

An aerial photograph of a rural landscape featuring a patchwork of agricultural fields in various shades of green and brown. A winding road or path cuts through the fields. Overlaid on the image are several thin, white contour lines that follow the topography of the land. The text is centered in the lower half of the image.

# CLimate INTelligence

+  
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# CLINT

## CLIMATE INTELLIGENCE

Extreme events detection, attribution and adaptation design using machine learning







CLIMATE INTELLIGENCE will design new Machine Learning algorithms and tools  to process big climatological data sets  across different spatiotemporal scales.



AI enhanced CLIMATE SCIENCE will advance detection, causation, and attribution of tropical cyclones , heatwaves and warm nights , droughts  along with compound events and concurrent extremes.



AI enhanced CLIMATE SERVICES will be developed at the EU continental scale across the water, energy, and food nexus  and in selected climate change hotspots (arid , snow , delta ).



CLIMATE SERVICES INFORMATION SYSTEMS will be deployed as web processing services based on most advanced open  software and data standards, and AI-enhanced Climate Service products including a Demonstrator will be set up to be commercially exploited after the project.

A new H2020 project responding to the call:

*Building a low-carbon, climate resilient future:  
climate action in support of the Paris Agreement*

| Participant No. | Participant organisation name   | Country       |
|-----------------|---|---------------|
| 1               | Politecnico di Milano (POLIMI)  | IT            |
| 2               | Fondazione Centro Euro-Mediterraneo sui Cambiamenti Climatici (CMCC)          | IT            |
| 3               | Helmholtz-Zentrum Geesthacht Zentrum für Material-und Küstenerforschung (HZG) | DE            |
| 4               | Agencia Estatal Consejo Superior de Investigaciones Científicas (CSIC)        | ES            |
| 5               | Sveriges Meteorologiska Och Hydrologiska Institut (SMHI)                      | SE            |
| 6               | HKV Lijn in Water BV (HKV)  | NL            |
| 7               | E3-modelling AE (E3M)   | EL            |
| 8               | The Climate Data Factory (TCDF)   | FR            |
| 9               | Deutsches Klimarechenzentrum GMBH (DKRZ)                                      | DE            |
| 10              | Stichting IHE Delft Institute for Water Education (IHE)                       | NL            |
| 11              | European Centre for Medium-Range Weather Forecasts (ECMWF)                    | International |
| 12              | Universidad de Alcalá (UAH)   | ES            |
| 13              | Justus-Liebig-Universität Giessen (JLU)                                       | DE            |
| 14              | Ramboll France (RBL)  | FR            |
| 15              | Universidad Complutense de Madrid (UCM)                                       | ES            |

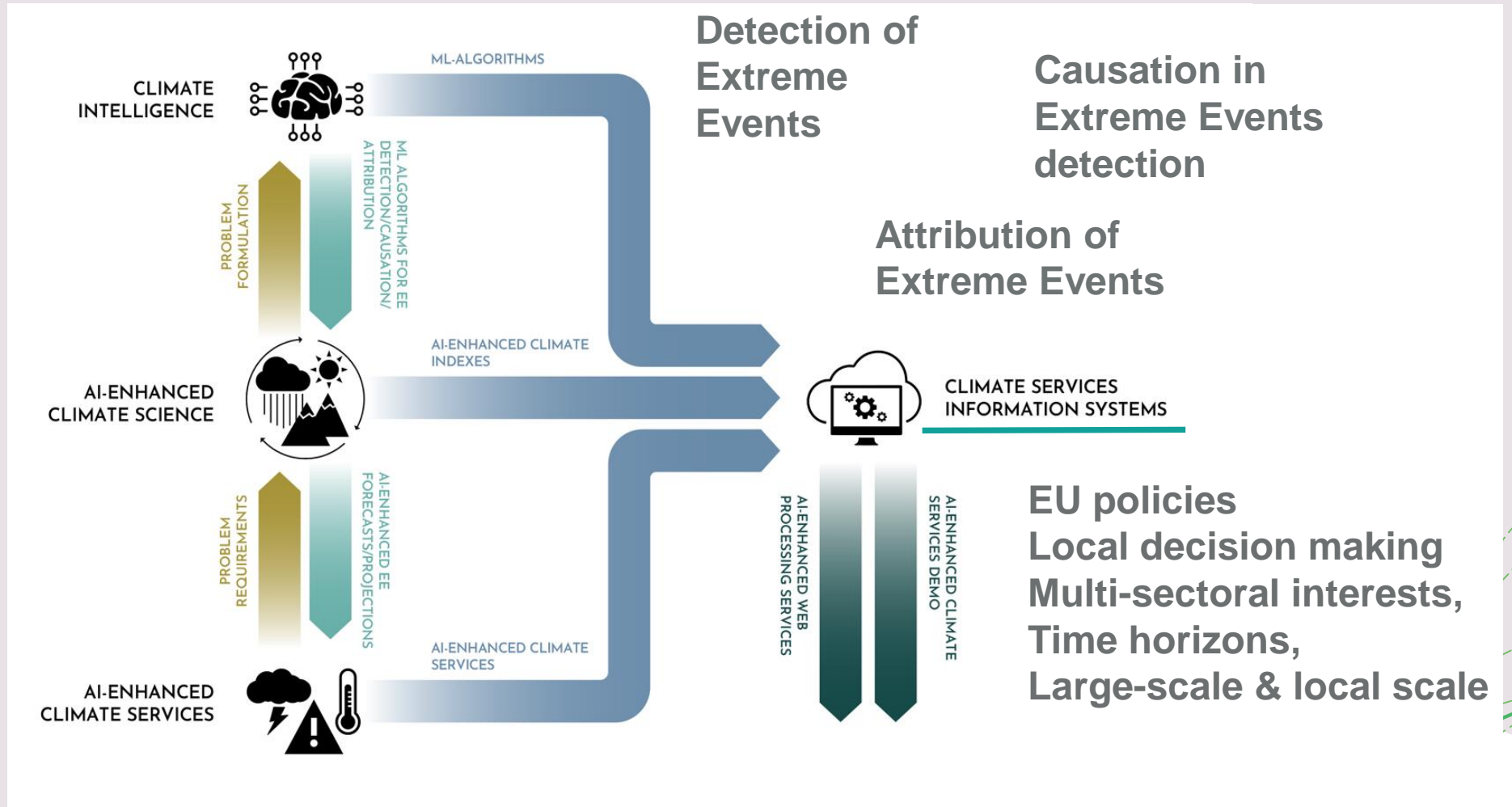
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# Concept

Machine Learning to advance discovery in Climate Science

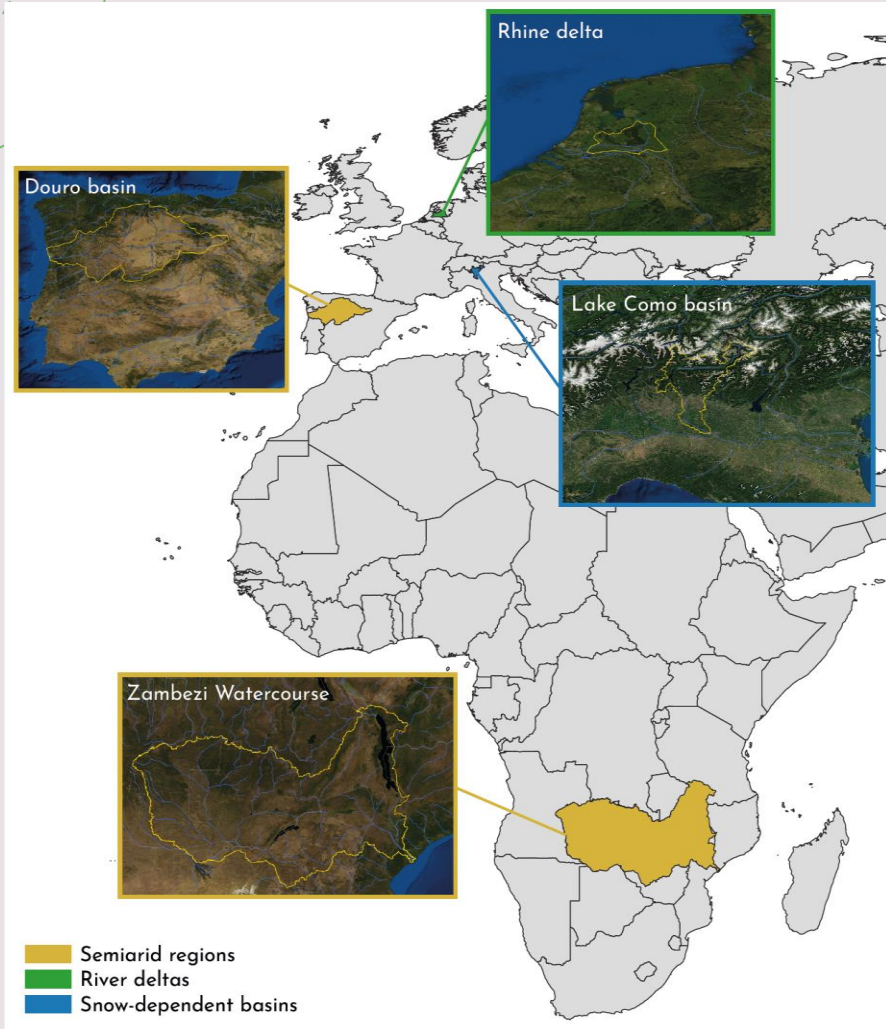
AI-enhanced Climate Services

Areas of concerns & risk and impact assessments



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# Climate Change Hot Spots



+ Rhine delta

+ Lake Como basin

+ Douro basin

+ Zambezi Watercourse



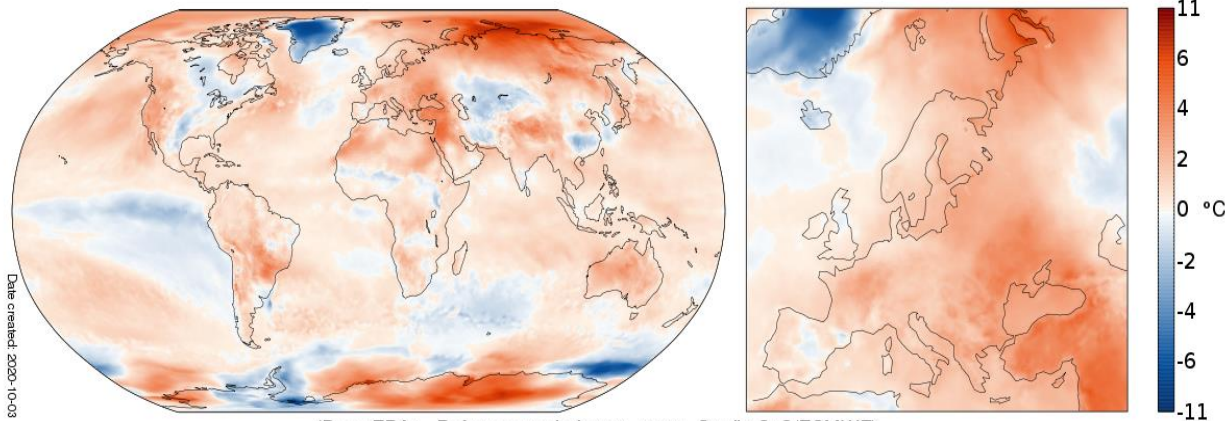
# The agriculture use case

The need for enhanced climate services



# Today, (very) recent past and...

Surface air temperature anomaly for September 2020



(Data: ERA5. Reference period: 1981-2010. Credit: C3S/ECMWF)




Source: Copernicus C3S

*Breaking new records every month*

## The 2020 drought

**Severe drought in south-eastern Europe**

**SEP 14** The September issue of the JRC MARS Bulletin - Crop monitoring in Europe - was published today, alongside two editions of the JRC MARS Bulletin global outlook series, on Turkey and Ukraine.



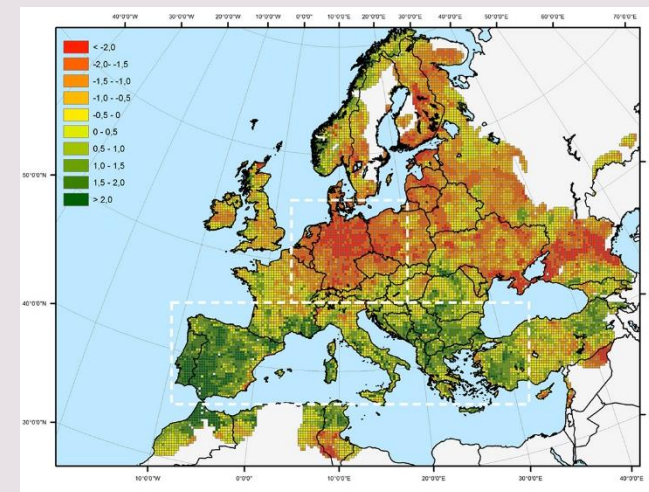
Continued hot and dry conditions in eastern Romania and eastern Bulgaria further deteriorated the outlook for maize yields.  
©Gina Sanders - stock.adobe.com

**Yield forecasts for EU summer crops revised further downwards**

According to the crop monitoring Bulletin for Europe, at EU level, the yield forecasts for all summer crops were revised downwards, most markedly for Romania, Bulgaria and Greece. Overall, the EU-level yield forecast for summer crops is now close to the 5-year average.

Severe drought conditions continued in eastern Romania, eastern Bulgaria, and southern Ukraine, with further negative impacts mainly on maize and sunflowers. Drought is now also observed in north-eastern Greece, the country's main sunflower production region, and a prolonged precipitation deficit has started to impact maize in central Ukraine.

Source: EU Science Hub

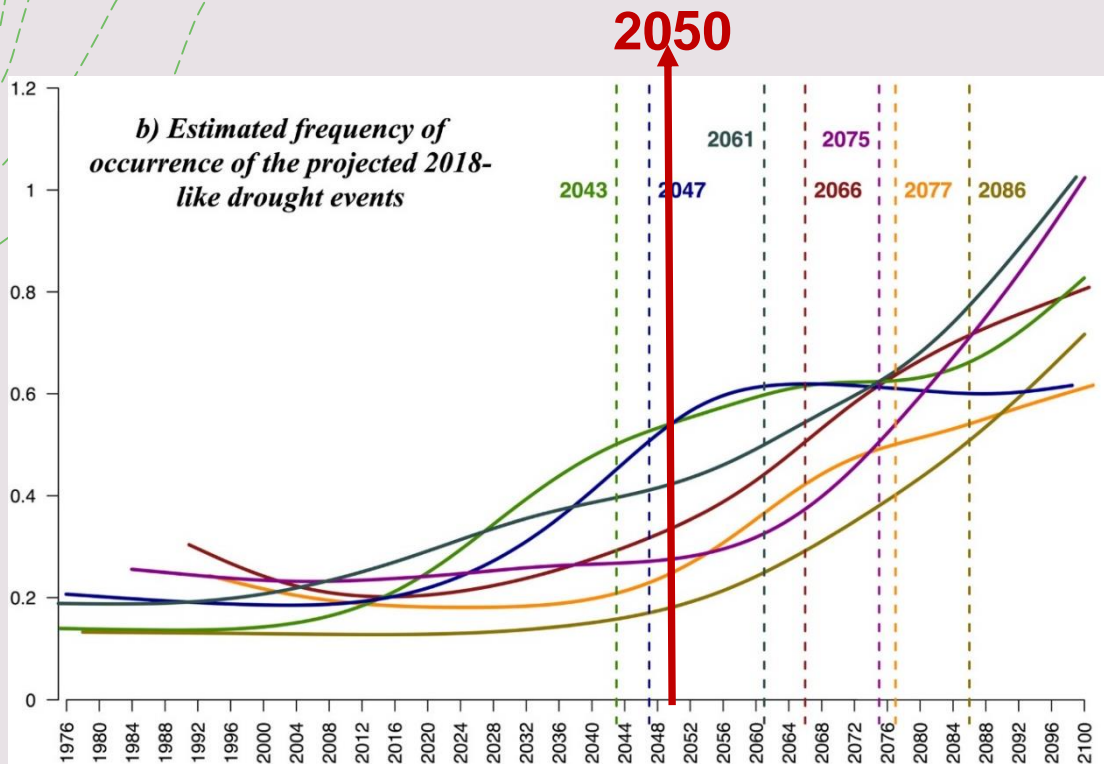


## The 2018 drought

Spring-to-summer SPEI: dry (red)/wet (green).

Source: Toreti et al. Earth's Future 2019

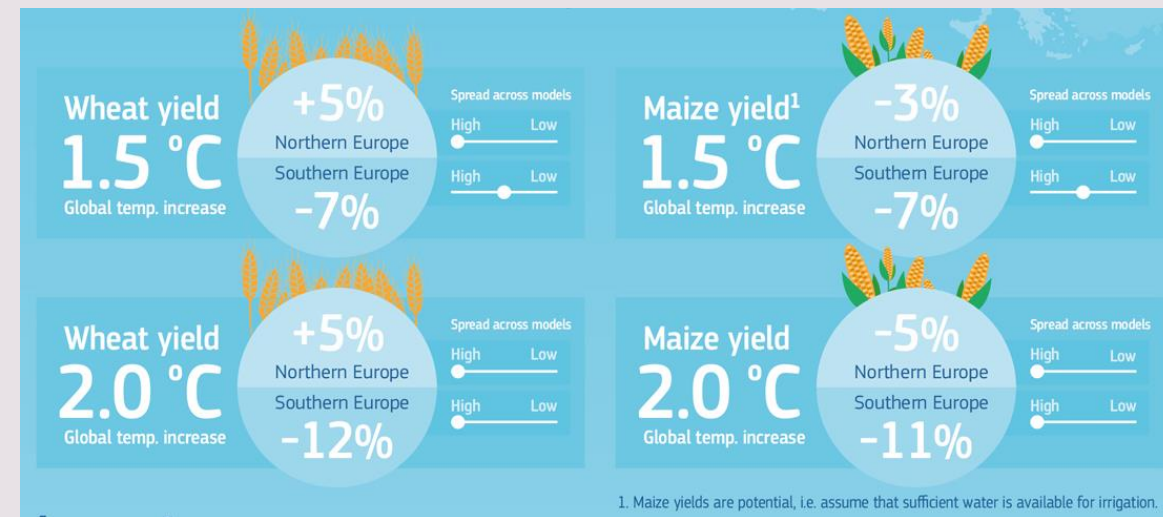
# Climate projections



By 2050, drought events like 2018 are expected to become the norm



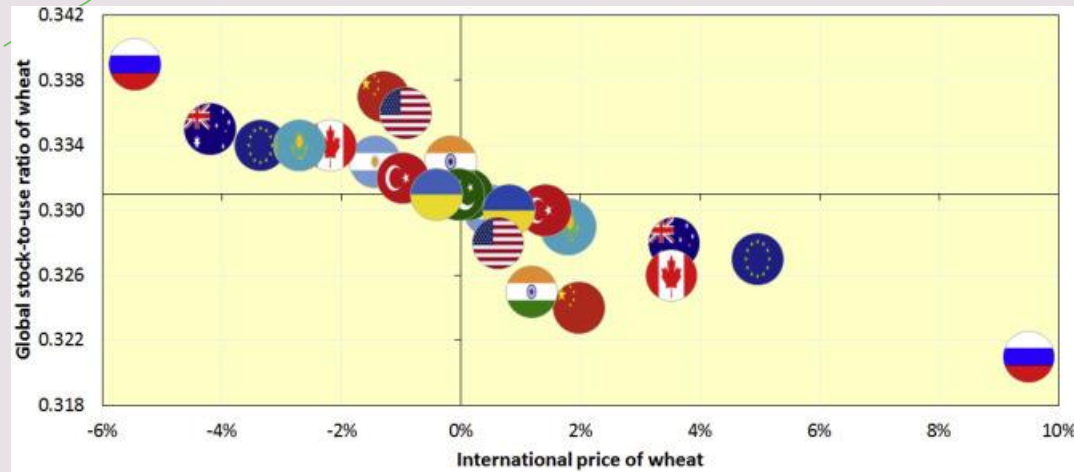
## JRC PESETA 4 Multi-sectoral impact assessment. The agri results



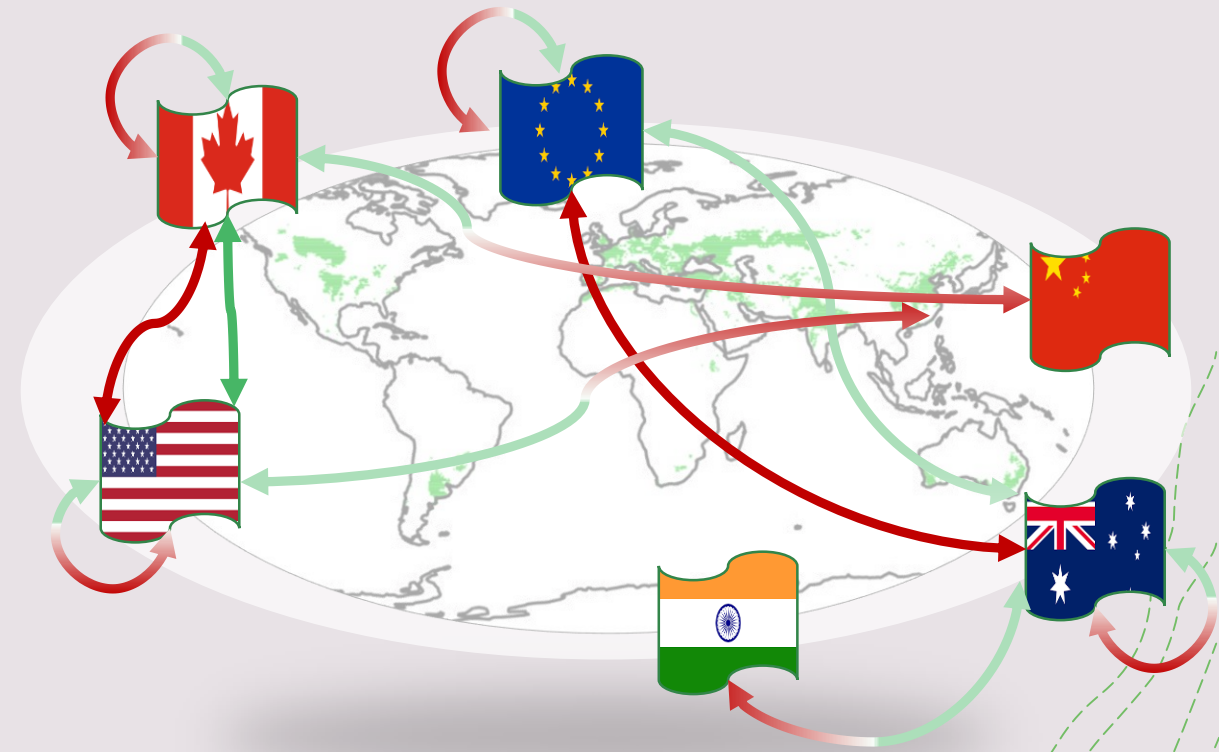
Crop yield projections assuming no changes in agro-management (e.g. irrigation)

# A globally connected world

*Large scale climate extremes occurring in a single producing region may shock the market*



Source: Chatzopoulos et al.  
Weat. Clim. Extremes 2020



*But... large-scale climate extremes in key wheat producing areas are dependent and tend to co-occur*



Adapted from Toreti et al. Sci Rep 2019

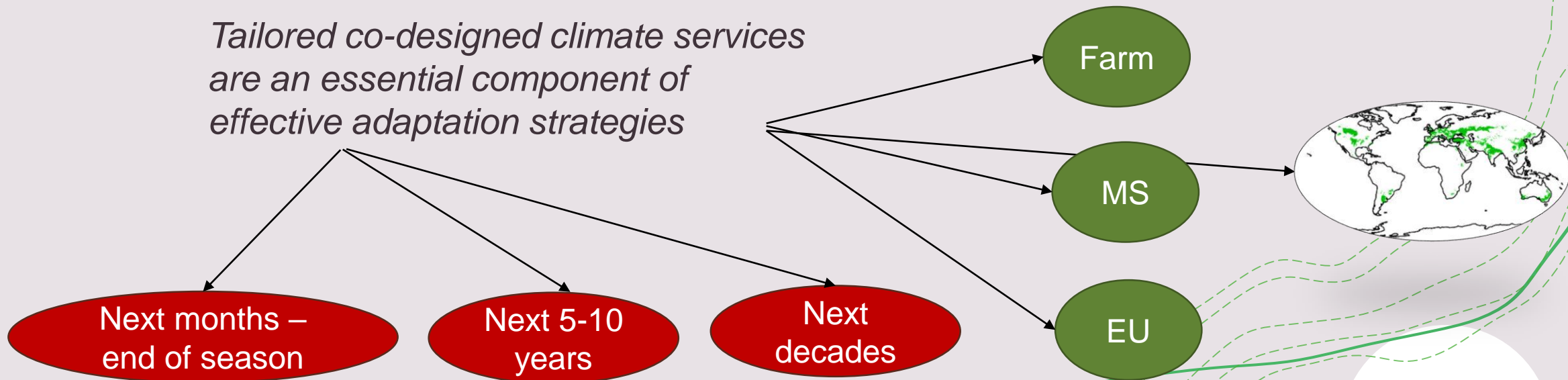


# Enhancing agriculture's climate resilience

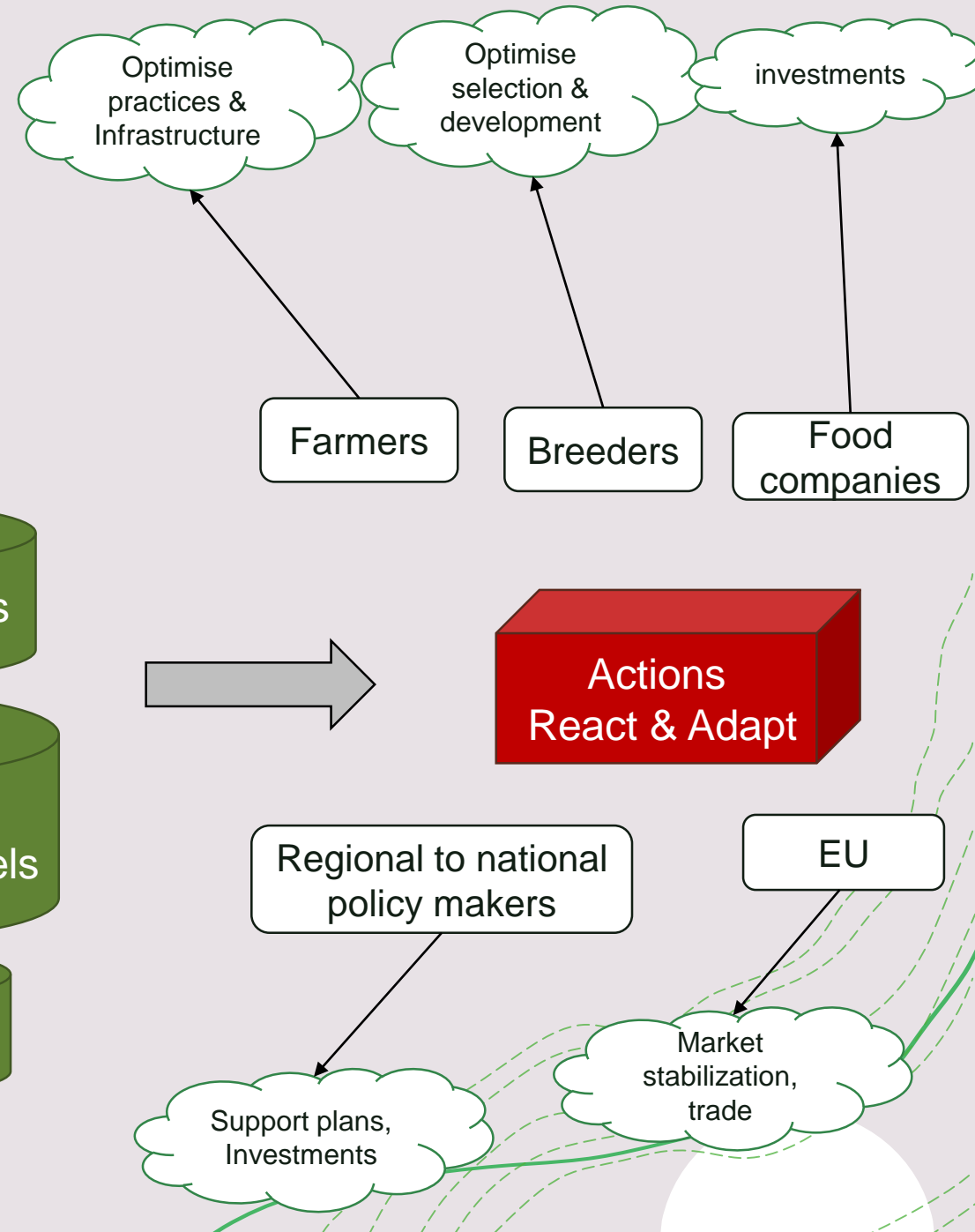
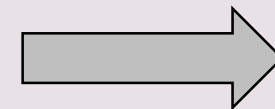
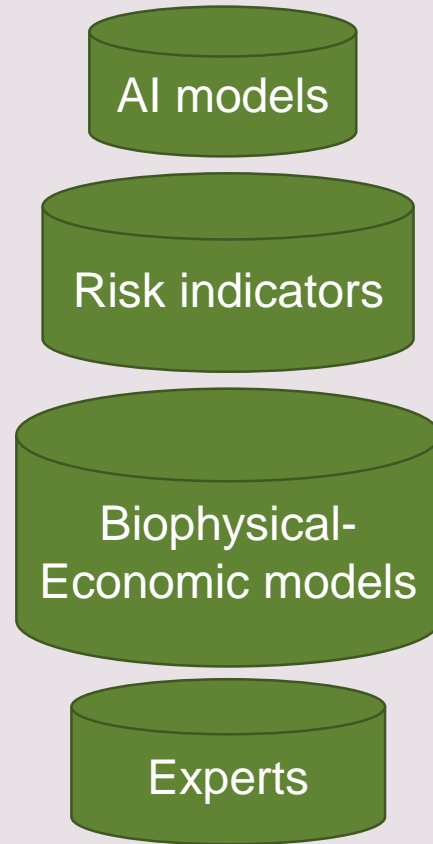
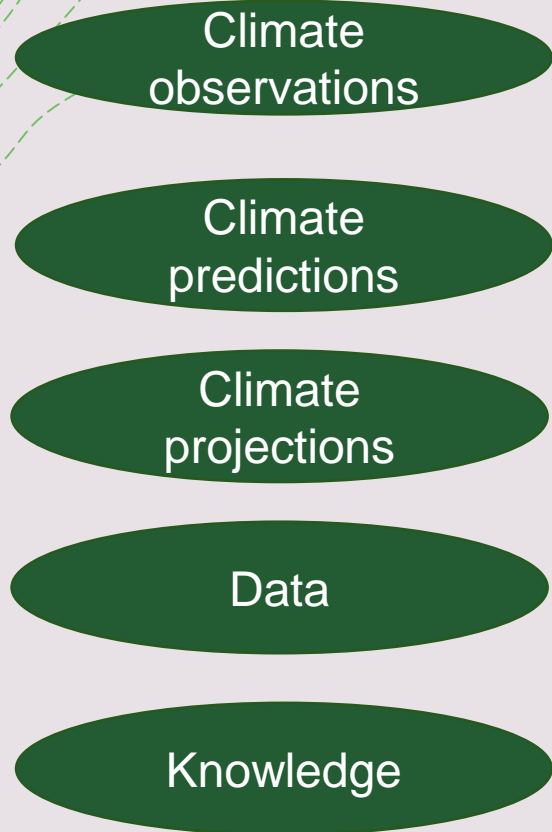
SUSTAINABLE MITIGATION & ADAPTATION

Evolving the agri systems by responding to short- and long-term changes

*Tailored co-designed climate services are an essential component of effective adaptation strategies*



# Informed actions



# CLINT Impact

- + Enhanced adaptive capacity, from pan-European to local scale
- + Reduced vulnerability to climate change
- + Enhanced actions on adaptation
- + Strengthened scientific knowledge on climate
- + Better informed Climate Services and decision-making

An aerial photograph of a rural landscape featuring a patchwork of agricultural fields in various shades of green and brown. A winding road or path cuts through the fields. Overlaid on the image are several thin, white, wavy contour lines that suggest topographical features or data points. The overall scene is bright and clear, with a focus on the geometric patterns of the farmland.

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