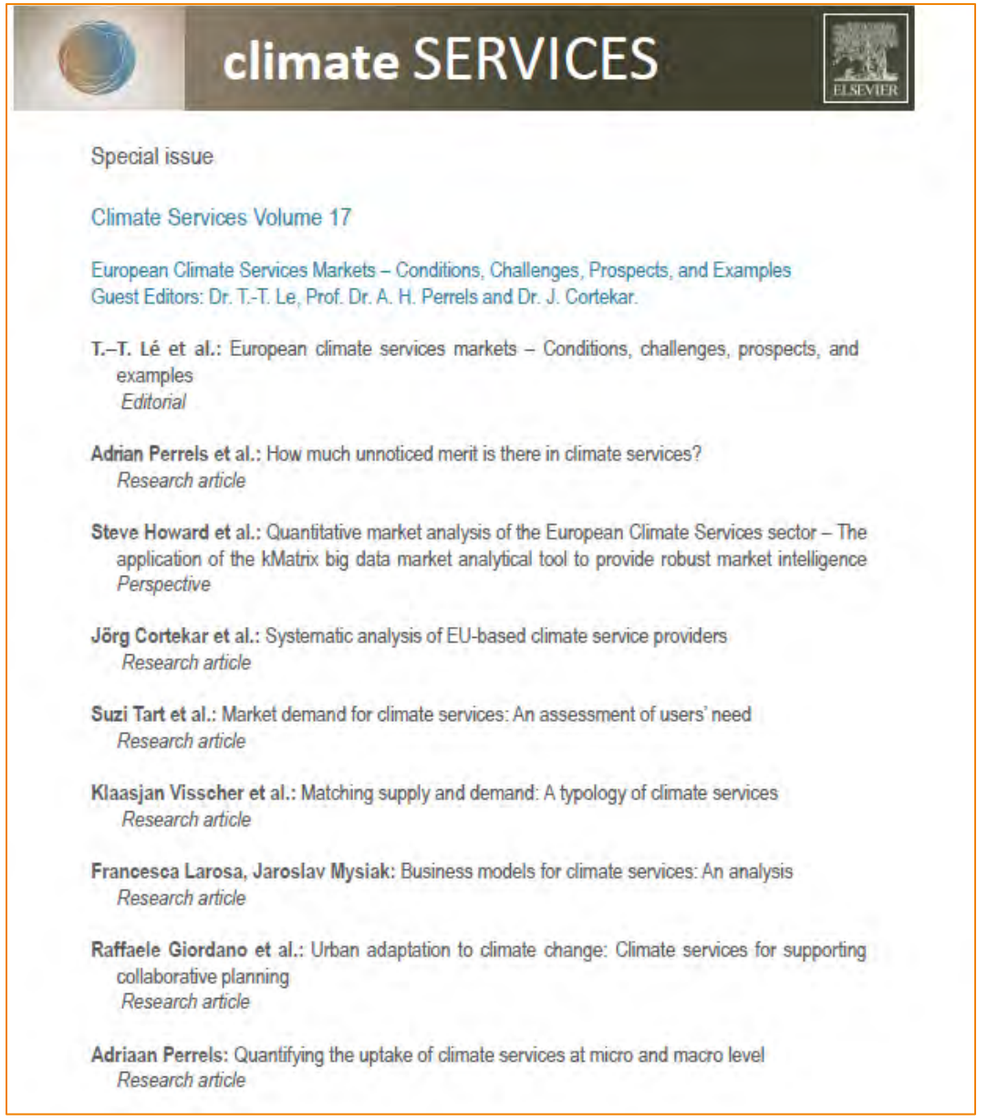
Jesse Scott,
Member of the Gas, Coal, and Power Markets team, International Energy Agency, Paris

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, since 2024 Jaroslav Mysiak
- 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 2025

- 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 2025

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

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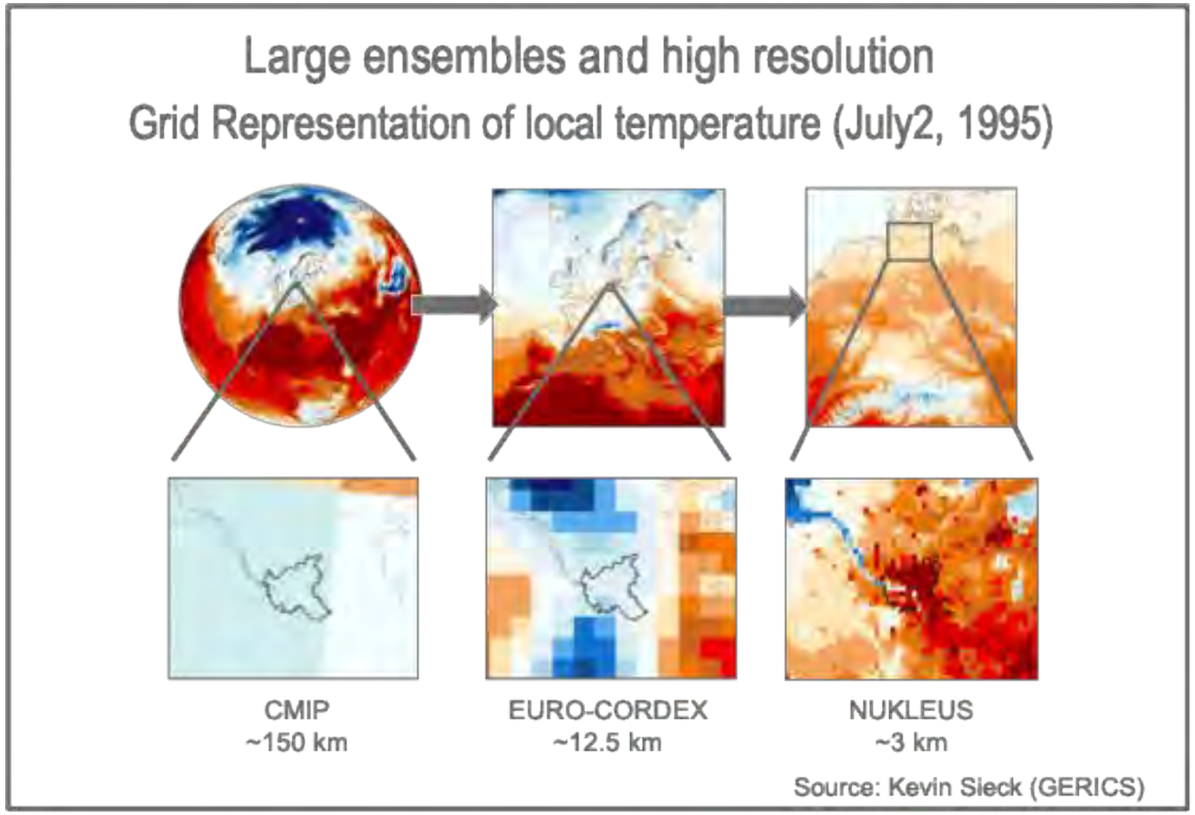

Climate Services today in 2025

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

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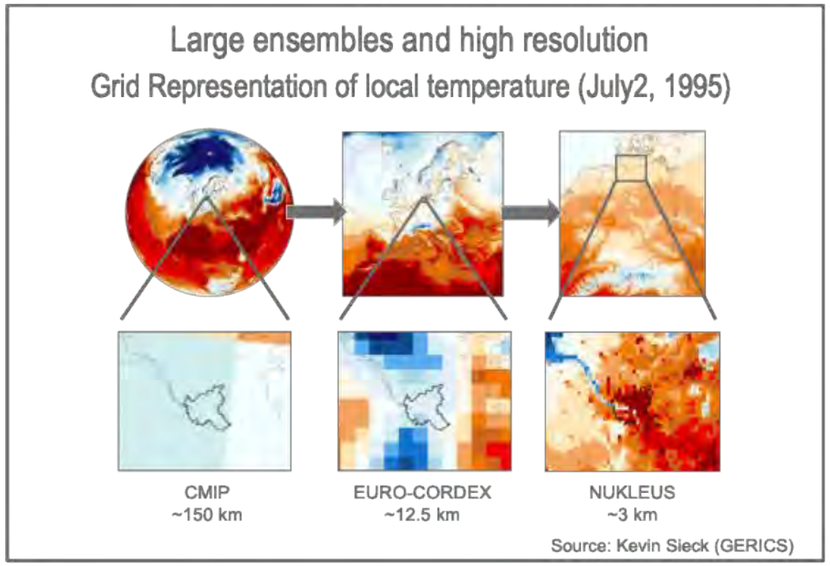

Climate Services today in 2025

- 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

Type of climate services providers / purveyors	Cultural background
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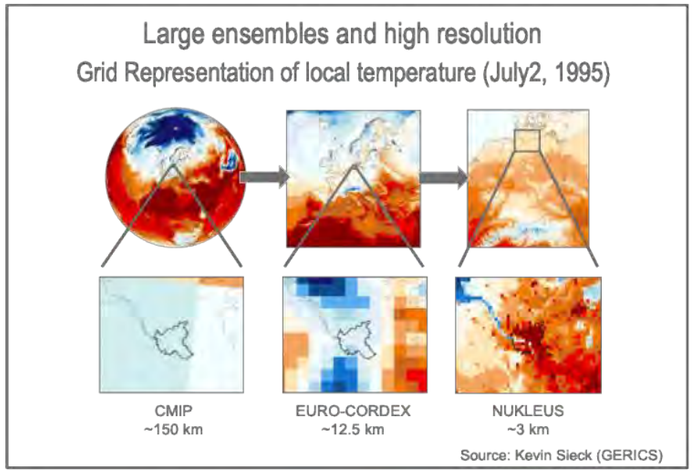


Climate Service Center Germany GERICS

- Founded in 2009 by the German Federal Ministry of Education and Research
- Since 2014 scientific organizational entity of Helmholtz-Zentrum Hereon (former Helmholtz-Zentrum Geesthacht)
- Financed by programme-oriented funding of Helmholtz Association
- Based in Hamburg's Chilehaus
- Director Prof. Dr. Daniela Jacob
- Interdisciplinary team of natural scientists and socio-economists
- Approx. 80 staff members

Chilehaus Hamburg

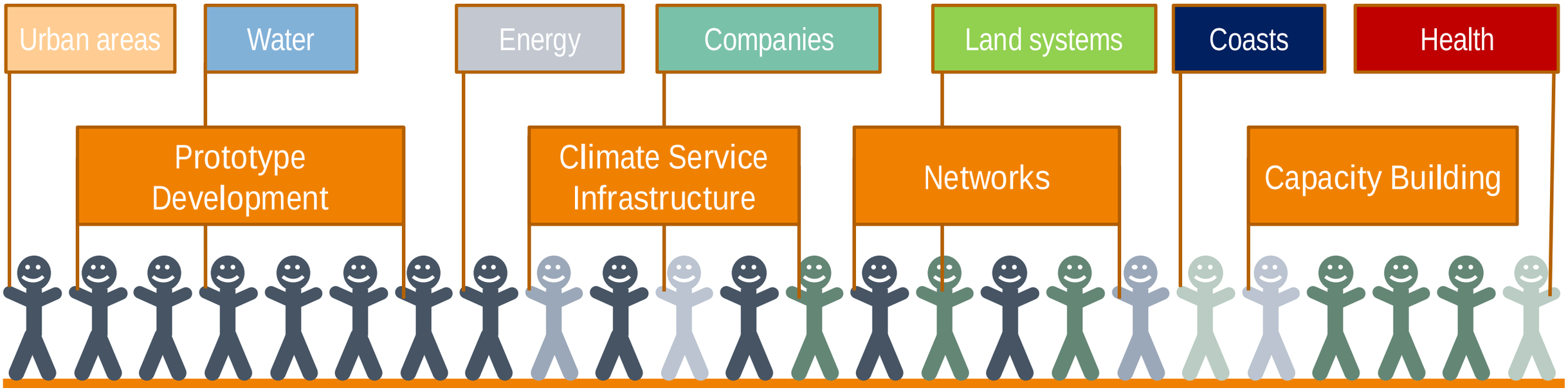
www.climate-service-center.de

www.gerics.de

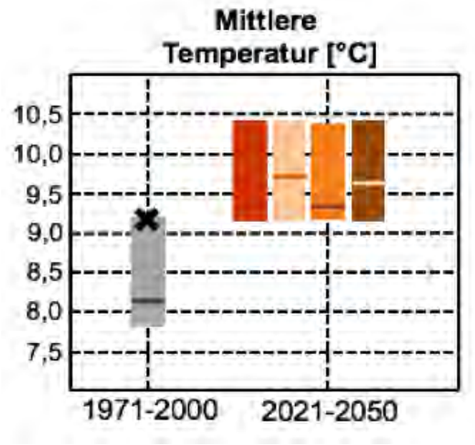
Climate Service Center Germany GERICS

GERICS develops science based prototype products and services in support to government, administration and business in their efforts to adapt to climate change.

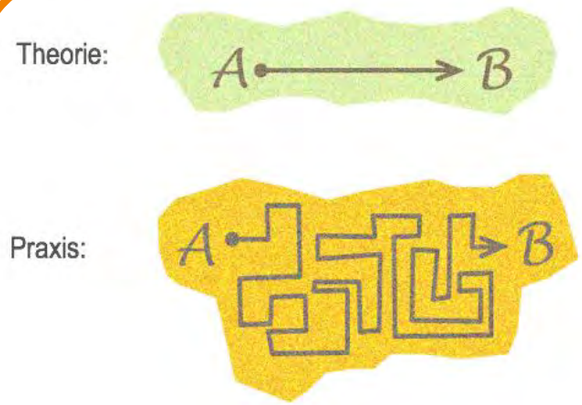
- Climate Services include the transformation of climate-related data – together with other relevant information – into customised products *(European Commission 2015, Roadmap for Climate Services).*
- The development of Climate Services requires transdisciplinary approaches.



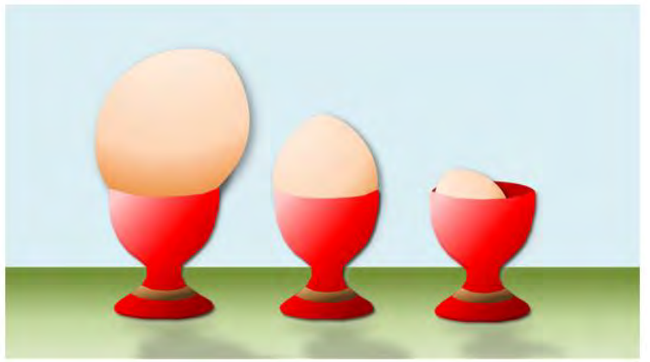
Climate Services - fundamental principles @GERICS in 2009ff



Current state of knowledge

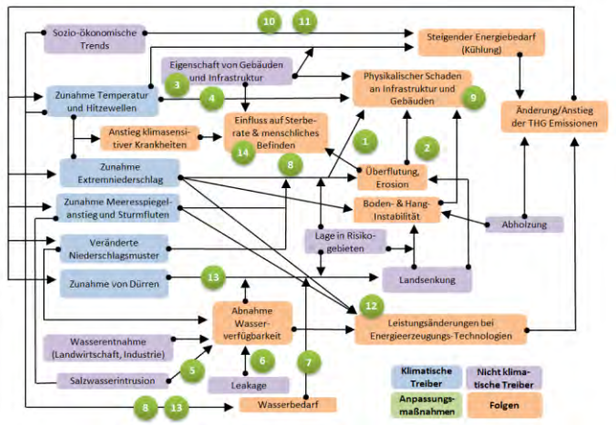


Practical applicability



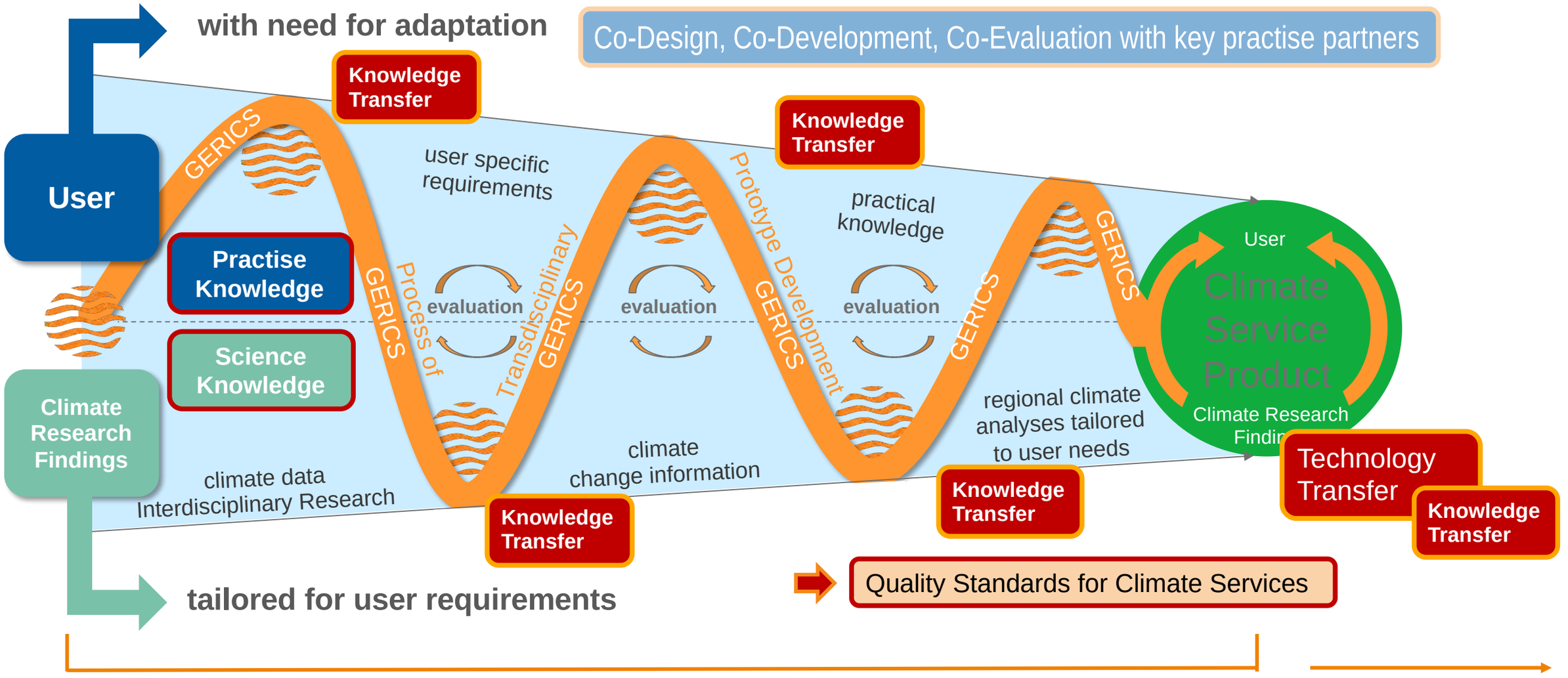
Tailored solutions

Combined view of mitigation and adaptation

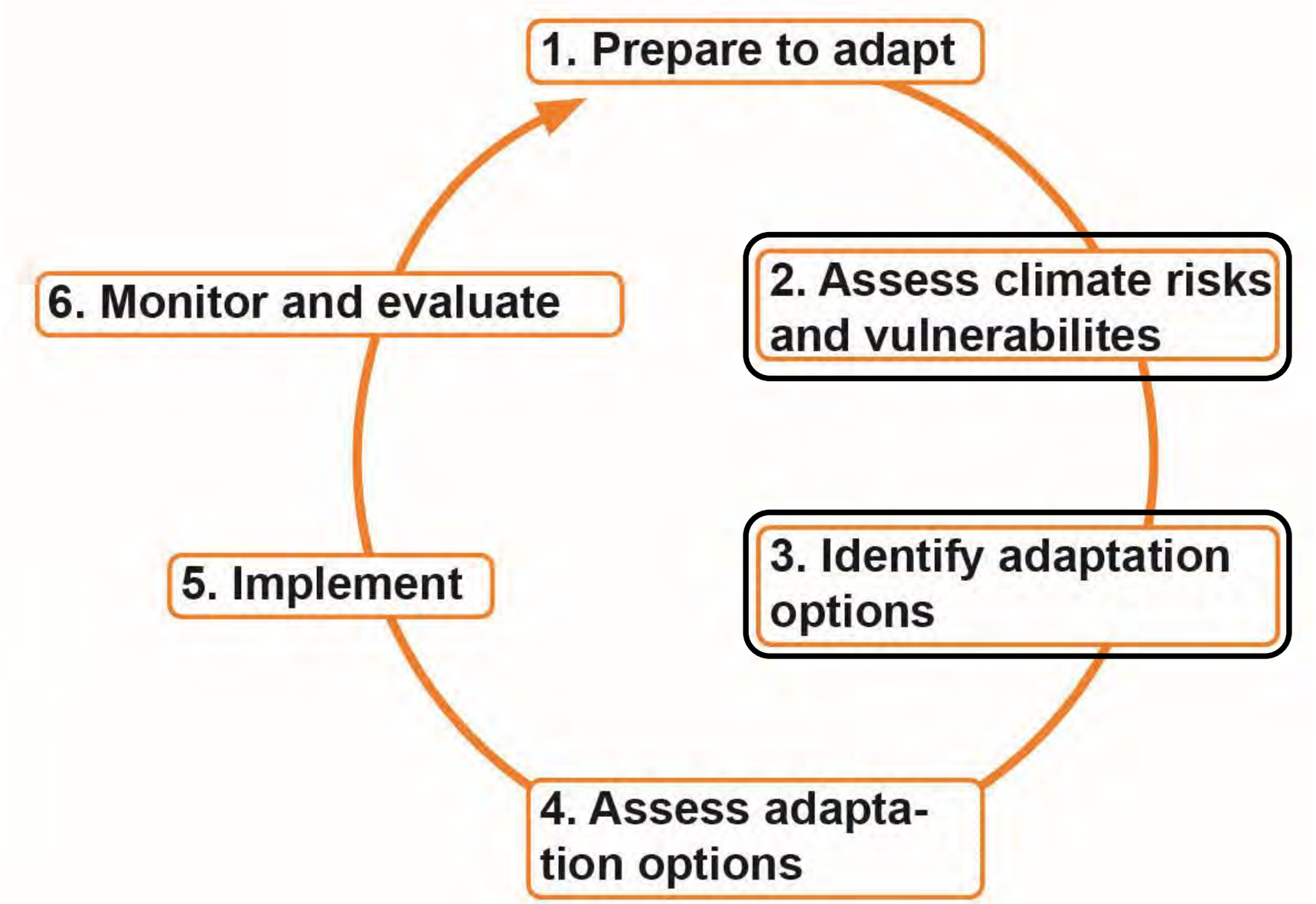


Holistic approach

GERICS Co-creation of climate products



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



e.g.:

- **Cascading and compound hazards**

Identifiy and test adaptation options:

- **Large scale irrigation**
- Green roofs

Source: EEA, 2018. National climate change vulnerability and risk assessments in Europe. EEA Report 1/2018

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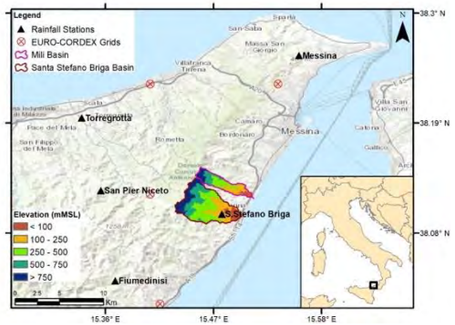
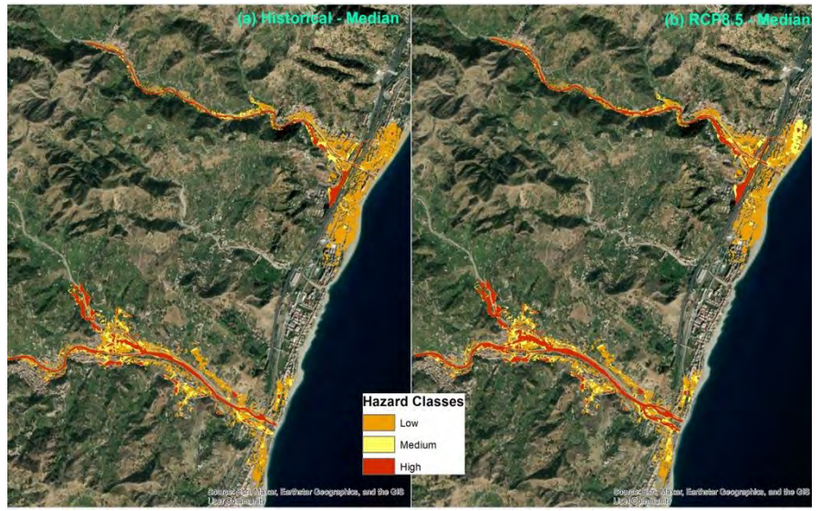
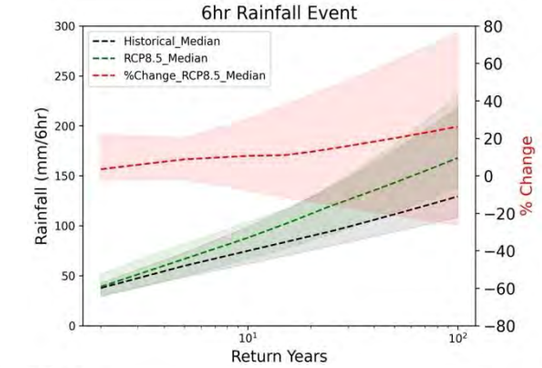
Goal: Develop Flood and Heat Wave Risk assessment to be integrated in multi-hazard risk workflow

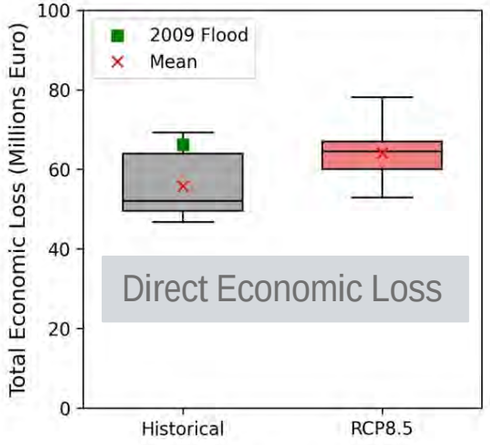
- Hazard scenarios developed with EURO-CORDEX REMO ensembles under RCP8.5 scenario
- Integration with geophysical risks (earthquake and tsunami)

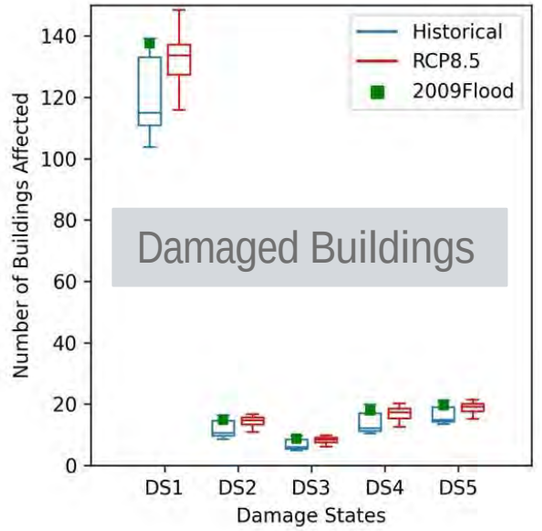
Extreme rainfall-induced flood hazards in the urban basins in Sicily











Sirisena et al., *Natural Hazards,* submitted

Remedio et al. in prep.

GFZ GEOMAR AWI

CASCO | Risk workflow for CAScading and COmpounding hazards in COastal urban areas

HELMHOLTZ

Thermal comfort

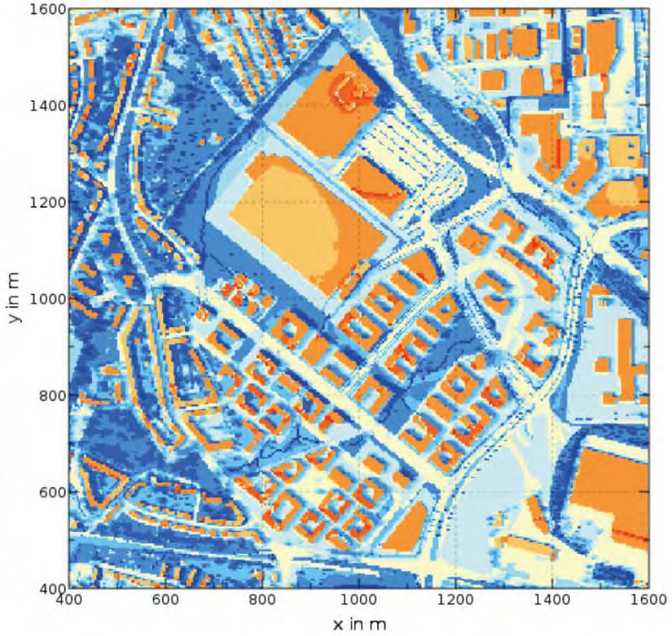
Wind comfort / Storm hazards

Air quality

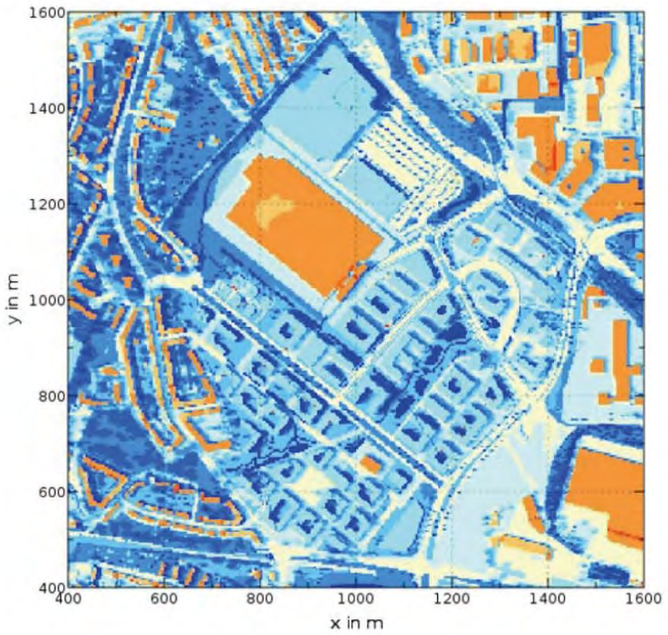
PALM-4U
simulated microscale impact of climate adaptation measures on local heat load

Surface temperature at 6 pm on a hot summer day

Scenario 1:
"few adaptation measures"



Scenario 2:
"with more adaptation measures"



Temperature level equal to baseline depending on surface type

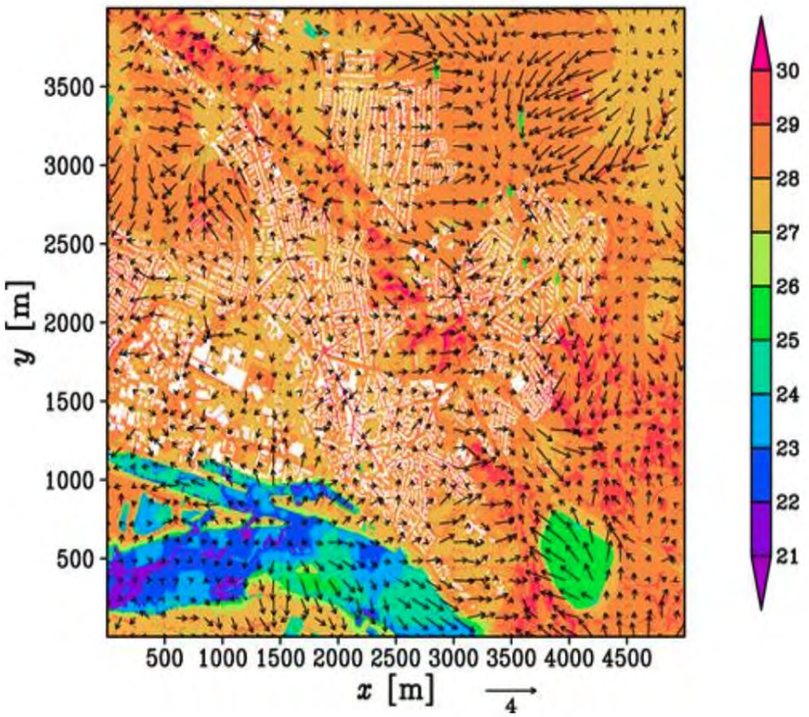
- Ungreened roofs have heated up to 60°C to 75°C
- Green roofs have surface temperatures of 40°C to 45°C

[UC]² | ProPolis

Generating usable climate information

USEFUL → USABLE → USED

Perceived as a potential contribution to decision making

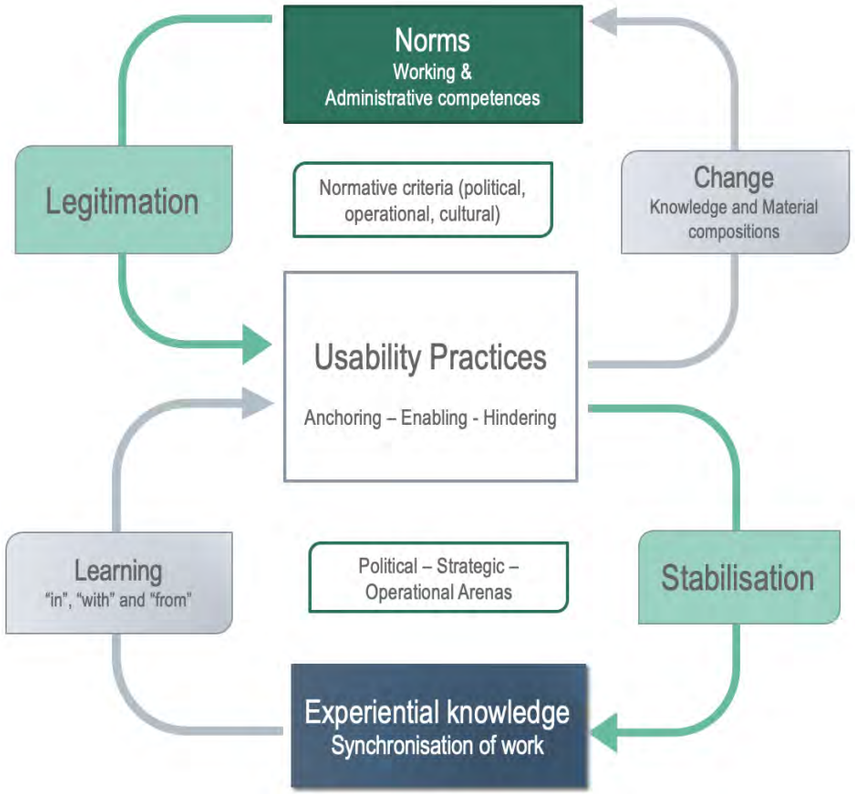


Temperature ° C at a height of 2 m and wind speed at a height of 10 m, 4pm. “City of Geesthacht” model.

Exploring fitness for policy and decisions

Created with Co-Pilot, M365

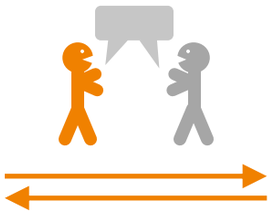
Process-oriented usability assessment framework



Reveco 2023, *Climate Services;* Bender et al. 2024.

GERICS Styles of engagement pave the ways to implementation

Styles

INFORMATION	CONSULTATION	DIALOGUE	PARTNERSHIPS
			

Development

Intensity of engagement
Degree of knowledge integration

Controllability of results
Number of potentially reachable societal actors

Implementation

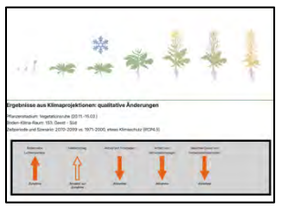
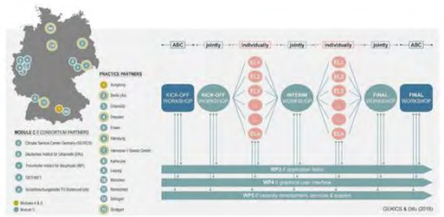
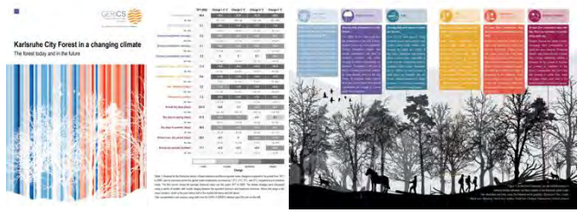
Reachable by wide range of actors, but not always context-specific	Better understanding of the decision-making context and needs	Leading to direct exchange on the topic leading to a better mutual understanding	Long-term relations lead to trust and iterative discussions for implementation

Likelihood to support context-specific implementation

Level of interaction

styles

examples

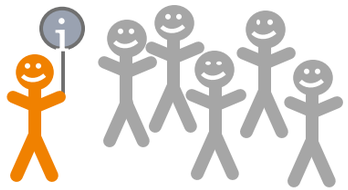
INFORMATION	CONSULTATION	DIALOGUE	PARTNERSHIPS*
			
“HEAR US”	**“TELL US”**	**“LET'S TALK”**	**“LET'S WORK TOGETHER”***
Book “Klimawandel **in Deutschland**” *Lead of the compilation of all information on climate change in Germany*	CoKLIMAx climate data usage strategy *Co-developed strategic recommendations on the basis of interviews and a survey*	Adapter product platform *Co-developed digital climate data products for agricultural sector*	GERICS process model *Co-developed model how to use climate information in operational processes*
			
“Landkreis-Ausblicke” *Condensed climate information for each county in Germany*	Brochure for homeowners *Survey for households about flash floods in Bleckede*	PALM-4U *Living lab to co-develop scientifically-based, but practice-oriented urban climate model*	Climate Action Sheet *Co-developed brochure about impact of the changing climate on Karlsruhe’s city forest*
			

Steuri B., Viktor E., El Zohbi J., Jacob D. Fashionable Climate Services: the hats and styles of user engagement. Bull. Am. Meteorol. Society. 2022; 103: E2341 E2353; https://doi.org/10.1175/BAMS-D-22-0009.1

Blue Economy: Coastal Tourism and Beach Management

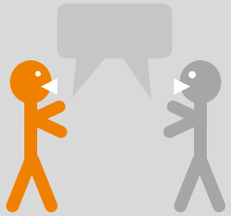
Cross-sectoral, Multi-level Coast & Climate Governance

1. Initiating Contact. Listening coastal stakeholders



2. Establishing a trustful cooperation

3. Identifying problems



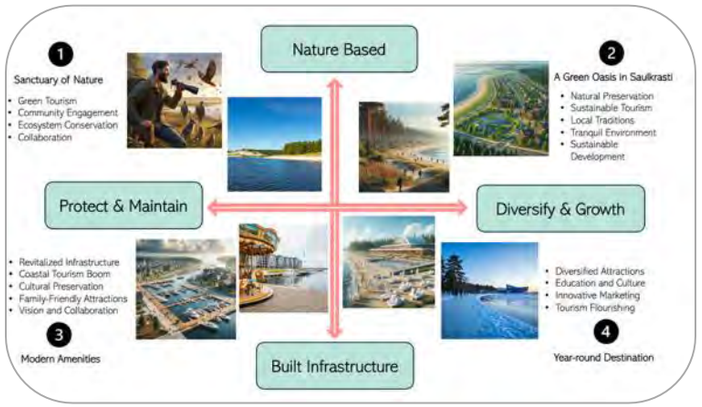
Cabana and Celliers 2025. Climate Information to Action: Challenges for Baltic Beach Management" Ocean and Coastal Management (submitted).

4. Co-production of solutions with stakeholders

5. Benefits

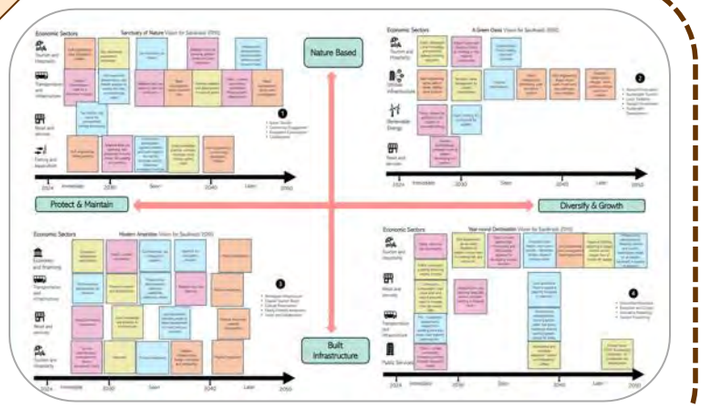
Climate-resilient coastal tourism development

Collaborative Mapping



Visioning

Comm. Vul. Ass.

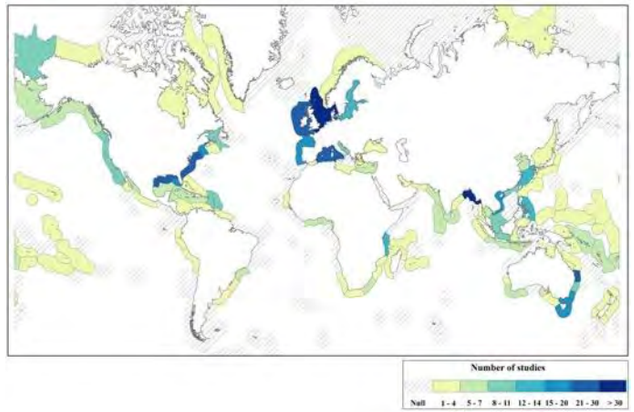


Adaptation pathways

Interreg Baltic Sea Region
Co-funded by the European Union
BLUE ECONOMY BEACH-SOS

Enhance Knowledge-base, Develop Theory, Expand our Reach

Literature Reviews



Cabana, D, et al. 2023. Enabling climate change adaptation in coastal systems: A systematic literature review. Earth's Future, 11, e2023EF003713. https://doi.org/10.1029/2023EF003713

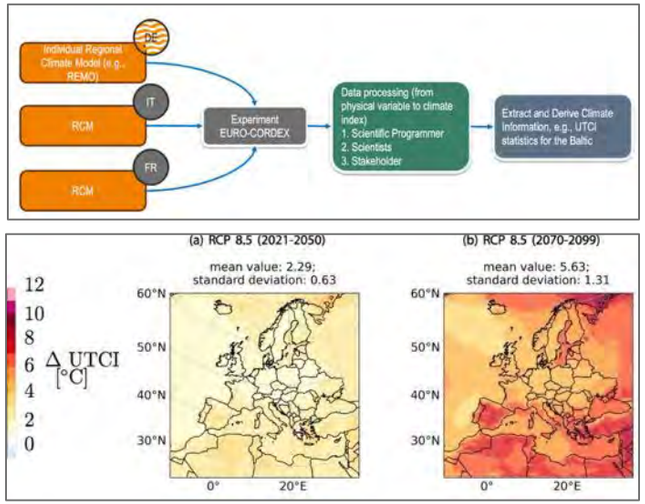
Baumann L, et al. 2023. Anticipating and transforming futures: a literature review on transdisciplinary coastal research in the Global South, Ecosystems and People, 19:1, 2288957, https://doi.org/10.1080/26395916.2023.2288957

Theory & Concepts

Lange M, et al. 2023. Climate-smart socially innovative tools and approaches for marine pollution science in support of sustainable development. Cambridge Prisms: Coastal Futures 1, 1-20. https://doi.org/10.1017/cft.2023.11

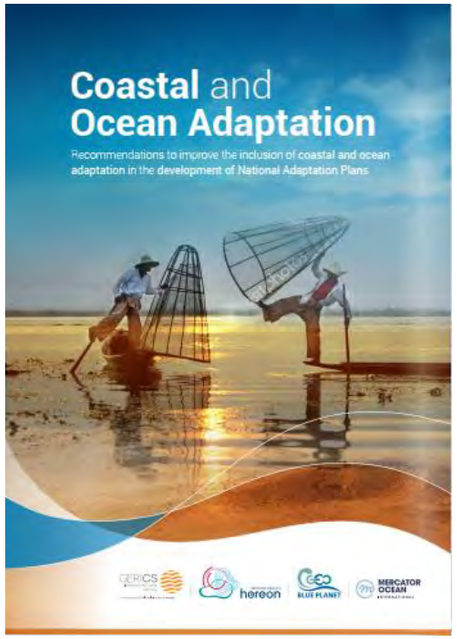
Celliers L, et al.2021. The 'last mile' for climate data supporting local adaptation. Global Sustainability. 2021;4:e14. https://doi:.org/10.1017/sus.2021.12

Regional Modelling Framework



Nam C, et al. 2024. Changes in universal thermal climate index from regional climate model projections over European beaches. Climate Services, Volume 34, 100447, https://doi.org/10.1016/j.cliser.2024.100447

Policy Contribution



Celliers L, et al. 2025. Coastal and Ocean Adaptation. Recommendations to improve the inclusion of coasts and ocean adaptation requirements in the NAP development process. Technical Report. GERICS, GEO Blue Planet.

UNFCCC

Integrating Climate Information into Business Strategies

Site-Characteristic -
Climate-Fact-Sheets

What are the next steps?

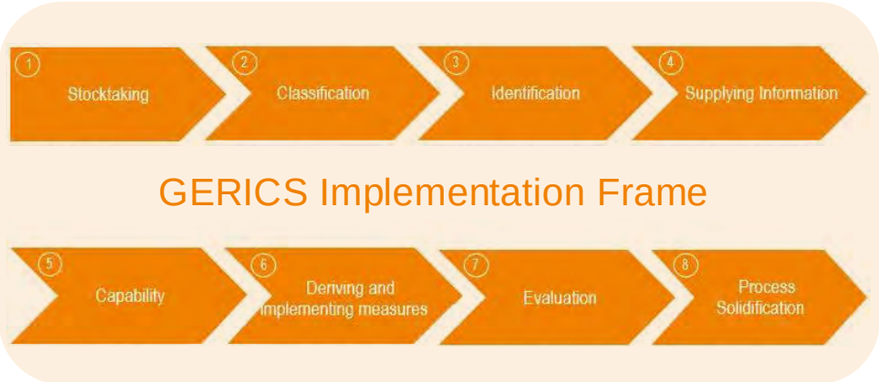
Implementation procedure for corporate decision-makers unclear!

What happens now?

Climate Outlooks on County Level

GERICS Climate Service Center Germany

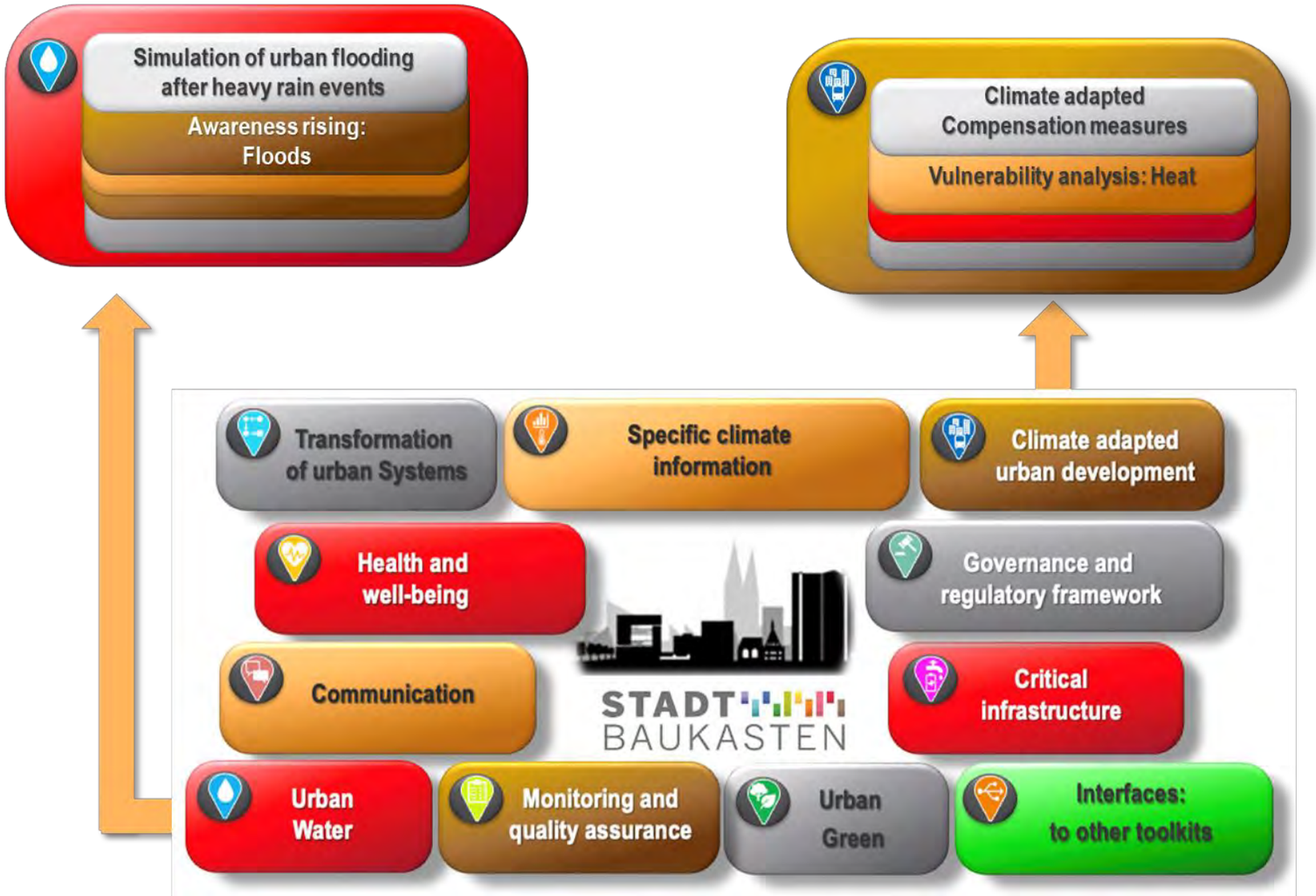
An institution of Helmholtz-Zentrum **Hereon**



RSAG Zuhause unterwegs. · HPA Hamburg Port Authority · HOCHBAHN · otto group · transdev the mobility company · STADTREINIGUNG.HAMBURG

Implementation of Climate information in operational processes

Co-Design Urban Climate Services based on Cities' Needs – The GERICS' City Toolkit



Co-production needs ...

- Early and continuous engagement of all stakeholders
- Building trust
- Customized Services to the user circumstances
- Capacity development and awareness creation
- Learning from best practices
- Establishing institutional arrangements
- Use simple language but not simpler



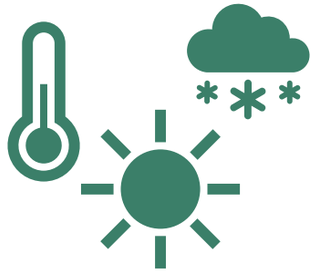


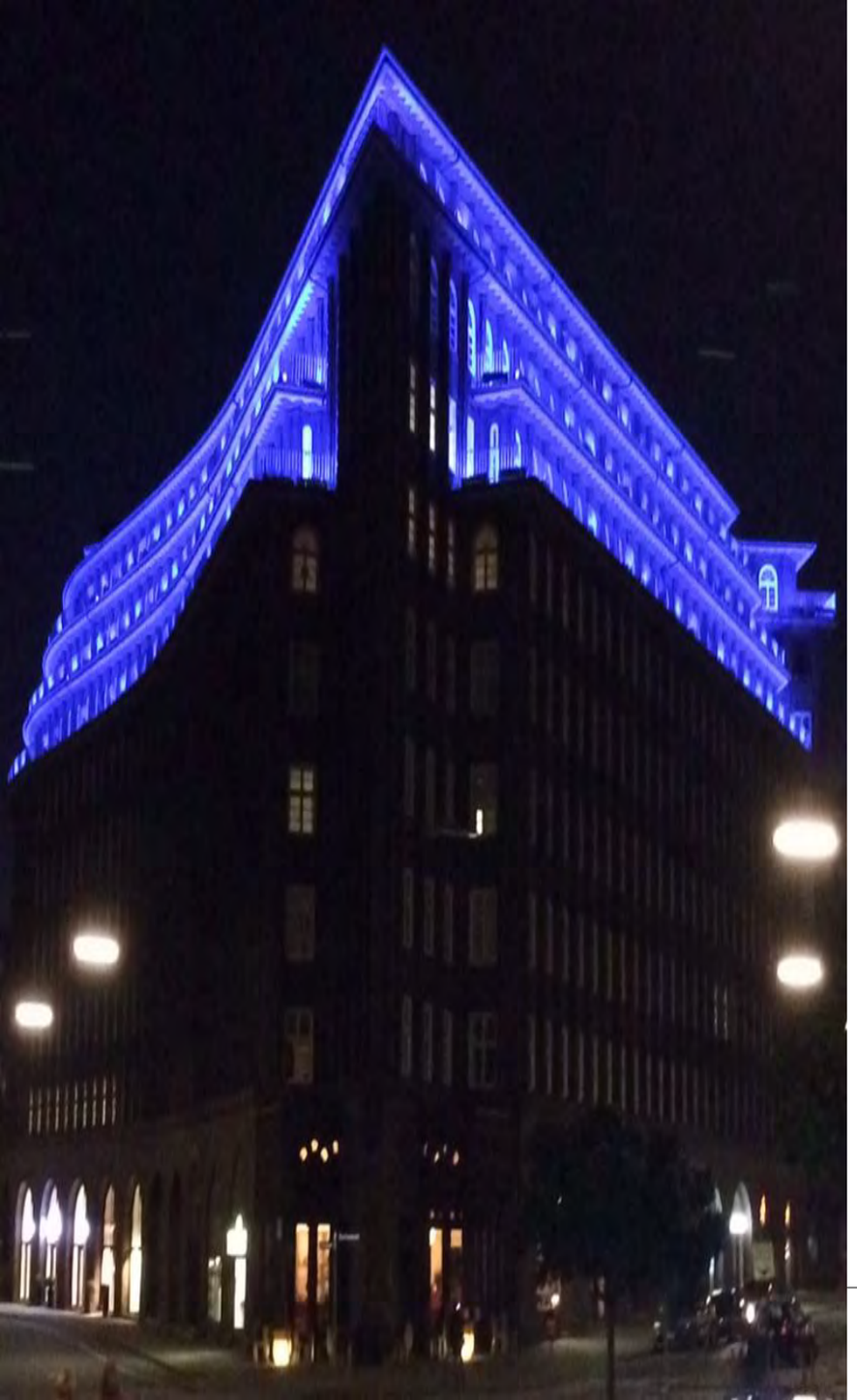


Source: Jacob et al., 2025: Co-production of climate services: challenges and enablers. *Front. Clim.* 7:1507759

Some future needs ...

- 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





Thank you very much!