
TOGETHER TOWARDS
RESILIENCE
COMMUNITIES AT THE FOREFRONT
WEBSTIVAL
NOVEMBER 19, 2025
CLIMAAX
climate ready regions
EU MISSIONS
ADAPTATION TO CLIMATE CHANGE

# WELCOME


**ATHANASIA MARIA TOMPOLIDI**

Policy and Project Officer – EURADA

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# WEBSTIVAL AGENDA

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## D1 18 NOVEMBER 9-11 CET

9:00-9:15 | WELCOME AND INTRODUCTION

9:15-9:30 | CLIMAAX A KEY PROJECT FOR THE ADAPTATION MISSION AND FOR CLIMATE ADAPTATION IN THE EU

9:30-10:10 | EMPOWERING LOCAL ACTION FOR CLIMATE ADAPTATION IN EUROPE + *Q&A*

10:25-11:00 | BRIDGING PROJECTS, STRENGTHENING REGIONS: SHARED TOOLS FOR CLIMATE RESILIENCE

## 19 NOVEMBER 9-11 CET D2

9:00-9:20 | THE IMPORTANCE OF WHAT IS ASSESSED AND THE WAY IT IS ASSESSED FOR ACCELERATING ADAPTATION

9:20-9:50 | CONNECTING TOOLS AND EXPERIENCE IN THE CLIMAAX HANDBOOK + *Q&A*

10:00-10:30 | DATA-DRIVEN ALGORITHMS, BIG DATA, AND METHODS FOR EWS AND CLIMATE RISK ASSESSMENT IN EUROPE

10:30-10:45 | FROM COLLABORATION TO IMPACT: ADVANCING THE CLIMAAX COMMUNITY OF PRACTICE

10:45-11:00 | WRAP-UP

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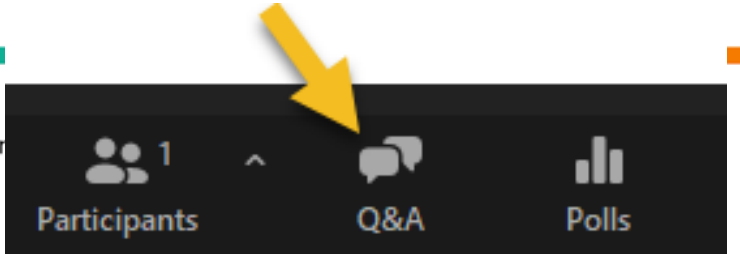
**THIS SESSION IS RECORDED**

TURN OFF YOUR CAMERA AND MUTE YOUR MICROPHONE IF YOU PREFER NOT TO BE SEEN OR HEARD

**TYPE YOUR QUESTIONS INTO THE Q&A BOX IN THE BOTTOM BAR**

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# KEYNOTE SPEECH

**RICHARD SMITHERS**

Technical Director, Climate Adaptation Lead – RICARDO

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## ADAPTATION TO CLIMATE CHANGE

#EUmissions #HorizonEU #MissionClimateAdaptation

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# Climate Risk Assessment: the importance of what is assessed and the way it is assessed for accelerating climate adaptation

**Richard Smithers, Director, MIP4Adapt**

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# MIP4Adapt's functions

## Community of Practice

- Knowledge sharing
- Identifying research gaps
- Informing policy development

## Communications and Promotion

- Disseminating data, knowledge and tools
- Promoting Mission Projects' activities/results
- Increasing collective impact

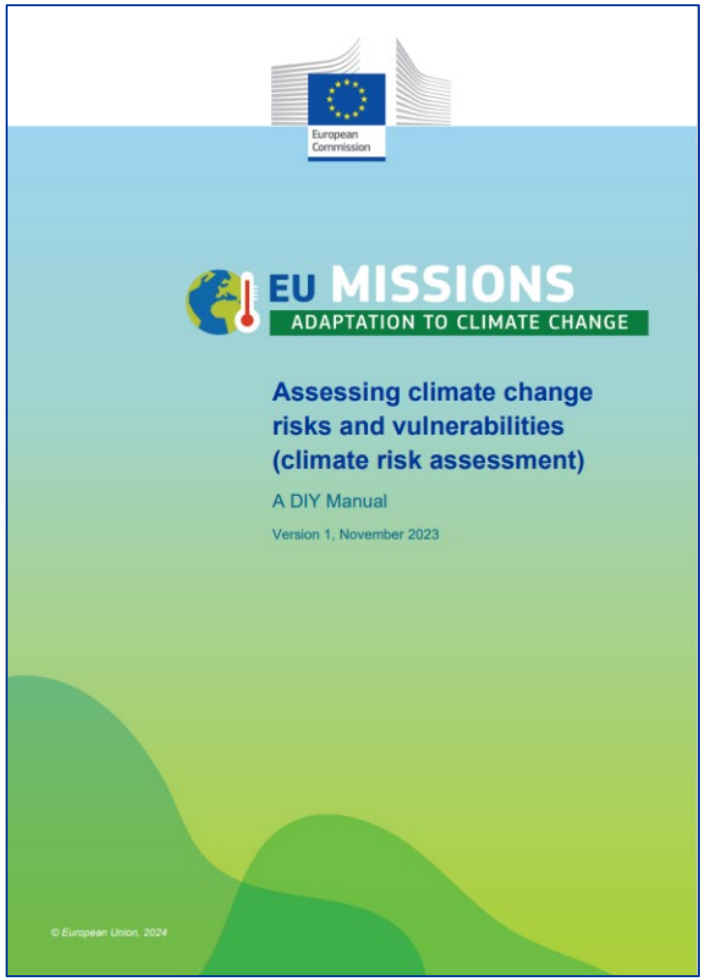
## Technical assistance to regions

- Providing data, knowledge and tools
- Training and sharing best practices
- Providing technical assistance

## Monitoring and evaluation

- Collecting data for Mission monitoring
- Stimulating exchange of lessons learnt


Step 6
Monitoring, Evaluation and Learning (MEL)
Step 1
Preparing the ground for adaptation
Step 5
Implementing adaptation policies and actions
RAST
Regional Adaptation Support Tool
Step 2
Assessing climate risks and vulnerabilities
Step 4
Assessing and selecting adaptation options
Step 3
Identifying adaptation options




Available from the Mission Portal. Go to “Solutions” and then “Resources”

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# Using a common language


Definition of risk based on IPCC AR6

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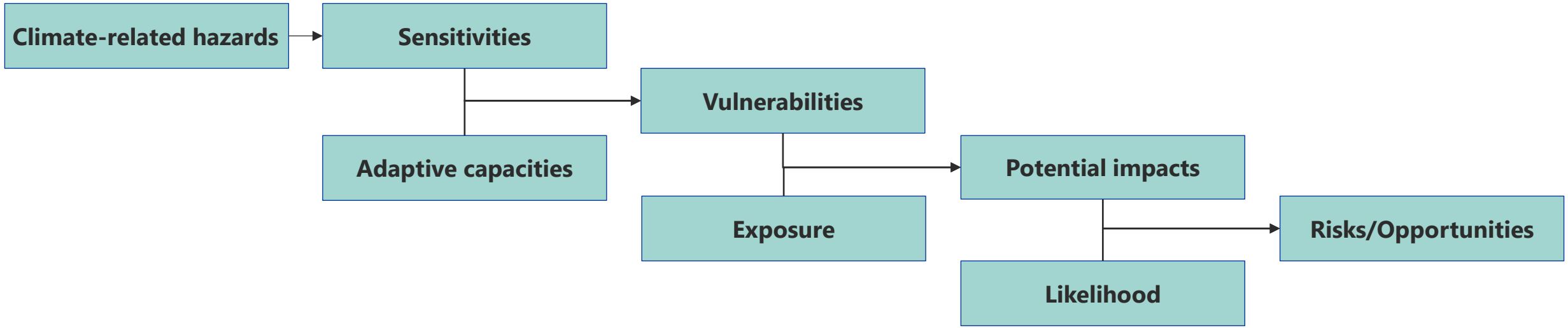
# What do you need to assess



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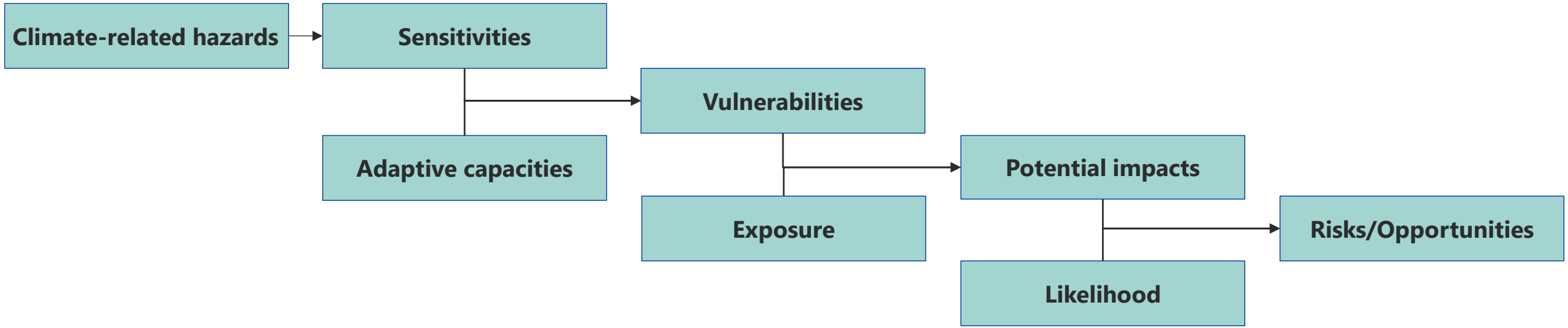
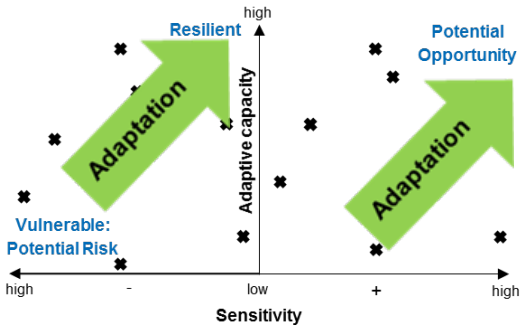
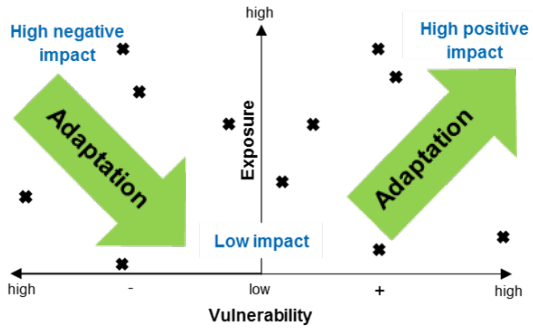
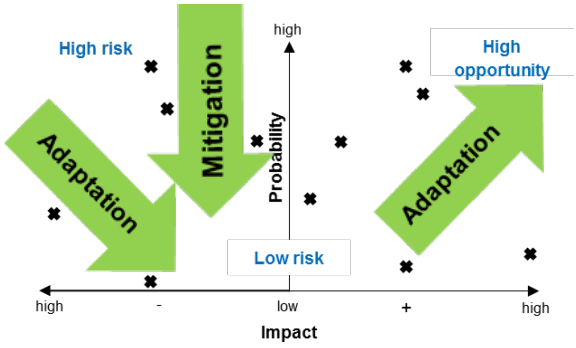
# What you assess informs your actions and monitoring



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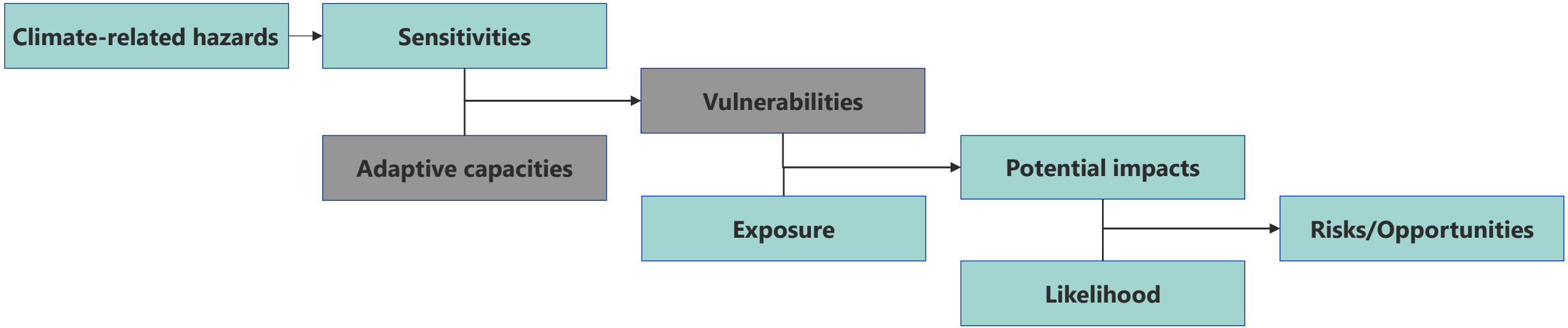


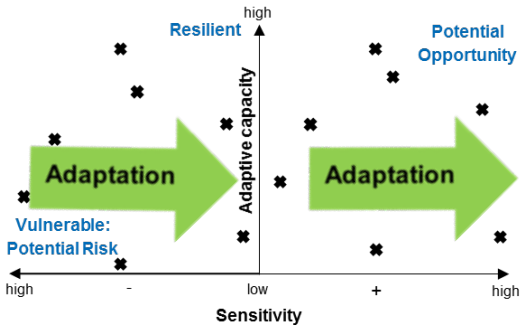


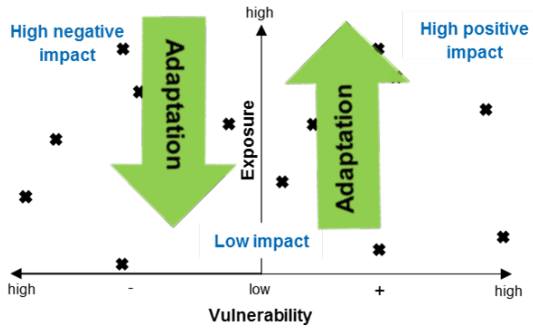


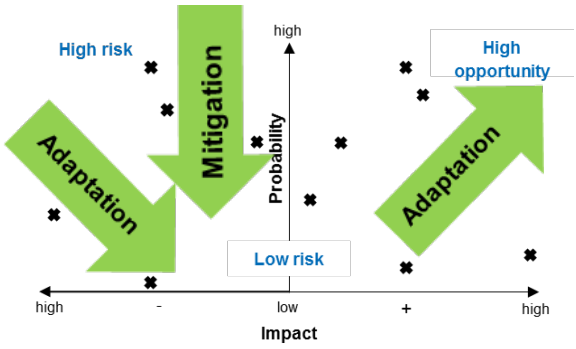

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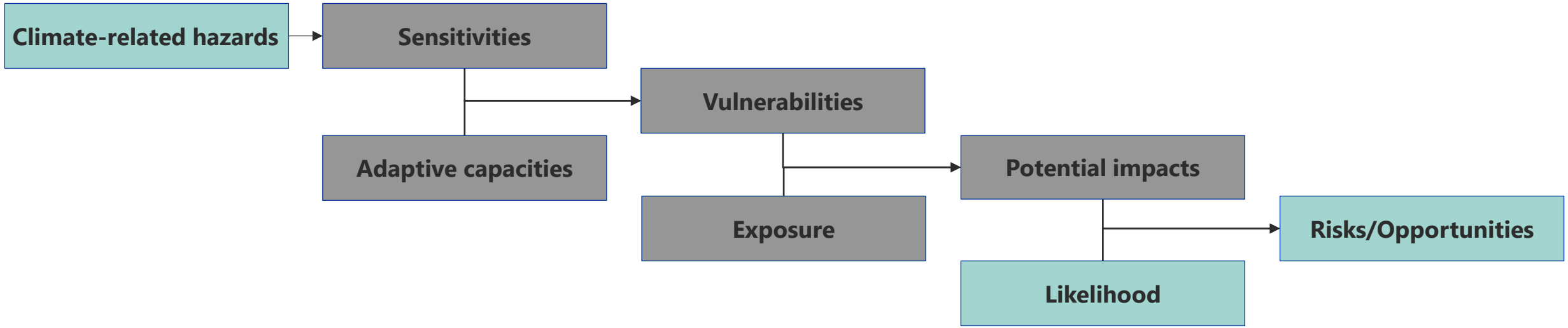
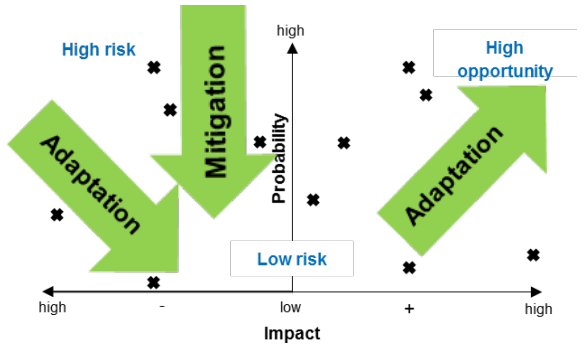
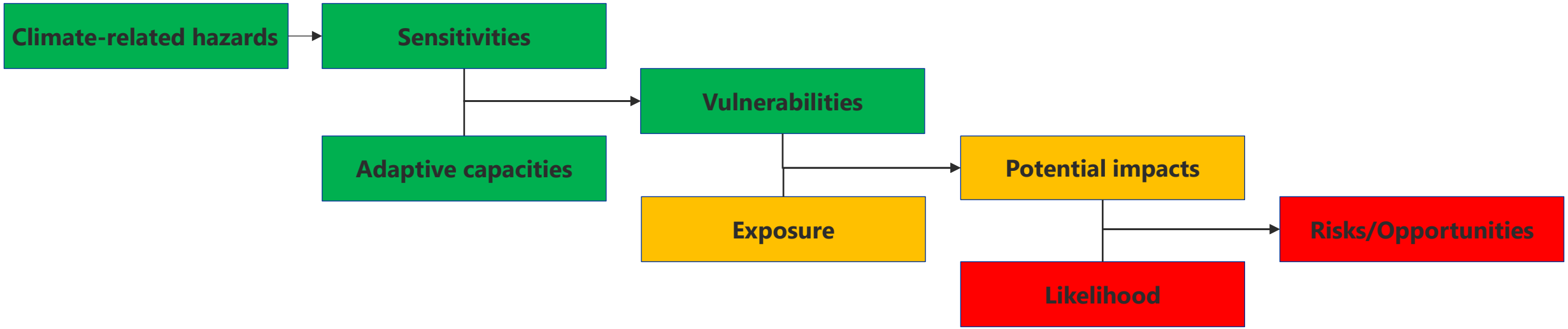
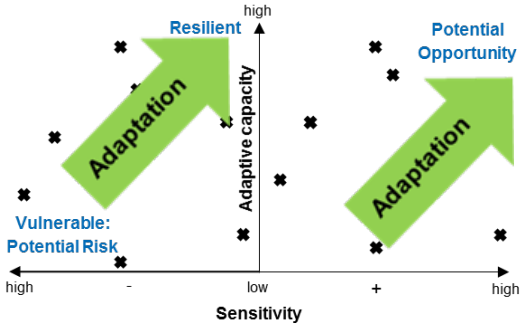
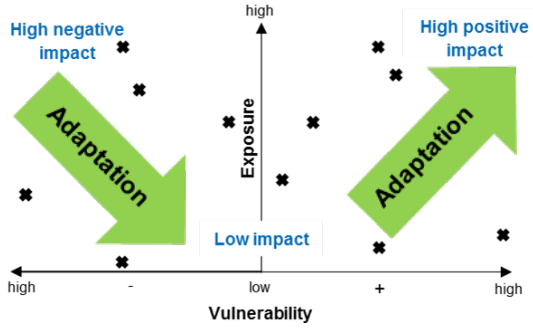


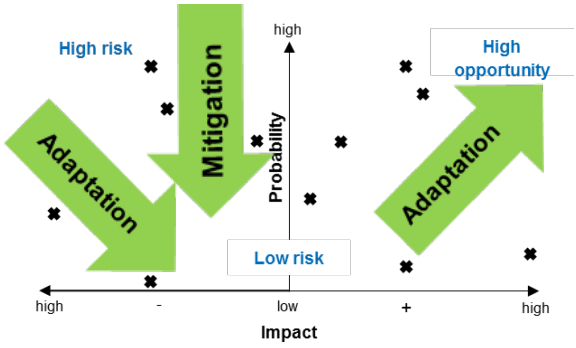



# Appreciating the limitations of data and models

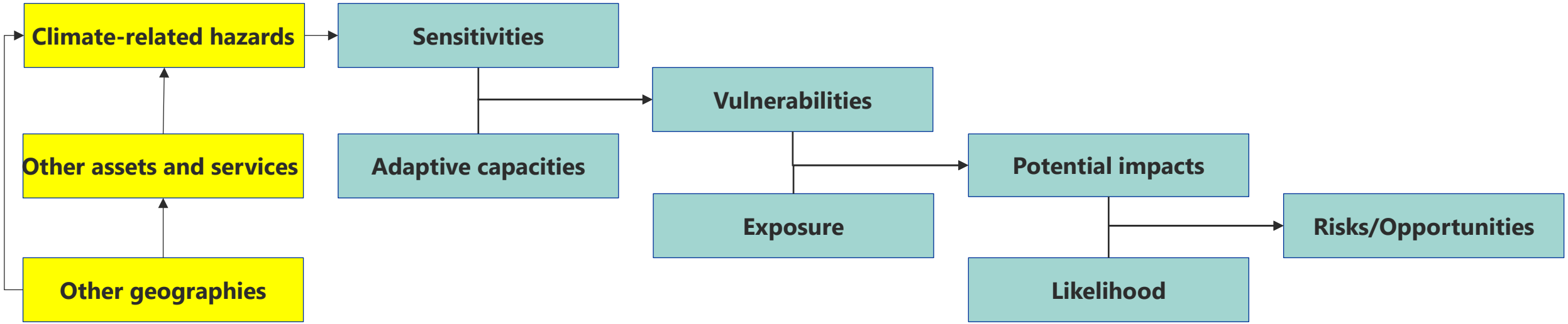


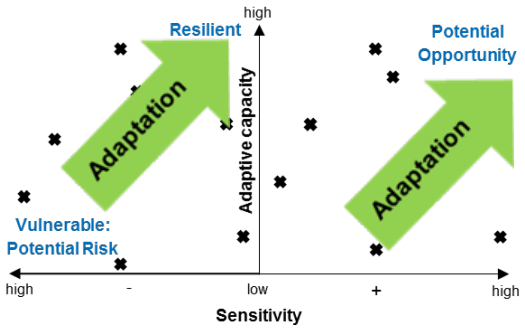



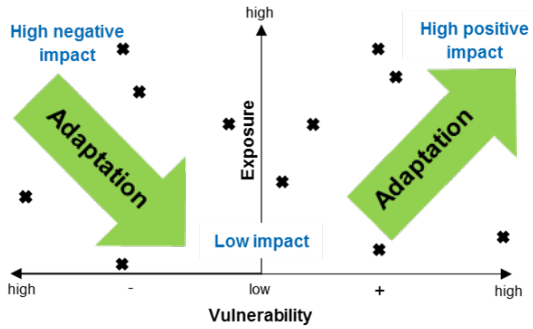



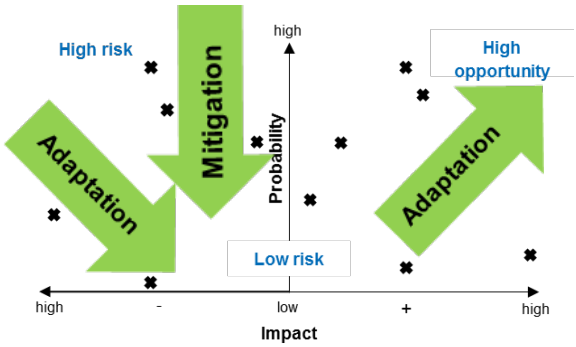



# Importance of assessing indirect sensitivities



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# Importance of collaboration and cooperation

**Within your region or local authority**

- Ecosystems and nature-based solutions
- Land use and food systems
- Water management
- Critical infrastructure
- Health and human wellbeing
- Local economic systems
- Knowledge and data
- Governance and engagement
- Behavioural change
- Finances and resources

**With other geographies**

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# Importance of involving stakeholders and citizens

Ensuring:

- Assessments are relevant, credible and legitimate
- Common understanding, commitment, and the desire to implement resultant actions

STEPS 2, 3, AND 4:
ASSESSING RISKS AND SELECTING ADAPTATION OPTIONS

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**FOCUS GROUPS AND WORKSHOPS**

Focus groups provide an opportunity to secure input and validation regarding single sectors or themes particularly from those who are responsible, accountable or have specific expertise from the public, private and third sectors. Subsequently bringing all such individual focus groups together in workshops can then provide opportunities to identify and resolve synergies and trade-offs across sectors and themes. This includes addressing indirect impacts, spill-over effects, and potential maladaptation.

For knowledge exchange, social learning and co-creation of new ideas, workshop formats such as **World Café**, **Fish Bowl**, role-play exercises and **Pro Action Café** are recommended. These methods create open and interactive spaces for dialogue, helping to generate diverse perspectives and shared understanding.

**CITIZEN SURVEYS**

You can develop surveys to consult citizens about their perceptions, concerns and motivations regarding climate vulnerabilities, risks, and adaptation options. Examples include the **climate change survey in Valladolid - ES**, the **KNOWING EU project survey on coping climate change**, and the **citizen survey in the IMPETUS project in seven bioclimatic regions across Europe**. Understanding collective perceptions, concerns and motivations is crucial for successfully developing and implementing your climate adaptation strategy or plan. It can provide you with valuable insights into potential barriers to adaptation actions and help you to develop your climate adaptation strategy or plan aligns with the needs and expectations of citizens, thereby increasing its relevance and their appreciation.

**LIVING LABS**

A living lab is a real-life testing environment where solutions are co-created, tested, and refined. It can enable joint assessment of climate risks and adaptation options with those who are at risk and/or who may benefit from proposed solutions.

A good example is the EU project **FEAST**, which utilises user-focused experimental environments to engage vulnerable groups, gaining their insights to address economic and geographic barriers to adopting sustainable diets. There are others working on turning **climate anxiety** into empowerment, such as those from the **CALM-EY** and **EMBRACE** projects in Lithuania, Italy, and Greece, which address emotional responses to climate change and seek to foster mutual learning and resilience. These living labs transform anxiety into proactive engagement, ensuring emotional well-being is considered when assessing key risks and vulnerabilities, setting adaptation priorities and objectives, and selecting suitable adaptation options through skilled facilitation and community empowerment.

**PARTICIPATORY TOOLS**

There are a myriad of well-proven participatory tools (such as the **MSP guide**) that can be used by focus groups or stakeholder workshops to facilitate input and progress Steps 2, 4 and 4. Tools such as visioning, **Pentagonal Problem**, **participatory mapping**, **study circles**, and cognitive mapping can be useful when seeking to establish common ground. In addition to these participatory tools, other structured formats like collaborative innovation labs provide dedicated environments for key stakeholders (including civil society, researchers, policymakers, and businesses) to co-develop and prototype solutions. These labs facilitate creative problem-solving by fostering interdisciplinary collaboration and iterative experimentation. Other options are hackathons, which are intensive, time-bound events where diverse teams rapidly design and test innovative solutions to specific challenges. They bring together technical experts, practitioners, decision-makers, and can generate ideas and accelerate the development of practical adaptation strategies.

There are also tools to help you manage expectations about roles and aspirations, incorporate diverse perspectives into decision-making and build a consensus to take action in prioritising and selecting adaptation options, including **participatory multi-criteria analysis**, **open forums**, and **round-robin**. The participatory multi-criteria analysis enables stakeholders to be actively involved in defining evaluation criteria, assigning relative importance to these criteria, and scoring different adaptation options. Through workshops, deliberative discussions, and interactive exercises, stakeholders, including policymakers, local communities, businesses, researchers, can express their priorities and reach a shared understanding of the most effective and feasible adaptation strategies. This participatory tool is key for Step 4 and ensures that decisions reflect multiple perspectives, enhance legitimacy, and increase local ownership of the selected actions

Table 2 presents other participatory activities. Your purposes for engaging and communicating with stakeholders and citizens in Steps 2, 3 and 4 should guide your choice of participatory activities.



Setúbal Municipal Council on Environment (CME) Inaugural Meeting, September 2024

Source: DIY Manual on Engaging Stakeholders and Citizens in Climate Adaptation

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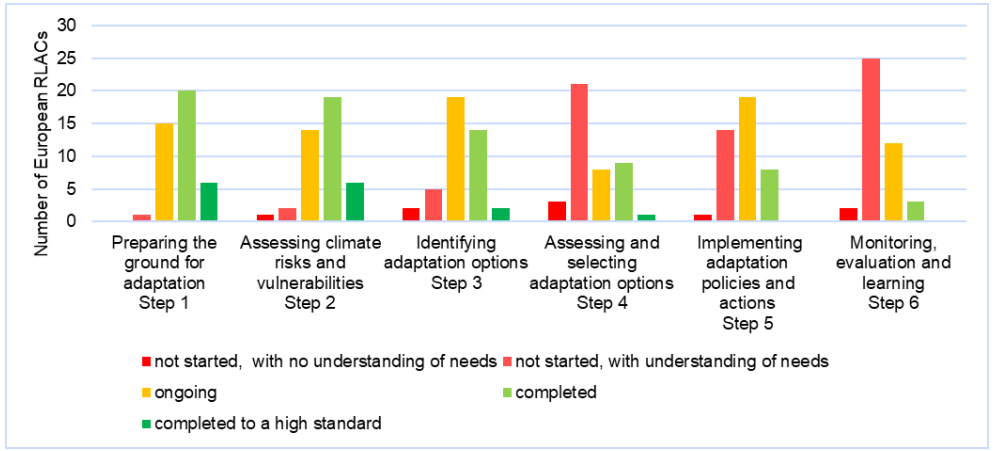
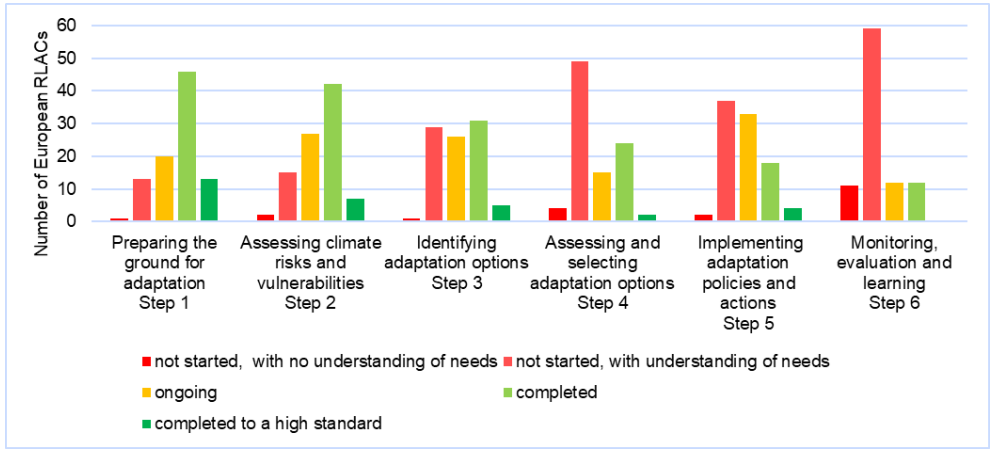
# Risk assessment driven by adaptation planning

Technical assistance completed Sep 2025

Technical assistance ongoing Sep 2025

Before

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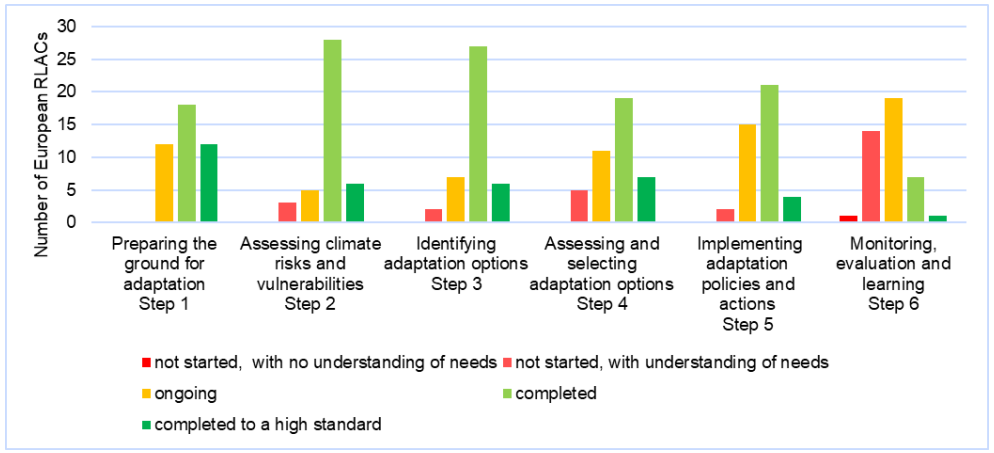


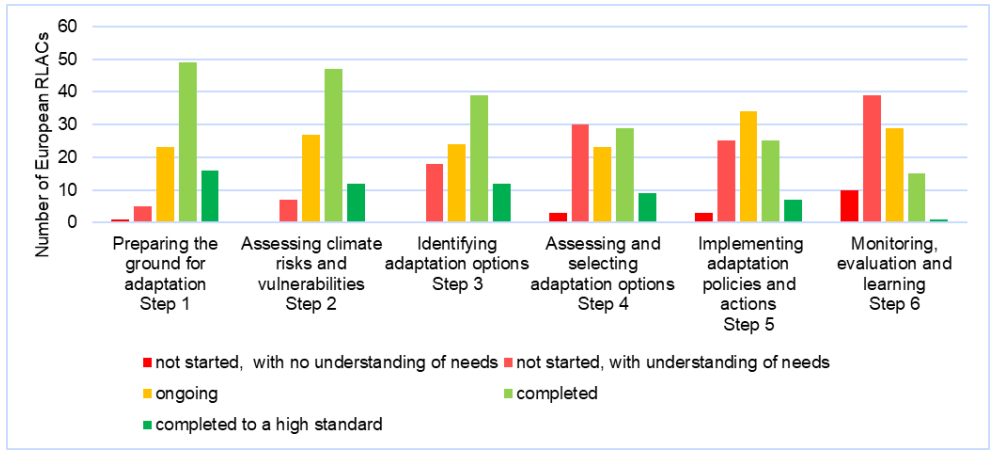

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# How can risk assessments accelerate adaptation

The importance of:

- Using a common language
- Identifying sensitivities, adaptive capacities and exposure to inform adaptation actions and meaningful monitoring
- Appreciating the limitations of data and models
- Assessing indirect sensitivities through collaboration and cooperation
- Involving stakeholders and citizens

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# Thank you !

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**#HorizonEU**

**#MissionClimateAdaptation**

# TECHNICAL SESSION 1

**CHRISTOPHER POLSTER**

Research Software Engineer, Development Section, Forecasts and Services Department – ECMWF

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# Connecting Tools and Experience in the CLIMAAX Handbook

**Christopher Polster, ECMWF**

**3rd Webstival**
*19 November 2025*

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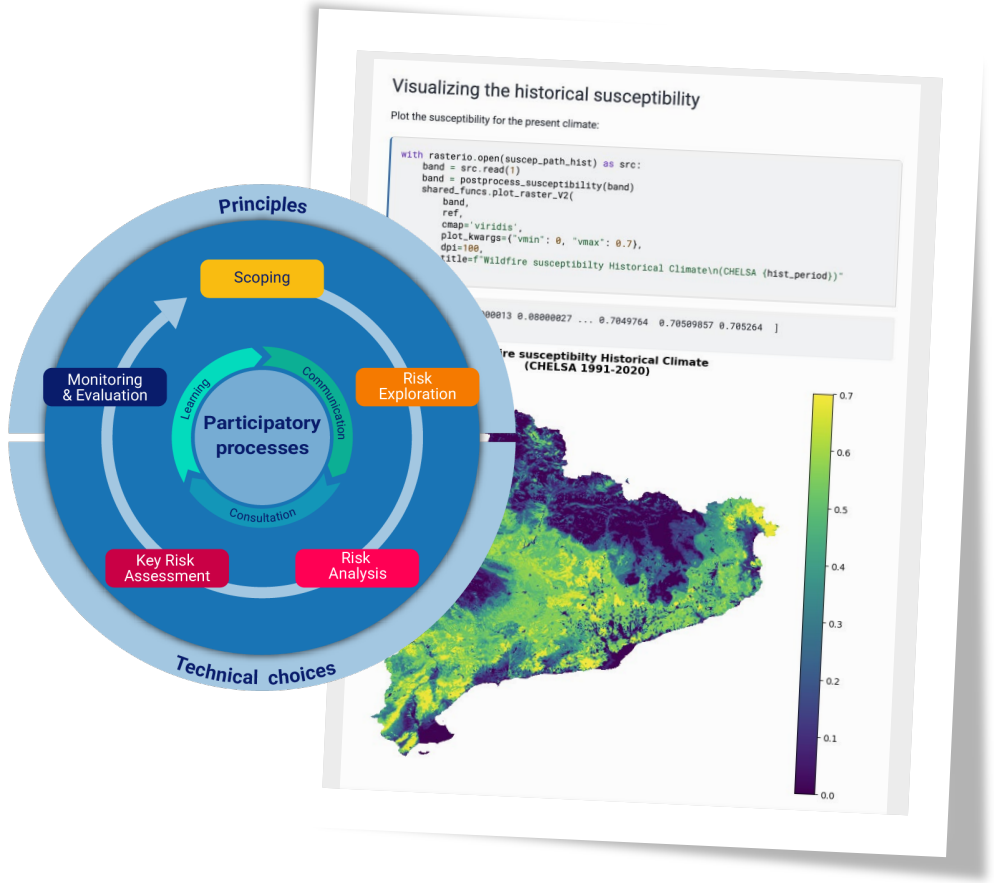
# handbook.climaax.eu

- A Handbook for regional climate risk assessment: conceptual **framework and toolbox**

  **Risk** = **Hazard** × **Exposure** × **Vulnerability**

- Web based, open source, access for everyone
- Ready-to-go tools with preconfigured defaults and customisation options
- Some technical expertise required




GitHub

jupyter

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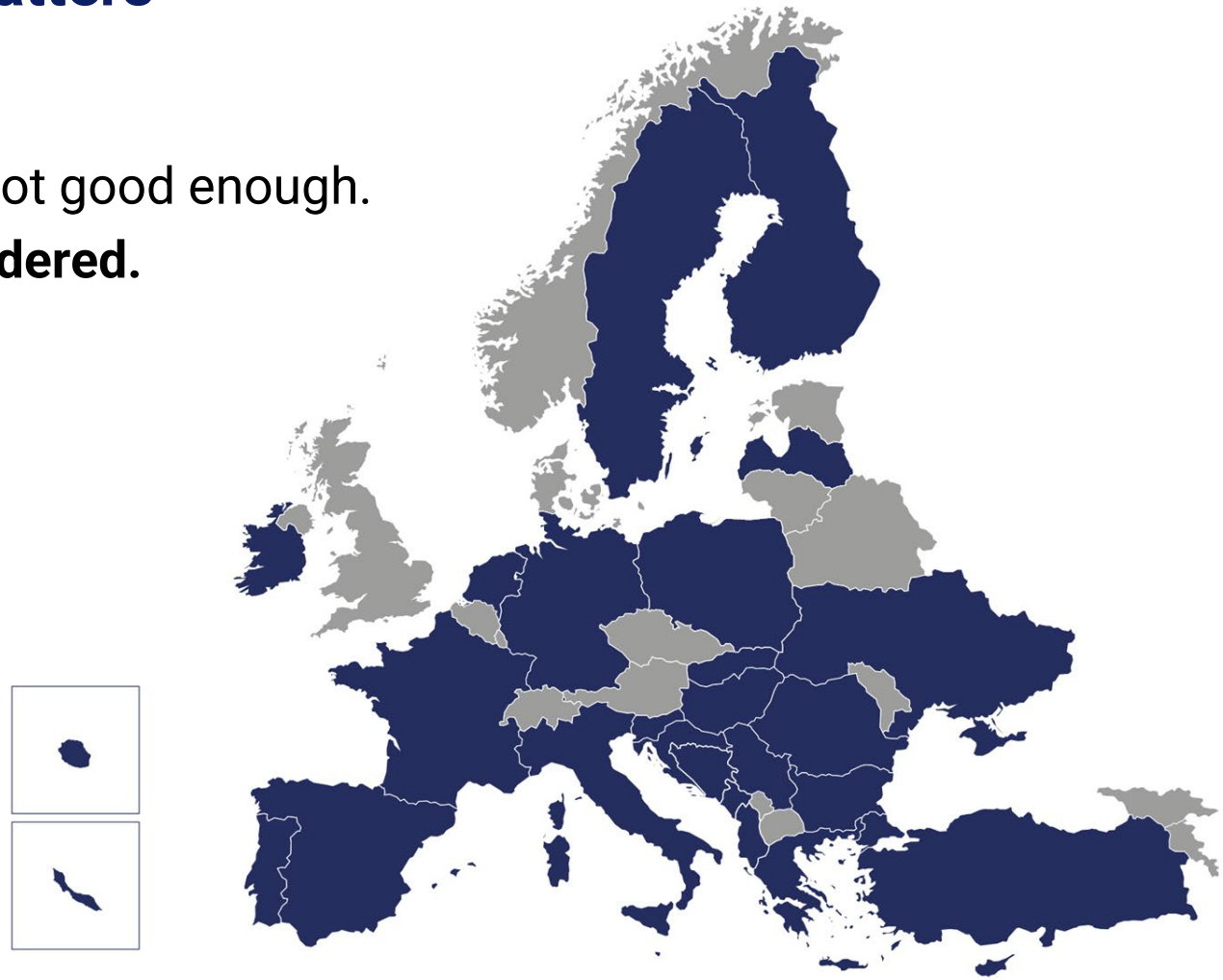
# Regional CRA – local experience matters

Top-down European-scale assessment is not good enough.
**Local context and expertise must be considered.**

**Local dimensions of CRA:**

- Hazards
- Exposure and vulnerability
- Requirements
- Relevant stakeholders
- Capacity
- …



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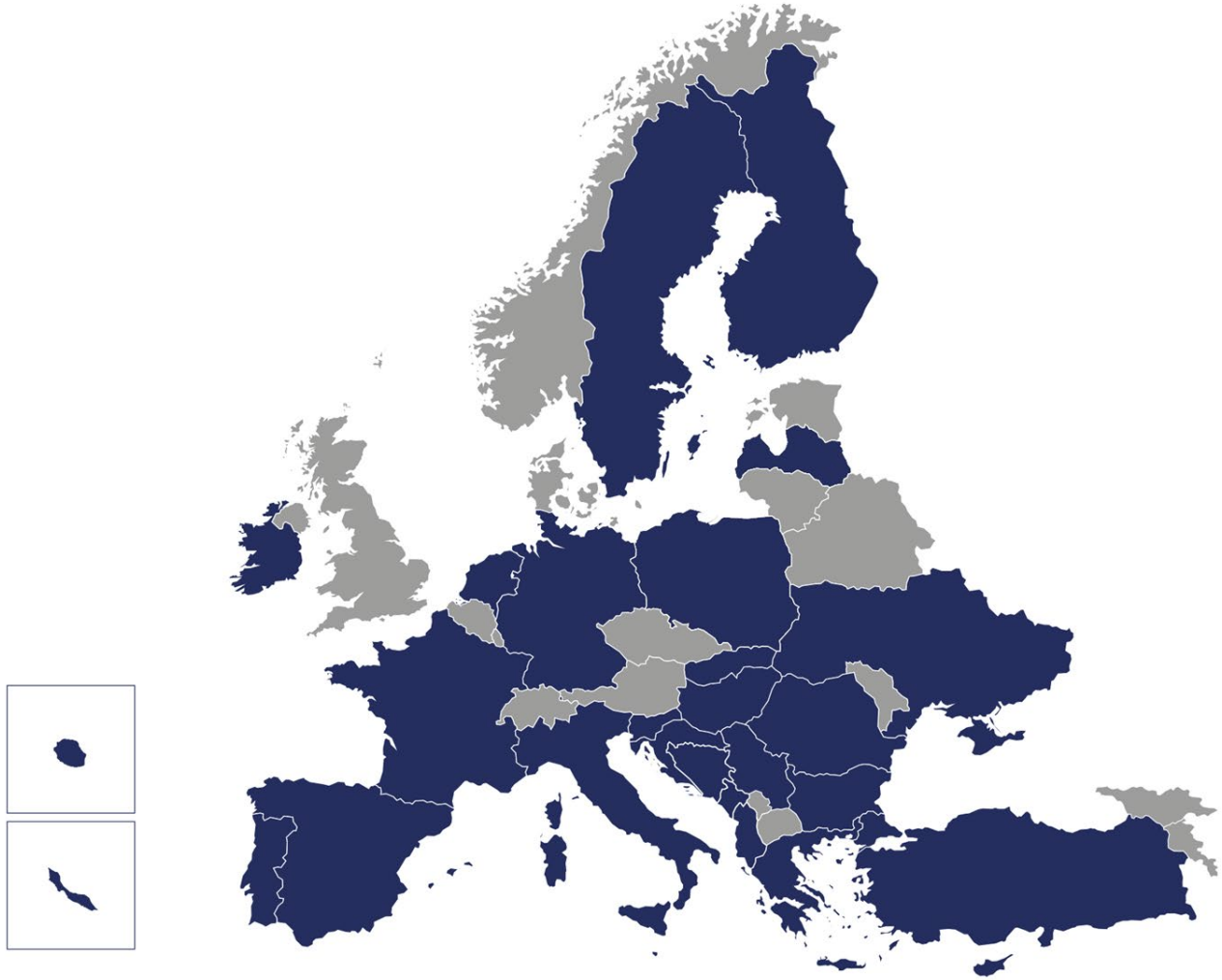
# A Handbook shaped by experience

- **CLIMAAX experts**
- **5 pilot regions**: co-development of framework and workflows
- **> 60 regions selected from open calls**: using, adapting and building on the Handbook



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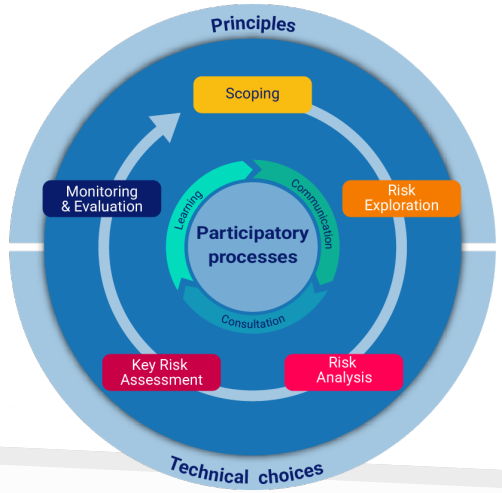
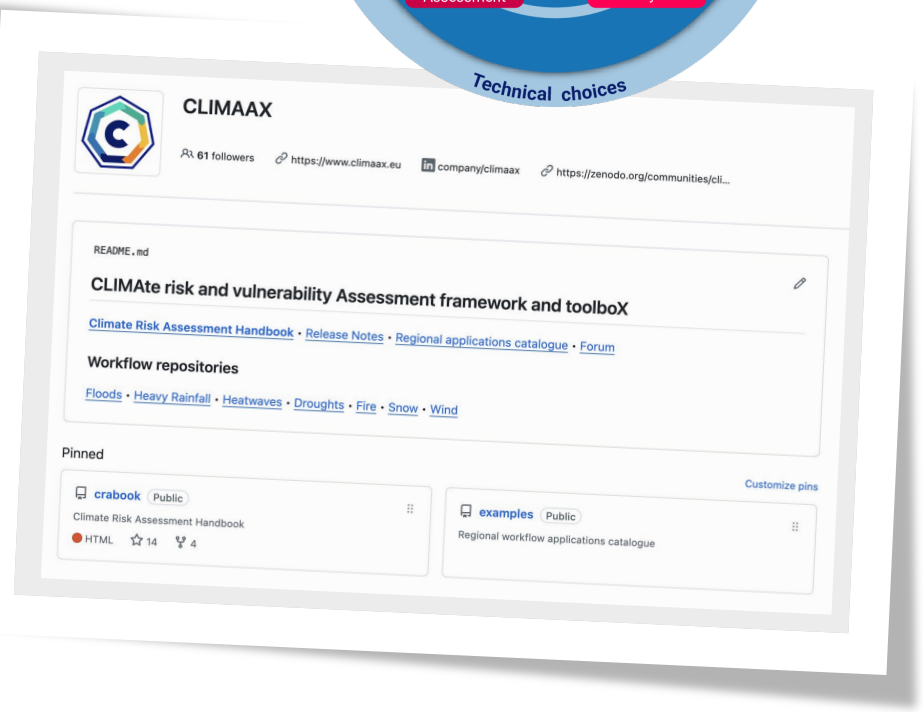
# A Handbook shaped by experience

How to capture **diversity of experience and best practices** to ensure **relevance and practicality?**

- Tool-agnostic CRA Framework
- Open development, open source
- Flexible workflow implementations

GitHub

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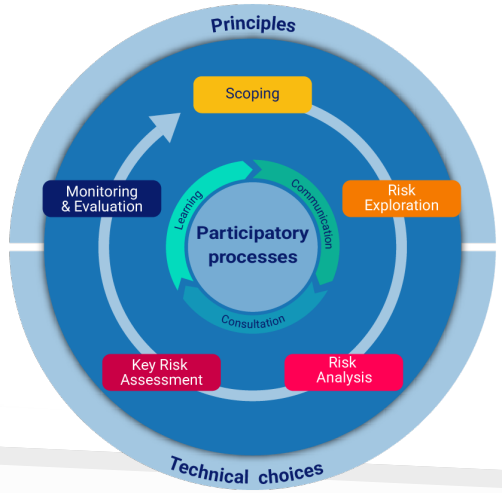


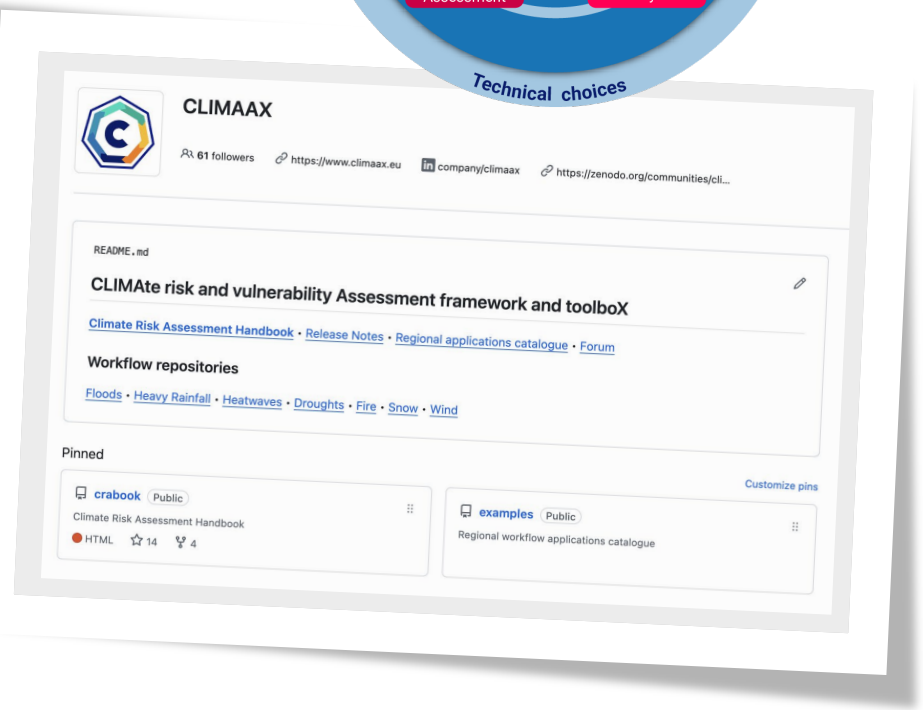


**Vision: community-driven and -maintained Handbook**

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# Local experience in the Handbook

- **Workflow additions and improvements** based on feedback and support requests

- Framework: **guiding questions**
- **Frequently Asked Questions**

- Project outputs: **zenodo.org/communities/climaax**


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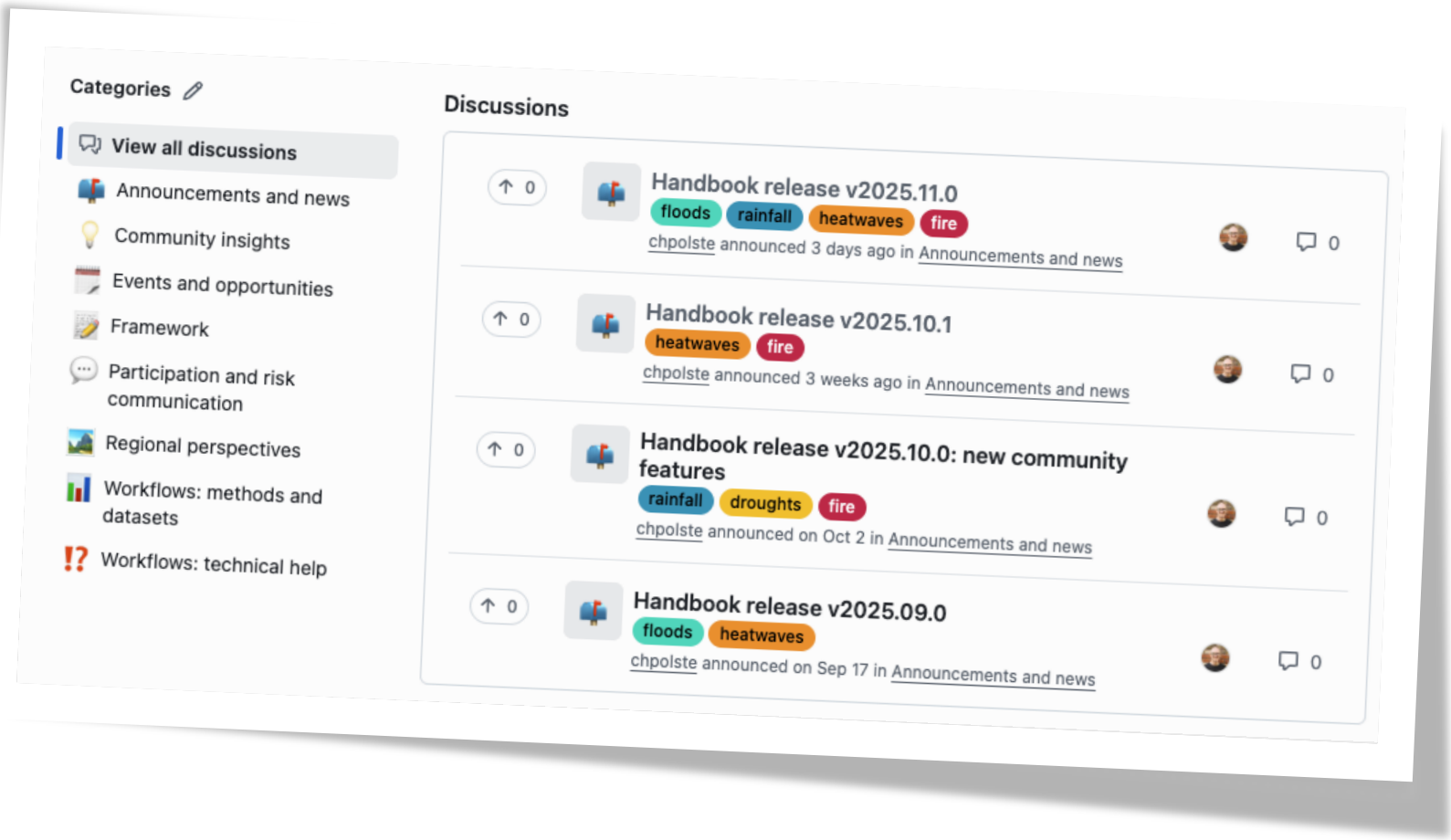
# New! github.com/orgs/CLIMAAX/discussions

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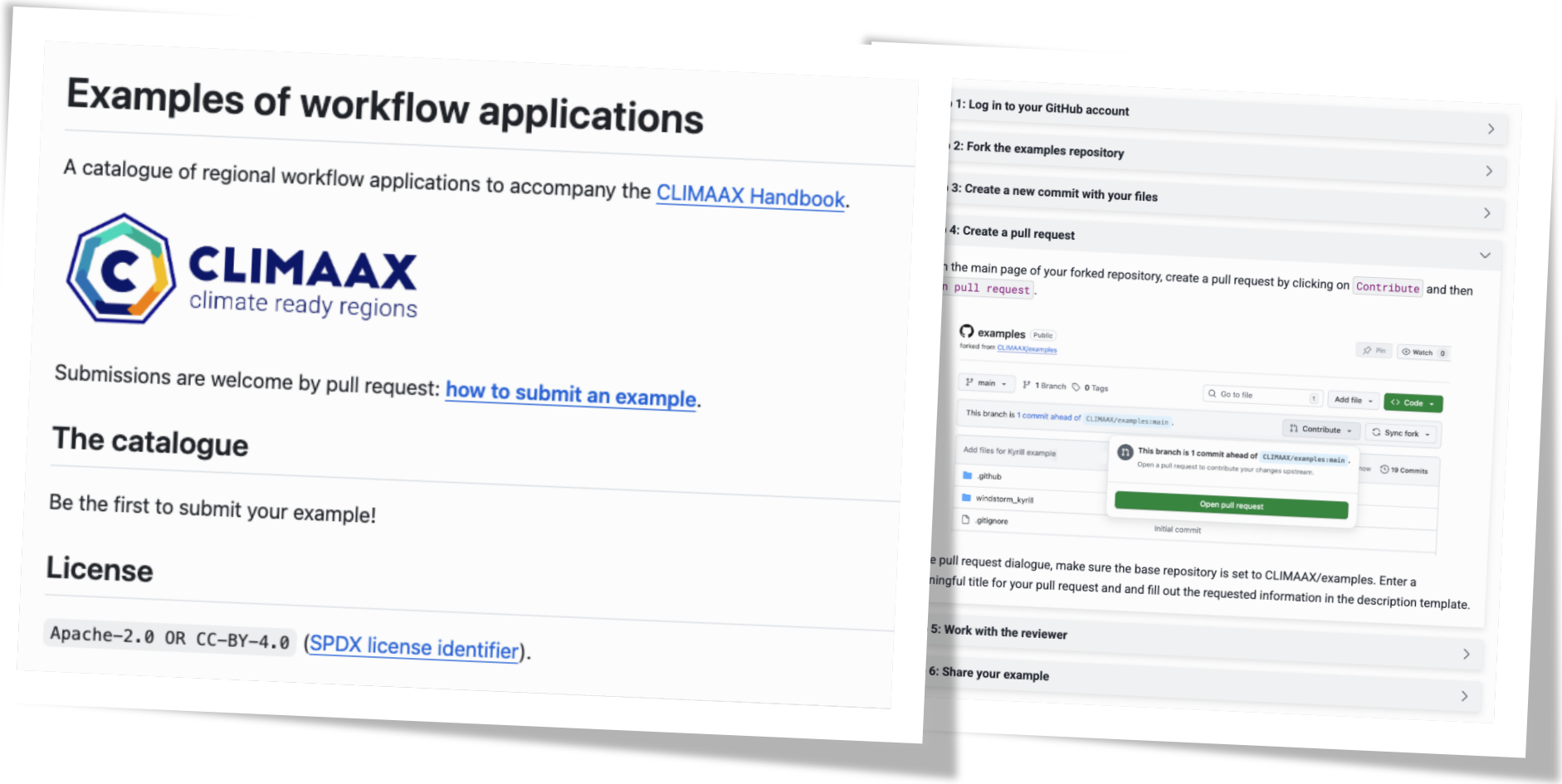
# New! github.com/CLIMAAX/examples

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# Your turn!

**Explore the Handbook.**
**Make it your own.**
**Contribute on GitHub.**
**Engage with other regions.**

handbook.climaax.eu/community/engage.html
handbook.climaax.eu/community/contribute.html

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# TECHNICAL SESSION 2

**MAURIZIO MAZZOLENI**

Assistant Professor – STICHTING VU

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CLIMAAX
climate ready regions

# Data-driven algorithms, Big Data, and methods for Early Warning Systems and Climate Risk Assessment in Europe

**Maurizio Mazzoleni, Vrije Universiteit Amsterdam**

*19th of November 2025*

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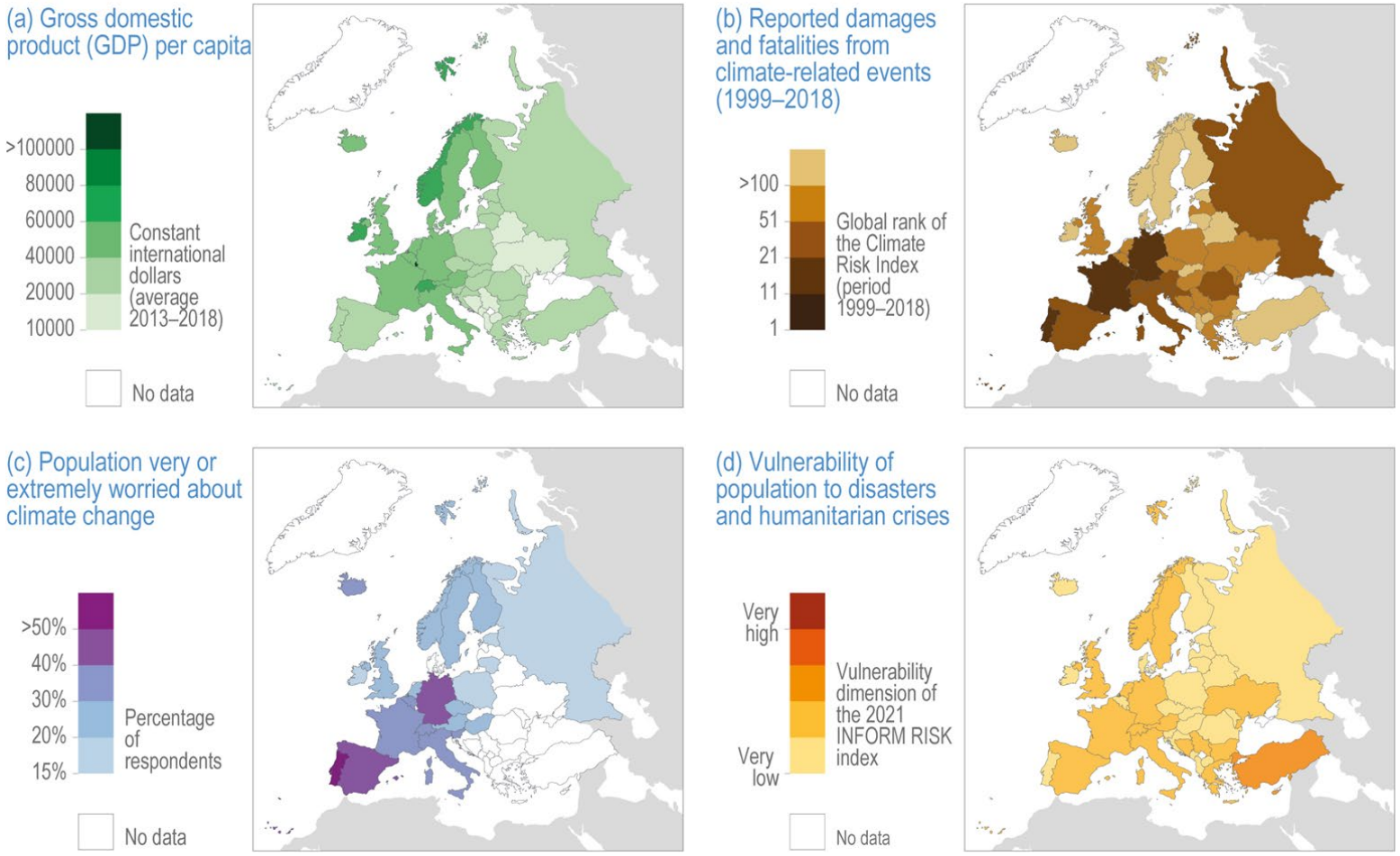
# Climate risk




https://www.ipcc.ch/report/ar6/wg2/chapter/chapter-13/

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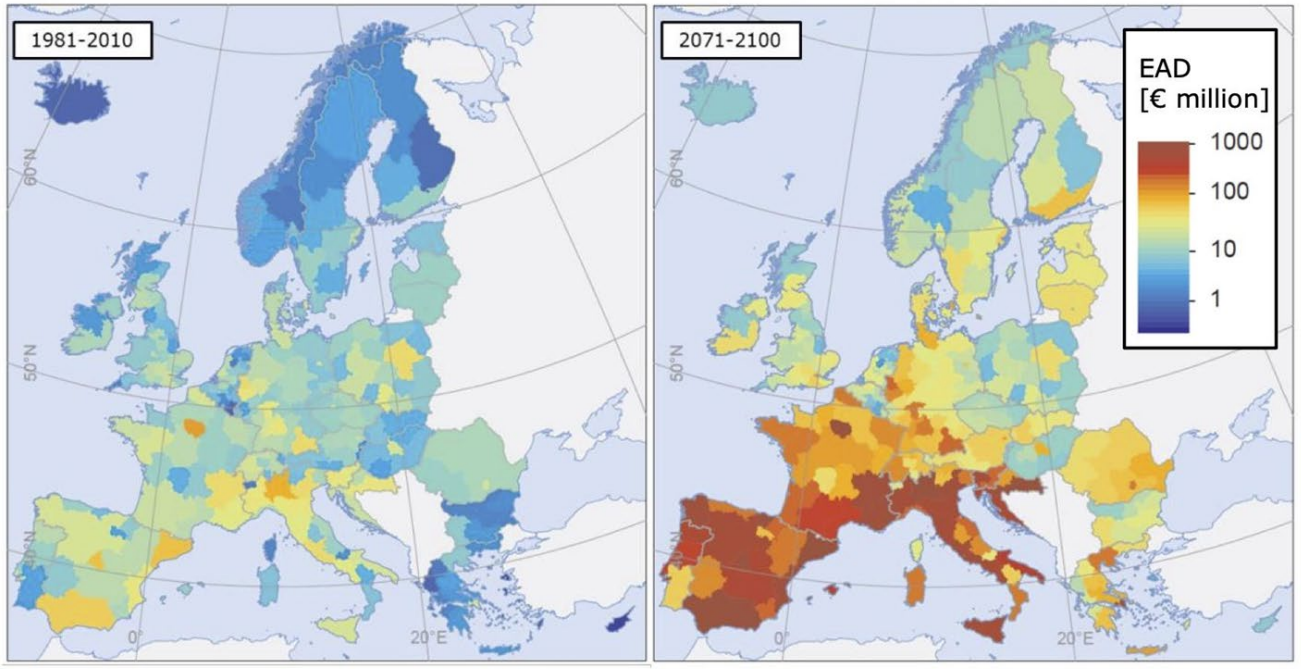
# Climate risk

**Expected annual damage to critical infrastructure in European regions, due to climate change, by the end of the century (million EUR)[3]**




2018 Report from the Commisson to the European Parliament and the Council on the implementation of the EU Strategy on adaptation to climate change

**It is crucial to reduce both short- and long-term climate risks**

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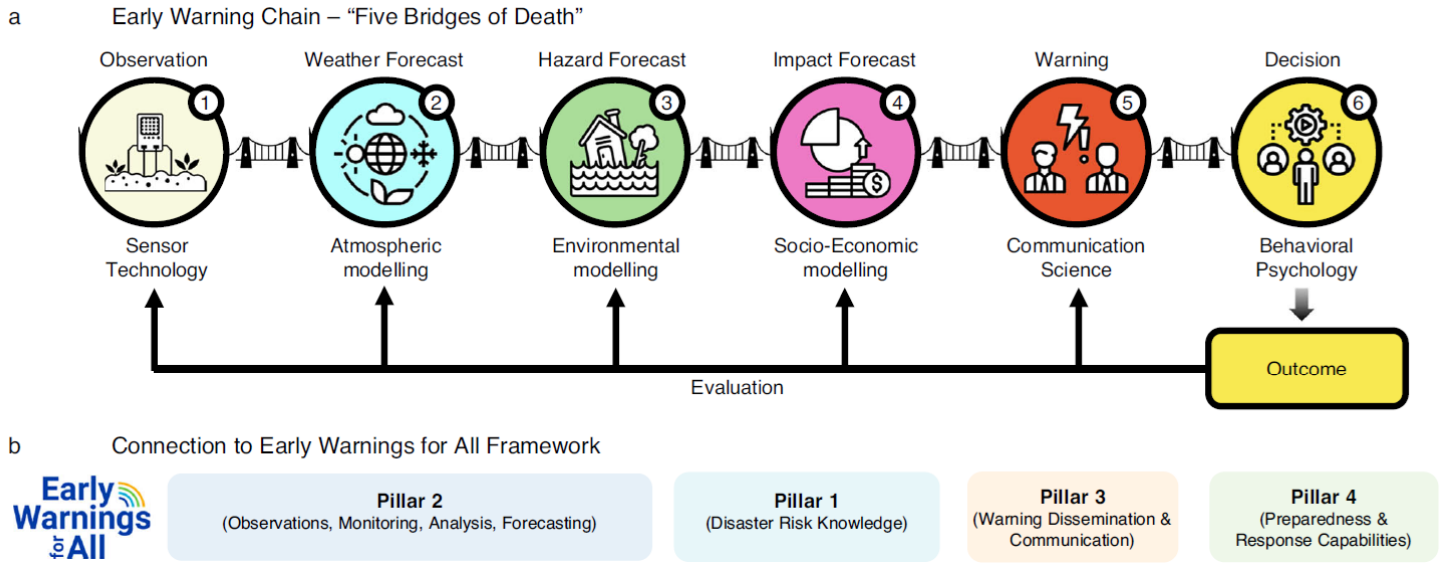
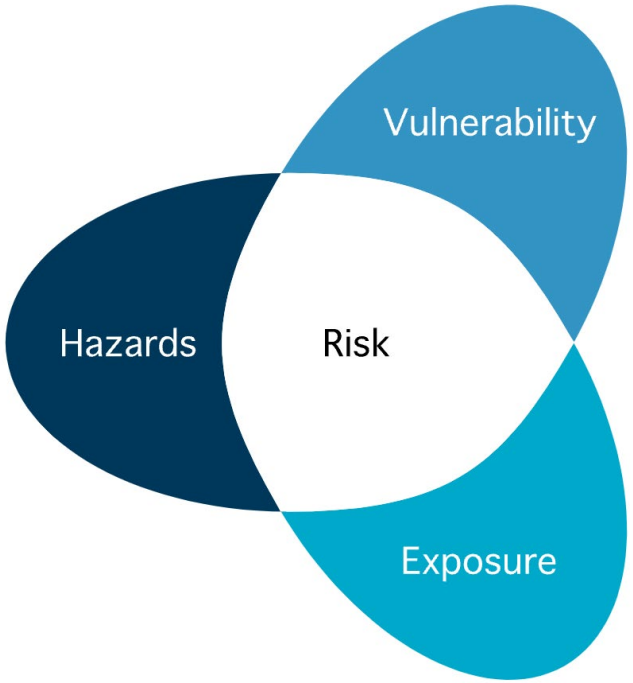
# Climate risk assessment

## Short-term climate adaptation




## Long-term climate adaptation




Reichstein, M. et al. (2025). Early warning of complex climate risk with integrated artificial intelligence. Nature Communications, 16(1).

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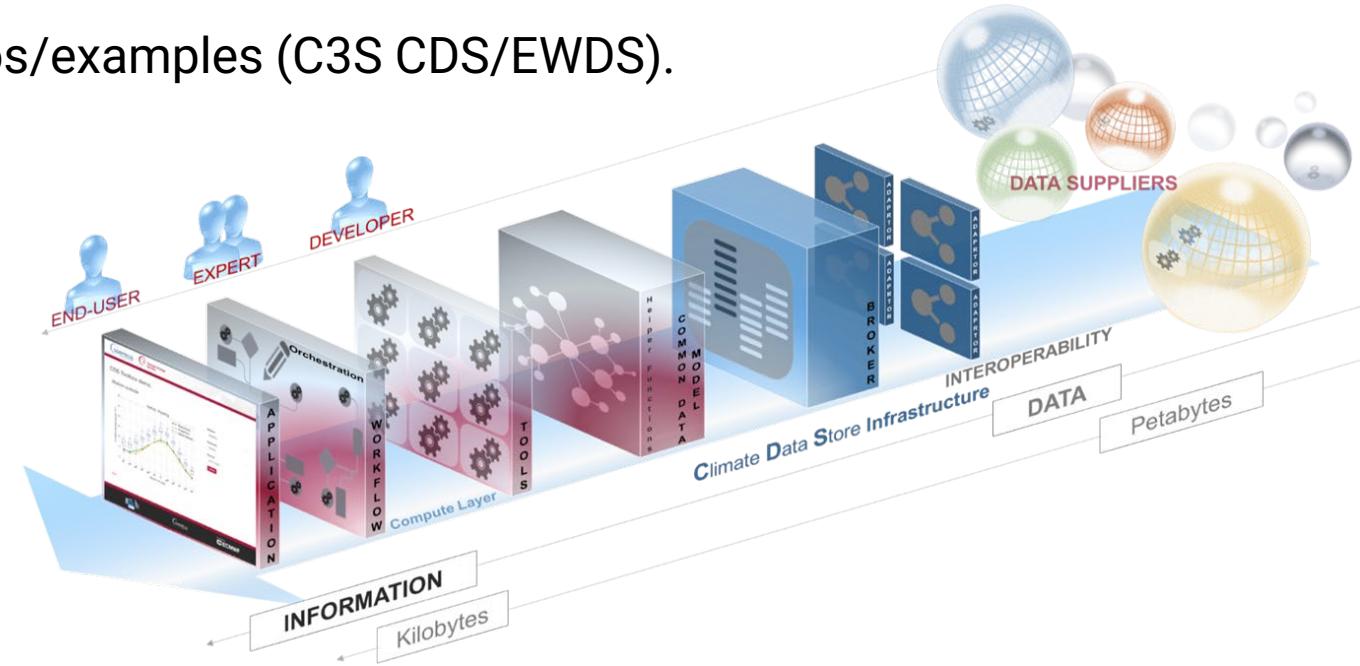
# Big-data landscape:

- EO satellites (GPM/IMERG, Sentinel)
- Reanalyses (ERA5/C3S),
- In-situ & IoT,
- Administrative & census,
- Crowd/citizen science
- Telecom & mobility, social media. Show logos/examples (C3S CDS/EWDS).

The C3S Climate Data Store (CDS) provides easy access to a wide range of past, present and future climate datasets via a searchable catalogue.

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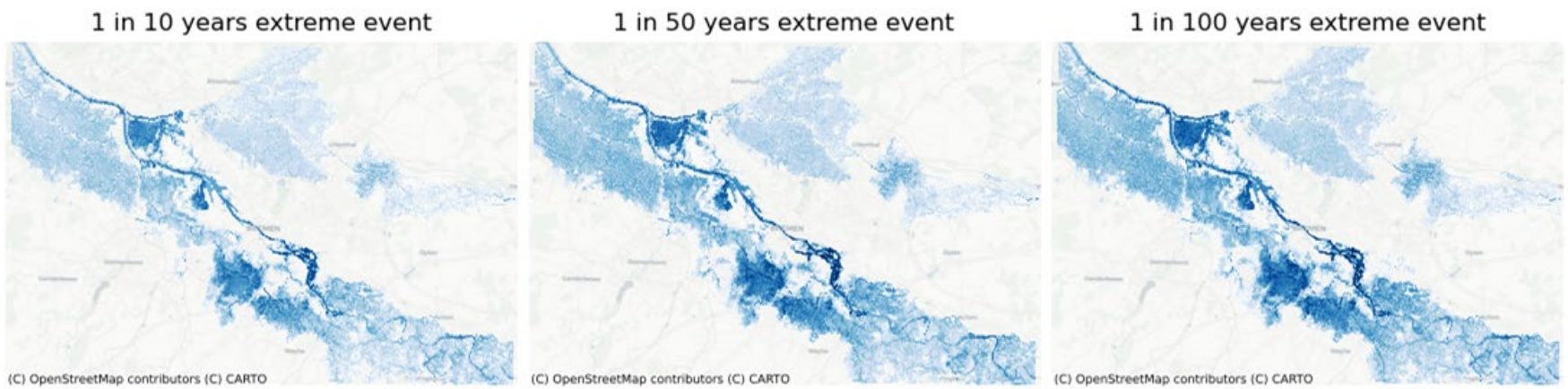
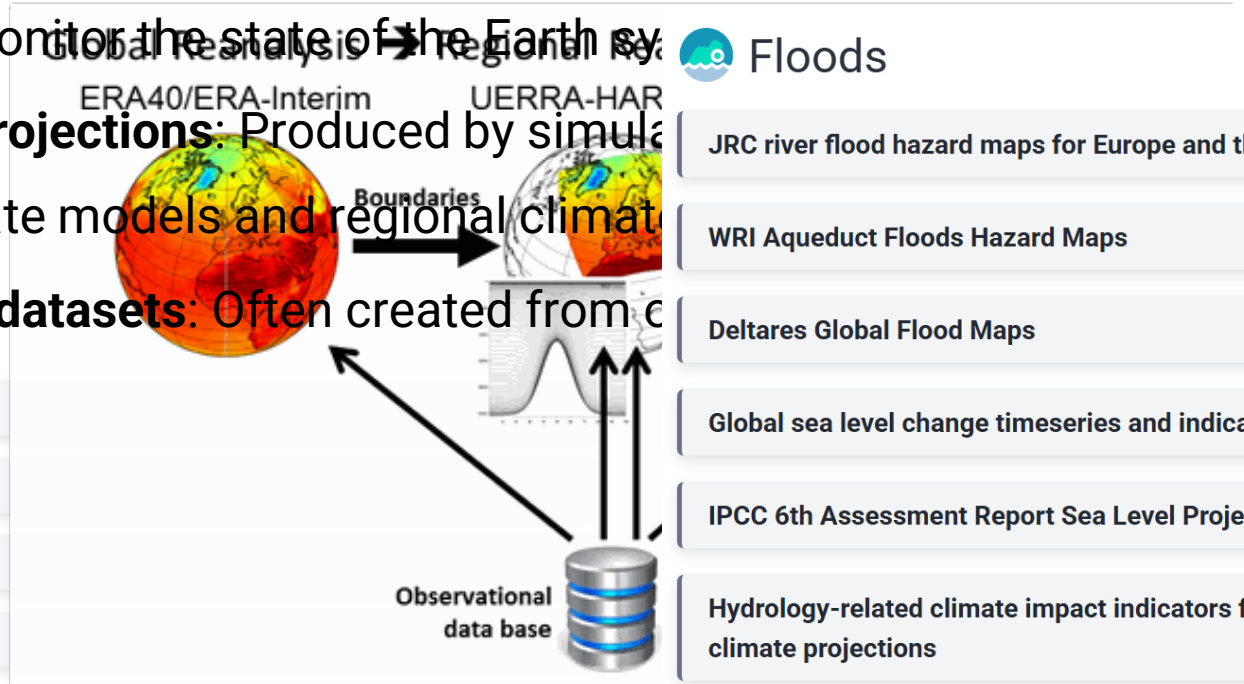
# Hazard data

- **Reanalysis**: Recreation
  of available observatio
- **Observations**: Observa
  platforms that monitor the state of the Earth sy
- **Climate model projections**: Produced by simula
  (e.g. global climate models and regional climat
- **Hazard-specific datasets**: Often created from c




CMIP6

CMIP5

CORDEX

ISIMIP3b

ECLIPS-2.0

CHELSA-EUR11

## Floods

- JRC river flood hazard maps for Europe and the Mediterranean Basin region
- WRI Aqueduct Floods Hazard Maps
- Deltares Global Flood Maps
- Global sea level change timeseries and indicators from 1950 to present day derived from reanalysis
- IPCC 6th Assessment Report Sea Level Projections
- Hydrology-related climate impact indicators from 1970 to 2100 derived from bias adjusted European climate projections

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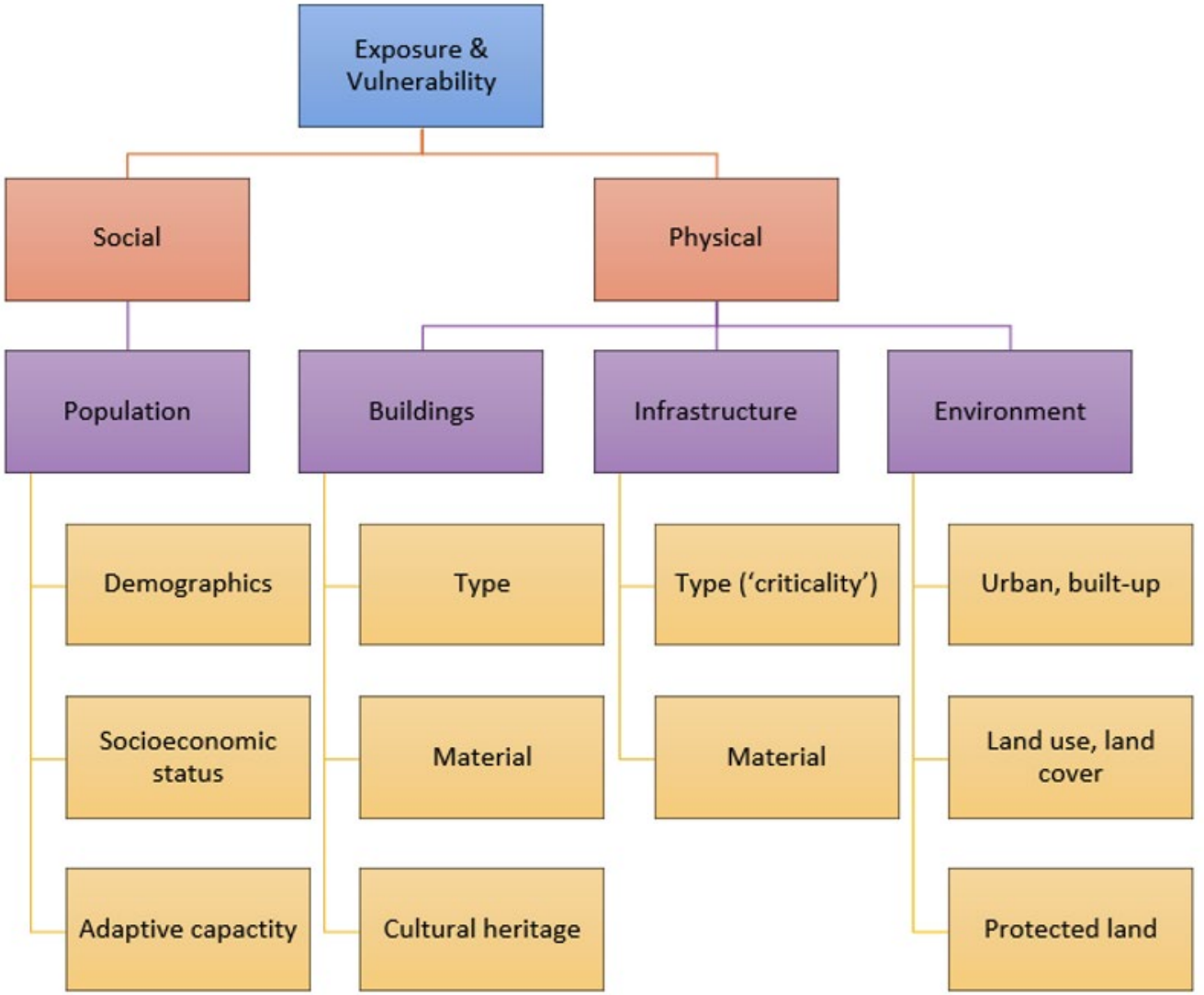
# Exposure and vulnerability data

A number of large scale climate and socio-economic data are available

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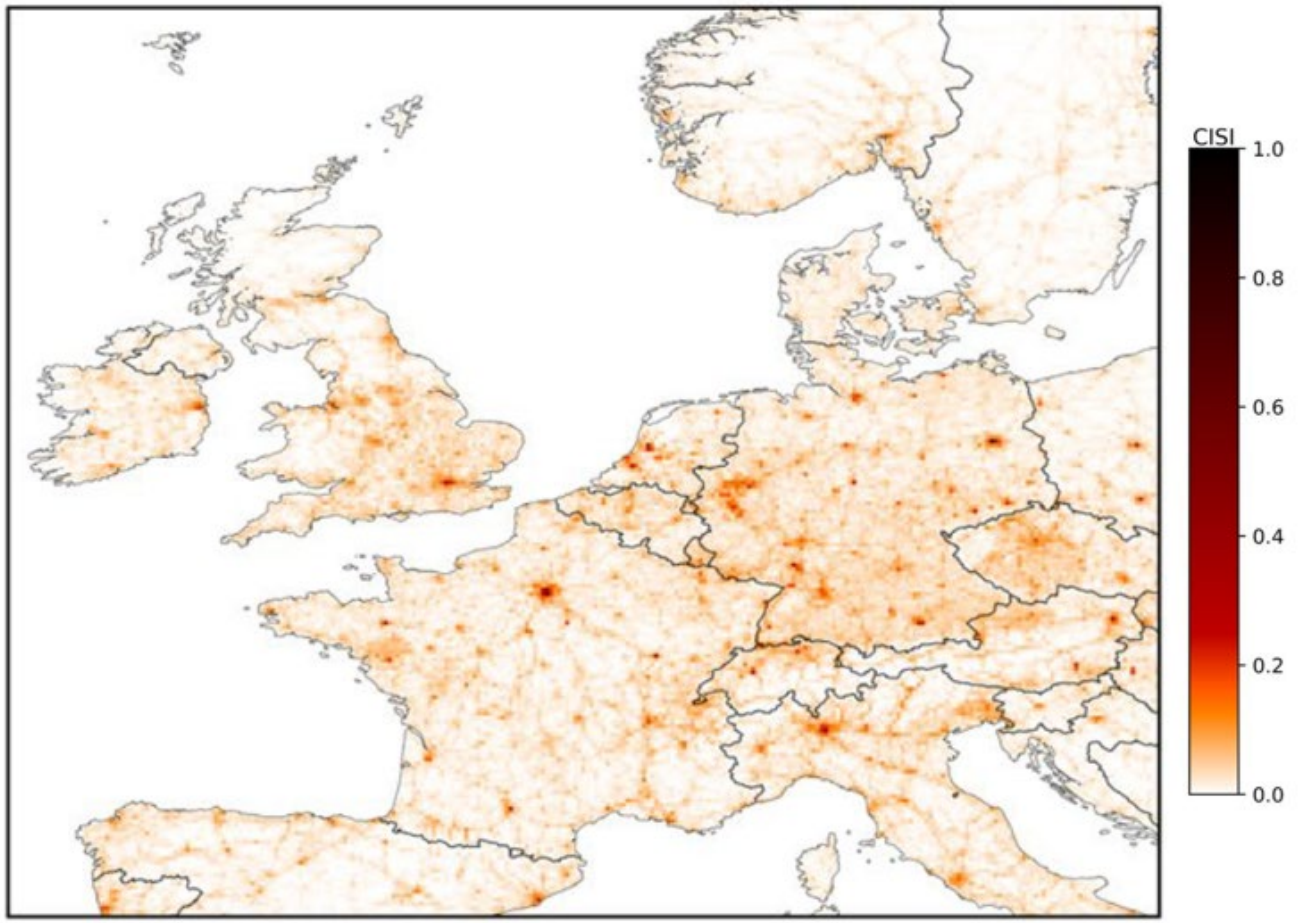
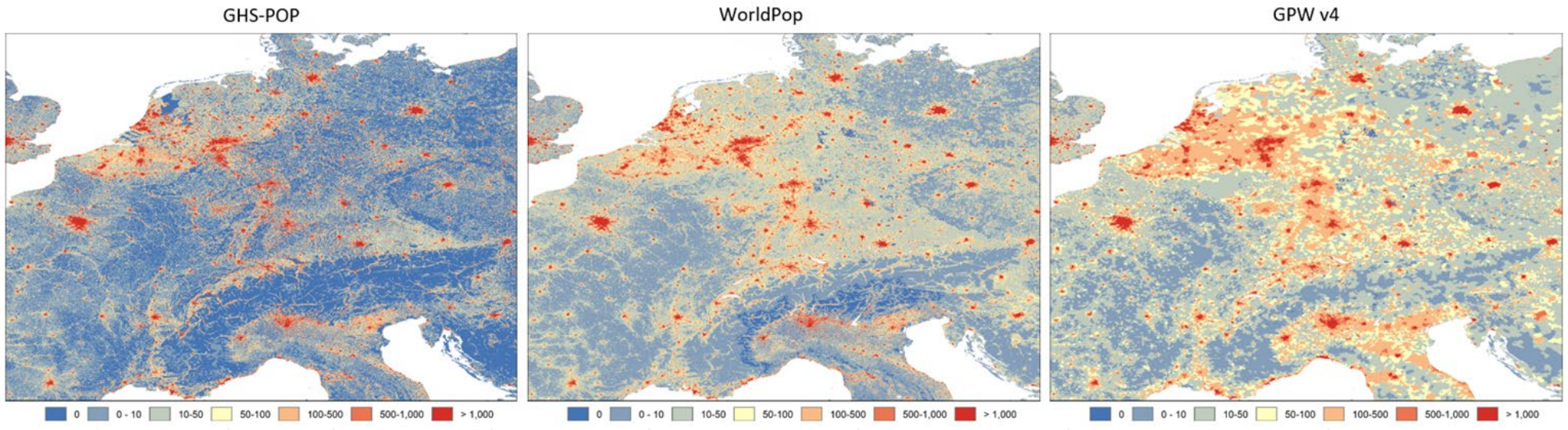
# Exposure data



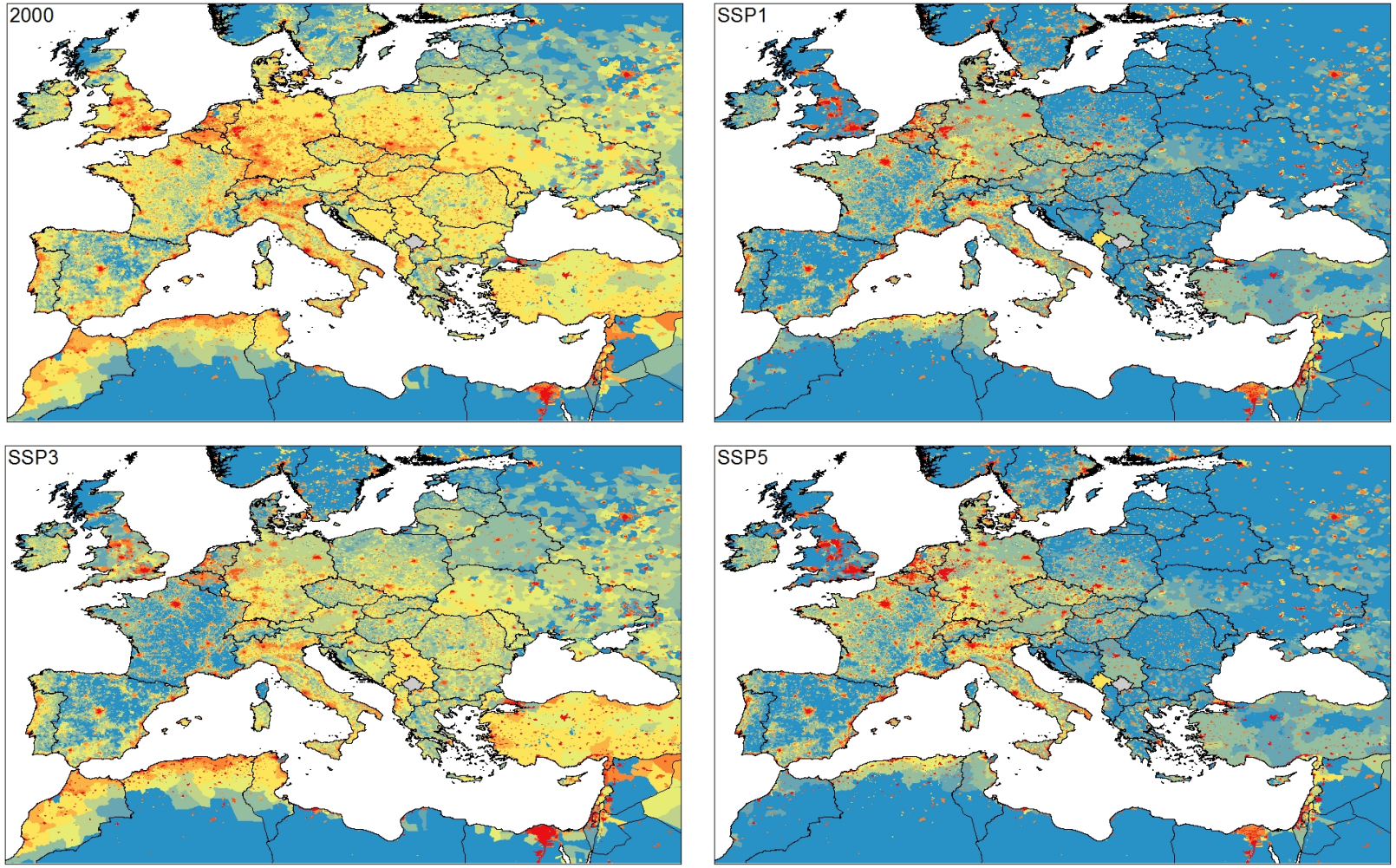

| Variable | | Spatial | Temporal | Spatial | | | |
|---|---|---|---|---|---|---|---|
| Settlements | | | | | | | non coordinate e system: de |
| | | | | | | | missing |
| Buildings, Infrastructure | | | | | | | with the data cumbersome wnload, n); Limited e in southern |
| Infrastructure | | | | | | Easy to use (compared to OSM) | olution |
| Land cover | CORINE | Europe | 1990, 2000, 2006, 2012, 2018 | 100 m | Copernicus Land Monitoring | Relatively long time series | Fewer land cover categories or less spatial detail than LUISA |

# Exposure data

| Dataset | Spatial scale | Temporal resolution | Spatial resolution | Analysis type | References | Pros | Cons |
|---|---|---|---|---|---|---|---|
| GHS-POP | Global | 1975-2030 | 100 m, 3 | Spatial distribution | European | Lightly modelled based | Overconcentration of |
| GEOSTAT | Europe | 2006, 2011, 2018, 2021 | 1 km | Derived and modelled from census data | GEOSTAT | Based on census data of 2011 and 2021 | No pan-European coverage; 2006 and 2018 modelled |
| HANZE 2.0 | Europe | 1870-2020 | 100 m | Modelled from GEOSTAT 2011 | Paprotny & Mengel, 2023 | High spatial and temporal resolution | No pan-European coverage |
| EUROSTAT | Europe | 1960-2023 | NUTS regions | National census and population registries | EUROSTAT | Consistent across EU countries | No pan-European coverage |



# Exposure data




Population projections

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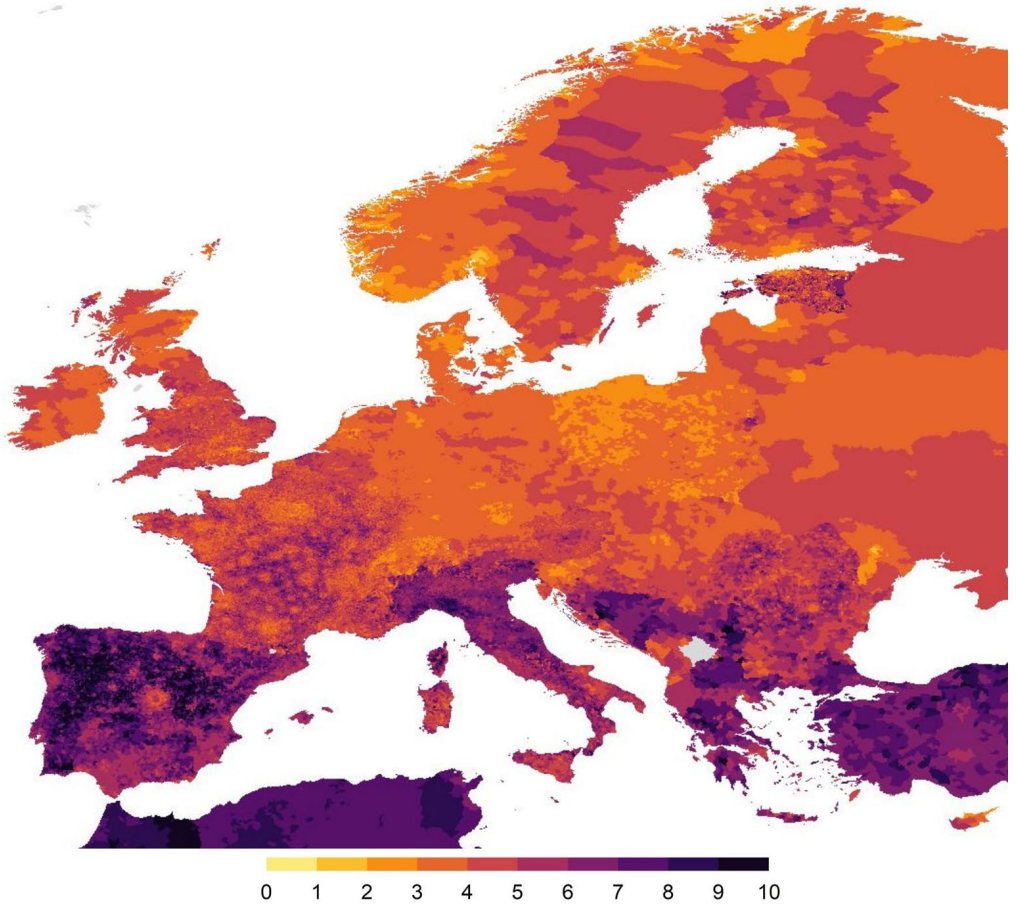
# Vulnerability data

- Age and sex
- Education
- Income
- Inequality
- Poverty
- GDP
- Social Vulnerability index

| Variable | Scenarios | Temporal resolution | Spatial resolution | References |
|---|---|---|---|---|
| Gross Domestic Product | SSPs 1-3 | 2010-2100 | 0.5 decimal degrees | **Dataset**; Murakami & Yamagata, 2019 |
| | SSPs 1-5 | 2005-2100 | 0.25 decimal degrees, 30 arcsec | **Dataset**; T. Wang & Sun, 2022 |
| GDP/capita | SSPs 1, 3, 5 | 2015-2050, 2050-2100 | 30 arcsec | Burek et al., 2020 |
| Rural population | SSPs 1, 3, 5 | 2015-2050, 2050-2100 | 30 arcsec | Burek et al., 2020 |




Reimann et al. (2024)

Pan-European future vulnerability projections datasets

# Climate risk assessment

Different methods have been proposed over the years for assessing climate risk. Here are three widely used ones:

- Product between Hazard, Exposure, and Vulnerability (i.e Risk index method)
- Damage analysis based on damage curves, Hazard, and Exposure
- Exposed assets or population to a certain climate-related hazard

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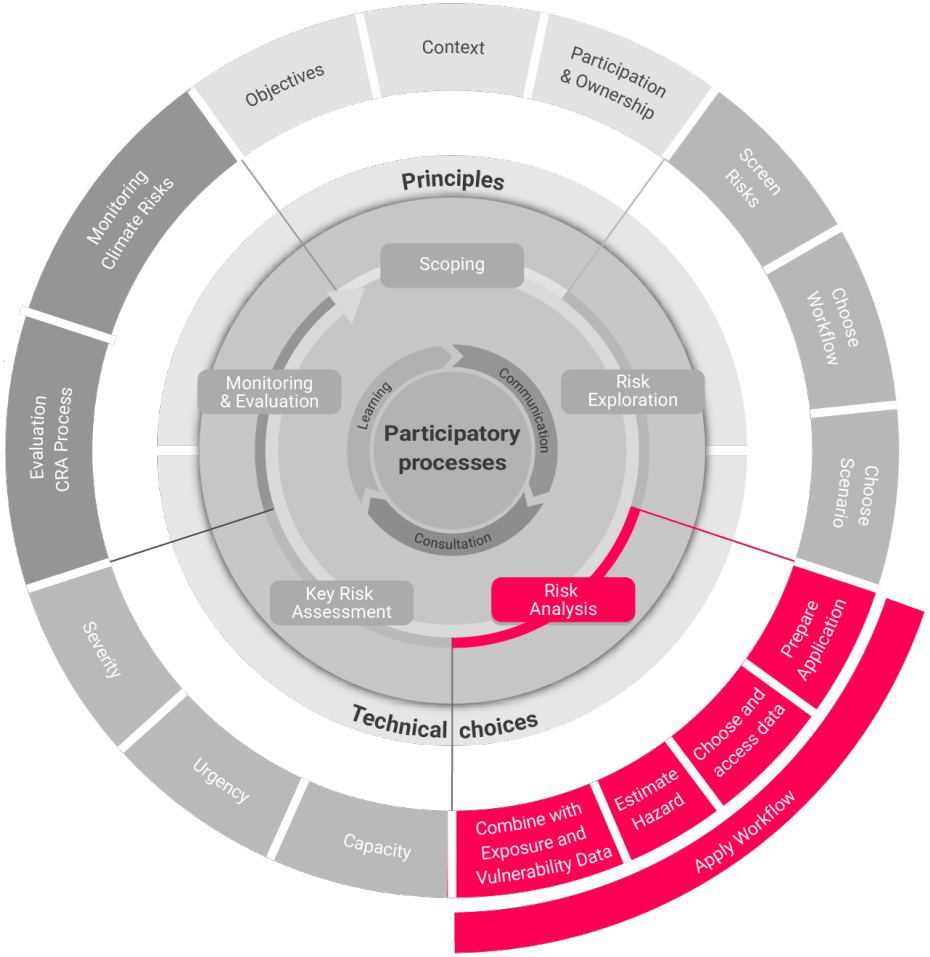
# CLIMAAX Risk Analysis:

- Once the Risk Exploration is completed, the next step is to apply the risk workflow and scenario decisions in the Risk Analysis to estimate risk in a given region.
- The risk workflows consider four main steps to calculate a region's individual Climate Risk
- The objective is to give regions repeatable, comparable, and locally-customisable risk workflows they can actually run."
- Possibility to assess risks from a variety of climate hazards, exposed elements and vulnerability under present and future conditions

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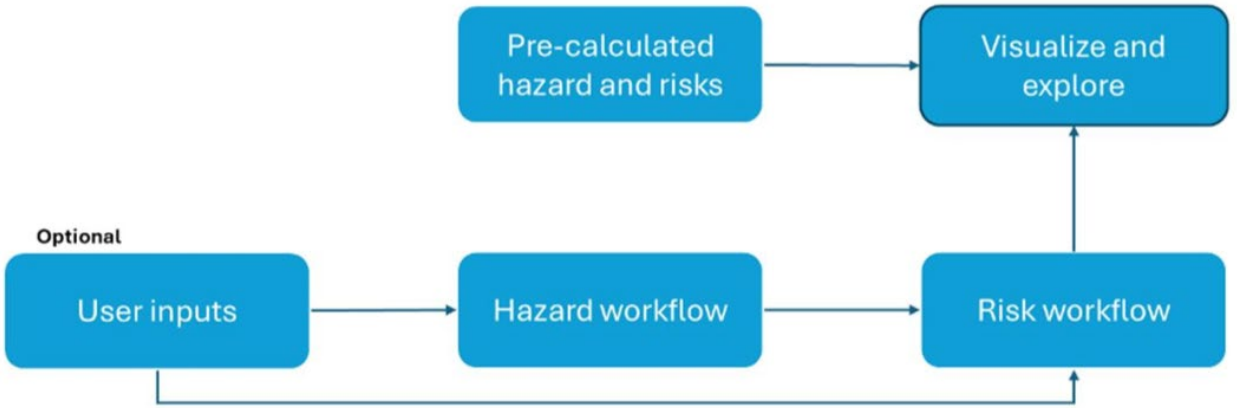
# Toolbox characteristics

- **User levels**: Workflows application (Intermediate and advanced users ), customize workflos with local data/Jupyter (expert users)
- **Data**: pan-European hazard & scenarios + exposure + vulnerability; supports adding local data.
- **Methods & coverage**: 3 CRA methods implemented (risk indexing; expected damage via damage curves; assets/population exposed) across 14 workflows for 9 hazards (river/coastal f[illegible] precipitation, drou[illegible] multi-risk).

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# CLIMAAX Risk workflows

| | Hazard type | Risk assessment | Hazard data | Exposure and vulnerability | Risk output |
|---|---|---|---|---|---|
| | River floods (flood maps) | Damage assessment | River flood depth and extent maps | Land use, vulnerability damage curves | Map of flood depth and damage |
| | Coastal floods | Damage assessment | Coastal flood depth and extent maps | Land use, vulnerability damage curves | Map of flood depth and damage |
| | Flood damage and population exposed | Damage assessment and exposure | Flood depth maps | Open street map, Buildings damage and population exposure | Map of flood damage; population exposed and displaced; exposed critical infrastructures |
| | Extreme precipitation | Risk index method | Precipitation intensity for a given return period, impact rainfall thresholds | Critical infrastructures and population density | Impact rainfall thresholds; Shift in magnitude and frequency |
| | Urban heatwaves | Risk index method | Maximum Land Surface Temperature | Population density | Heatwave risk level |
| | Drought risk | Risk index method | Drought hazard index calculated based on monthly precipitation timeseries | Multiple exposure and vulnerability indices (social and economic) | Map of relative drought risk |
| | Agricultural drought | Damage assessment | Crop yield reduction | Total crop production and aggregated crops revenue | Map revenue loss |
| | Wildfire risk | Risk index method | Fire susceptibility | Population, Economy, Ecology | Road, Population, Ecological and Economic risks |
| | Wildfire exposure | Exposed population | Fire Weather Index | Population density | Exposed population |
| | Heavy snowfall | Exposed population | Annual probability of occurrence | Population density | Exposed population |
| | Blizzards | Exposed population | Annual probability of occurrence | Population density | Exposed population |
| | Windstorm | Damage assessment | Footprint of maximum wind gusts | Land use, vulnerability damage curves | Wind damage map |
| | Multi-hazard | Risk index method | Precipitation and temperature thresholds as proxy of floods and heatwaves | Airports and sensitivity and adaptive-capacity indicators | Risk maps of extreme temperature and precipitation |

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# CLIMAAX Risk workflows – Climate data used for historical and future scenarios

| | Hazard type | Time horizon(s) | Future scenarios | Datasets |
|---|---|---|---|---|
| | River floods (flood maps) | 1980, 2030, 2050, and 2080 | RCPs 4.5 and 8.5 | JRC and Aqueduct |
| | River floods (discharge analysis) | Reference (1971-2000) and 2011-2040, 2041-2070, 2071-2100 | RCPs 2.6, 4.5 and 8.5 | Hydrological climate impact indicators |
| | Coastal floods | Historical (ca. 2018) and 2050 | RCP 8.5 | Flood maps based on GTSM |
| | Flood damage and population exposed | 1980, 2030, 2050, and 2080. Population in 1975, 1990, 2000, 2015 or the population projection of either 2025 or 2030. | RCPs 4.5 and 8.5 | JRC, Aqueduct, and GHSL |
| | Extreme precipitation | Historical (e.g. 1976-2005) and future periods (e.g. 2041-2070) | RCP 8.5 | EURO-CORDEX |
| | Urban heatwaves | Historical (1971-2000) and three future periods (2011-2040, 2041-2070 and 2071-2100) | RCPs 4.5 and 8.5 | EURO-CORDEX |
| | Drought risk | Historical (e.g. 1979-2019) and future periods (e.g. 2015-2100) | SSP1-RCP2.6, SSP3-RCP7.0, SSP5-RCP8.5 | ISIMIP |
| | Agricultural drought | Historical and future periods (e.g. up to 2050) | RCP2.6, RCP4.5, RCP8.5 | EURO-CORDEX |
| | Wildfire risk | Two past (1961–1990 and 1991–2010) and five future (2011–2020, 2021–2040, 2041–2060, 2061–2080 and 2081–2100) periods | RCPs 4.5 and 8.5 | ECLIPS2.0 and EFFIS datasets |
| | Wildfire exposure | Historical (e.g. 1981-2005) and future periods (e.g. 2021-2098) | RCP2.6, RCP4.5, RCP8.5 | Fire danger indicators |
| | Heavy snowfall | Historical (e.g. 1940 to present) and three future periods (2011- 2040, 2041-2070 and 2071-2100) | RCP2.6, RCP4.5, RCP8.5 | ERA5 EURO-CORDEX |
| | Blizzards | Historical (e.g. 1940 to present) and three future periods (2011- 2040, 2041-2070 and 2071-2100) | RCP2.6, RCP4.5, RCP8.5 | ERA5 EURO-CORDEX |
| | Windstorm | Historical (e.g. 1979-2021) | – | Winter windstorm indicators |
| | Multi-hazard | Historical (e.g. 1961 to 2019) and three future periods (2011-2100) | RCP2.6, RCP4.5, RCP8.5 | UERRA MESCAN-SURFEX; EURO-CORDEX |

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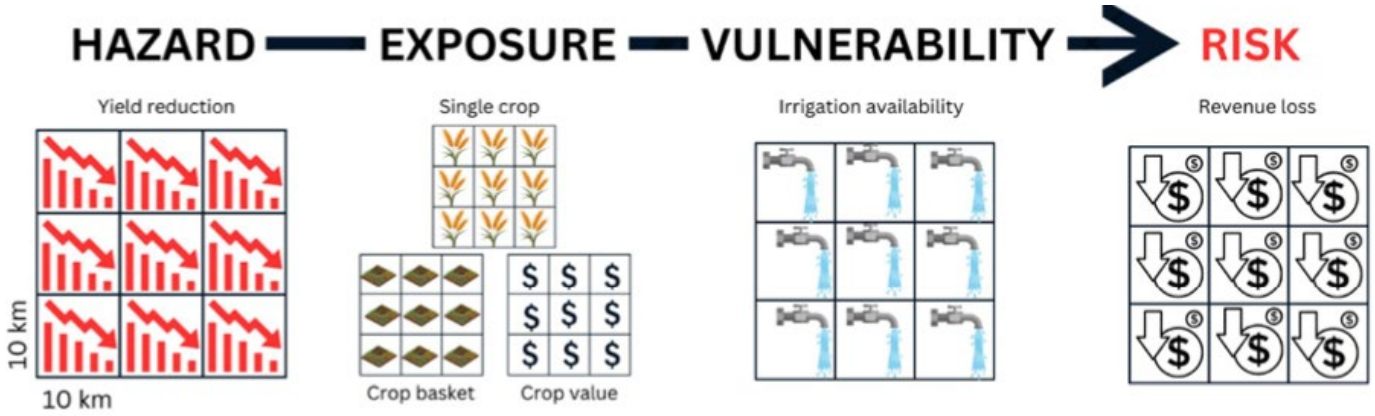
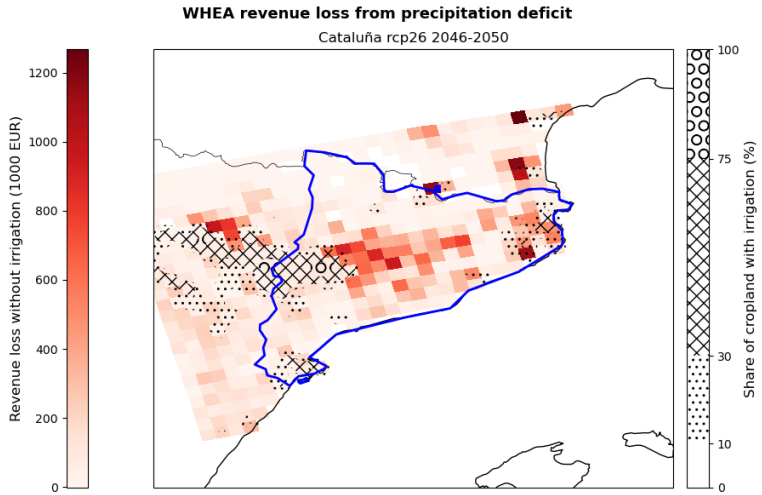
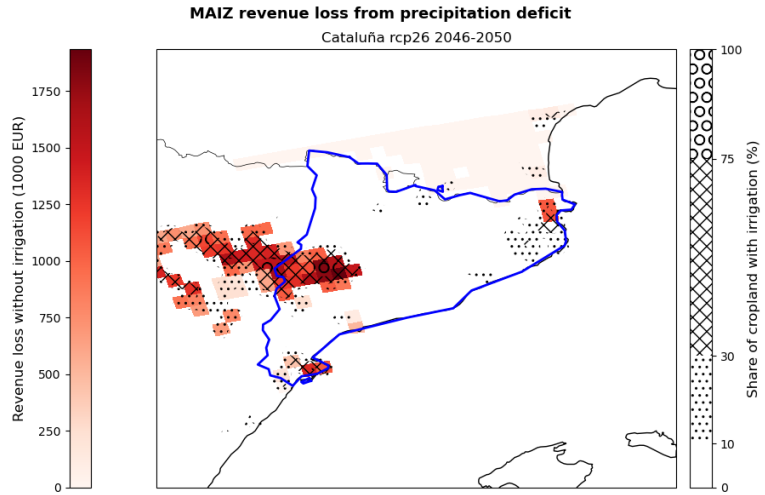
# Climate Risk Assessment – Risk index method

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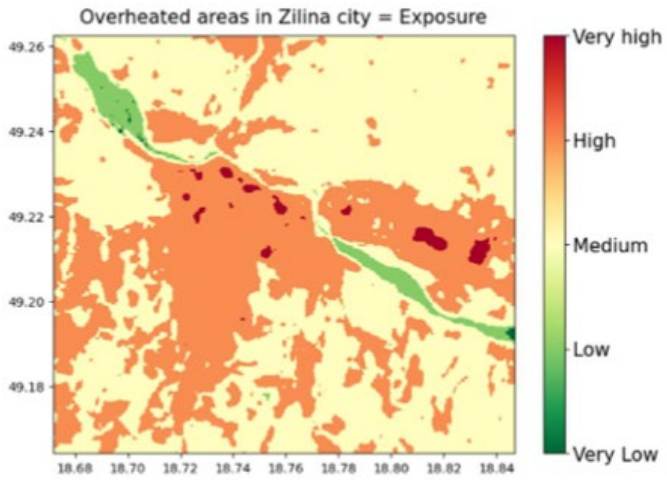
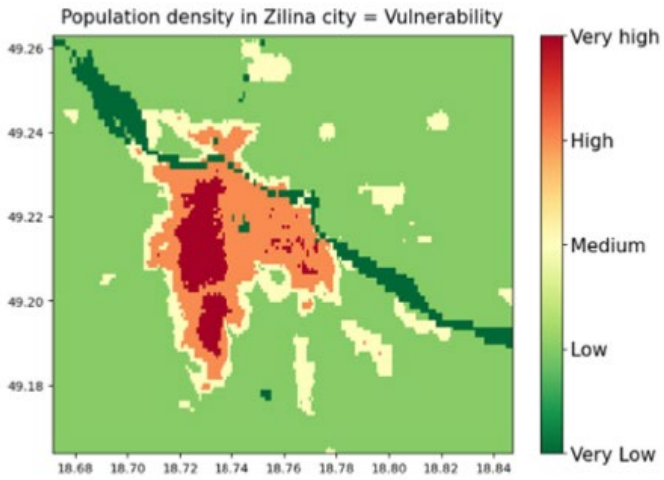
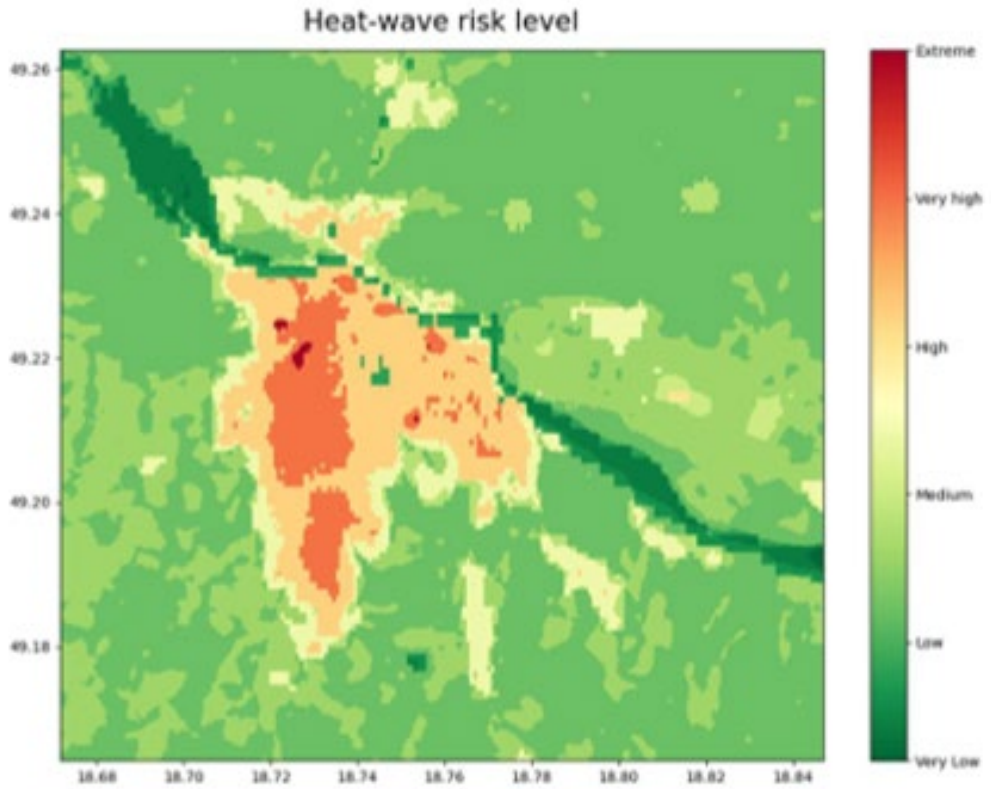
# Climate Risk Assessment – Risk index method

| | | Vulnerability | | | | |
|---|---|---|---|---|---|---|
| | | Class 1 | Class 2 | Class 3 | Class 4 | Class 5 |
| Exposure | Class 5: (T>50C) | 5 | 10 | 15 | 20 | 25 |
| | Class 4: (40C<T<50C) | 4 | 8 | 12 | 16 | 20 |
| | Class 3: (30C<T<40C) | 3 | 6 | 9 | 12 | 15 |
| | Class 2: (20C<T<30C) | 2 | 4 | 6 | 8 | 10 |
| | Class 1: (T<20C) | 1 | 2 | 3 | 4 | 5 |

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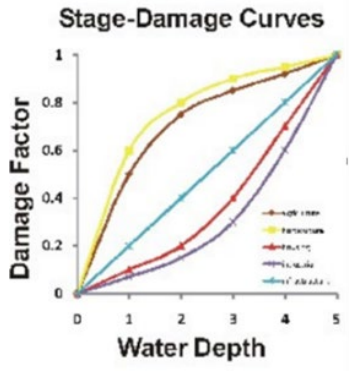
# Climate Risk Assessment – Damage assessment

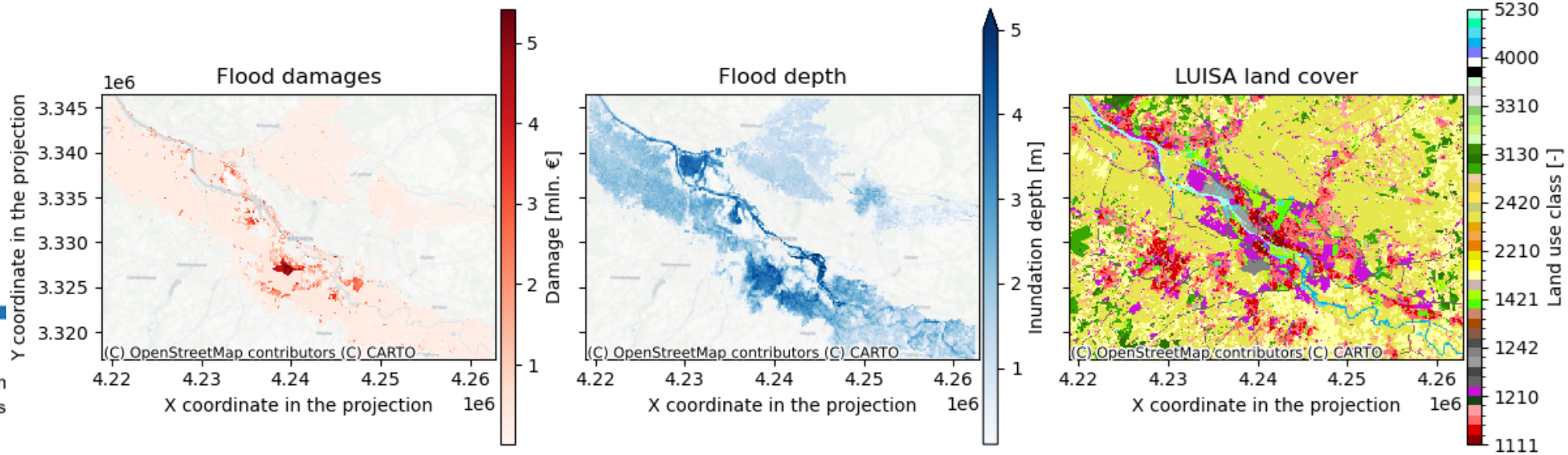
**Land use**

**Flood water depth (different return periods)**

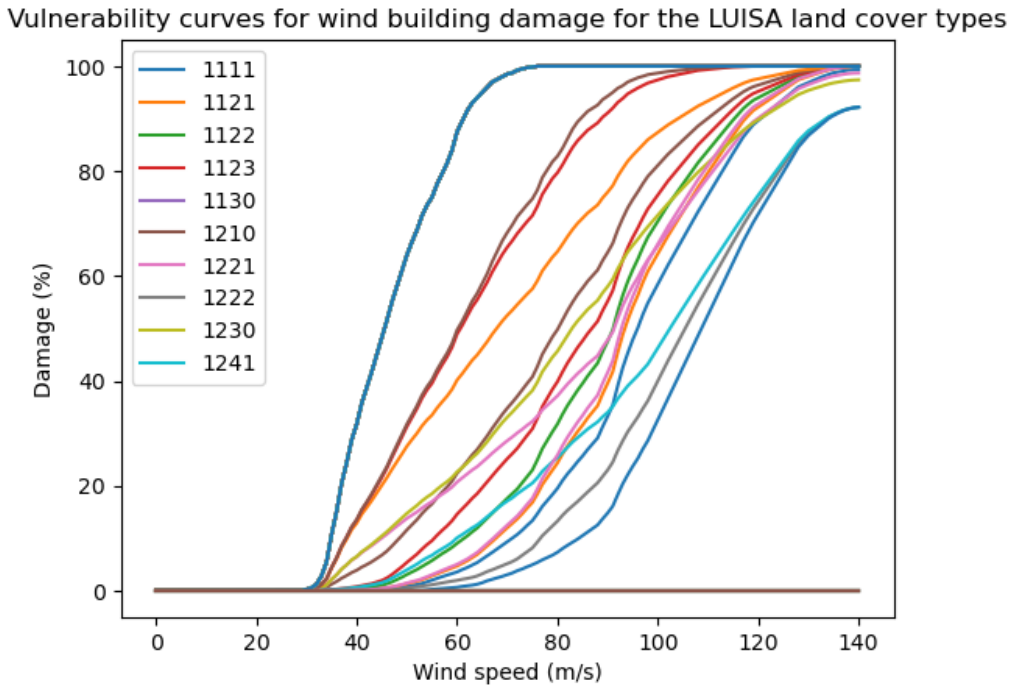


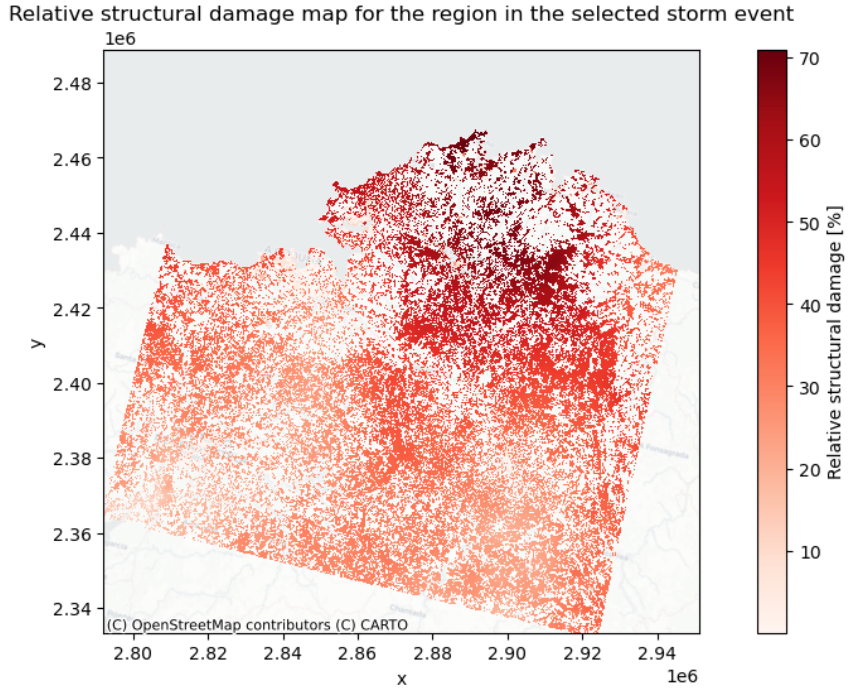

**Flood damage**

Maps of flood and associated damages for extreme river water level scenarios in current climate
1 in 100 year extreme event



# Climate Risk Assessment – Damage assessment




Example of vulnerability curve for 9 different land cover classes and damage map or a Europan region during a storm event

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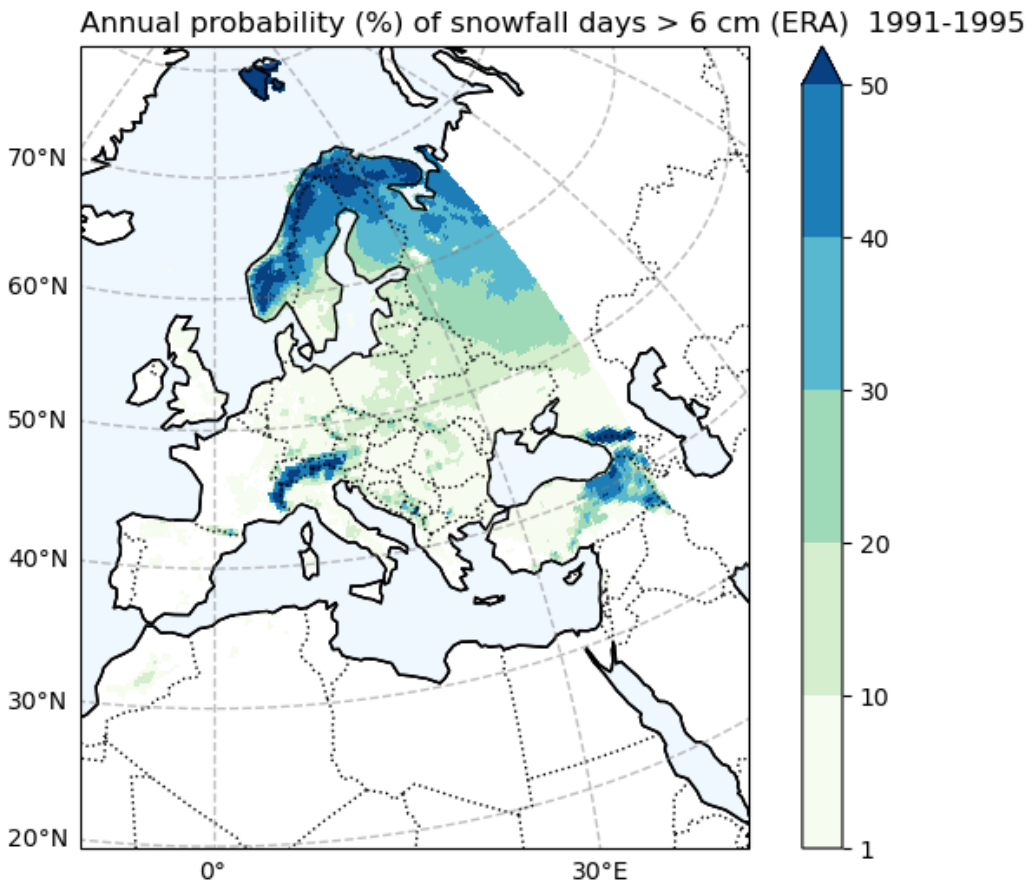
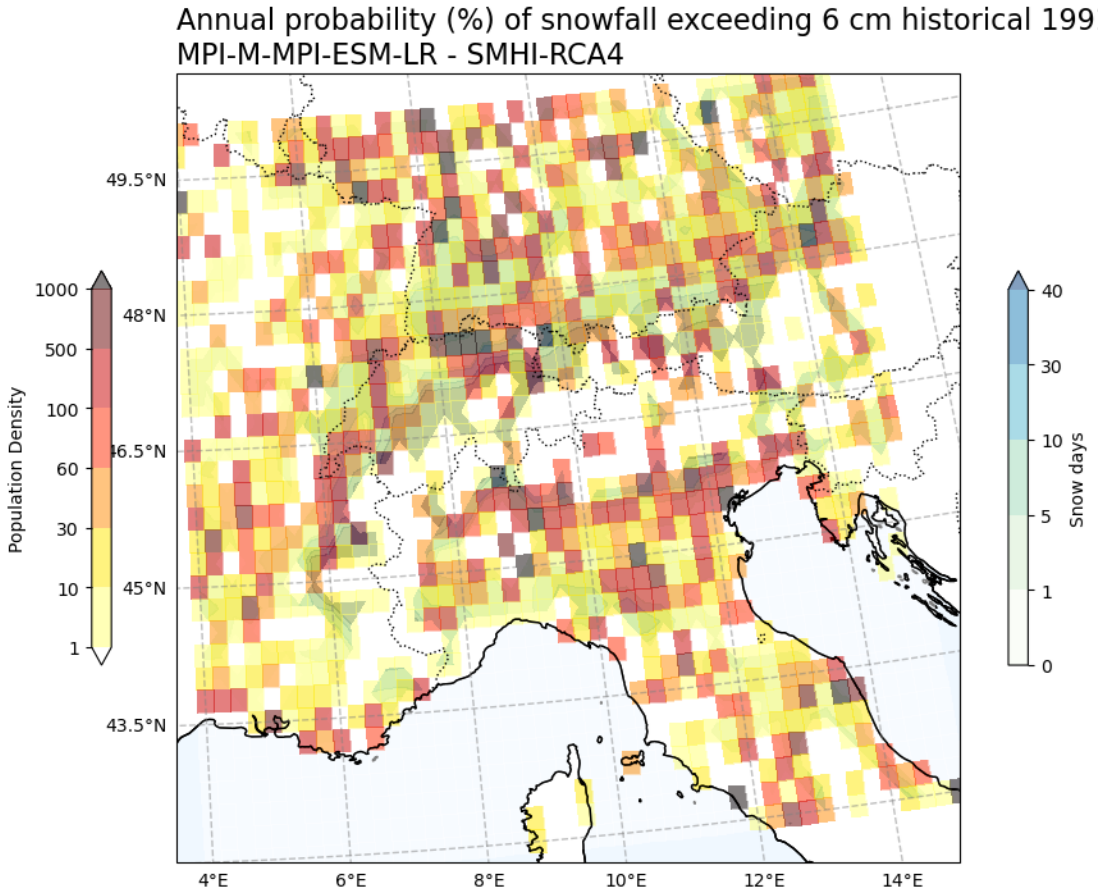
# Climate Risk Assessment – Exposed assets and population

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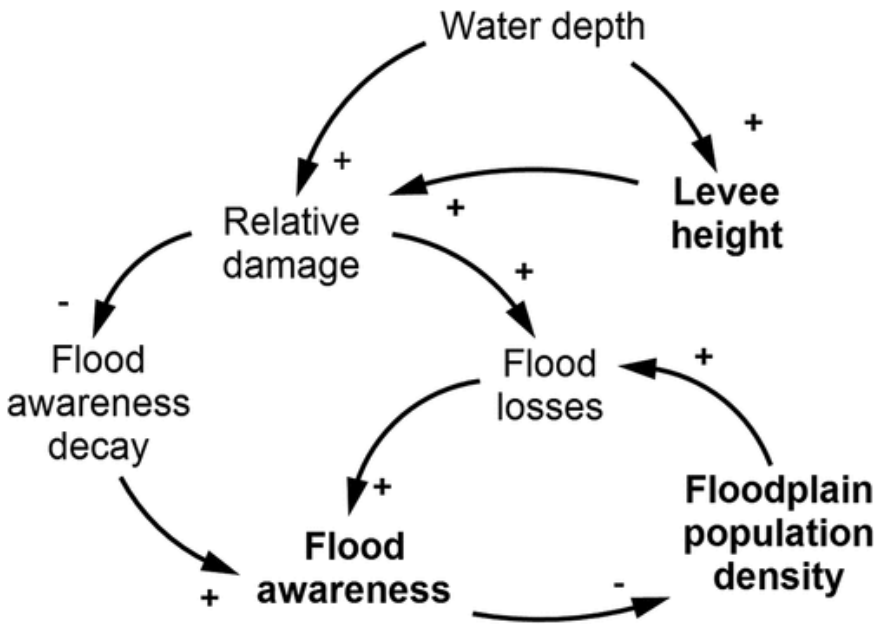
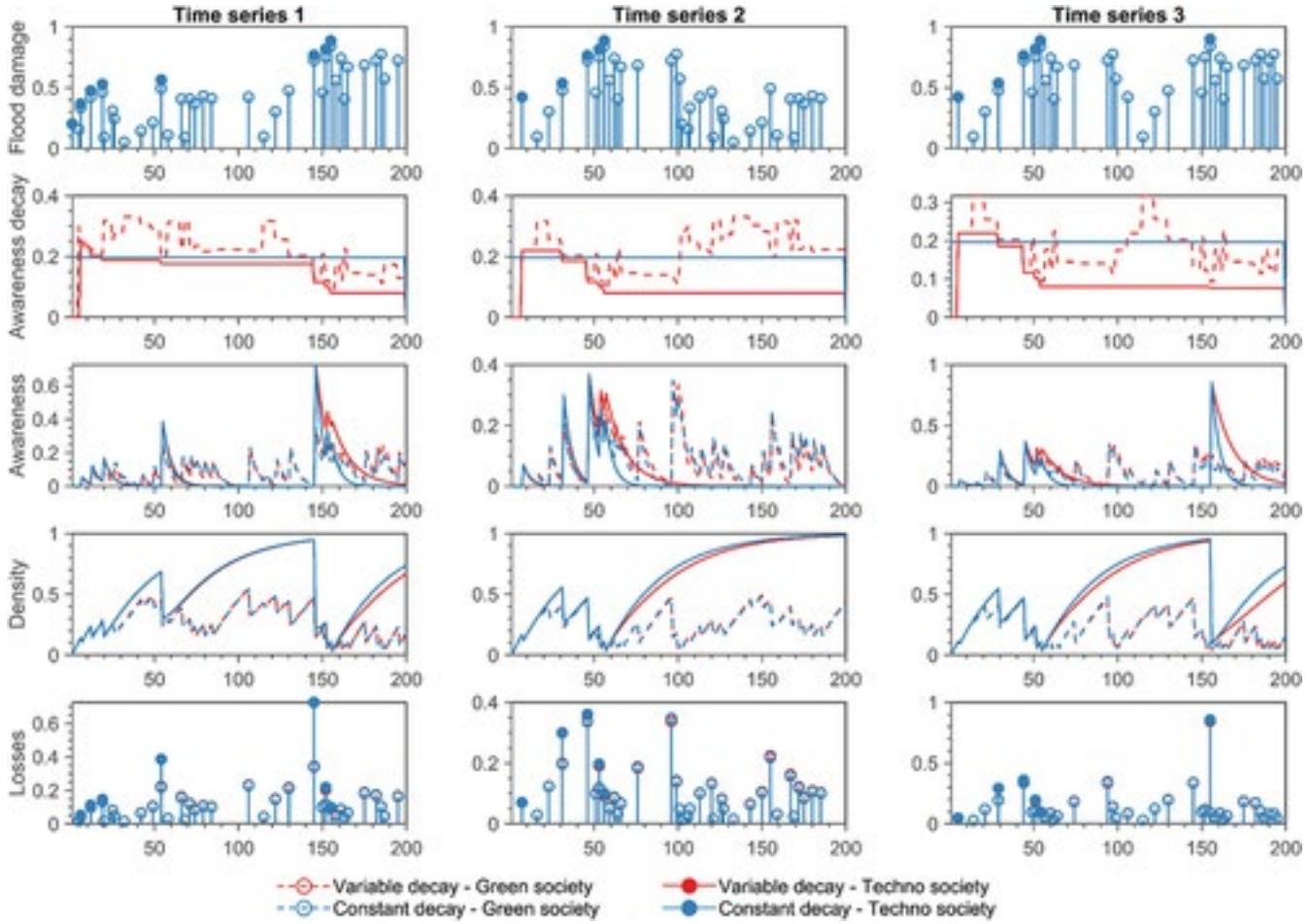
# Climate Risk Assessment – Including adaptation feedbacks




Mazzoleni, M., & Brandimarte, L. (2023). Modelling flood awareness in floodplain dynamics. Hydrological Sciences Journal, 68(4), 604-613.

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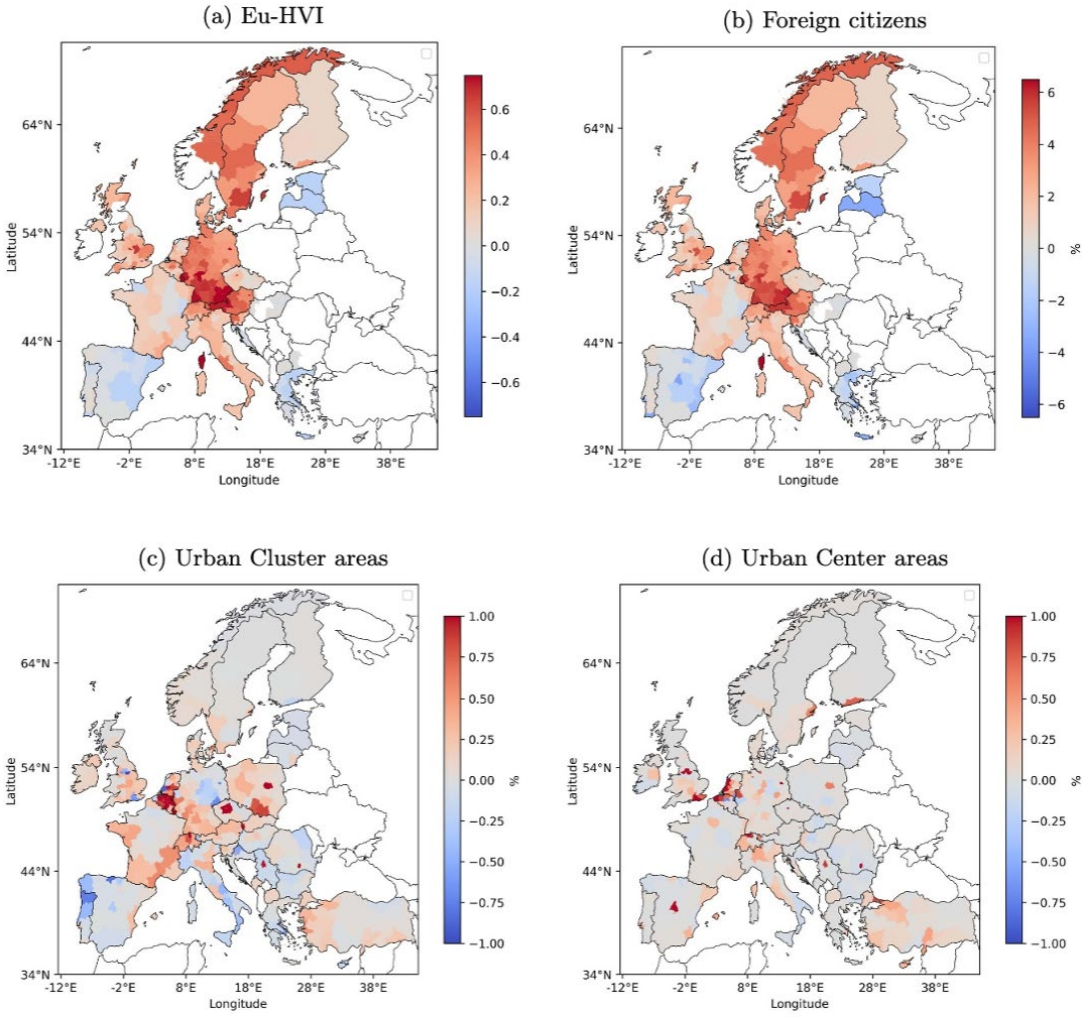
# Climate Risk Assessment – Dynamic vulnerability assessment

Here, we assessed dynamic heat vulnerability assessment for Europe, incorporating spatial and temporal dimensions through ordinary least squares regression.

The results suggest that foreign citizens may face increased heat vulnerability due to intersecting socioeconomic factors, highlighting the need for policies aimed at addressing disparities among foreign populations, and prioritizing sustainable urban planning.




Sestito, B., Reimann, L., Mazzoleni, M., Botzen, W. J. W., & Aerts, J. C. J. H. (2025). Identifying vulnerability factors associated with heatwave mortality: a spatial statistical analysis across Europe. Environmental Research Letters, 20(4)

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# Added value of AI in CRA

- **Detection of non-stationarity & extremes**: ML-aided change-point & tail modeling to update return periods sooner than classical baselines.
- **Nowcasting & short-lead prediction for EWS**: deep learning radar/satellite nowcasting to raise probabilistic triggers for floods, severe precip, wind.
- **EO-derived assets & people**: computer vision for building footprints, land use, critical infrastructure, and seasonal population proxies.
- **Vulnerability & impact**: Data-driven damage curves/impact functions (e.g., conditional on building type, income, age, health access).
- **Multi-risk**: Graph/causal models to propagate disruption across sectors (e.g., power → water → health).

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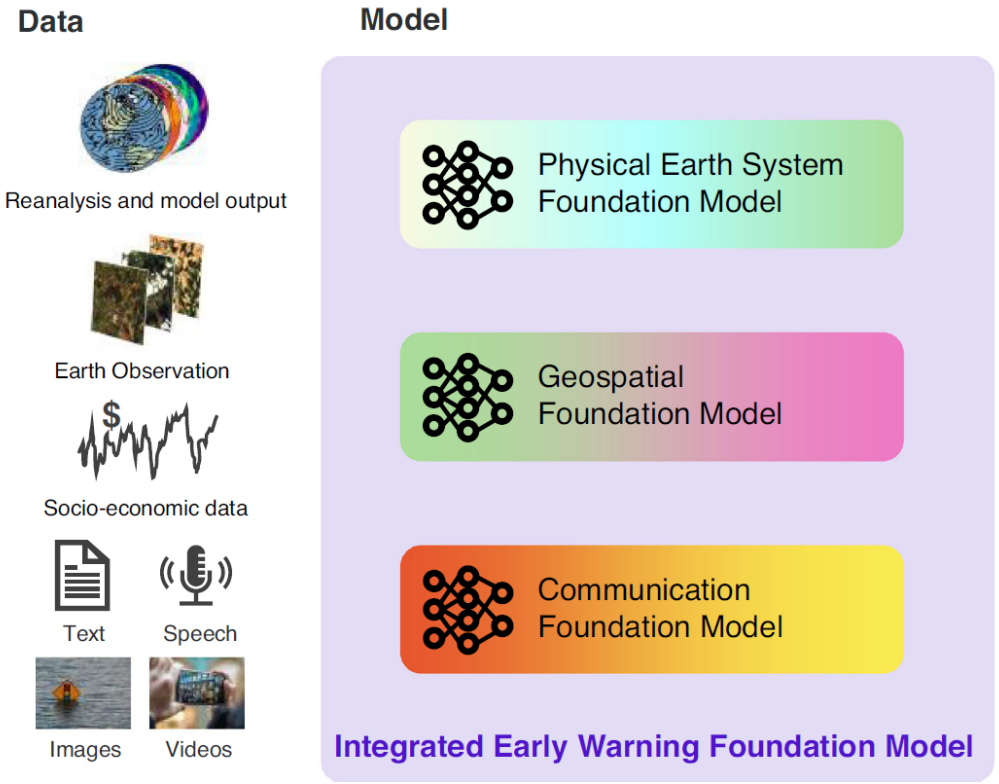
# AI for Early Warning System




- Improving forecast accuracy
- Towards localized warnings (higher resolutions)
- Democratizing access globally
- Moving from hazards to impacts
- Improve communication
- Better understanding of causality

Reichstein, M. et al. (2025). Early warning of complex climate risk with integrated artificial intelligence. Nature Communications, 16(1).

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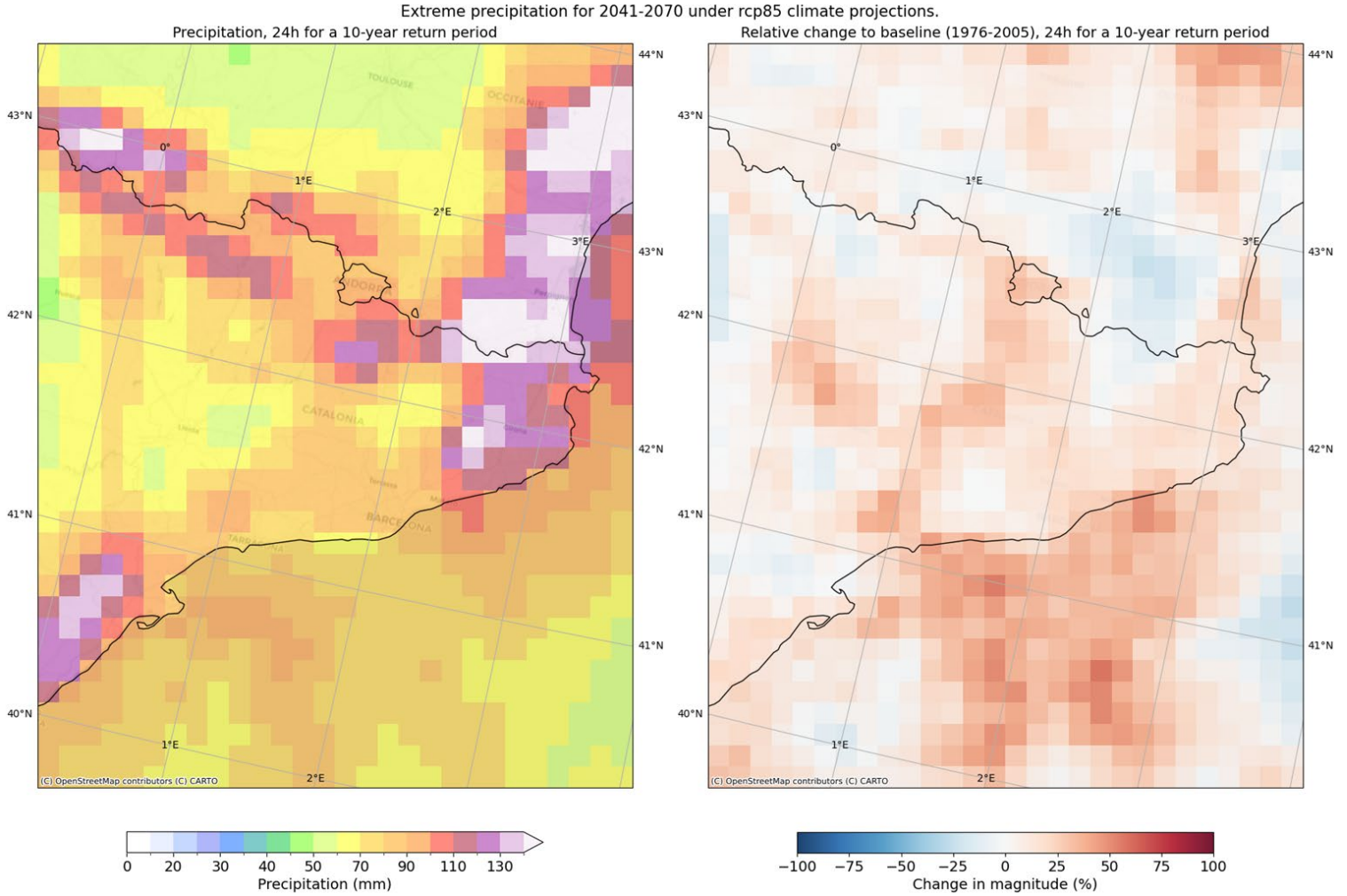
# Improving forecast accuracy: Extreme precipitation case, CLIMAAX

The extreme precipitation workflow has been constructed to guide users, communities, and regions in assessing critical impact-based rainfall thresholds for decision support values for early warning systems, helping link local potential risk and their consequences to specific rainfall intensity values




Meléndez-Landaverde, E. R., & Sempere-Torres, D. (2025). Design and evaluation of a community and impact-based site-specific early warning system (SS-EWS): The SS-EWS framework. Journal of Flood Risk Management, 18(1)

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# Impact-based forecast of drought


**Legend**

*Sectors considered*

- Wildfires
- Agriculture and Livestock
- Water-related
- Energy and Industry

*Methods*

| | |
|---|---|
| BLG | Binary Logistic Regression |
| CES | Cohen's d effect size |
| GAM | Generalised Additive Models |
| LG | Logistic Regression |
| RC | Rank Correlation |
| RF | Random Forest |

*Indicators*

| | |
|---|---|
| CI | Climate Indices |
| NDVI | Vegetation Index |
| SM | Soil Moisture |
| SPEI | Stand. Precip. Evapotrans. Index |
| SPI | Stand. Precipitation Index |
| SRI | Stand. Runoff Index |
| SSI | Stand. Streamflow Index |
| SSWI | Stand. Soil Water Index |
| S&G P | Streamflow and Groundwater Percentiles |


Shyrokaya, A., Pappenberger, F., Pechlivanidis, I., Messori, G., Khatami, S., Mazzoleni, M., & Di Baldassarre, G. (2024). Advances and gaps in the science and practice of impact-based forecasting of droughts. Wiley Interdisciplinary Reviews: Water, 11(2), e1698.



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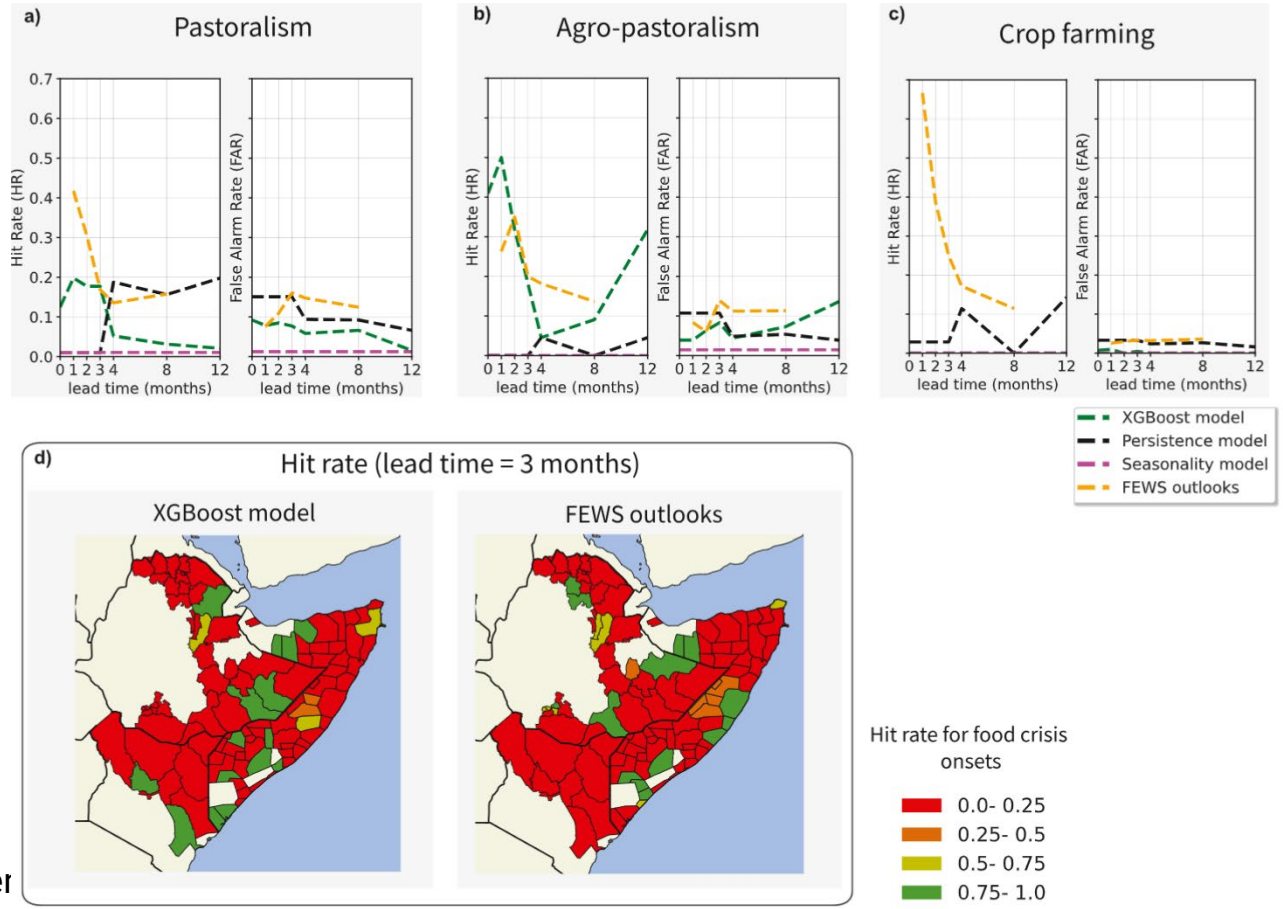
# Impact-based forecast of food security

Novel methods of increasing early warning capabilities is of vital importance to reducing food-insecurity risk using more than 20 datasets

They predicted 20% of crisis onsets in pastoral regions (n = 96) and 20%–50% of crisis onsets in agro-pastoral regions (n = 22) with a 3-month lead time




Busker, T., van den Hurk, B., de Moel, H., van den Homberg, M., van Straaten C., Odongo, R. A., & Aerts, J. C. (2024). Predicting food-security crises in the Horn of Africa using machine learning. Earth's Future, 12(8)

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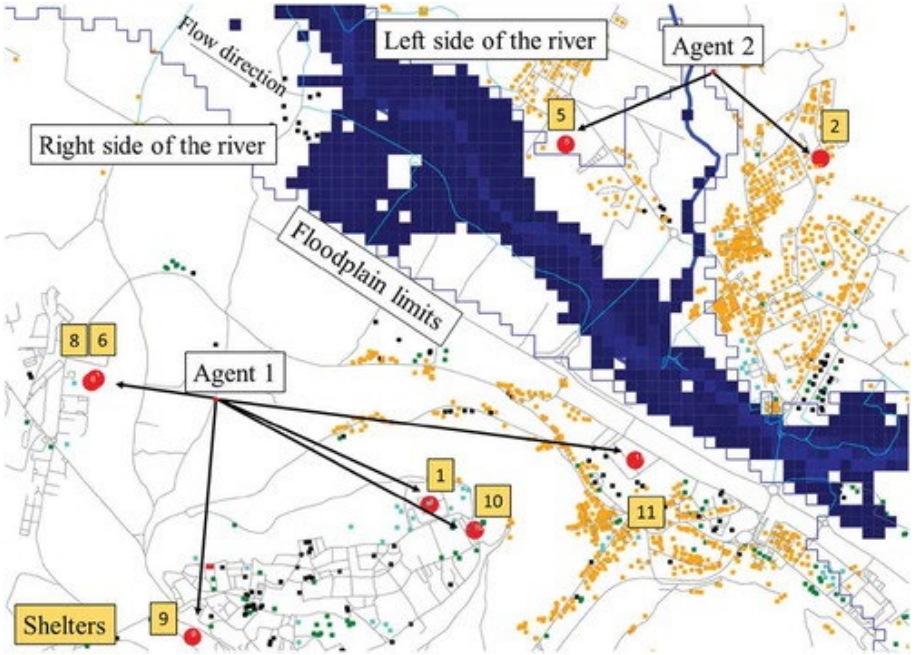
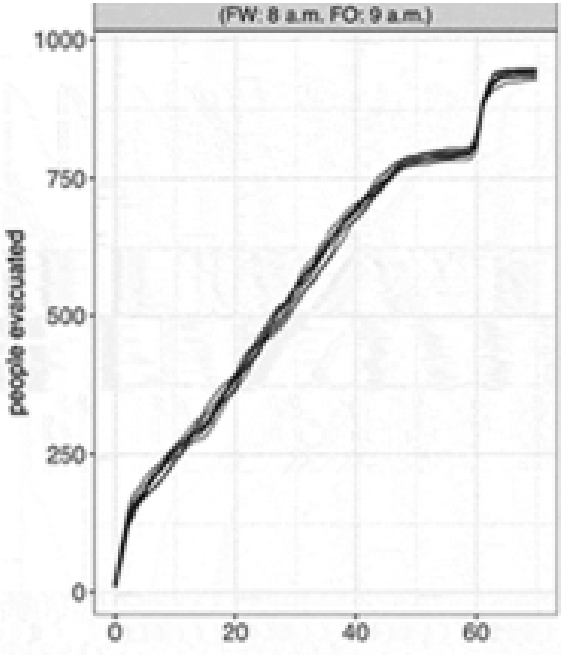
# EWS including human-water dynamics





Alonso Vicario, S., Mazzoleni, M., Bhamidipati, S., Gharesifard, M., Ridolfi, E., Pandolfo, C., & Alfonso, L. (2020). Unravelling the influence of human behaviour on reducing casualties during flood evacuation. Hydrological Sciences Journal, 65(14), 2359-2375.

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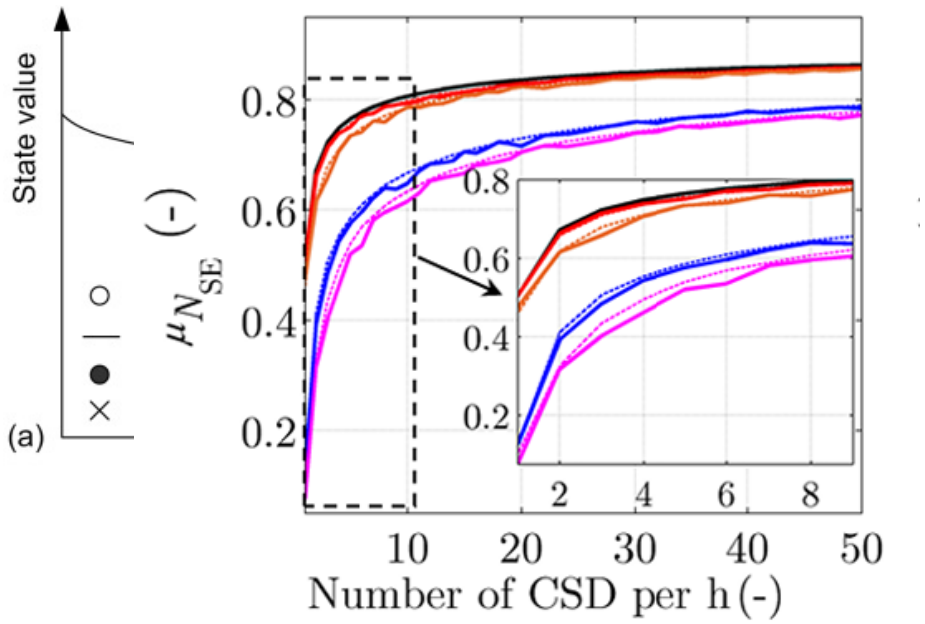
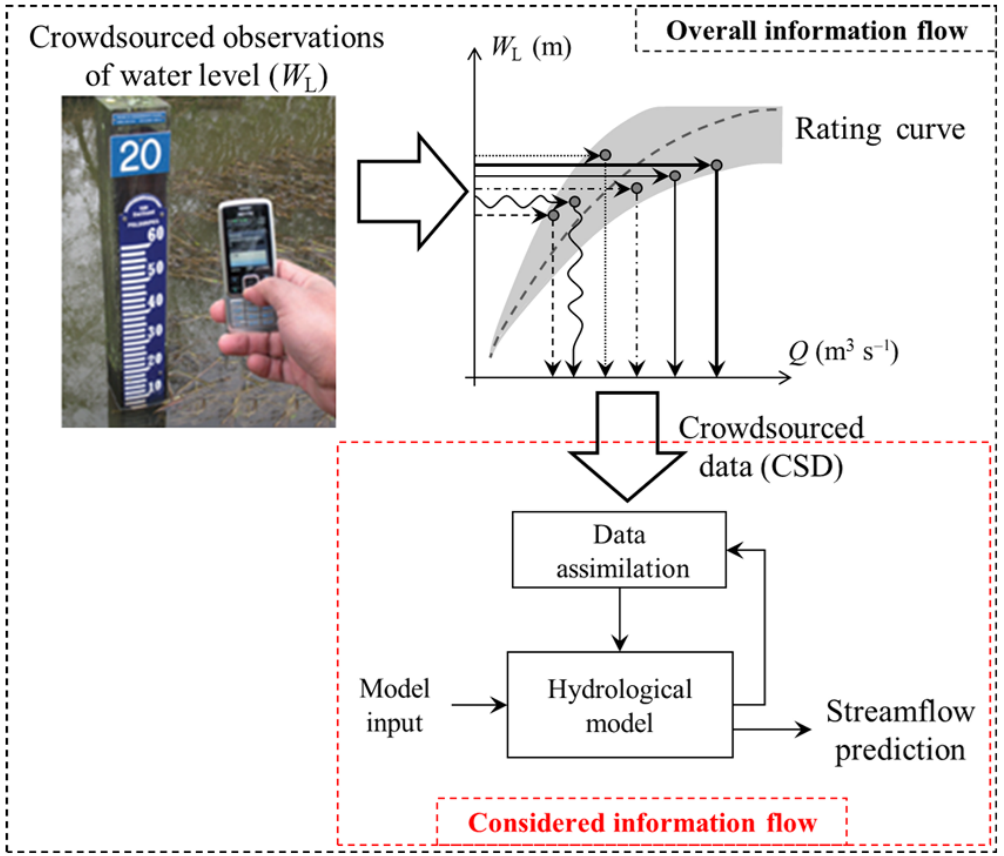
# Reducing uncertainty in EWS – Data assimilation




Data assimilation of streamflow data collected by citizens, random over time and inaccurate, can still complement traditional networks formed by static sensors and improve the accuracy of flood forecasts.

Mazzoleni et al. (2017). Can assimilation of crowdsourced data in hydrological modelling improve flood prediction?. HESS, 21(2), 839-861.

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# Conclusion

Big data can be extremely useful for improving climate risk assessment and EWS

AI and big data can help improve causality assessment and moving towards impact-based forecasting

CLIMAAX workflows will allow users for a flexible assessment of climate risk exploiting both big data and data-driven approaches

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# PRESEN TATION

**FULVIO BIDDAU**

Climate Resilience Researcher – CMCC Foundation

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climate ready regions

# From collaboration to impact: Advancing the CLIMAAX Community of Practice

**Fulvio Biddau (CMCC)**

*November 19, 2025*

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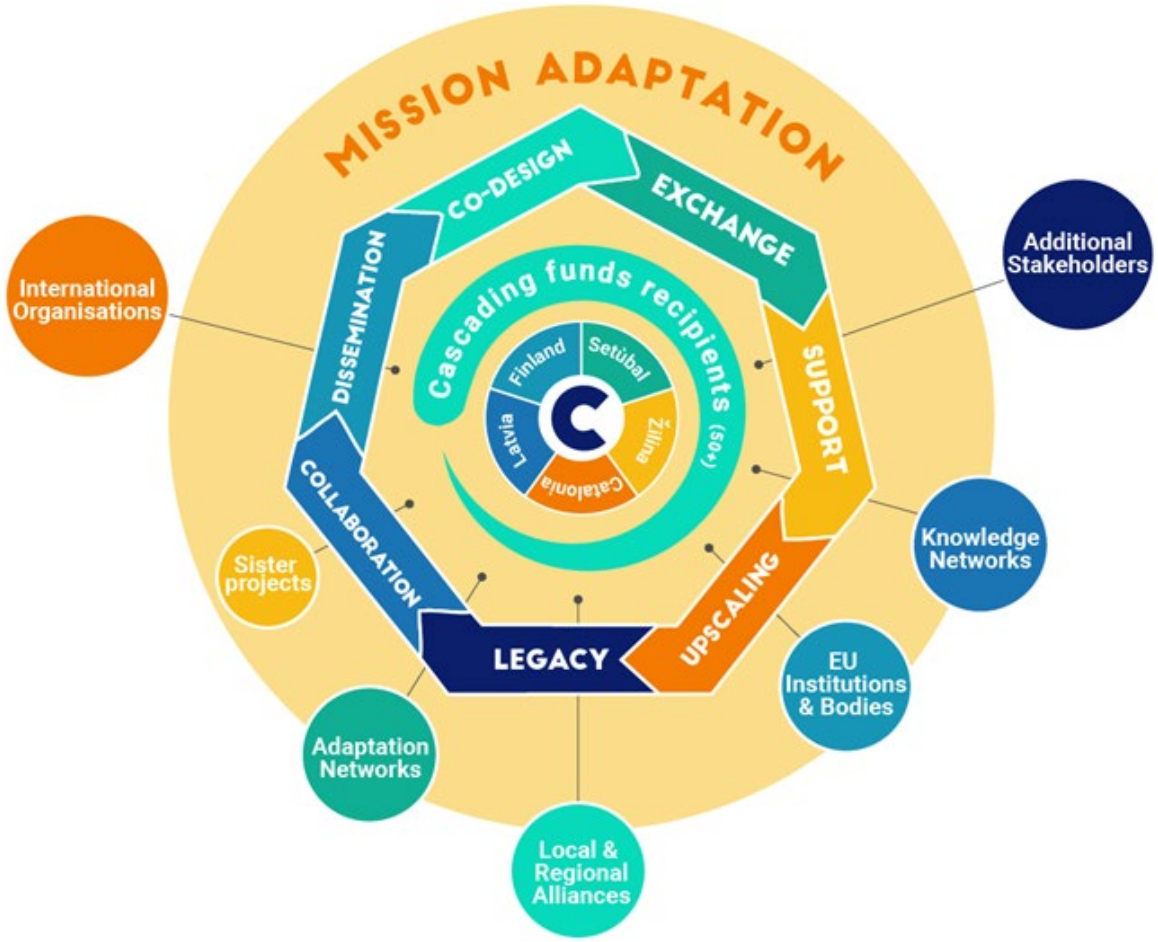
# CLIMAAX Community of practice

- Connect regions and practitioners working on Climate Risk Assessments (CRA).
- Foster co-design, knowledge exchange, and mutual learning.
- Bridge the gap between risk assessment and adaptation planning.

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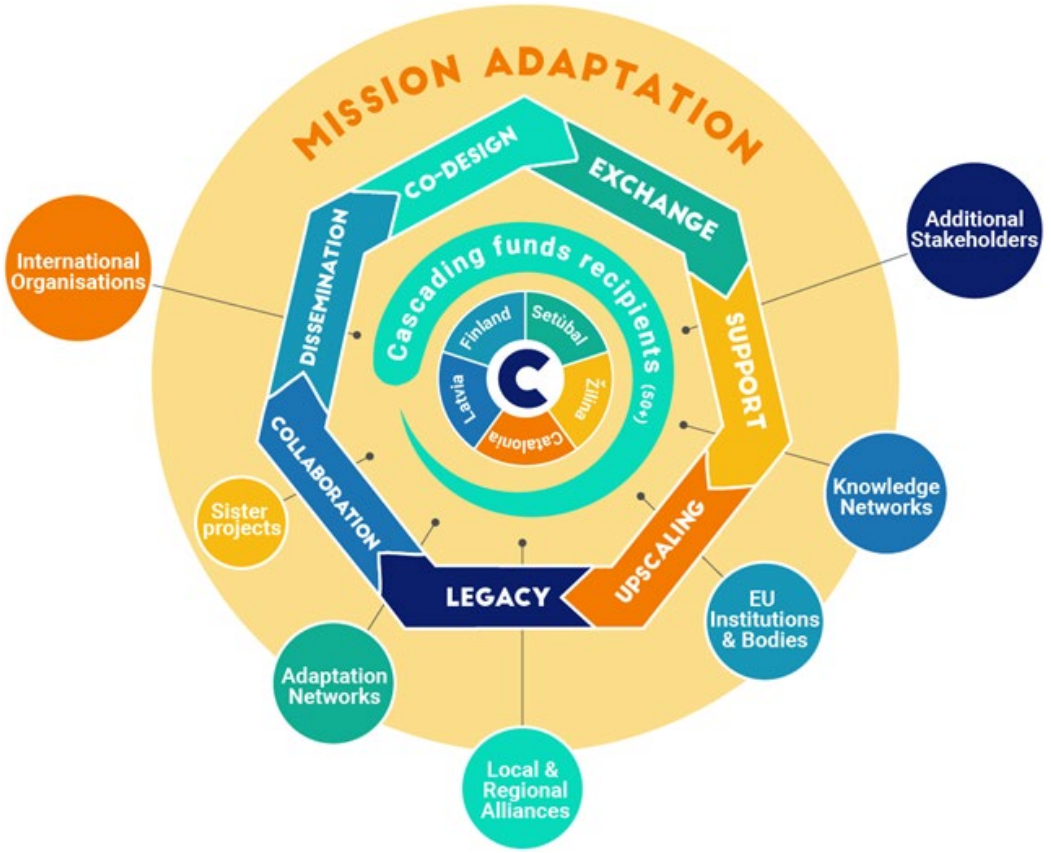
# CLIMAAX Cop

- **Engage and connect** with peers to share lessons learned and leverage their experience
- **Contribute** insights to inform CLIMAAX outcomes and activities
- **Collaborate** across regions with shared interests
- **Participate** in webinars, workshops, or other events of interest

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# CLIMAAX CoP journey

**Phase 1: Building the foundation**

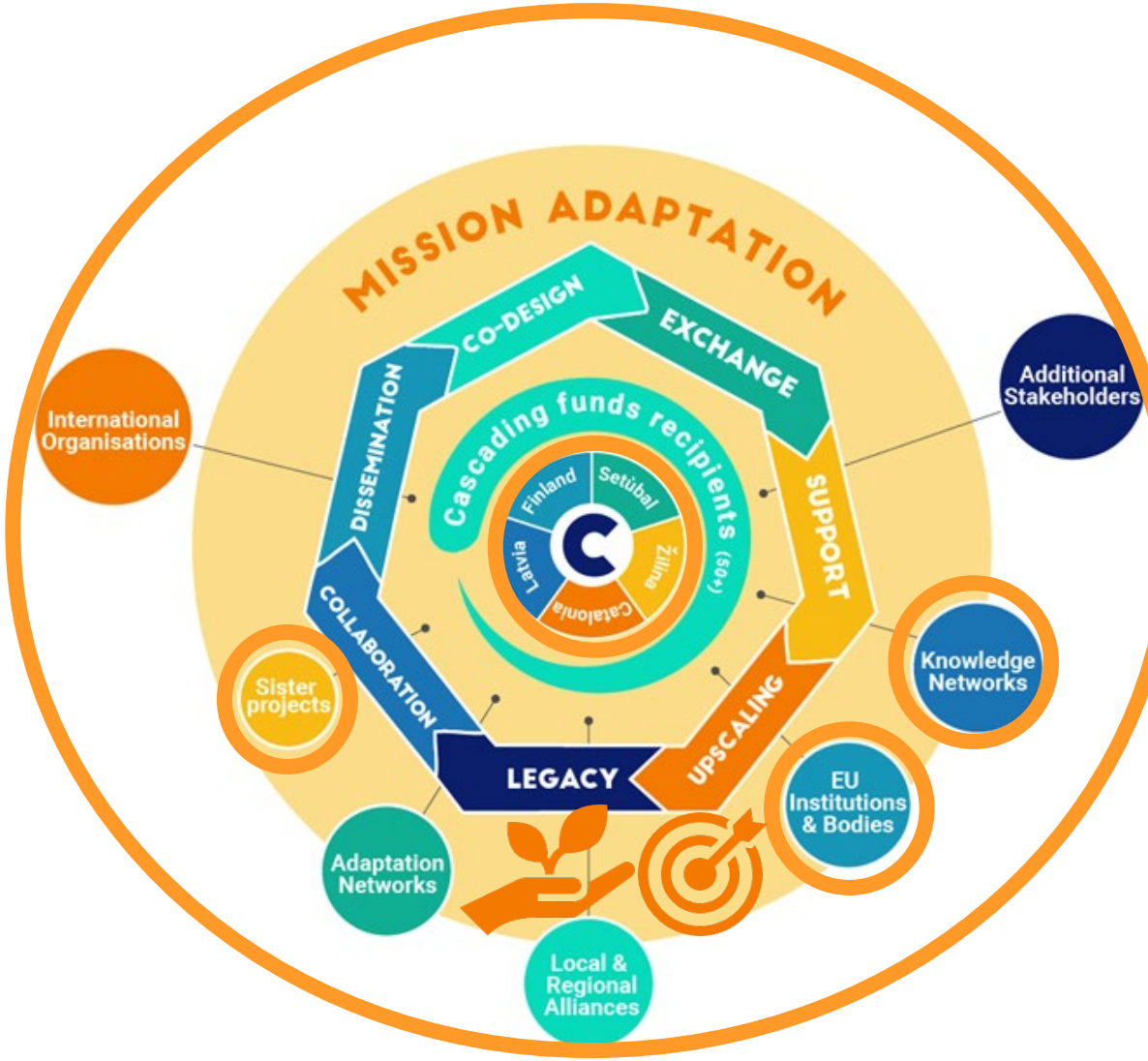
- Co-development & Piloting

**Phase 2: Growth and learning**

- Capacity building
- Guidance and support
- Mutual learning
- Co-design, test, and refinement

**Phase 3: Consolidating legacy and impact**

- Regional showcase and learnings
- Long-term sustainable resources

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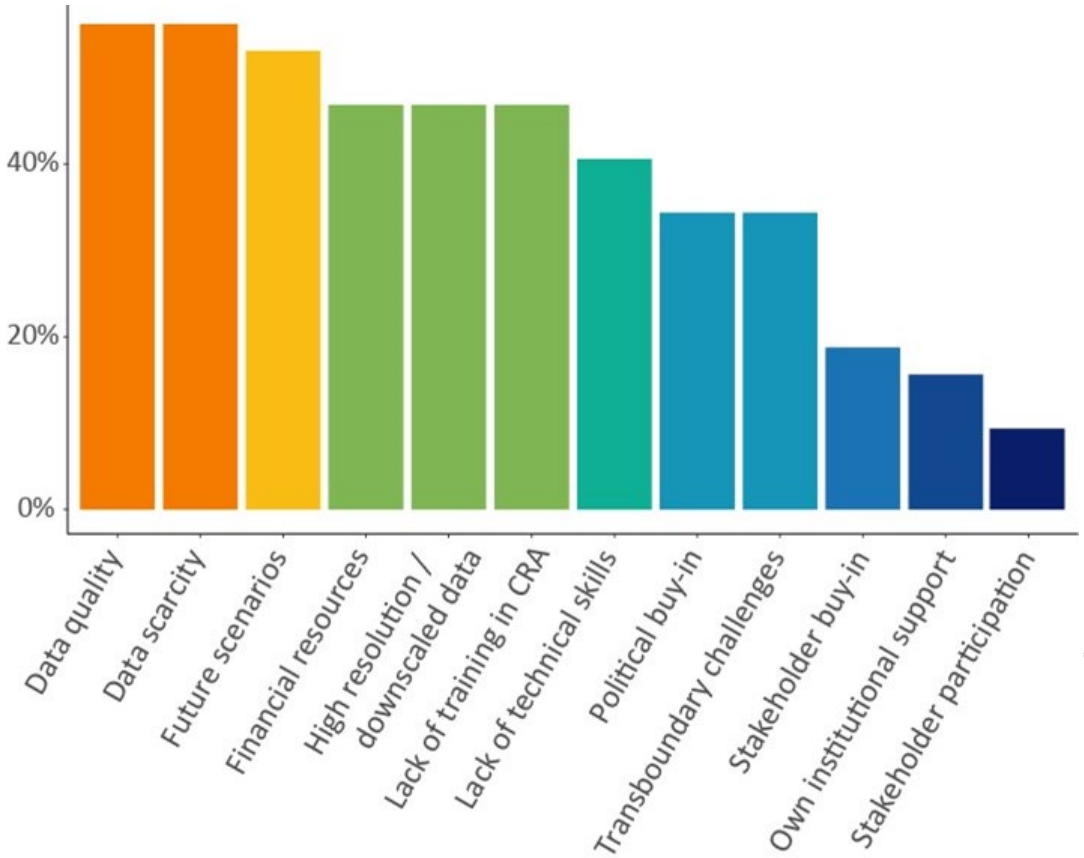
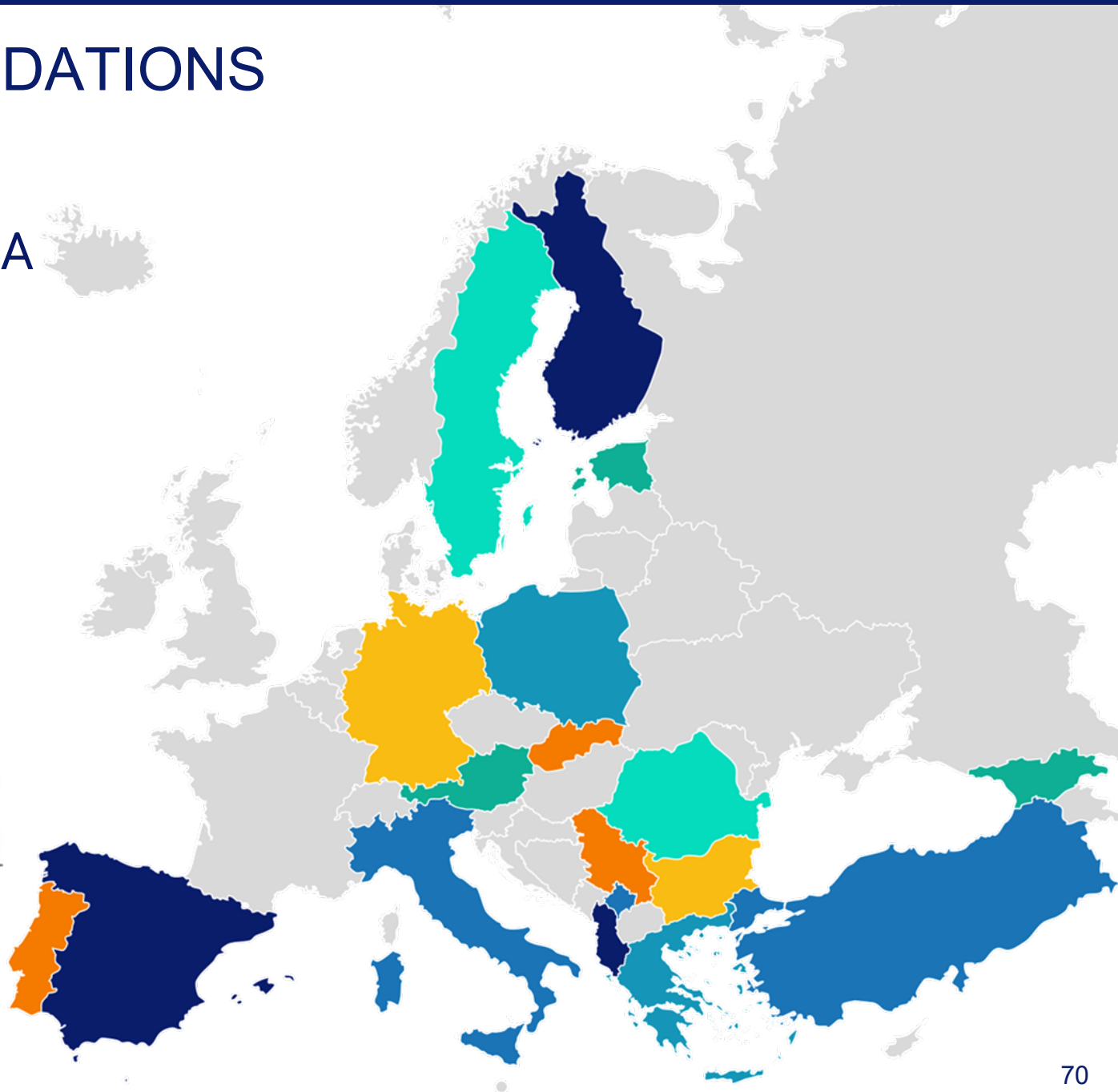
# Phase 1: BUILDING THE FOUNDATIONS

- Survey on current practices of CRA

## MAJOR CHALLENGES



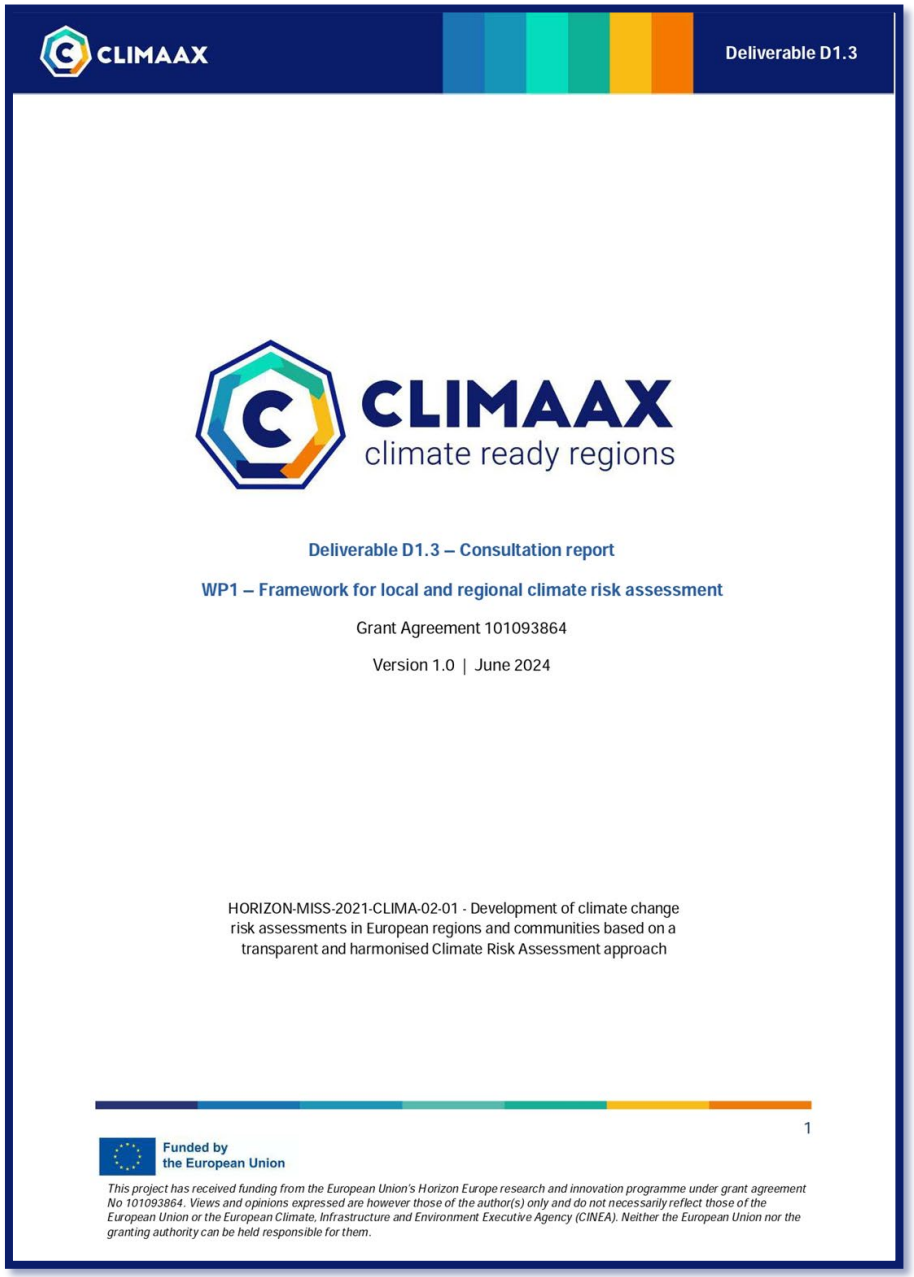
Take part
to our surveys
!! Scan these
!!

Survey on Investing in Climate Risk Assessments and Services

Survey on current practices of CRA

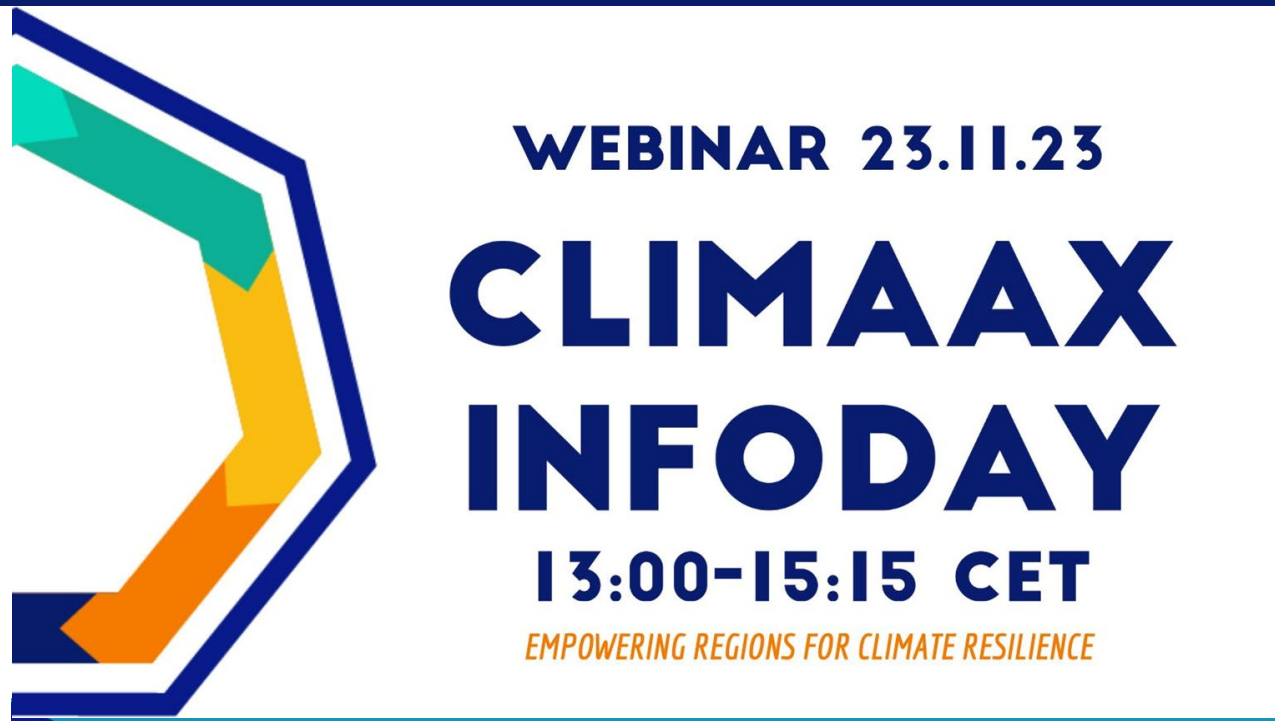
# Phase 1: BUILDING THE FOUNDATIONS

- Survey on current practices of CRA
- Survey on Investing in Climate Risk Assessments and Services
- Consultation for CRA framework



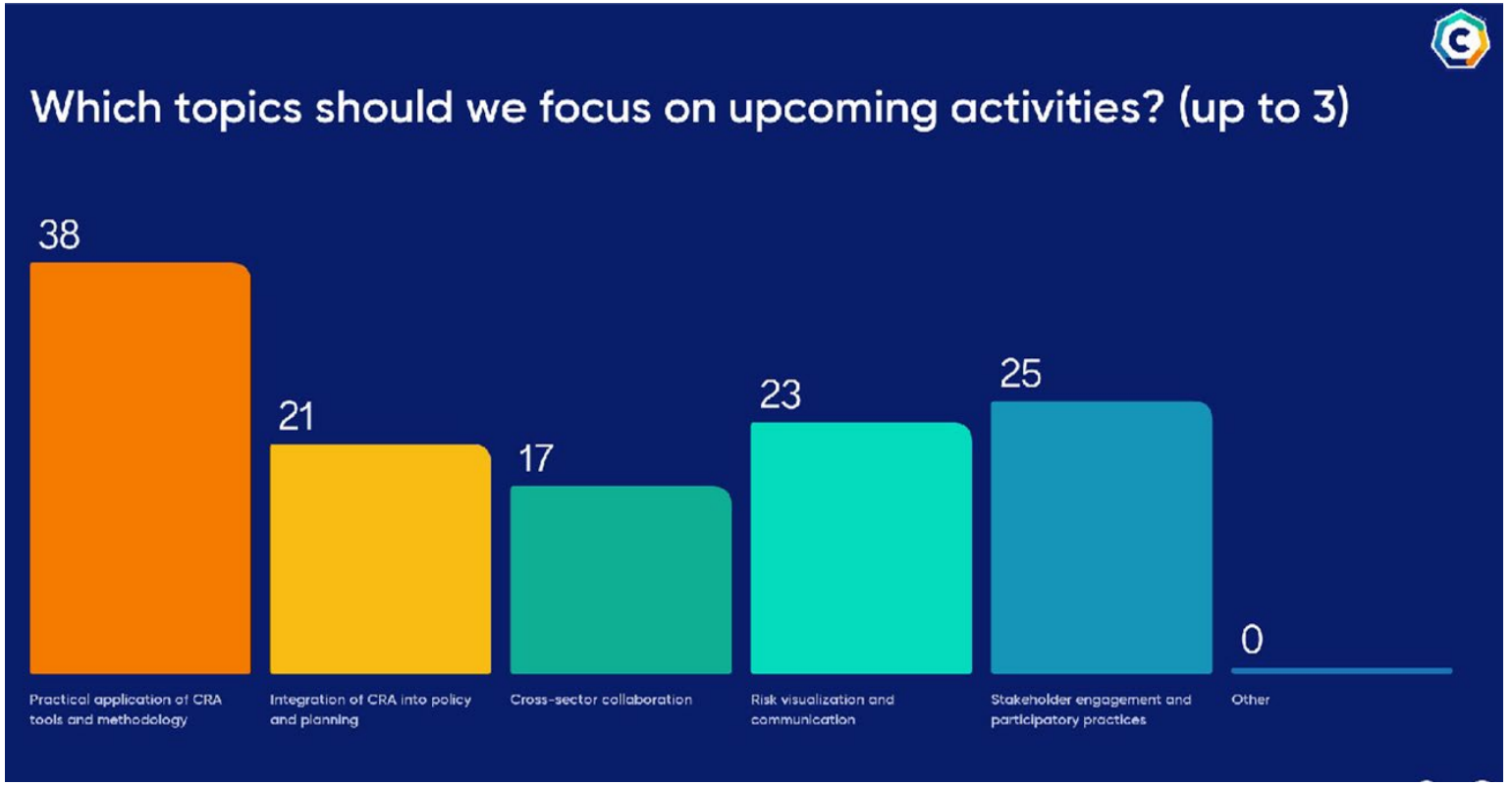
# COP activities

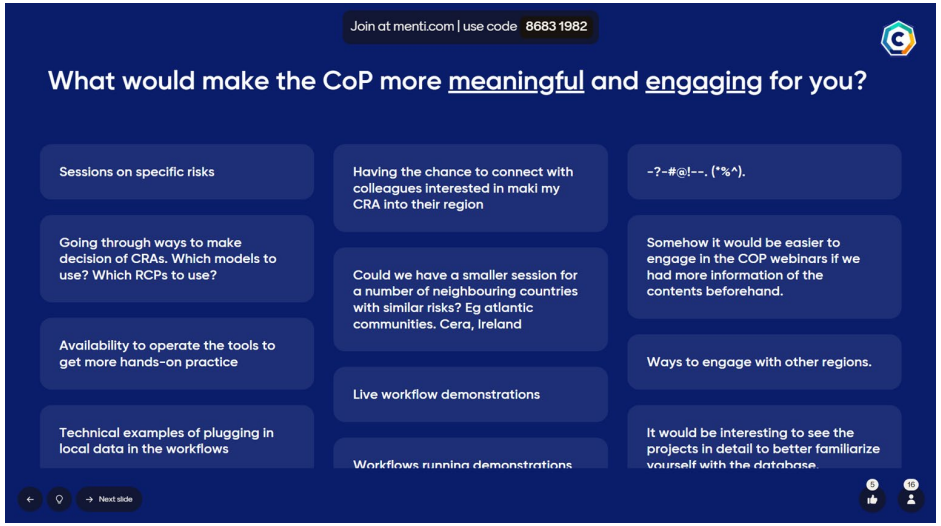
- Survey on current practices of CRA
- Consultation for CRA framework
- Survey on Investing in Climate Risk Assessments and Services
- Thematic webinars and workshops (available on *YouTube*!)




# Phase 2: expanded cop

A program of events responding to community needs and interests with tailored guidance, support resources, and inspiration

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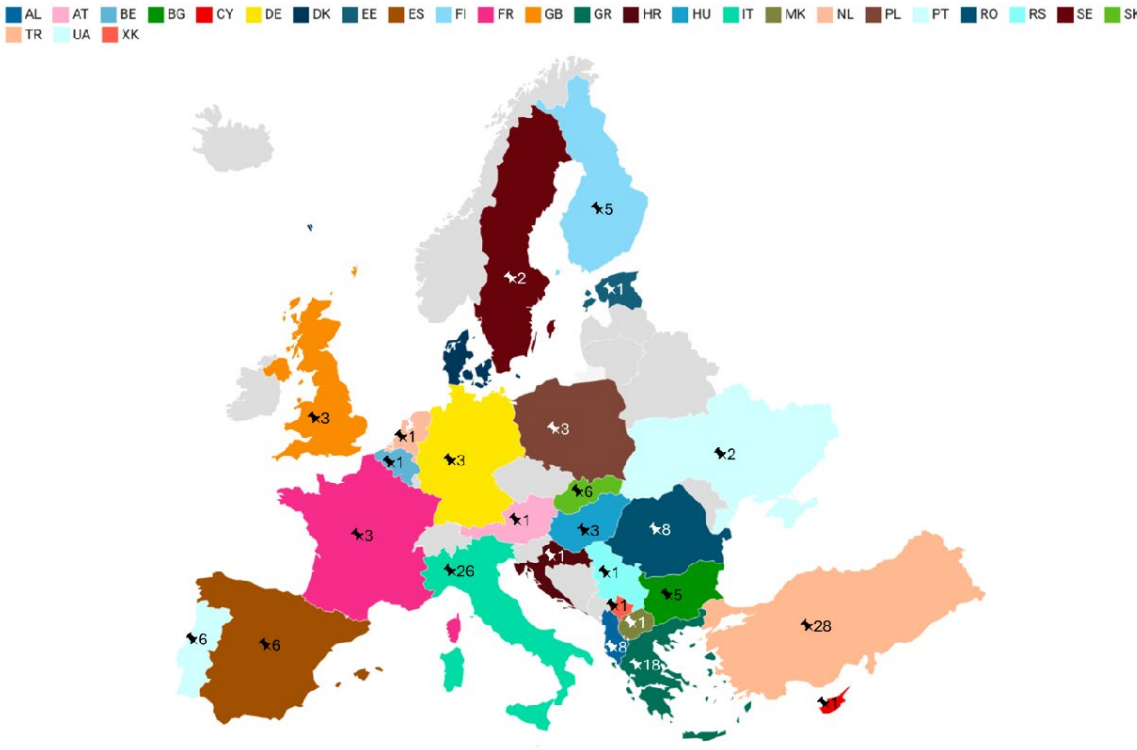
# Phase 2

1. **Thematic webinars** and workshops connecting science, policy and practice
2. **Surveys and consultations** on current practices and challenges
3. **Demo & co-design sessions** for refining and fostering usability of CLIMAAX outcomes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- **Leverage existing EU knowledge and initiatives** - fostering synergies with the Mission on Adaptation to Climate Change and other EU-funded projects.
- **Support in understanding and applying** the CLIMAAX Framework and Toolbox
- **Finetune new tools and bridge the gap** between climate risk assessment and management



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# Third phase: consolidating legacy and impact

- **Regional showcase webinars and dialogues**

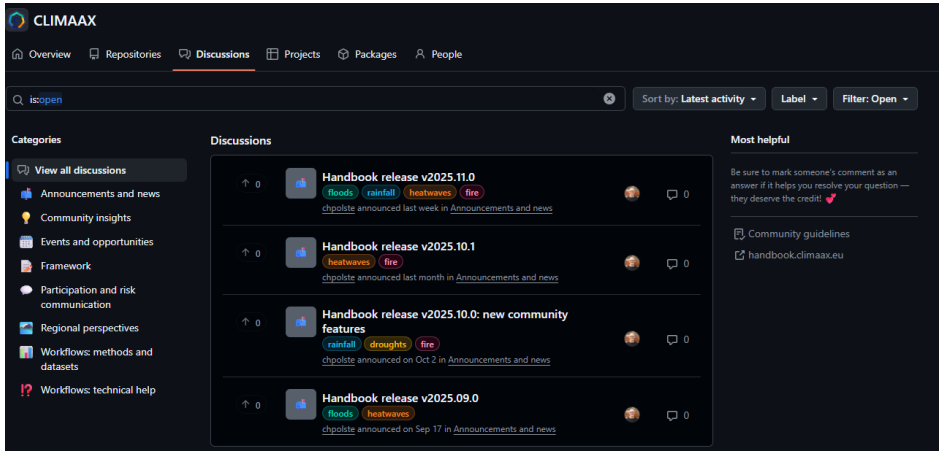
Connecting toolbox developers and regional practitioners to exchange lessons learned from regional CRAs

- **Dedicated online community forum**

A new space for P2P exchange and knowledge sharing

- **Promote exchange across climate service communities**

To foster awareness, collaboration, and uptake of solutions for climate resilience in Europe.


Move beyond traditional developer-end user model

Empowering local practitioners to take ownership and an active role in the use, extension and adaptation of CLIMAAX resources

Facilitate the uptake and continuous improvement of CLIMAAX tools and framework

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# Upcoming events

- **27 Nov 2025, 10.30 CET Heatwaves**
- **11 Dec 2025, 10.30 CET Wildfire**
- **19 Feb 2026 10.30 CET River floods**
- **… more hazard-specific sessions will follow — stay tuned!**


**Heatwave Risk Assessment: learning from regions**

Date & Time: Nov 27, 2025 10:00 in Rome

Description: Join the CLIMAAX Community of Practice for the first session in its new hazard- and workflow-focused series. This webinar focuses on heatwave risk assessment, guiding participants through how to apply and interpret results from the CLIMAAX Toolbox.The session will feature experiences from Antalya (Türkiye) and Beiras e Serra da Estrela (Portugal), to learn how regions and local authorities used the Toolbox to analyse heat hazards, exposure, and vulnerability. The session will highlight knowledge sharing, practical lessons and challenges in integrating multiple data sources, engaging stakeholders, and using workflow outputs to inform adaptation planning and risk management strategies.

**Meeting Registration**

**First Name** * **Last Name** *

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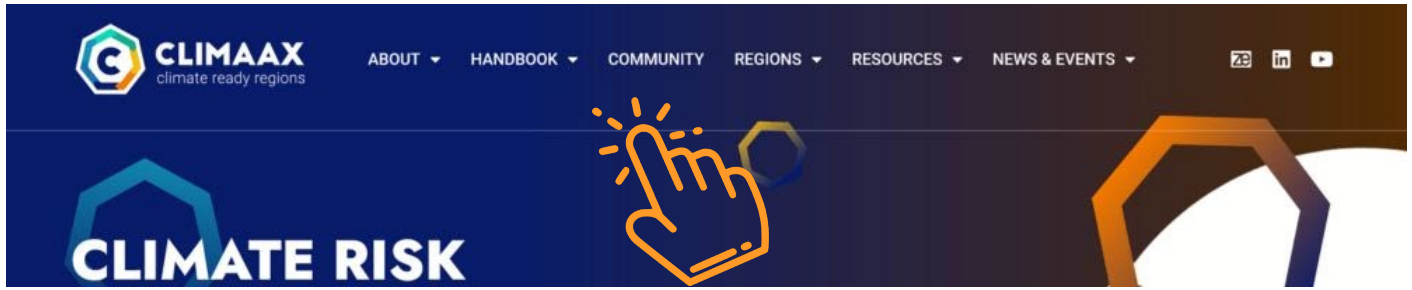
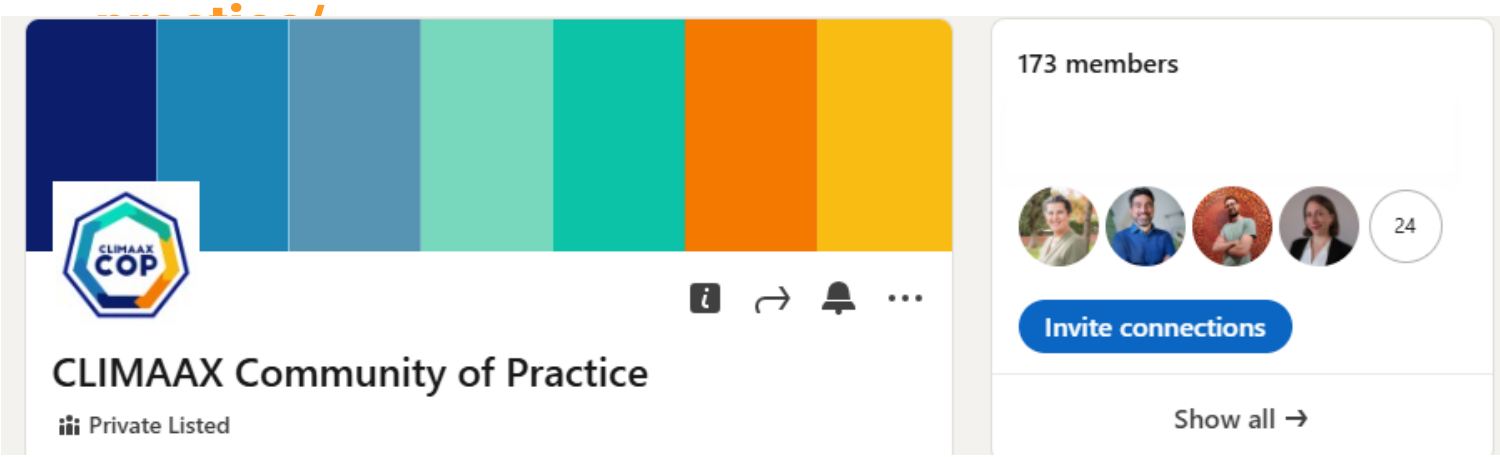
# How to engage in the Community of practice

- Join our LinkedIn group
- Take our surveys
- Subscribe to the CoP to receive communication of further updates




**https://www.climaax.eu/community-of-**

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# Thank you!

cop@climaax.eu

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# CLOSING REMARKS

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TOGETHER TOWARDS
RESILIENCE
COMMUNITIES AT THE FOREFRONT
WEBSTIVAL
NOVEMBER 18-19, 2025
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EU MISSIONS
ADAPTATION TO CLIMATE CHANGE