European Union

Union Civil Protection Knowledge Network

AI for Preparedness: Building capacity for AI-powered Disaster Risk Management

16 – 18 June 2025
Townhall Europe Sq. de Meeûs 5, 1000 Bruxelles

European Union

Union Civil Protection Knowledge Network

Registration and welcome coffee

Day 1 – Monday, 16 June 2025
Townhall Europe, Sq. de Meeûs 5, 1000 Bruxelles
13:30 – 14:00

European Union

Opening of the workshop

Hans Das, Deputy Director-General,

DG ECHO, European Commission

14:00 – 14:30

Union Civil Protection Knowledge Network

Panel: EU Institutional Landscape of AI developments for DRM under the Preparedness Union Strategy

Moderator: Juha-Pekka Jäpölä, DG ECHO.B3

14:30 – 15:30

- *DG CNECTC.1*, Charalampos Tsitlakidis
- *DG ECHO.B2*, Alessandro Carrotta
- *DG JRC.E1*, Christina Corbane
- *Research Executive Agency*, Rodrigo Gutierrez-Dominguez
- *European Environment Agency*, Eva Ivits

Destination Earth

EU flagship initiative

AI for Preparedness: Building capacity for AI-powered Disaster Risk Management

16 June 2025

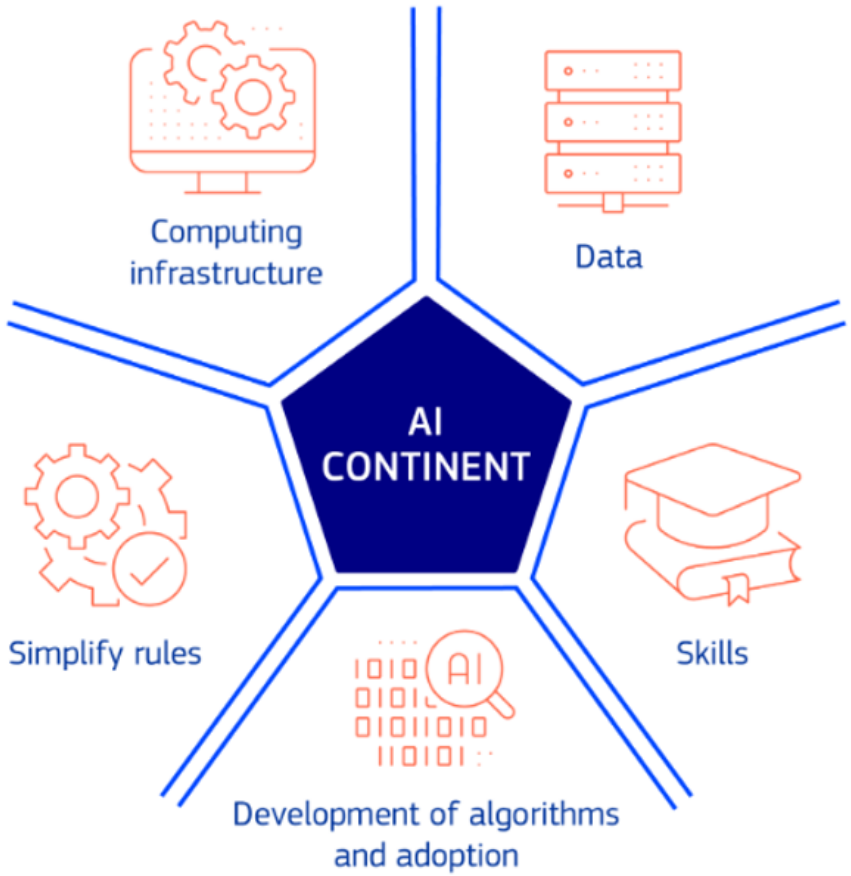
Charalampos Babis TSITLAKIDIS

Head of the Destination Earth Sector

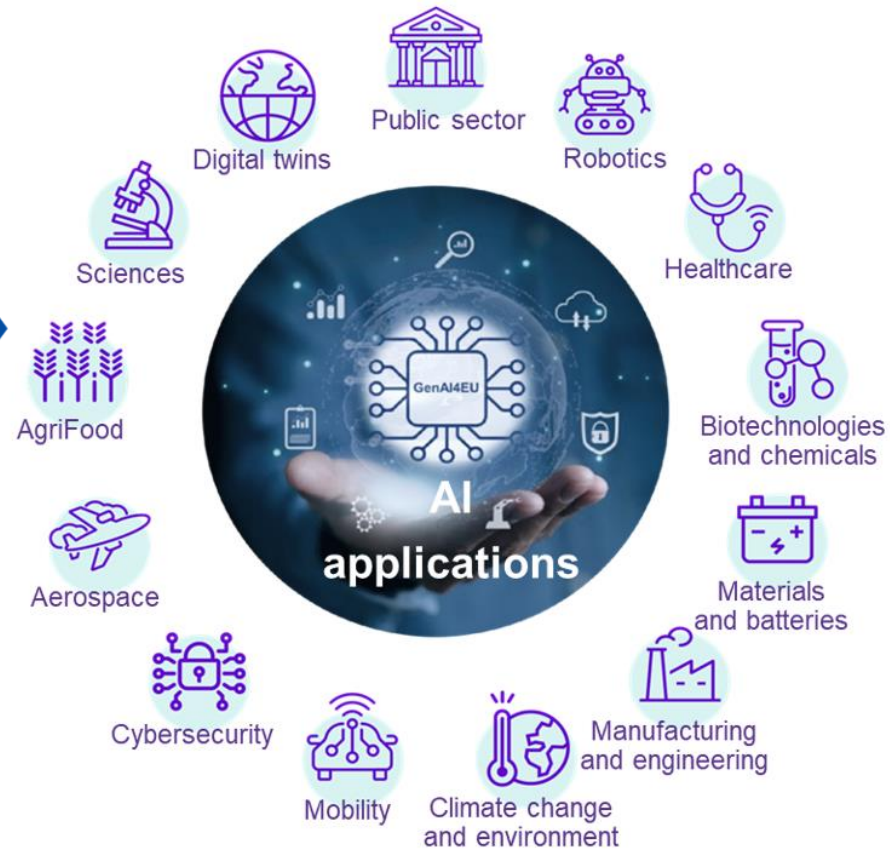
DG CNECT

Unit C.1 – High Performance Computing and Applications

The 5 strategic areas of the action plan



Apply AI Strategy



A Highly Accurate Digital Twin of the Earth

Monitor, simulate and predict natural phenomena and the impact of human activity on Earth

Assist in designing accurate adaptation strategies and climate change related mitigation measures

Accelerate the EU's green and digital transition

Leverage existing and new data sources and EU's advanced digital and computing infrastructure

Create and test "what if" scenarios and to integrate impact sector applications for more sustainable development

Support decision-making at various levels (e.g. EU, national, regional, local)

Make complex simulation systems more accessible to a large range of users and applications

Scale up existing models and boost the exploitation of AI-based ones

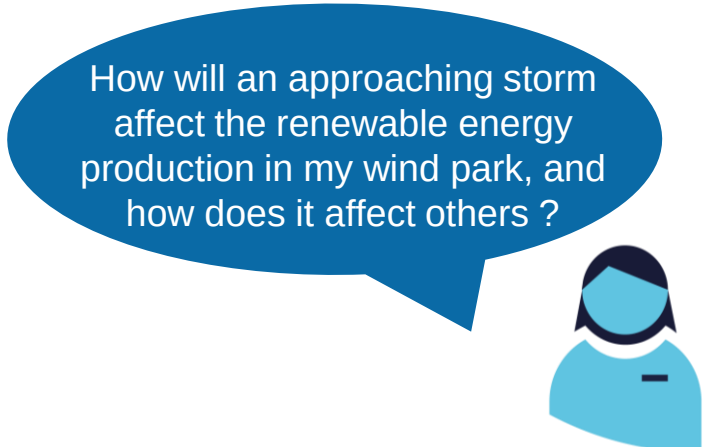
Funding under the **Digital Europe Programme** ***(≈500 MEUR)***

Important R&I activities under **Horizon Europe**

Implemented by ECMWF esa EUMETSAT

Outcomes of Phase I – Extremes DT

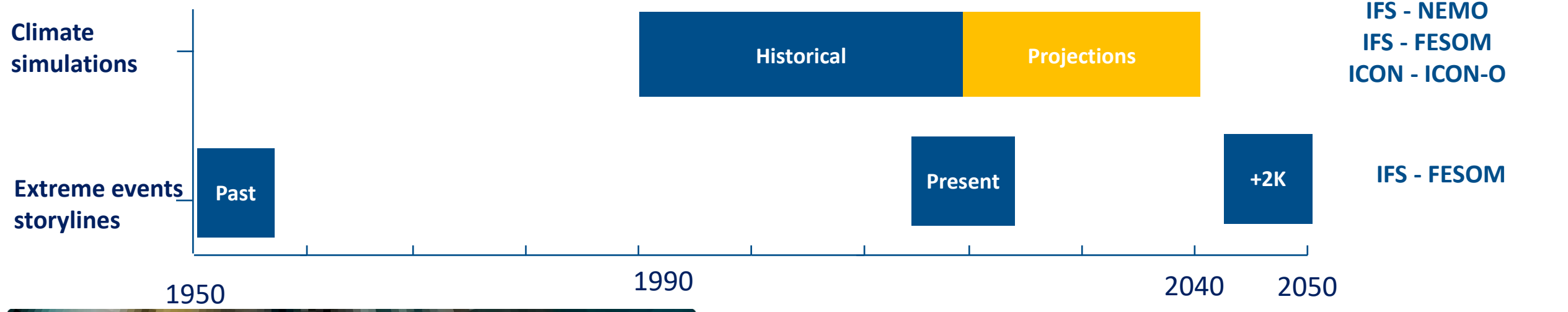
- First comprehensive evaluation of global medium-range forecasts at 4.4 km in near real-time – demonstrating clear benefits at local scale (TC, orographic precipitation)
- End-to-end workflows for the regional, on-demand, component for selected configurations set up; including impact sector models for selected use cases

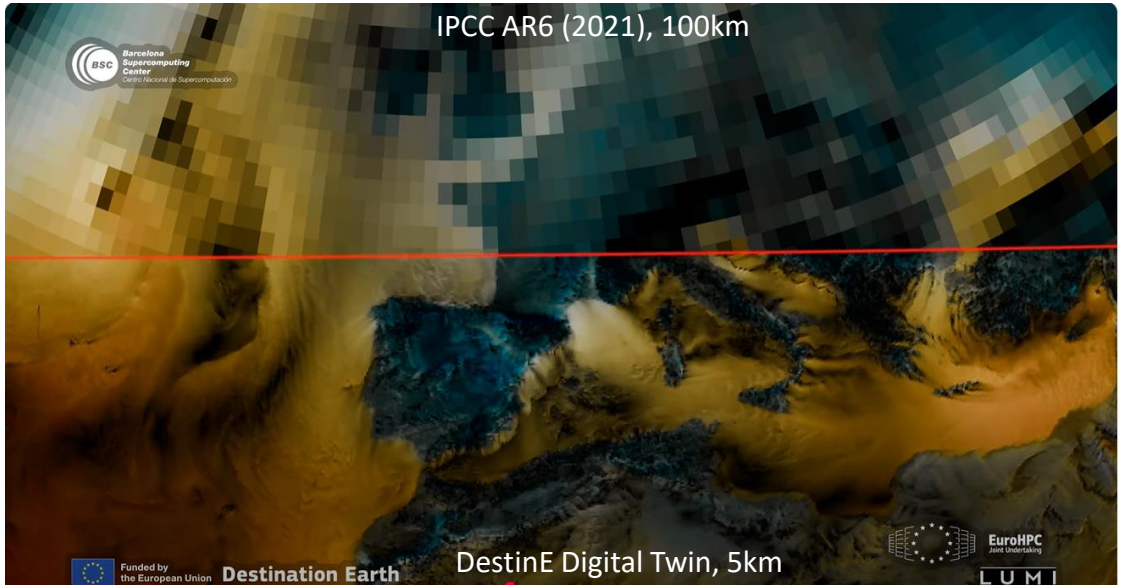


Outcomes of Phase I - DestinE Climate Change Adaptation Digital Twin

- ✓ **Globally consistent climate information at KM-scale**
- ✓ **To enable policy actions in support of climate change adaptation**

60 years at 5 km atmosphere, 5km / 1/12° ocean
> 90 years at 10 km atmosphere, 5 km / 1/12° ocean

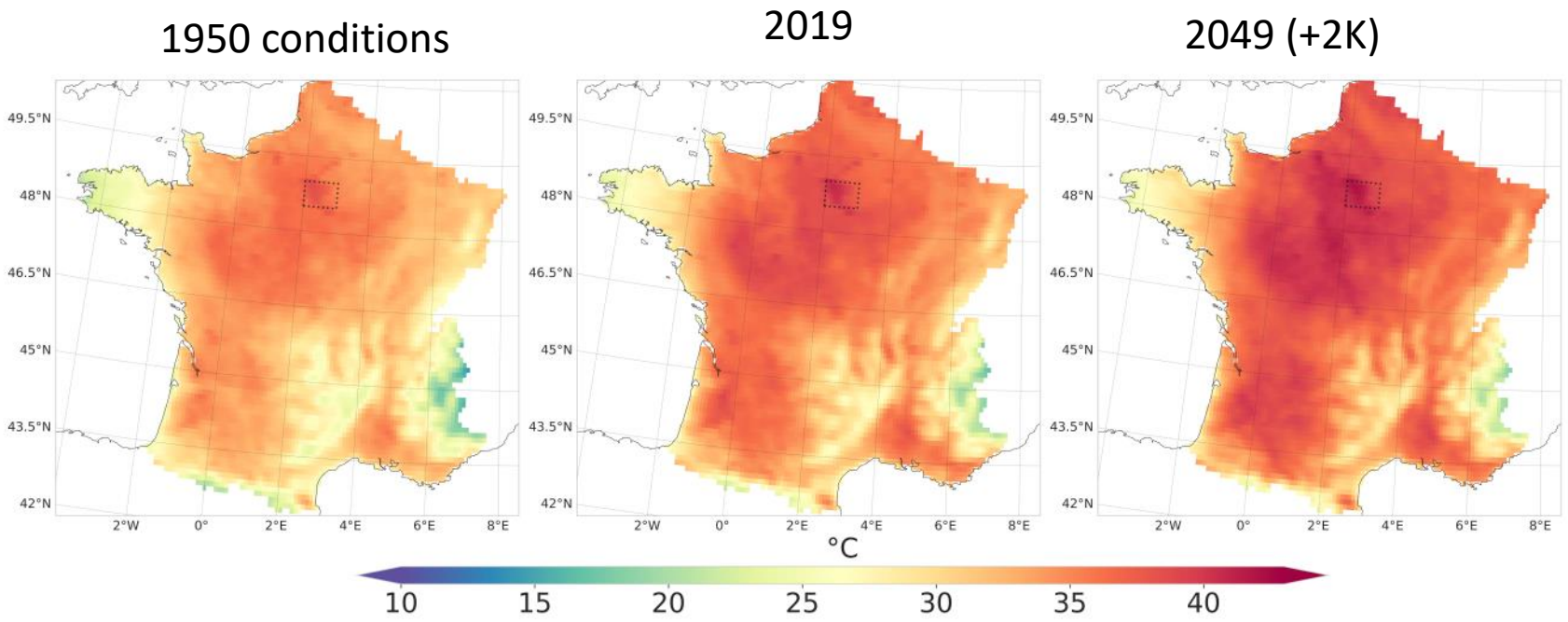




CLIMATE DT: replaying recent extreme events

“What-if” the 2019 heatwave occurred in 1950 or 2049 ?

IFS-FESOM with large-scale nudged towards ERA5 (2018-2023)

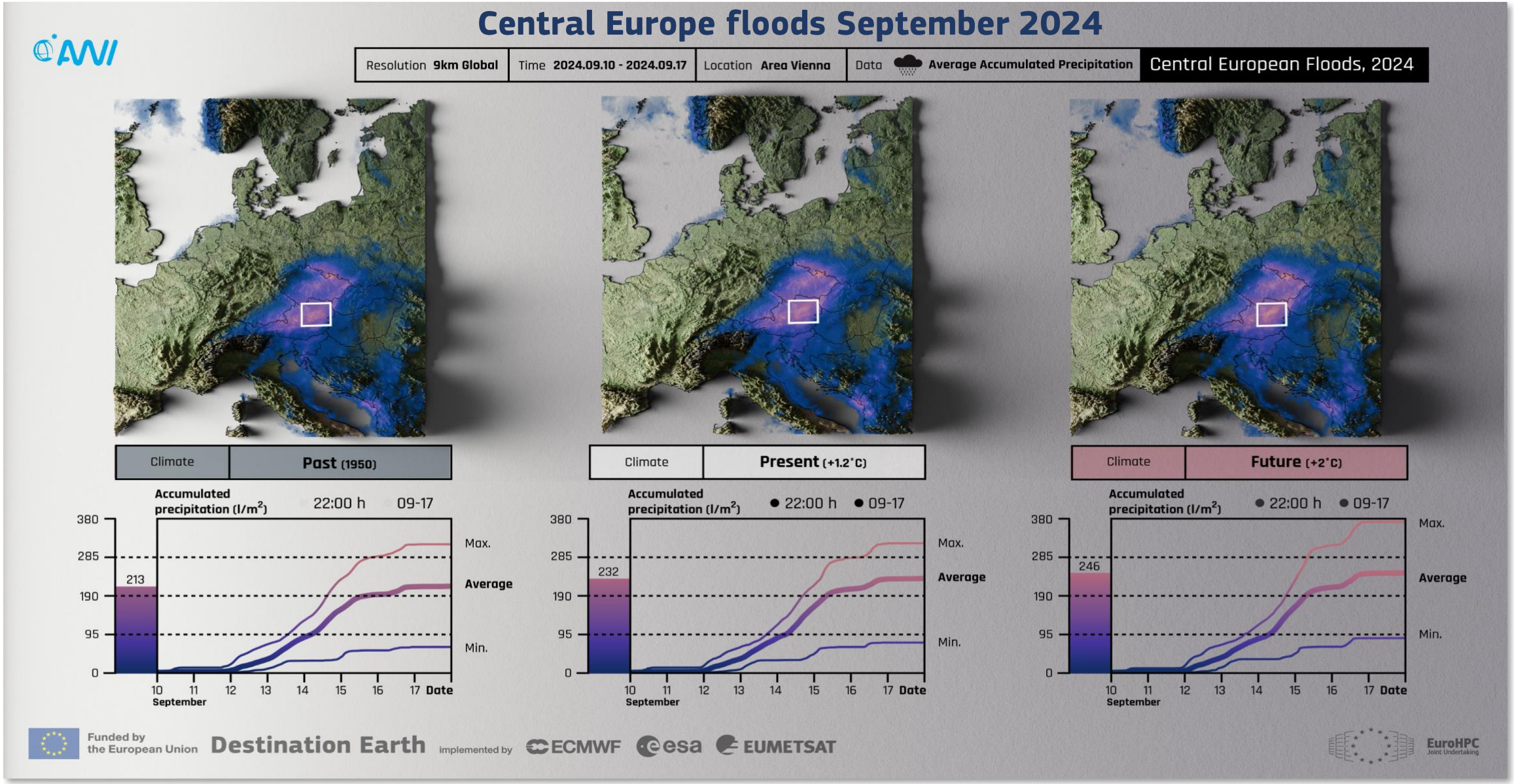


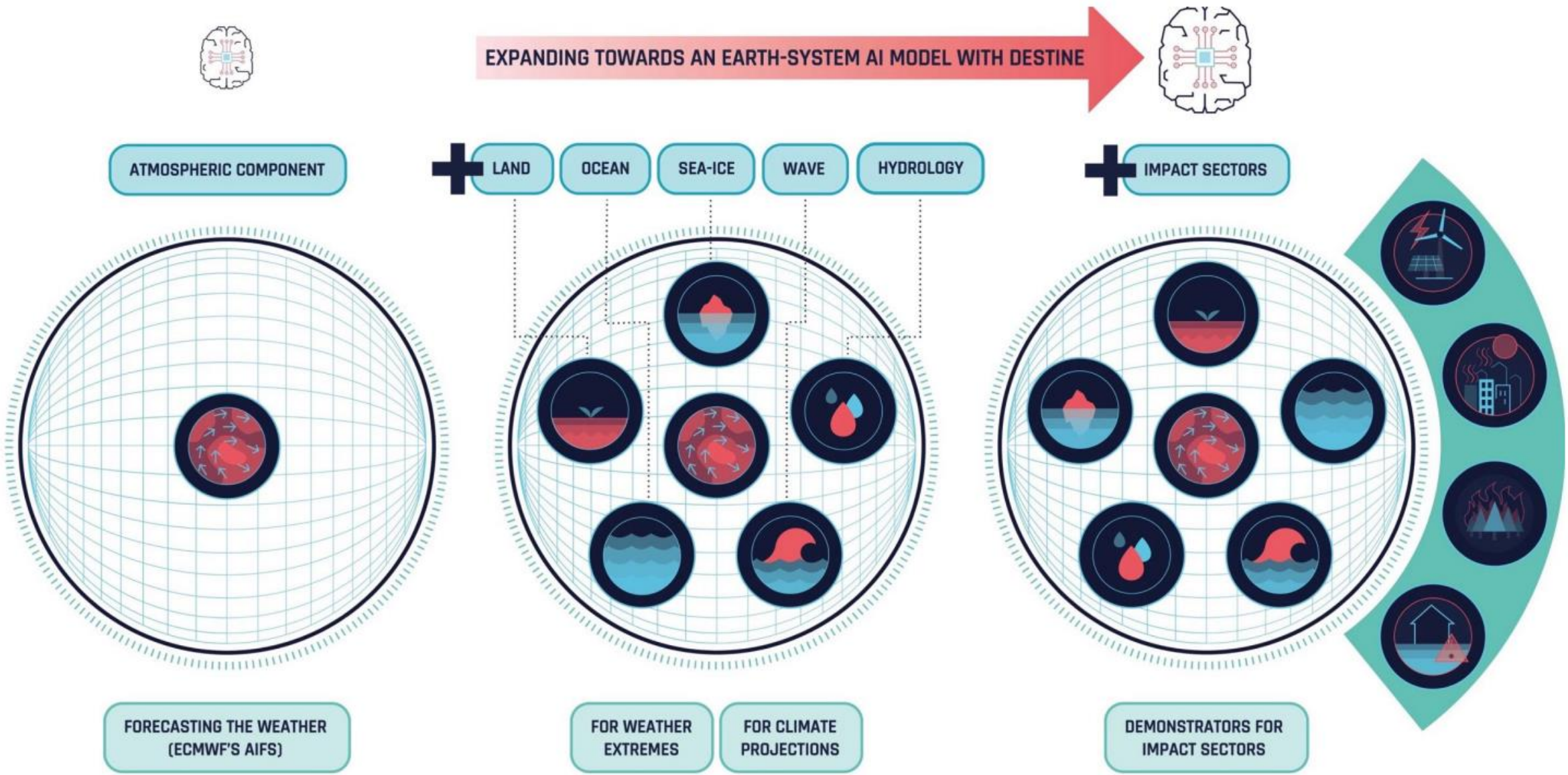
d) Maximum 2m-temperature (Paris)

	00:00	01:00	02:00	03:00	04:00	05:00	06:00	07:00	08:00	09:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
2049	29.5	28.8	28.2	27.9	27.7	27.7	29.0	31.0	33.4	35.9	38.1	39.9	41.0	41.8	42.1	41.8	41.8	40.4	38.9	36.9	34.8	33.5	31.9	30.6
2019	30.1	29.2	28.5	28.0	27.4	27.1	28.1	29.9	32.4	35.0	37.2	38.8	39.8	40.5	40.8	40.9	40.5	39.4	38.8	37.3	35.5	34.1	32.8	31.5
1950	27.1	26.4	25.7	25.2	24.5	24.3	25.3	27.3	29.6	31.9	34.2	35.9	37.2	37.9	38.2	38.3	37.1	37.0	36.7	35.4	33.1	31.4	30.1	29.1

Maximum 2m temperature (Paris)

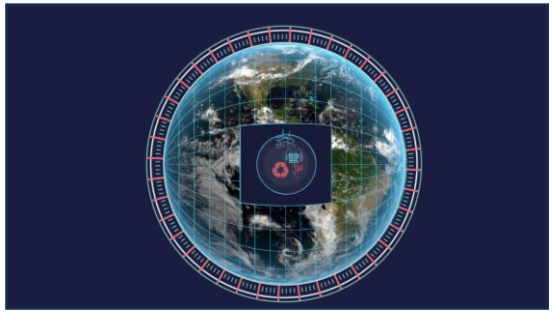
CLIMATE DT: replaying recent extreme events




EXPANDING TOWARDS AN EARTH-SYSTEM AI MODEL WITH DESTINE
ATMOSPHERIC COMPONENT
LAND
OCEAN
SEA-ICE
WAVE
HYDROLOGY
IMPACT SECTORS
FORECASTING THE WEATHER (ECMWF'S AIFS)
FOR WEATHER EXTREMES
FOR CLIMATE PROJECTIONS
DEMONSTRATORS FOR IMPACT SECTORS

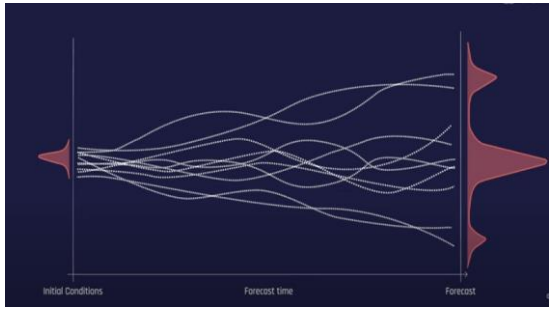
Exploiting AI in DestinE

AI Climate simulator



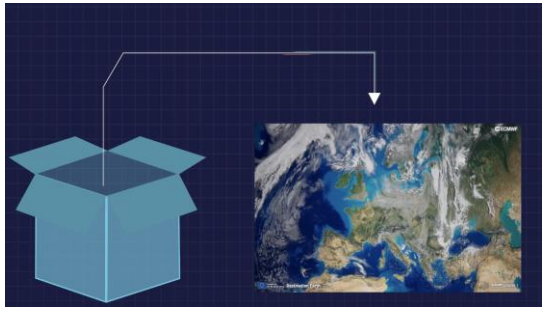
- To explore “what if” scenarios in a changing climate.
- A climate emulator which can be used for enhanced interactivity and uncertainty quantification.

European ML foundation Quantify uncertainty



- Develop and deploy multi-purpose ML workflows for various applications and from data to trained models.
- ML-based approaches will also be used to quantify uncertainties in both the Climate and on-demand Extremes DTs.

AI Forecast in a box



- To augment DestinE’s interactive features.
- ML prediction systems are packaged together with the product generation pipeline for delivery to users .

LLM – Chatbots (weather & climate)

- A comprehensive climate and weather aware conversational AI system.
- To enhance the access to complex information.
- Combining LLMs with digital twin data to revolutionize the way users interact with climate and weather data.

In summary

Outlook

- ✓ Further enhancement of the system, integration of additional digital twins, development of applications and services, up to completion of the digital twin of Earth system and full operationalisation of the system.
- ✓ Increased focus on extreme events in a future climate – linking the climate and extremes DTs
- ✓ Increased focus on supporting our Member States to uptake DestinE capabilities (data, what-if simulations, tools), combine them with existing sources of information, and exploit them into their existing workflows
- ✓ Increased focus on AI to support Member States in their tasks on adapting and mitigating climate change impacts (e.g. higher resolution AI models; AI applications for translating weather and climate data into weather and climate information)

Workshops and events:

4th DestinE User eXchange 25-26 June, Vienna (at LPS 2025)

Thank you!

https://destination-earth.eu/
https://platform.destine.eu/
https://digital-strategy.ec.europa.eu/en/policies/destination-earth

CNECT-DESTINE@ec.europa.eu

#DigitalEU #DestinE #DigitalDecade #DigitalEUProgramme #EUGreenDeal #EuroHPC

European Preparedness Union Strategy: Bridging Preparedness and AI Policy

AI for Preparedness: Building capacity for AI-powered Disaster Risk Management

Panel

EU Institutional Landscape of AI developments for DRM
under the Preparedness Union Strategy

16 JUNE 2025

Alessandro Carrotta – Policy Officer, DG ECHO

2025 European Preparedness Union Strategy

EUROPEAN COMMISSION

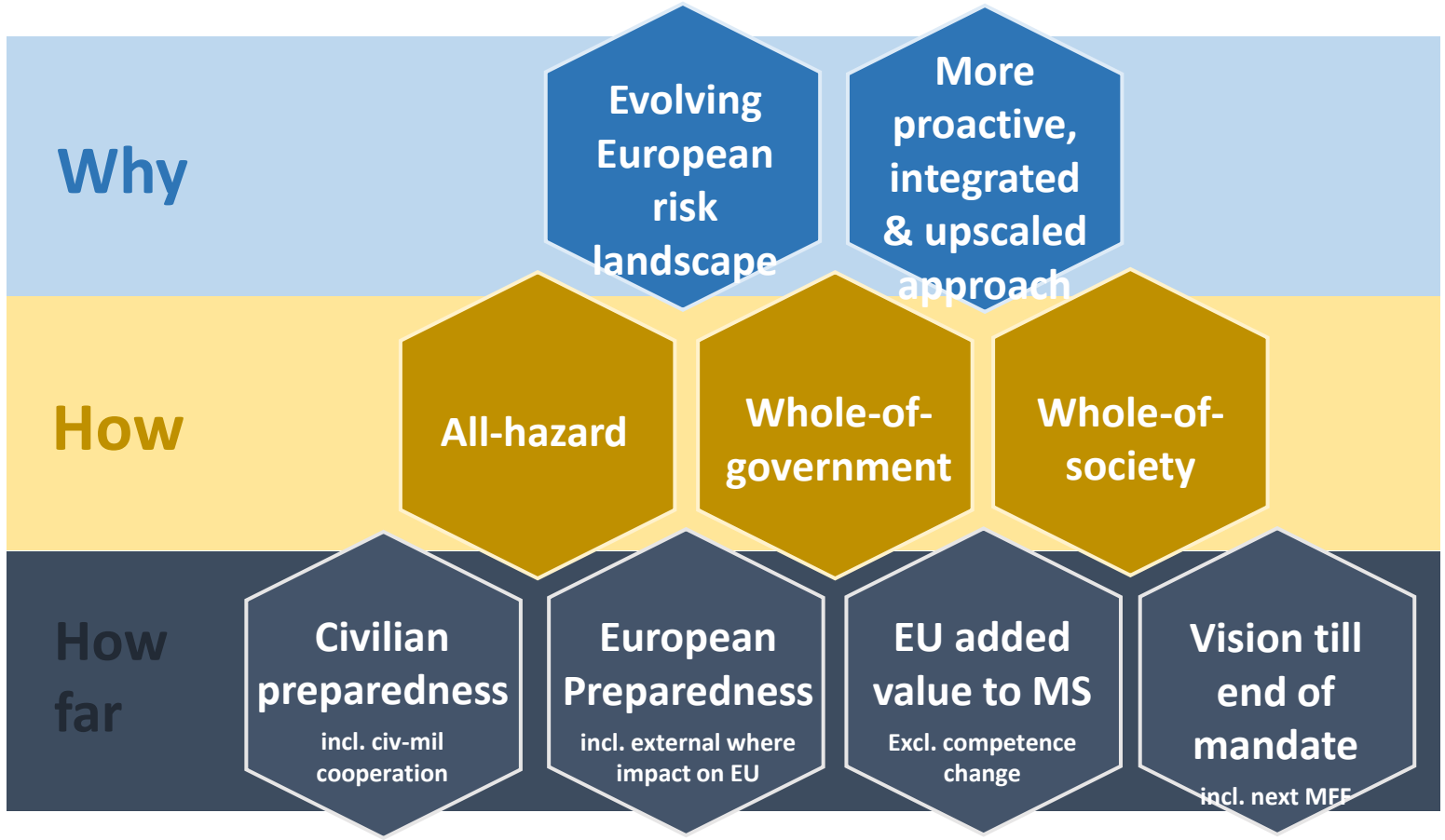
HIGH REPRESENTATIVE OF THE UNION FOR FOREIGN AFFAIRS AND SECURITY POLICY

Brussels, 26.3.2025
JOIN(2025) 130 final

JOINT COMMUNICATION TO THE EUROPEAN PARLIAMENT, THE EUROPEAN COUNCIL, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS

on the European Preparedness Union Strategy

EN EN



Thematic blocks of the strategy

1. FORESIGHT & ANTICIPATION

2. RESILIENCE OF VITAL SOCIETAL FUNCTIONS

3. POPULATION PREPAREDNESS

4. PUBLIC-PRIVATE COOP.

5. CIVIL-MILITARY COOP.

6. CRISIS RESPONSE

7. RESILIENCE THROUGH EXTERNAL PARTNERSHIPS

Bridging Preparedness and AI Policy

Match **operational needs/use cases** with **enabling conditions**

- **Apply AI Strategy** provides the enabling conditions—investments, standards, and governance—for trustworthy AI uptake.
- The **Preparedness Union Strategy** provides the real-world challenges where AI must prove its worth.

Challenges

- All involved societal actors (authorities, businesses, etc.) – not few frontrunners – have the human and institutional capacity to **make sense of AI tools**, **test them** and **trust them**.

Preparedness and AI: how to bridge?

- *Anticipatory action and real-time risk intelligence* - **Early Warning Systems**
  - flash flood prediction,
  - earthquake aftershock prediction, etc.

- *Support of pre-positioning of assets and targeted preparedness measures* - **Predictive Impact Modelling**
  - healthcare surge forecasting during heatwaves or pandemics

- *Cross-border risk management and faster operational coordination* - **Fire Detection and Spread Modelling**
  - AI-enhanced wildfire detection via satellite imagery, model fire behavior, and project smoke dispersion.
  - AI-powered computer vision on drone imagery automatically identifying risk zones

Preparedness and AI: how to bridge?

- *Systemic foresight and supports multi-hazard, multi-sectoral preparedness* - **Digital Twins for Scenario Planning**
  - Destination Earth's digital twins
  - AI-enhanced stress testing of cities or critical infrastructure

- *Resilient supply chains and shared strategic reserves* - **Crisis Logistics and Supply Chain Resilience**
  - AI-assisted stockpile planning: optimization of the positioning of critical reserves by simulating demand spikes under various scenarios.

- *Supports risk communication, trust, and societal resilience* - **Disinformation Monitoring During Crises**
  - AI for information integrity: monitoring social media to detect and flag false or harmful information.
  - Crisis communication bots: AI-powered assistants support CP authorities in disseminating accurate instructions to the public

MANY THANKS

You can find more info on:

https://commission.europa.eu/topics/preparedness_en

Artificial Intelligence for Disaster Risk Management @ the Joint Research Centre

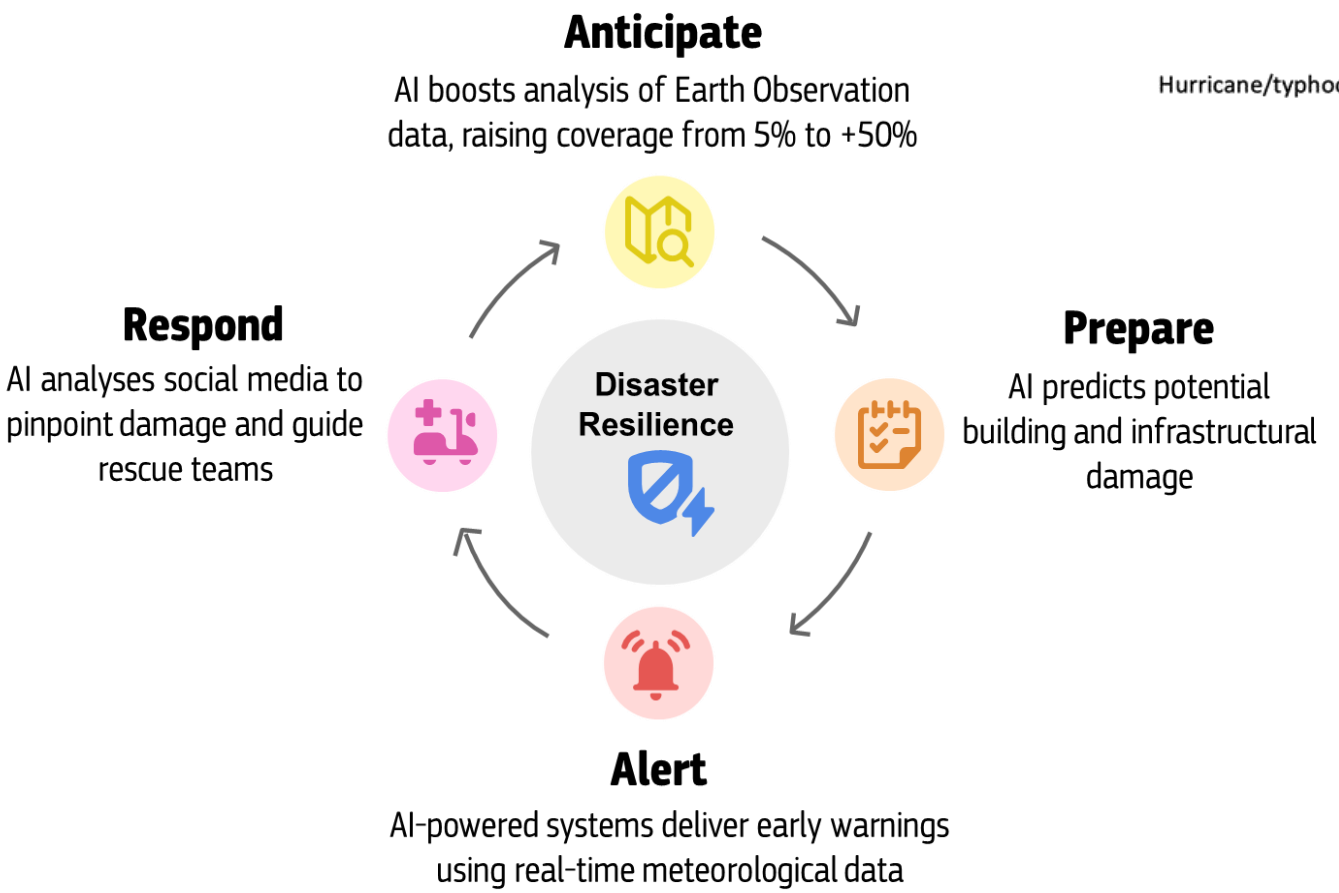
Christina Corbane

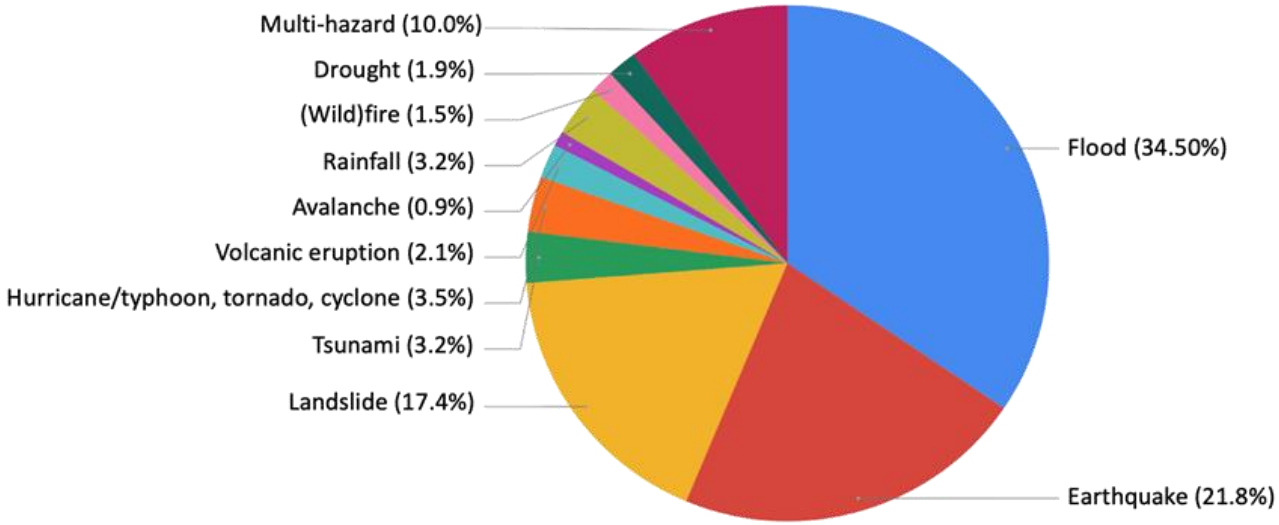
Deputy Head of the Disaster Risk Management Unit

Joint Research Centre , European Commission

European Commission

Application areas of AI in DRM





Source: Kuglitsch M. et al., 2022.

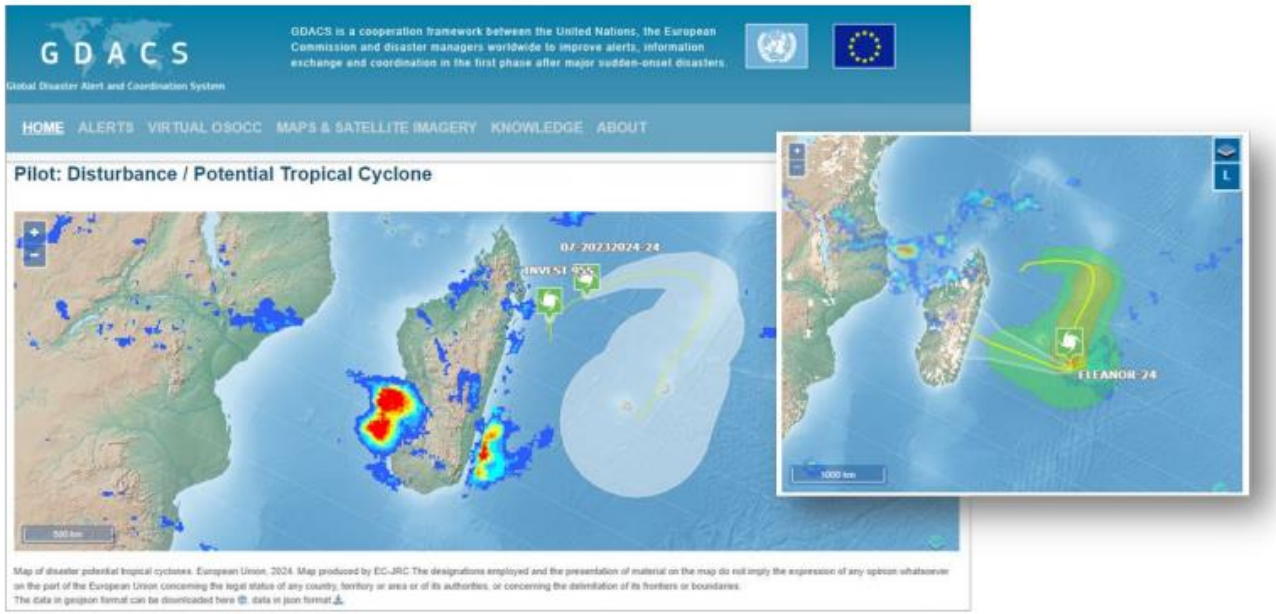
(covering 2018-2021)

Anticipation

AI in tropical cyclone anticipation

- Aims to increase anticipation time-window for preparedness measures
- Monitors and visualizes meteorological conditions for cyclone formation (cyclogenesis) within GDACS

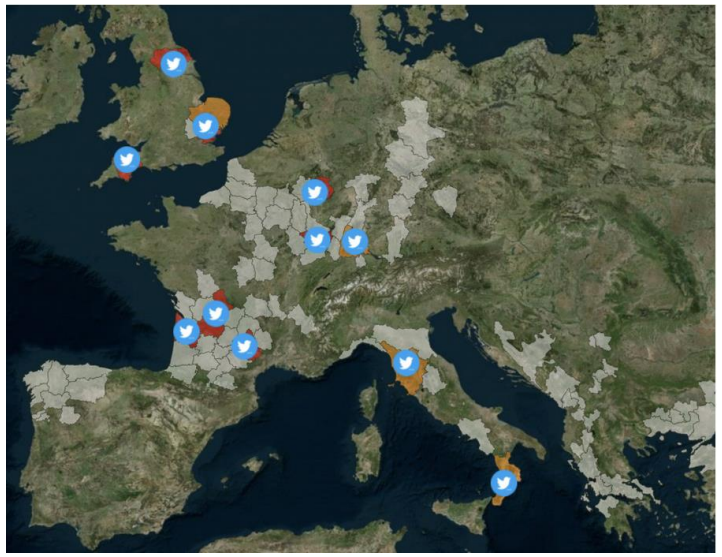
- **AI-powered Processing**
  - Automatically processes text-based weather bulletins from meteorological centers
  - Extracts details on potential tropical cyclogenesis conditions from unstructured text
  - Converts extracted data into structured format for GDACS use
- **Goal and Benefits**
  - Provides timely critical information for early stages of tropical cyclone formation
  - Enhances preparedness and response efforts



Response

Real-time (social) media analysis in disaster response

- Social media posts are a critical data source for disaster response, especially in the first 12-24 hours
- AI tools can quickly identify important information from social media to enhance response effort
- JRC's open-source software uses machine learning to scan social media posts in real-time, filter, geolocate, and analyze data to support emergency responders
- Examples: 2023 earthquakes in Türkiye and Syria, 2021 Haiti earthquake



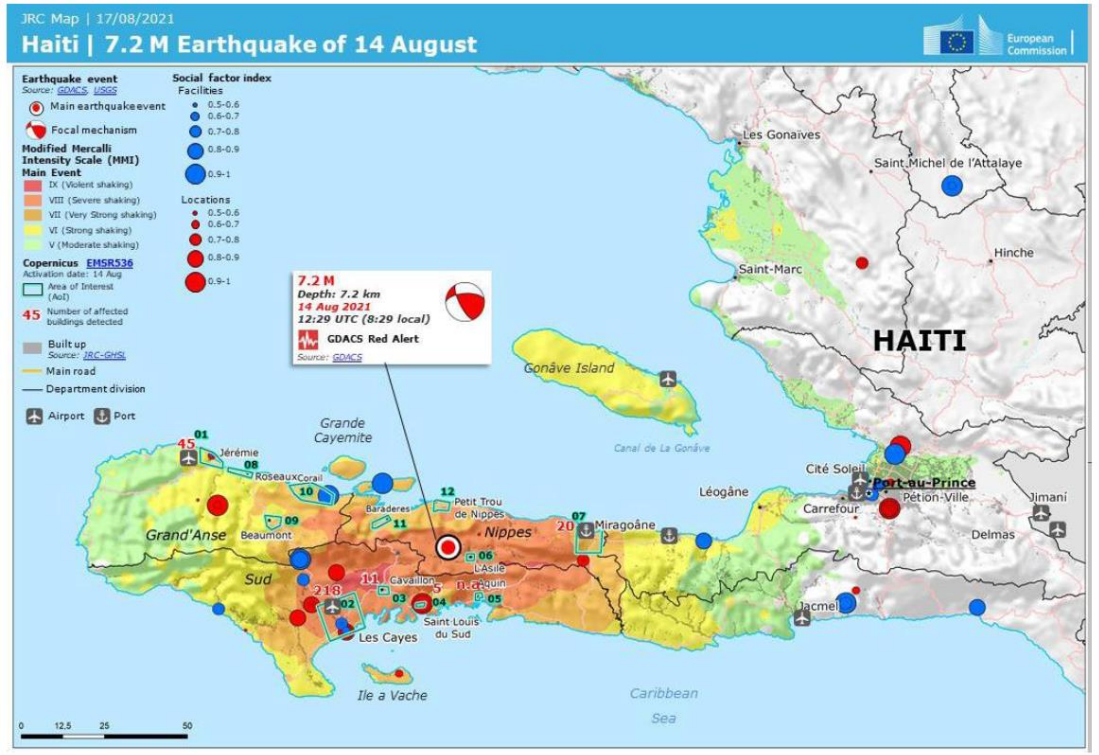
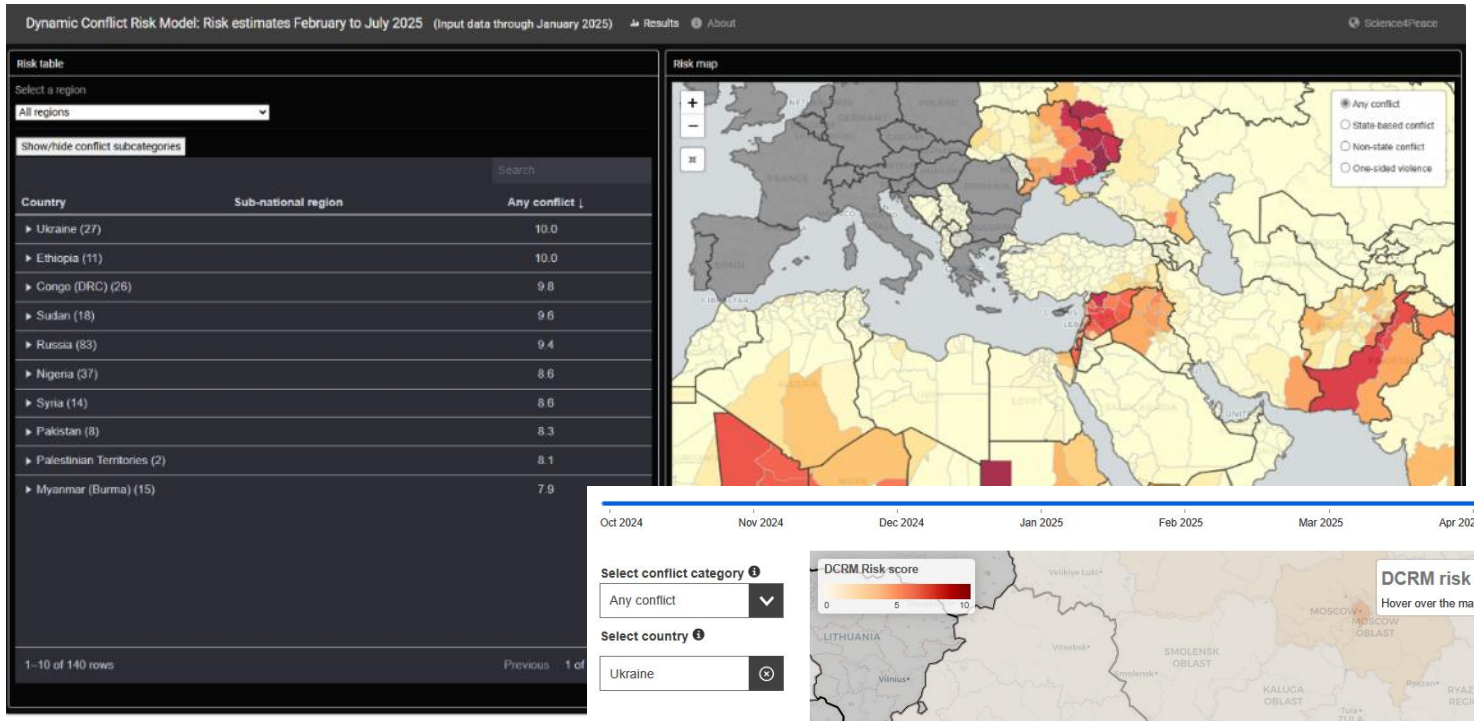


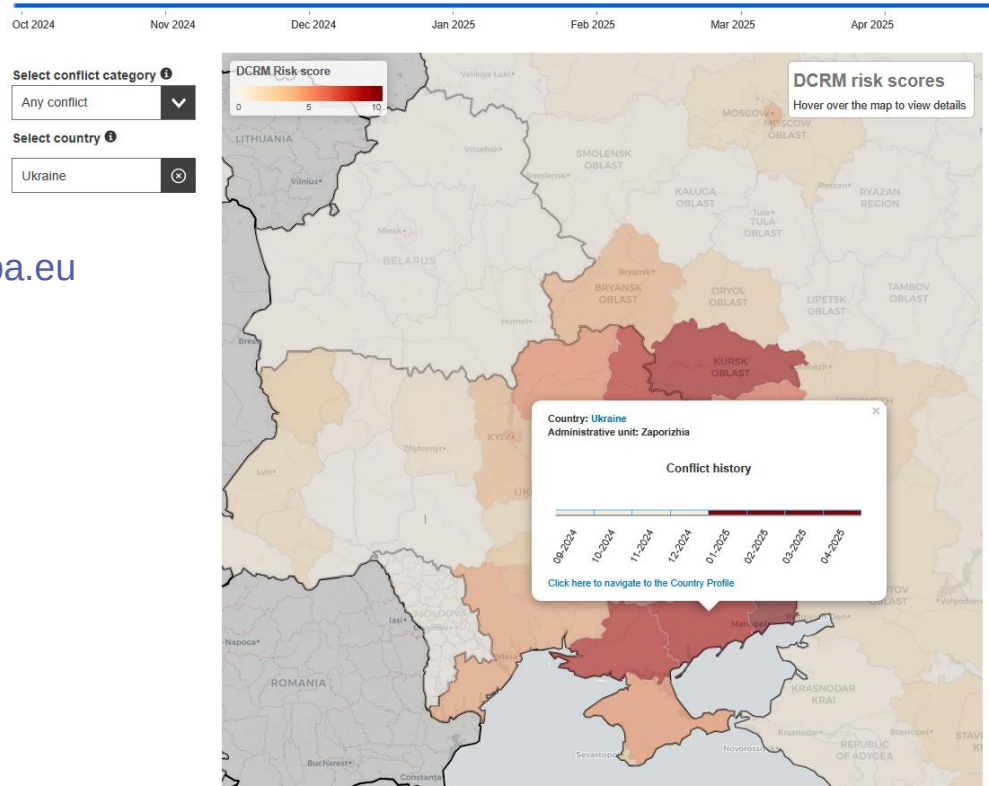
Fig. 15 - Geo-located text information about impacts on Facilities (Blue symbols) and Locations (Red Symbols). The figure contains also the shakemap and the locations AOI of the Copernicus EMS

Preparedness and prevention

- **Predictive Intelligence**: 6-month conflict forecasts for 2,600+ subnational areas across 140 countries
- **Risk Scoring**: AI assigns 0-10 risk scores for overall conflict and specific categories (state-based, non-state, one-sided violence)
- **Pattern Recognition**: Machine learning identifies complex relationships in 30+ years of conflict data that humans might miss



https://science4peace.jrc.ec.europa.eu



Conflict Risk Modeling
The Dynamic Conflict Risk Model

Thank you

European Crisis Management Laboratory

Global Disaster Alert and Coordination System

DRMKC – Risk Data Hub

DRMKC – INFORM

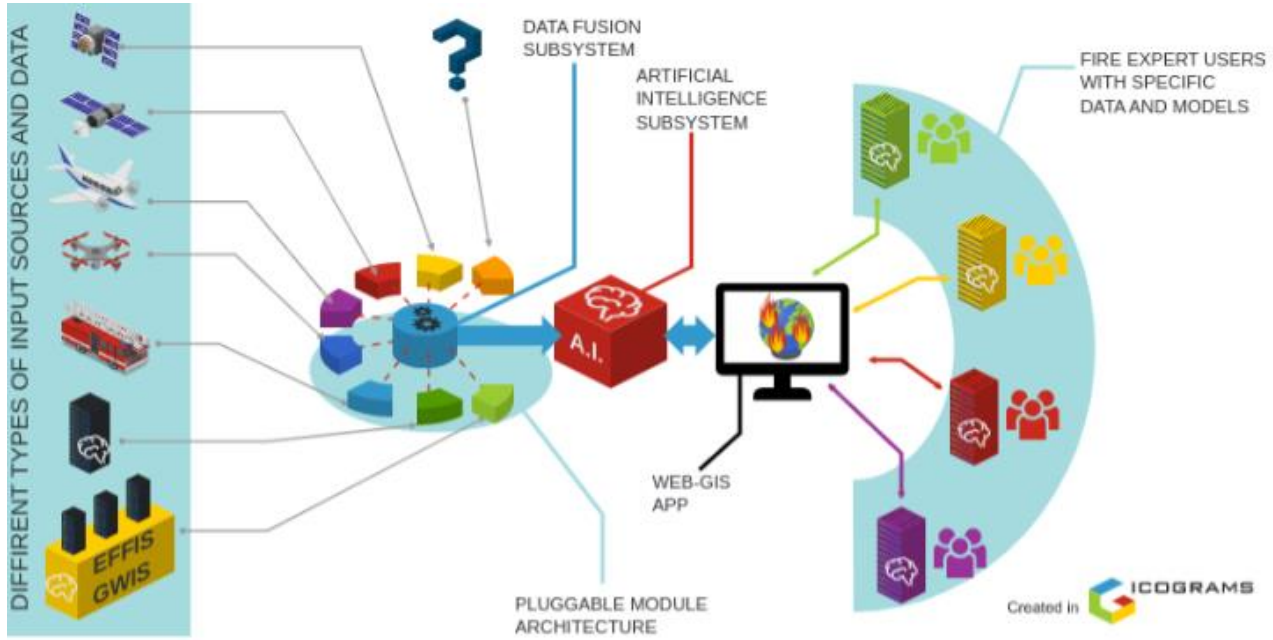
Copernicus Emergency Management Service

ECHO – ERCC Daily Maps

EU Science Hub
joint-research-centre.ec.europa.eu

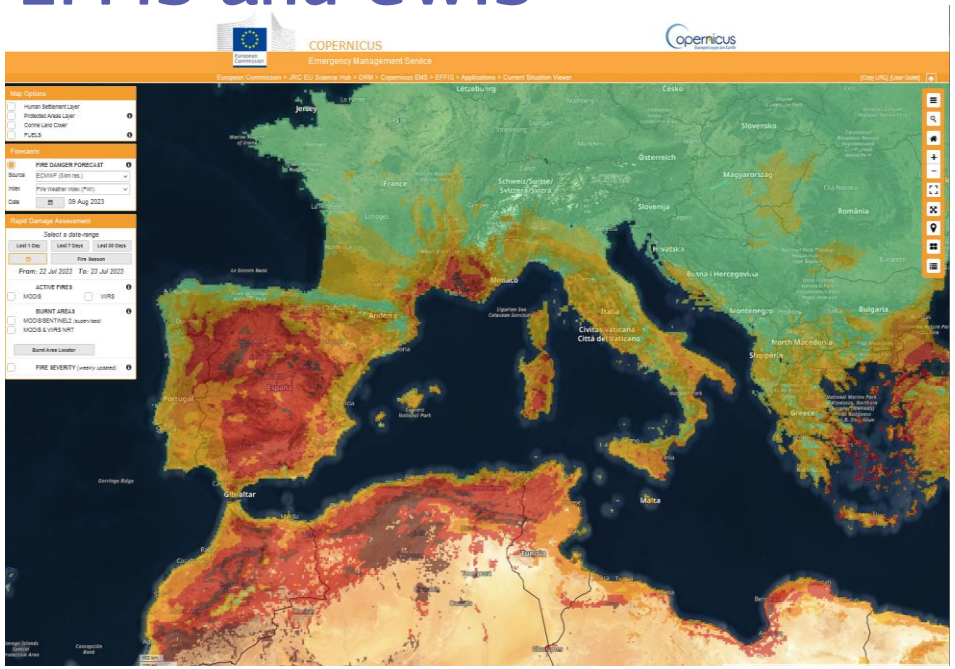
Early warning (Alert)

AI for Good



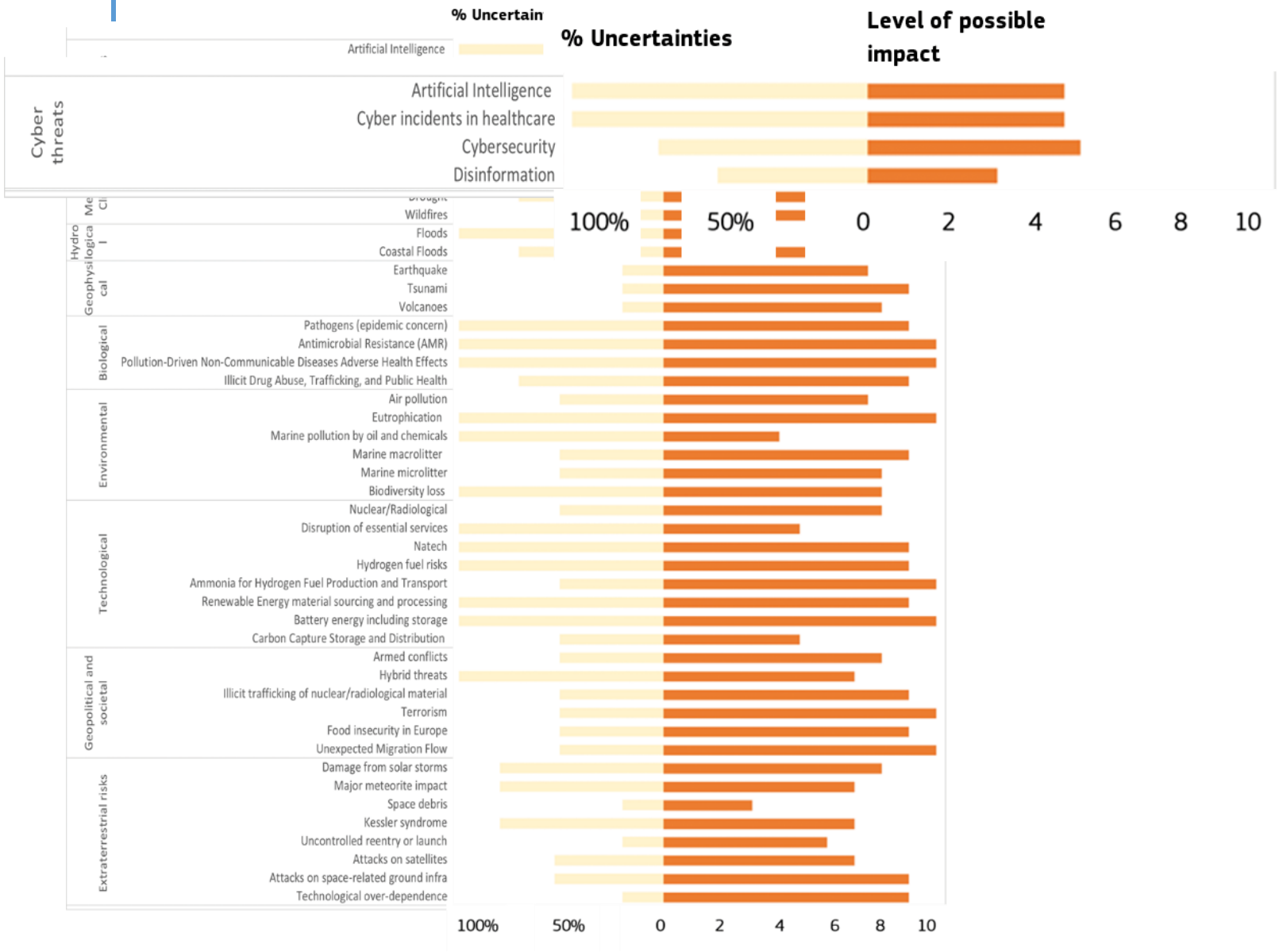
Overall platform scheme

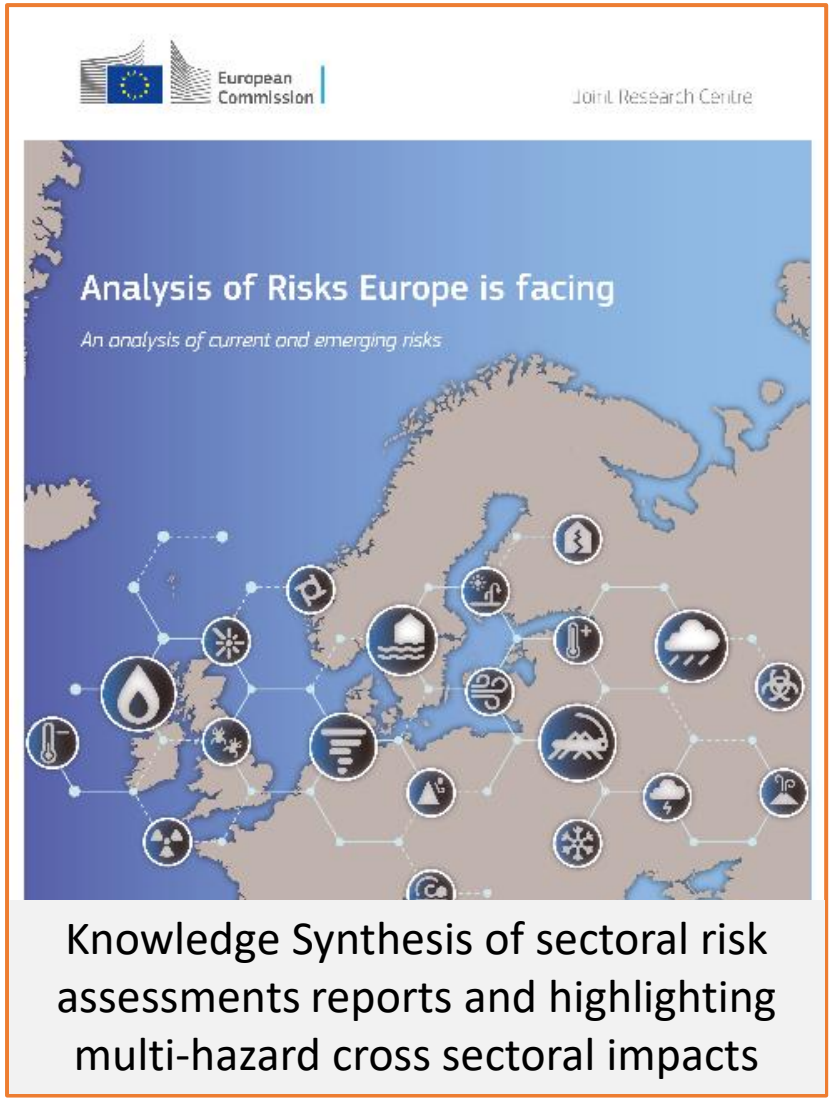
EFFIS and GWIS



Enhance wildfire management (JRC and DG CONNECT)

AI Risks in the Analysis of Risks Europe is facing





Knowledge Synthesis of sectoral risk assessments reports and highlighting multi-hazard cross sectoral impacts

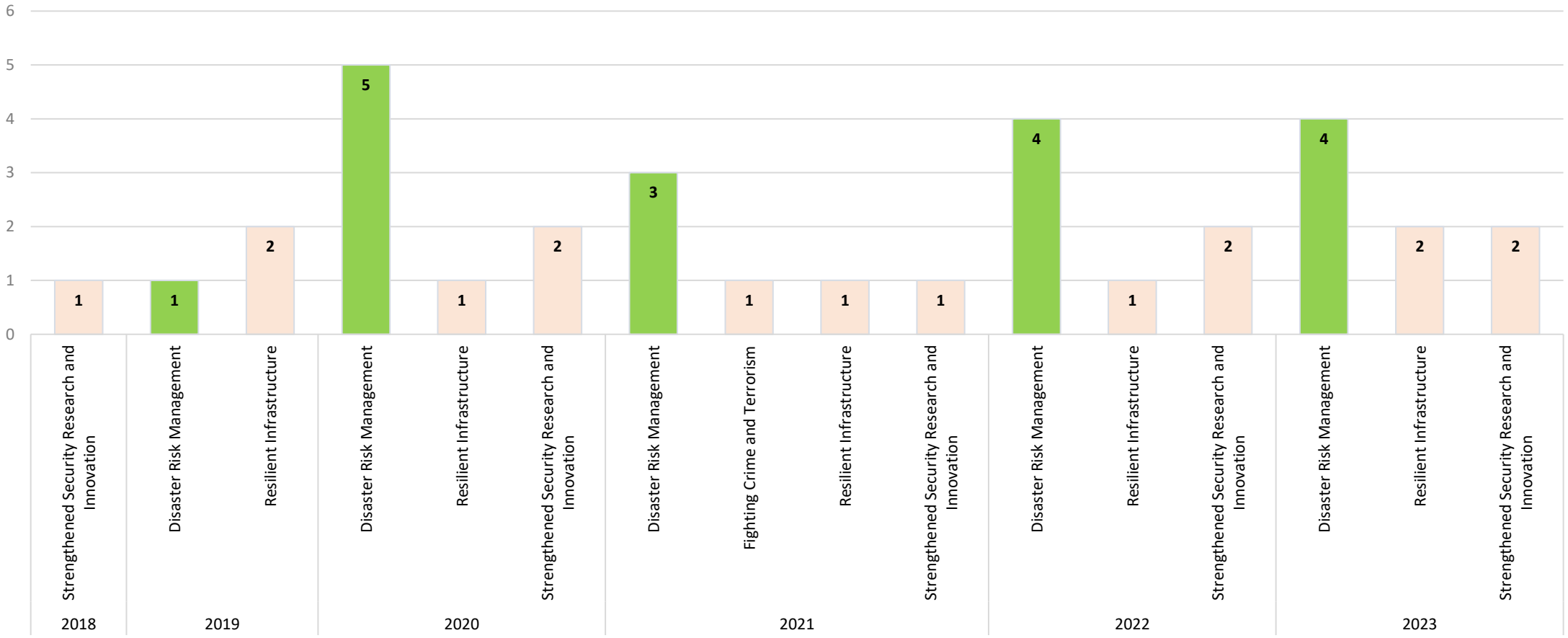
EU Institutional Landscape of AI developments for DRM under the Preparedness Union Strategy

European Research Executive Agency

Rodrigo Gutiérrez Domínguez REA.C2

European Commission

Security research projects relevant for the Preparedness Union with AI dimension – 2018 to 2023



- **C2IMPRESS** *"CO-CREATIVE IMPROVED UNDERSTANDING AND AWARENESS OF MULTI-HAZARD RISKS FOR DISASTER RESILIENT SOCIETY".* **COORDINATOR**: Sampas Bilisim Ve Iletisim Sistemleri Sanayi Ve Ticaret A.S. (TR). **Keywords**: Disaster Risk Reduction& Response, System Dynamic models, Agent Based Models, Artificial Intelligence, Decision Support System, Citizen Science, integrated disaster risk and resilience framework. **EU Contribution:** 4.175.836 €

- **CARMA** *"Collaborative Autonomous Robots for eMergency Assistance"*. **COORDINATOR**: CS GROUP – France (FR). **Keywords**: Crisis Management, Social Robotics, UGV, 3D Radar, Data Fusion, Path Planning, Artificial Intelligence, Natural Language Processing, eXtended Reality, Enhanced Situational Awareness. **EU Contribution**: 3.990.605 €.

- **SYNERGISE** *"A novel integrated SYstem of Systems streNgthening tEchnical and logistical capacities to ensure better Response to emerGencies by synergIStically addrEssing FRs capability gaps".* **COORDINATOR**: BUNDESANSTALT TECHNISCHES HILFSWERK (DE). **Keywords**: Autonomous swarm of robots, indoor localisation, vitals monitoring, augmented reality, human-machine teaming. **EU Contribution:** 5.575.877 €

Artificial intelligence

Self-assessment: Could the AI system/technique stigmatise or discriminate against people (based on sex, race, ethnic/social origin, age, disability, sexual orientation, religion, political affiliation, etc.)?

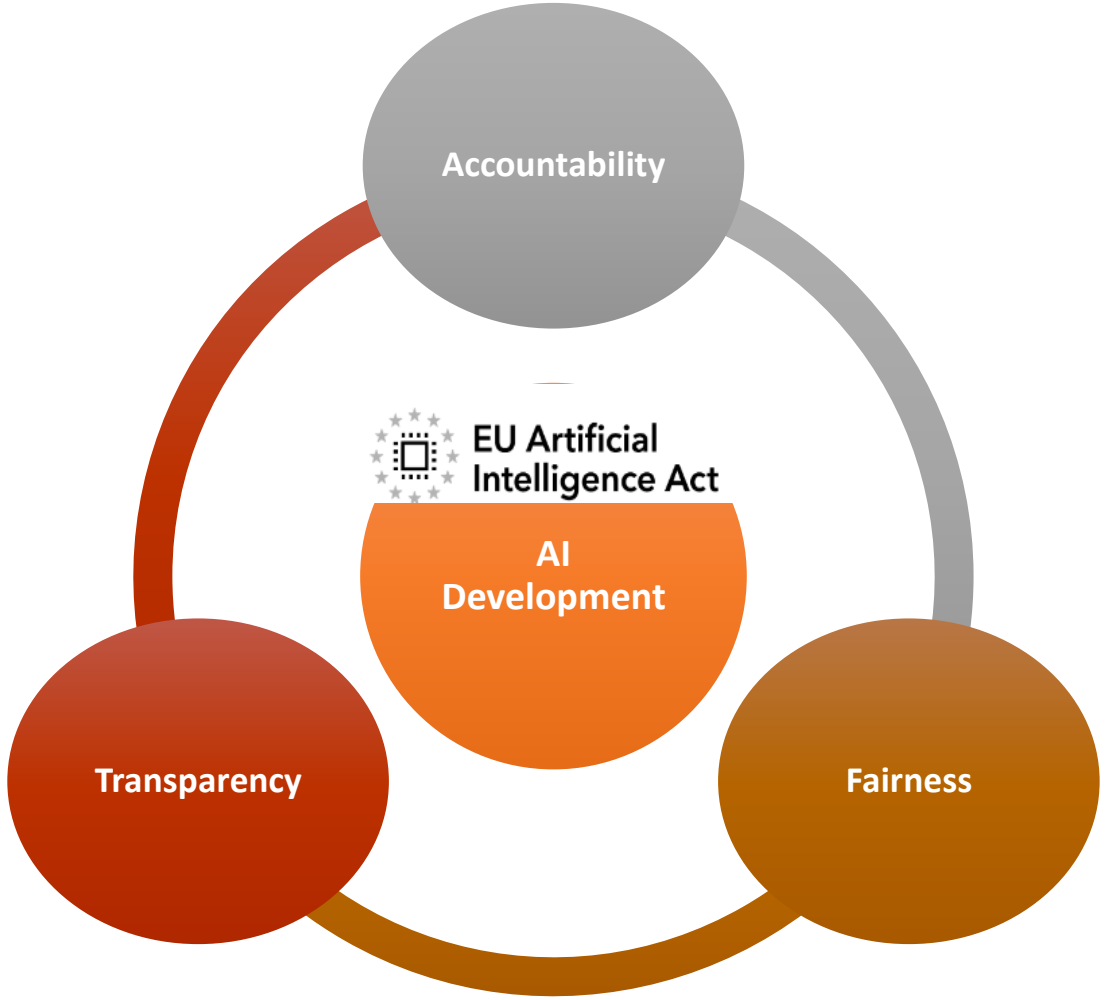
→ Explain how potential bias, discrimination and stigmatization will be avoided.

→'**Ethics by design' methodology**: concrete steps for each phase in the development process. E.g.:

- **Check for algorithmic bias during the detailed development phase**. Data could be processed in a biased way, and therefore algorithms should be checked for this. (E.g. by using counterfactual evaluation methods)
- Ensure that interface design honours principles of universal accessibility, and avoid the introduction of functional biases in the detailed development phase that make the system unequally functional for different end-users.

Artificial Intelligence in the Ethics Appraisal

1. **Human Rights Impact Assessment**: Evaluate potential human rights impacts throughout development, deployment, and post-deployment phases.
2. **Bias Prevention**: Implement measures to prevent bias, discrimination, and stigmatization in data and algorithms.
3. **Transparency and Informed Consent**: Inform users about AI interactions, capabilities, limitations, and decision-making processes.
4. **Human Control**: Ensure humans maintain control over critical decision-making aspects.
5. **Ethics Risk Evaluation**: Assess and mitigate potential negative social, environmental, and personal impacts.



EUROPEAN CLIMATE RISK ASSESSMENT

DestinE and the comprehensive assessment of current and future climate risks in Europe

Eva Ivits, EEA

European Commission

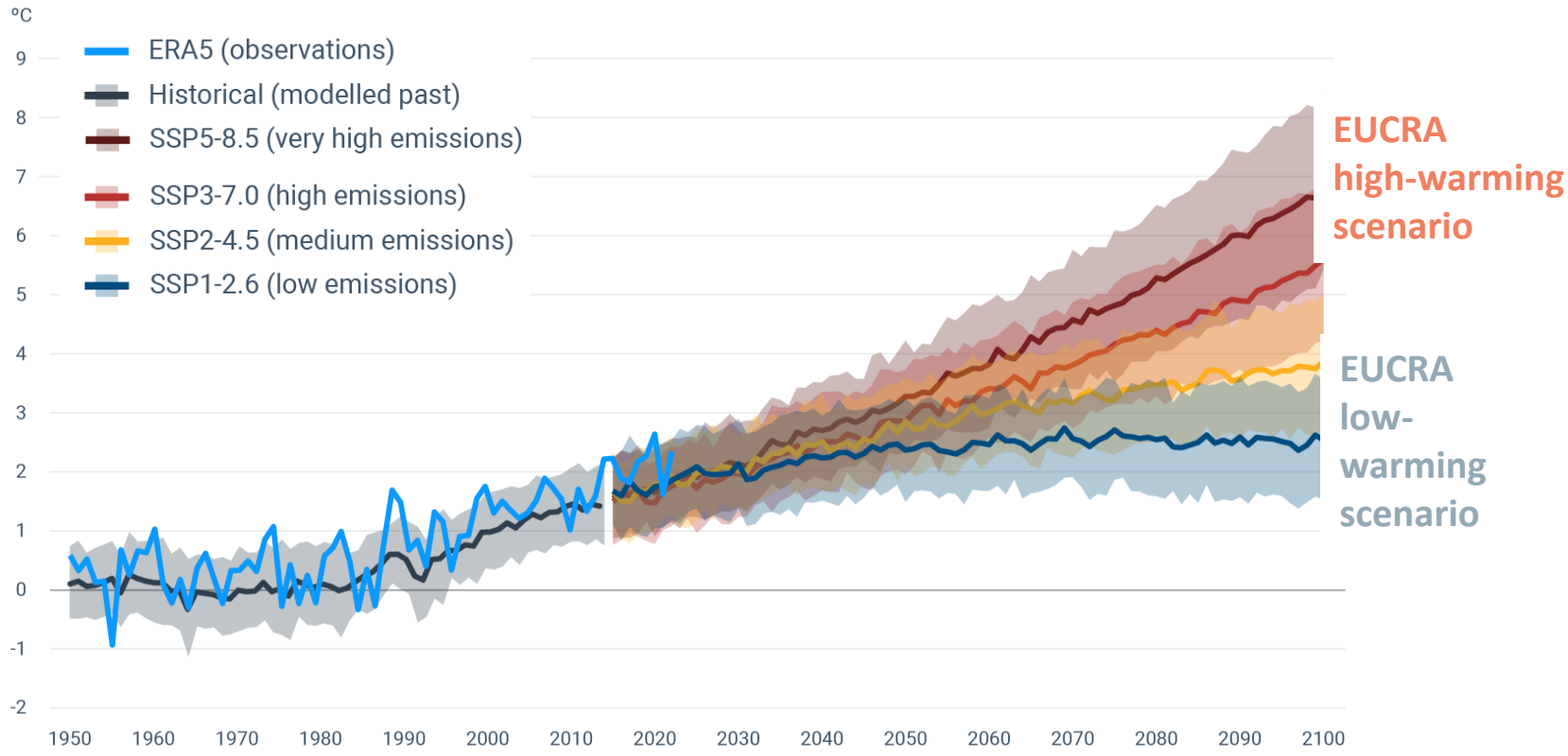
European Environment Agency

European Environment Agency
European Topic Centre
Climate change adaptation
and LULUCF

Climate Change Service
climate.copernicus.eu

Europe is not sufficiently prepared for rapidly growing climate risks

- Europe is the **fastest warming** continent.
- **Heatwaves** are getting worse.
- **Wildfires** are getting more frequent.
- **Rain patterns** are changing, both downpours and dry spells increase in magnitude.
- **Sea level rise** is accelerating and threatening coastal regions.
- **Less snow** in mountains, water cycle disruption.
- Spreading of **vector borne diseases**.
- 34 out of 36 major climate risks could reach **critical/catastrophic levels** during this century.



Source: Copernicus climate change service based on CMIP6

European Environment Agency

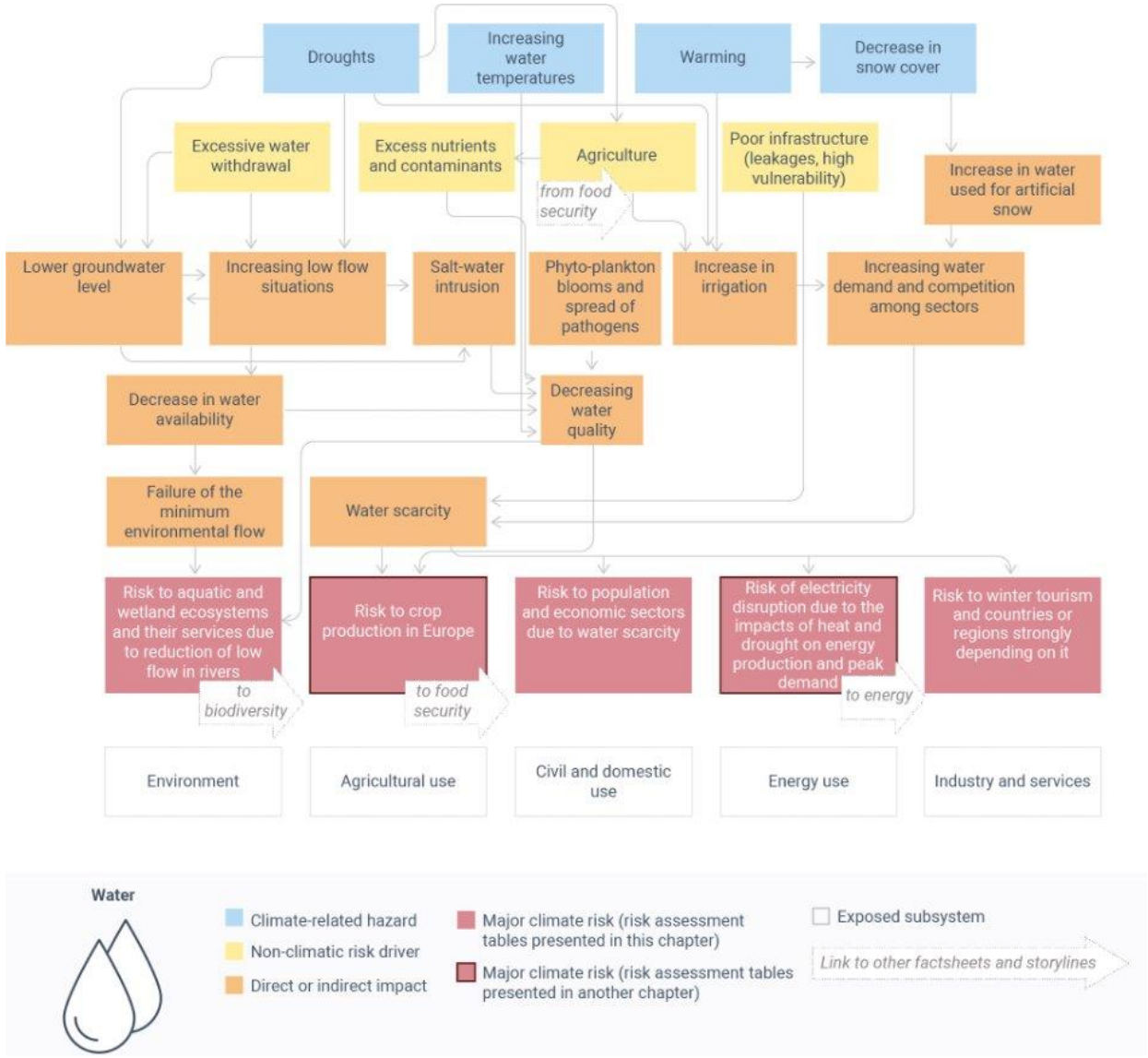
Climate risks can cascade from one system to another

Complexity of climate risk assessment:

- Climate risks are shaped by:
  - **climatic hazards** (e.g. heatwaves, droughts,...),
  - **non-climatic risk drivers** (land use, managements)
  - **how prepared we are.**

- Climate change is a **risk multiplier** that can exacerbate existing risks and crises.

- Climate risks **cascade across systems**, which can lead to system-wide challenges affecting whole societies, with vulnerable social groups most affected.



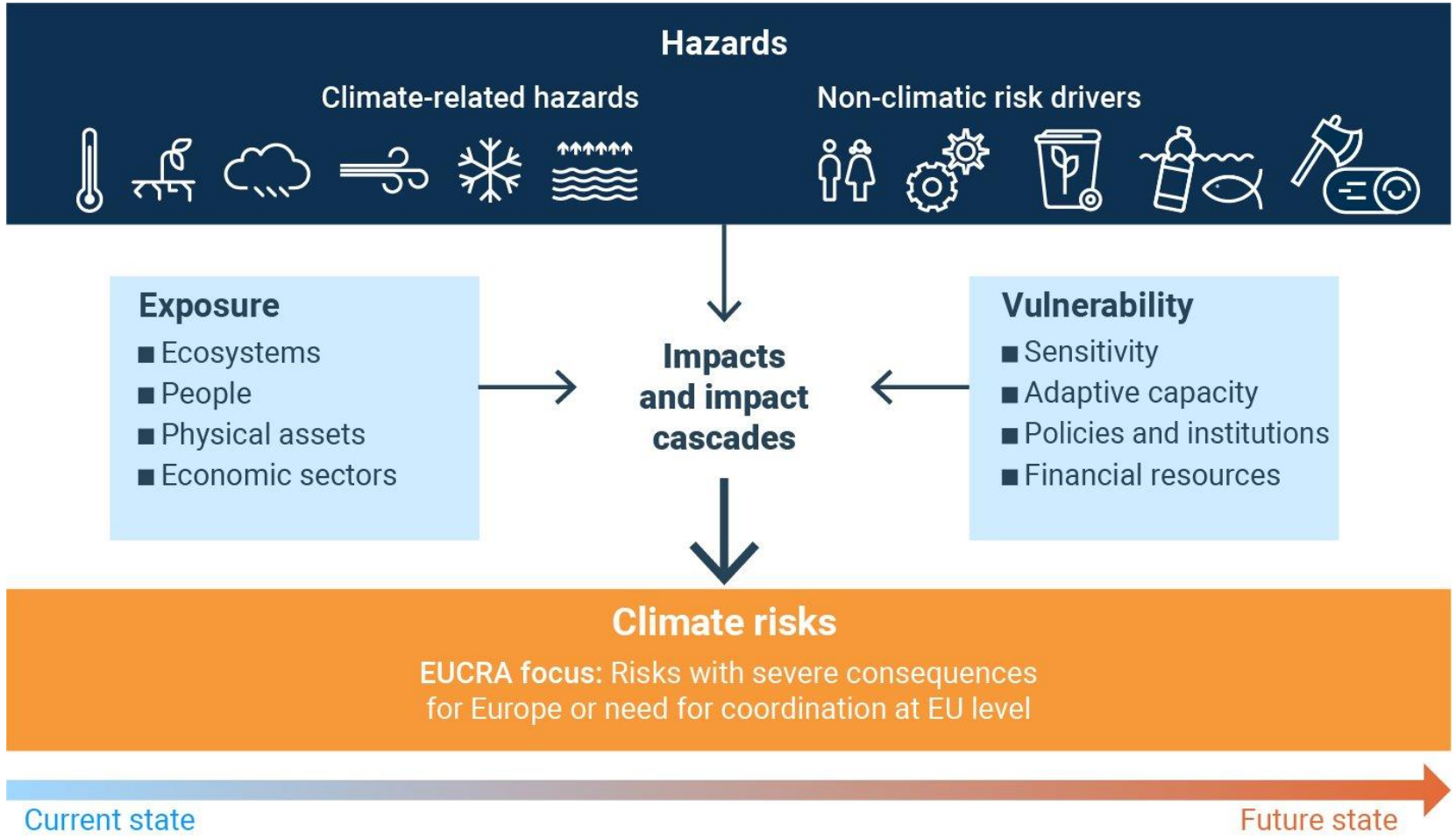
Source: European Climate Risk Assessment (EUCRA), EEA Report 01/2024. https://www.eea.europa.eu/en/analysis/publications/european-climate-risk-assessment

European Environment Agency

The European Climate Risk Assessment (EUCRA)

Next EUCRA aims assessing climate risks in the context of:

- Ecosystems and environment
- Spatial planning
- Food security
- Human health
- Justice and fairness
- Economic consequences
- Built environment and networks
- Industrial policy
- Migration
- EU security
- International and supply chain



European Environment Agency

DestinE contribution to European Climate Risk Assessments

Focus on **solutions** mitigating risks;

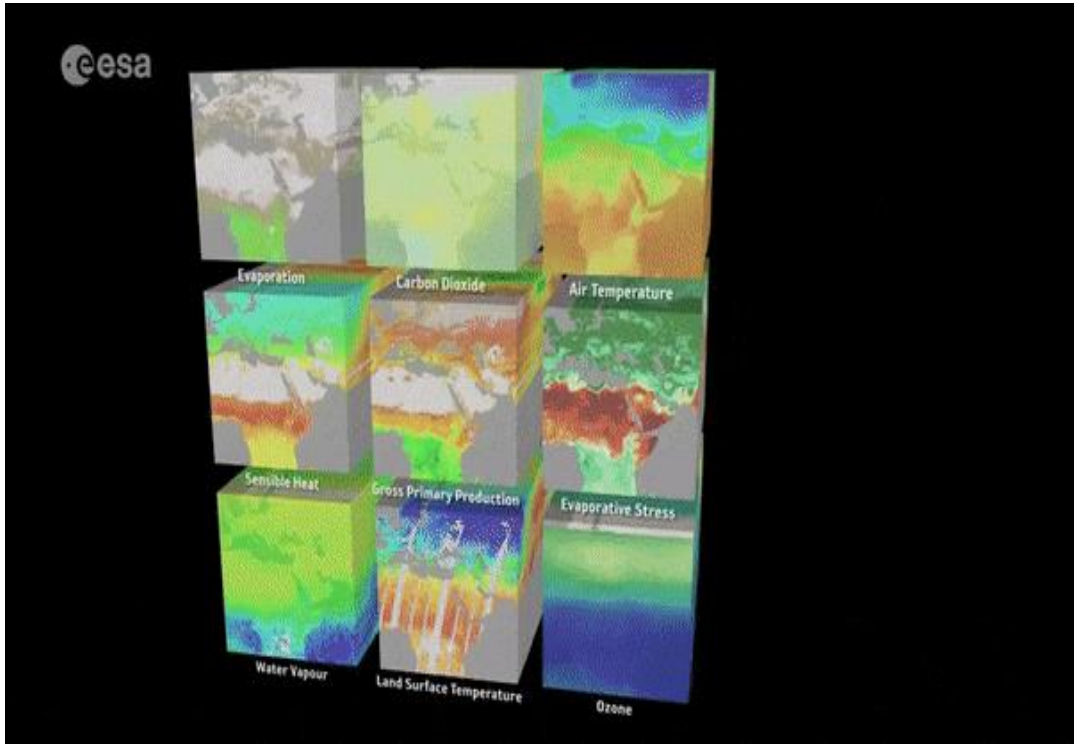
Enable **quantitative assessments** accompanying qualitative ones;

Identify major risks per system and across systems and sectors ;

Identify priorities for timely action ;

Produce **what-if analytics** and enable the user to **explore various scenarios**.

EUCRA-DestinE workshop:
8-9 September 2025,
co-organised by ECMWF and EEA



Reproduced from:
https://www.esa.int/ESA_Multimedia/Videos/2018/07/Earth_System_Data_Lab

European Environment Agency

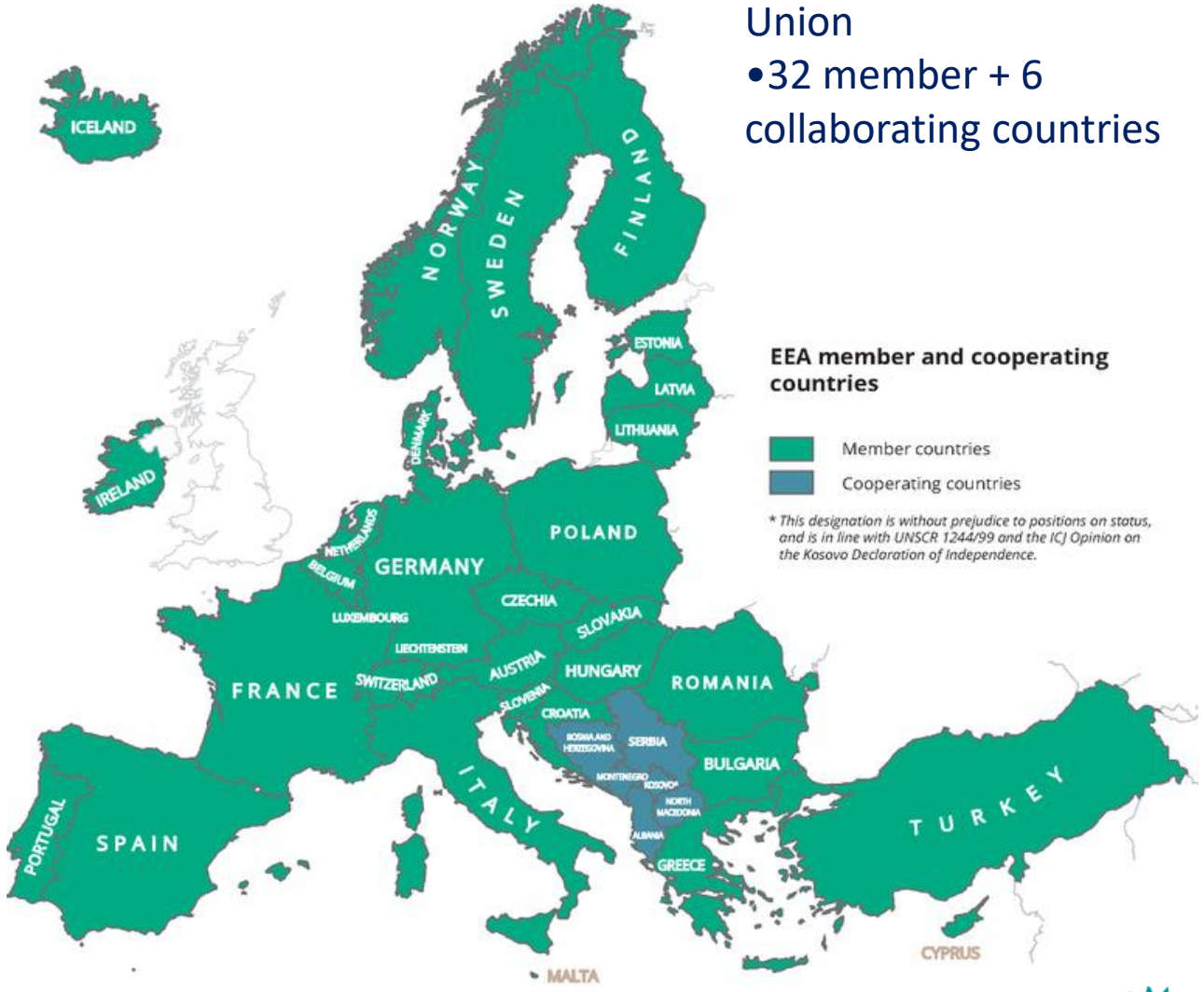
European Environment Agency

EEA **gathers** various data and information across Europe, **combines** and **translates** them into transparent assessments to **inform** key EU policy and decision-making.

EEA Climate Change Impacts & Adaptation:

- Provides policy support on climate change hazards, resilience, impacts and risks;
- Supports development and implementation of (sub-) national adaptation strategies

- Agency of the European Union
- 32 member + 6 collaborating countries



European Environment Agency

EUROPEAN CLIMATE RISK ASSESSMENT

DestinE and the comprehensive assessment of current and future climate risks in Europe

Eva Ivits, EEA

European Commission

European Environment Agency

European Environment Agency
European Topic Centre
Climate change adaptation
and LULUCF

Climate Change Service
climate.copernicus.eu