Bioeast and Beyond conference, Budapest, December 5, 2024

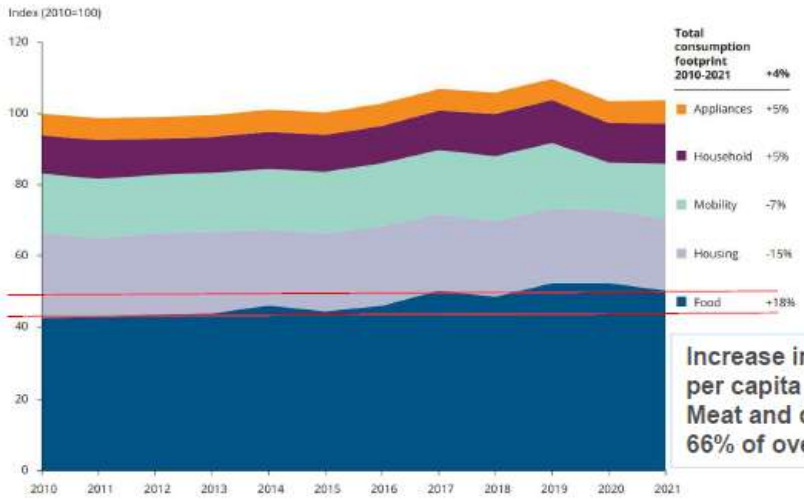
Food Systems in Europe Current shocks and interconnected challenges

Dr. Jean-Francois Soussana
INRAE, Vice-President for international policy
Chair of FACCE JPI

Source: JRC communication to FACCE JPI workshop on Food Systems and Shocks

Framing the European FS from a LCA perspective

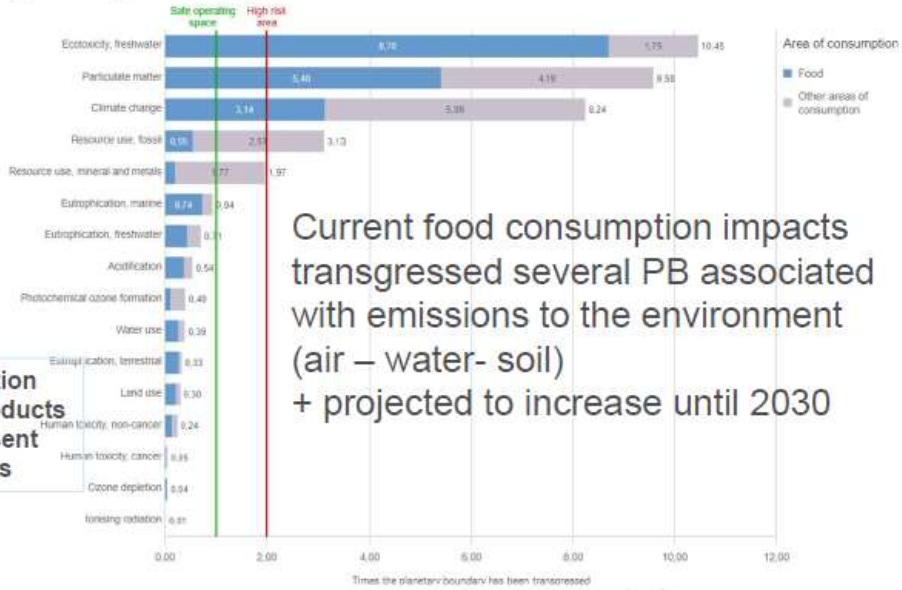
Evolution of the EU consumption footprint (2010-2020)
Food consumption footprint + 18 %



Increase in consumption per capita of food products
Meat and dairy represent 66% of overall impacts

Source: Sanye Mengual and Sala (2023).

Assessment of food consumption impacts per capita against planetary boundaries



Current food consumption impacts transgressed several PB associated with emissions to the environment (air – water- soil)
+ projected to increase until 2030

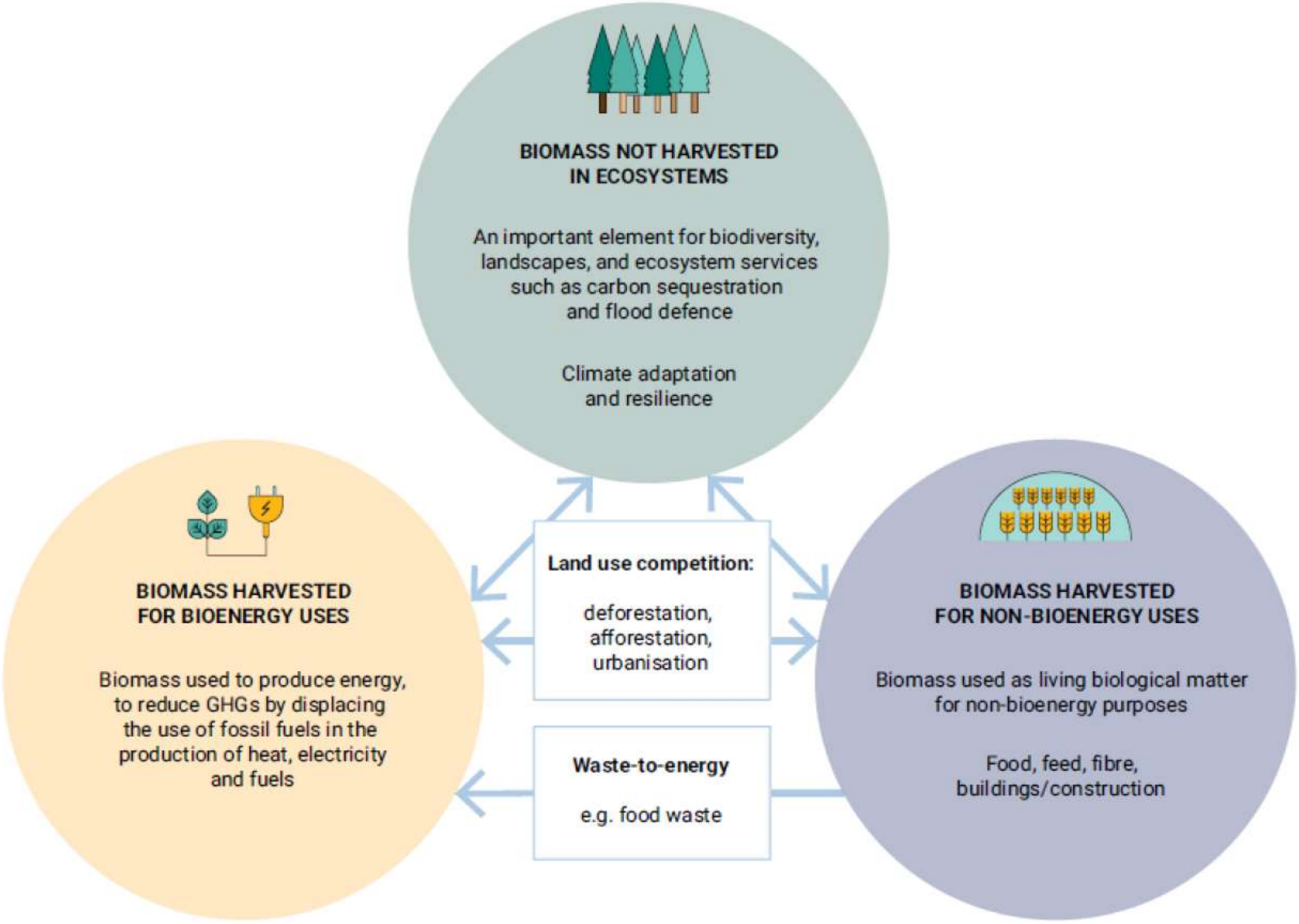
[Consumption Footprint | EPLCA (europa.eu)]

https://doi.org/10.1016/j.jenvman.2020.110686 Serenella Sala, Eleonora Crenna, Michela Secchi, Esther Sanyé-Mengual, Environmental sustainability of European production and consumption assessed against planetary boundaries

European Commission

Source: JRC communication to FACCE JPI workshop on Food Systems and Shocks

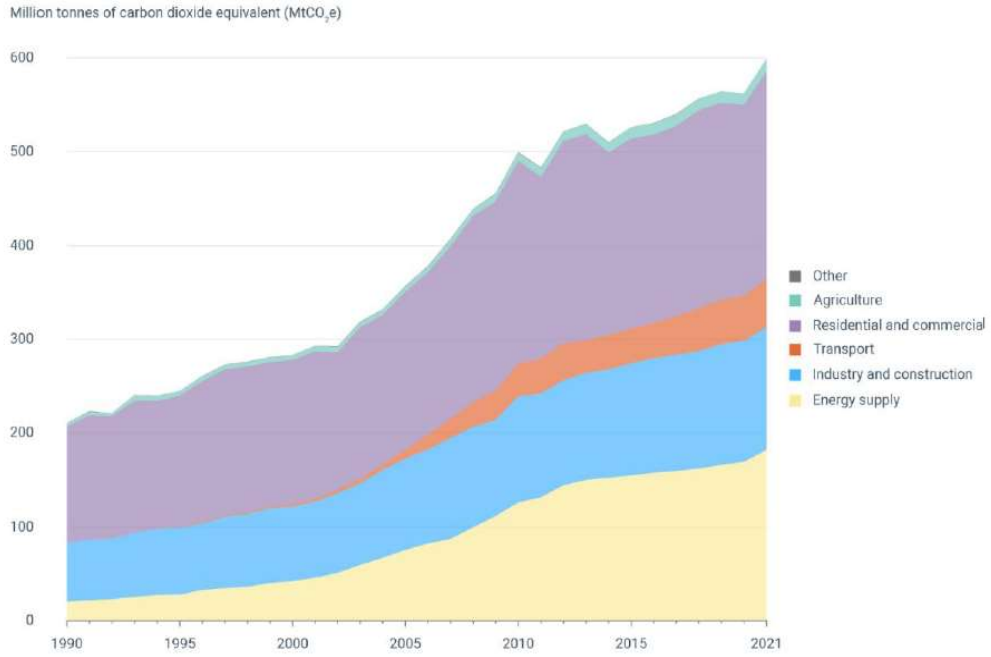
Competition for biomass: food systems and the bioeconomy



Source: European Scientific Advisory Board on Climate Change

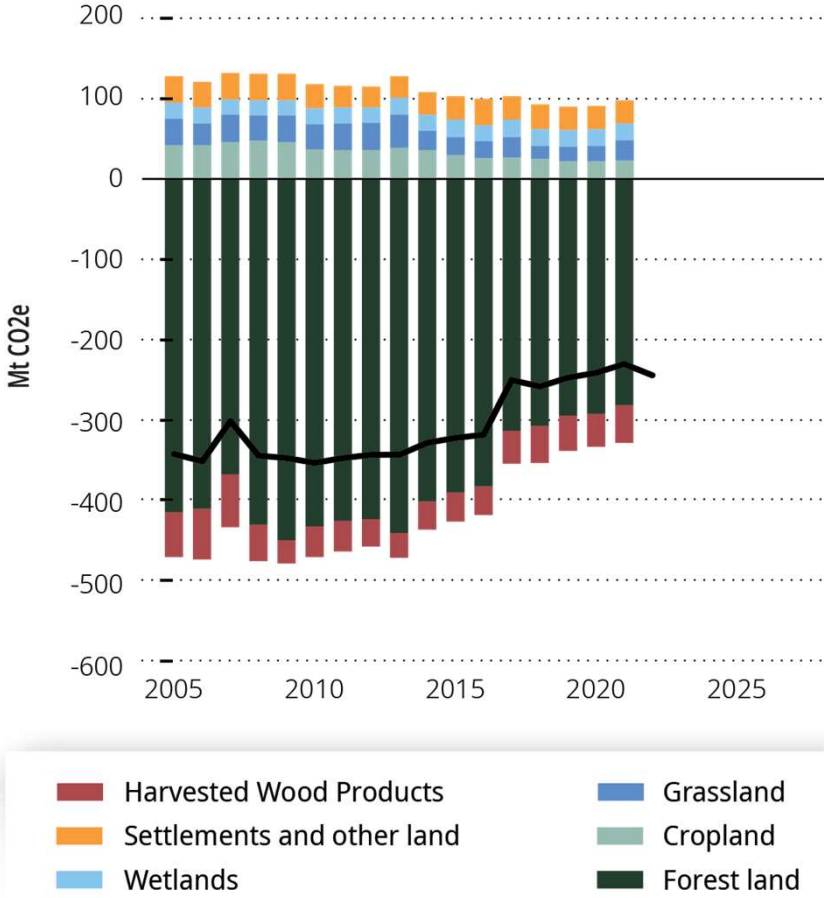
The EU reliance on biomass energy and climate change have negative impacts on the carbon sink (forests and soils)

Biomass use for bioenergy has been strongly increasing in the EU-27



Source: EEA based on EC (2023)

The carbon sink in the LULUCF sector has been declining rapidly



By 2040, future increase would be linked to uptake in advanced liquid biofuels and biomethane as part of enhanced value chains for biogenic carbon, while direct consumption of solid biomass has been modelled to decline (EC scenario)

Source: European Scientific Advisory Board on Climate Change

Food systems in Europe are impacted by climate change; yet at the same time they also contribute to climate change…

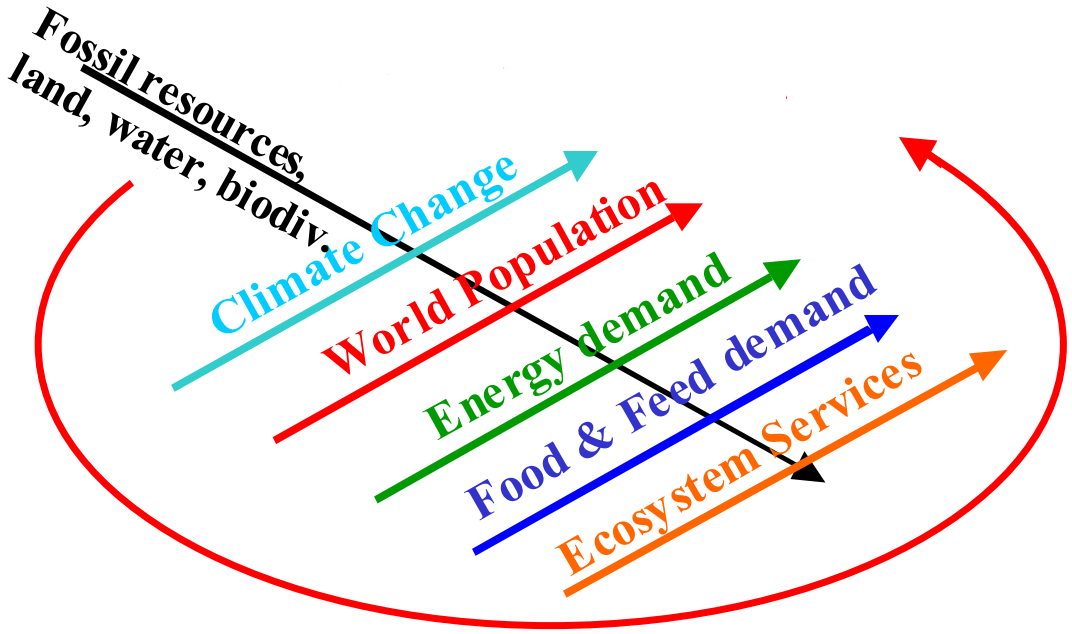
•**Europe is the fastest-warming continent**. Weather extremes, droughts and floods are negatively affecting crop and livestock production in Europe and beyond, hence impacting food availability/security.

• Shocks like **pandemics** and **wars** near Europe have shown the vulnerability of food supply chains, affecting **economy and security**.

•Europe's food system relies heavily on global resources (soil, freshwater) and a **limited number of suppliers** for key inputs.

•There is limited understanding of **how climate shocks impact society**, with food systems sustainability and justice issues remaining underexplored.

A perfect storm by 2030?

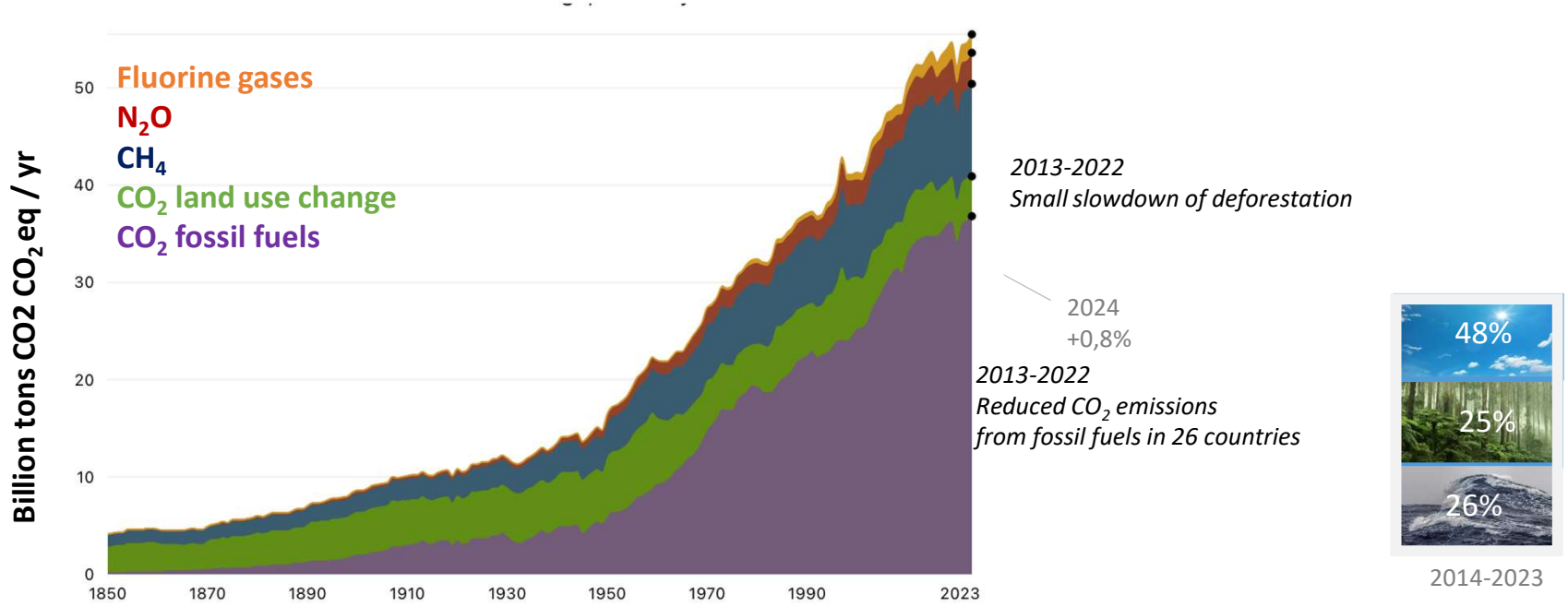


A "perfect storm" of food shortages, scarce water and insufficient energy resources threaten to unleash public unrest, cross-border conflicts and mass migration as people flee from the worst-affected regions.

Prof. John Beddington, former UK Chief Scientific Adviser, 2009

Fast increase in global greenhouse gas emissions

70% of emissions caused by fossil fuels:
2013-2022 +0,6% per year

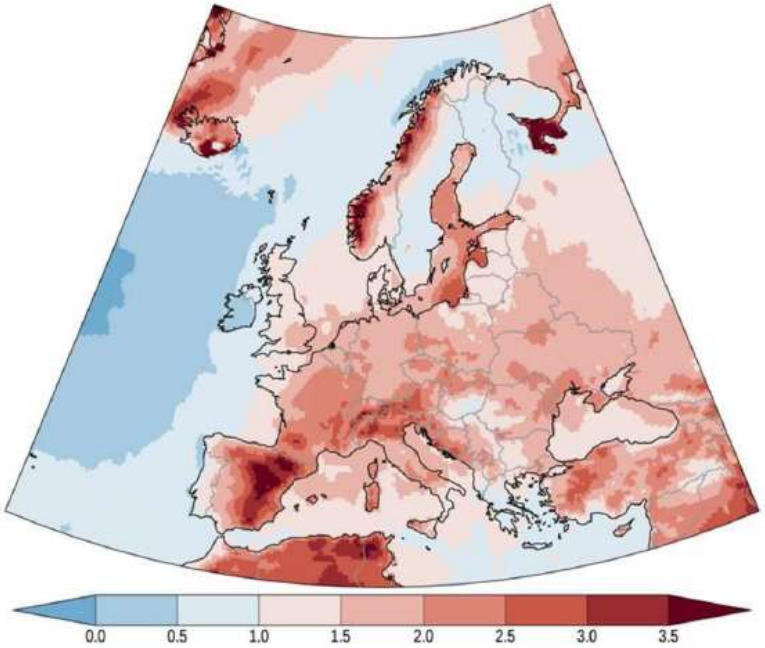


Source: Forster et al, ESSD, 2023; Global Carbon Budget, 2024

Carbon sinks in land and oceans store ca. 50% of anthropogenic CO_2 emissions. They need to be preserved

Global warming is accelerating – Europe is warming much faster than the global average

- 2023 was the warmest year on record by a huge margin; it is almost certain to have been the warmest year in the last 100,000 years.
- Each month since June 2023 was warmer than the corresponding month in any previous year.
- In each month since April 2023, the world's oceans were warmer than ever before recorded



Rate of change in temperature over 1950-2022 compared to global warming (multiplication)

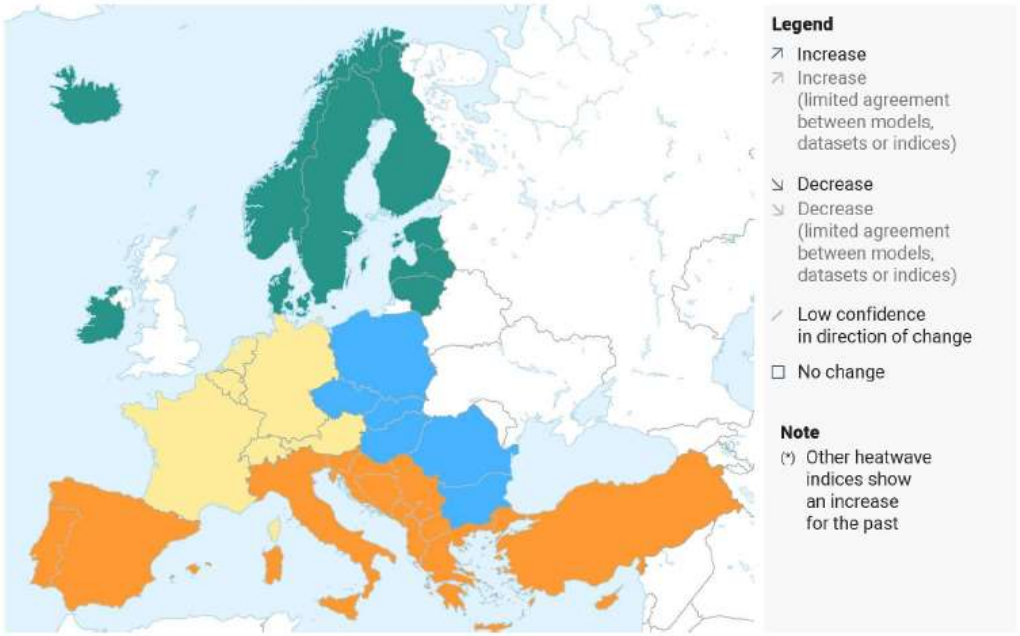
Source: Copernicus Climate Change Service

European Commission

Climatic risk drivers are accelerating in all regions

Land regions	Northern Europe			Western Europe			Central-Eastern Europe			Southern Europe		
	Past	Future		Past	Future		Past	Future		Past	Future	
		Low	High		Low	High		Low	High		Low	High
Mean temperature	↗	↗	↗	↗	↗	↗	↗	↗	↗	↗	↗	↗
Heat wave days	□(*)	↗	↗	↗	↗	↗	↗	↗	↗	↗	↗	↗
Total precipitation	↗	↗	↗	↗	⟋	↘	↗	↗	⟋	↘	↘	↘
Heavy precipitation	↗	↗	↗	↗	↗	↗	↗	↗	↗	↗	↗	↗
Drought	↗	↘	↘	↗	⟋	↗	↗	⟋	↗	↗	↗	↗

European regional seas	Past	Future
Sea surface temperature	↗	↗
Sea level	↗	↗

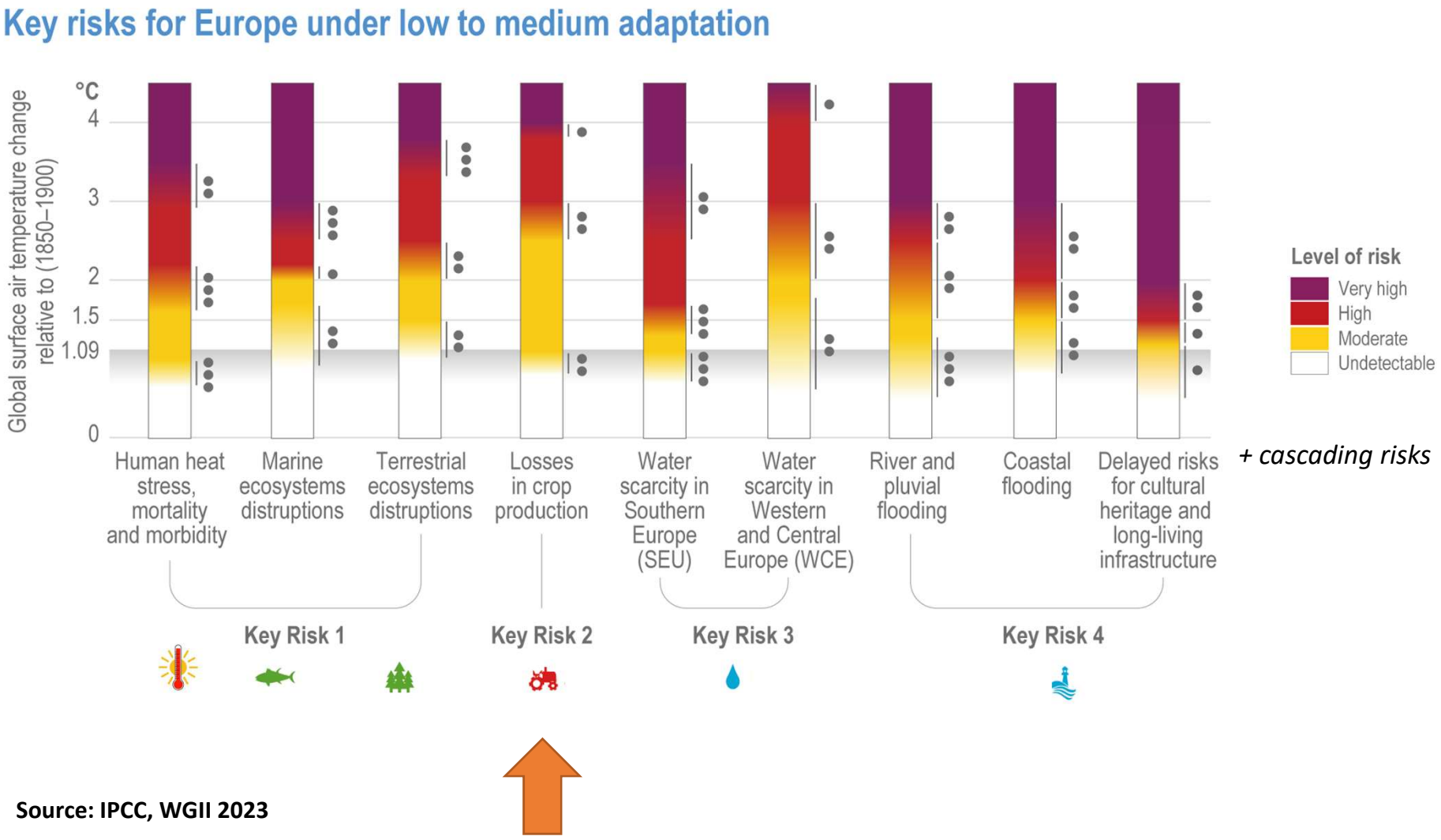


- **Heatwaves** are becoming more frequent and intense.
- **Rain patterns** are changing, with both downpours and dry spells increasing in magnitude.
- **Warmer winters** and **earlier start to spring**.
- **Increasing frequency of compound (extreme) events**, such as:
  - Hot and dry
  - Warm and wet
  - Freeze/thaw cycles in the east and north
  - Late frost after very warm winter and first half of spring

European Commission

Source: EU Climate Risk Assessment (EUCRA)

Key risks of climate change for Europe



Source: IPCC, WGII 2023

Climate risks for food systems in Europe

Climate risks for 'Food' cluster	Urgency to act	Risk severity			Policy characteristics		
		Current	Mid-century	Late century (low/high warming scenario)	Policy horizon	Policy readiness	Risk ownership
Crop production (hotspot region: southern Europe)	Urgent action needed	+++	++	++	Short	Medium	Co-owned
Crop production	More action needed	+++	++	++	Short	Medium	Co-owned
Food security due to climate impacts outside Europe (*)	Further investigation	++	++	+	Short	Medium	EU
Food security due to higher food prices	Further investigation	++	+	+	Short	Medium	Co-owned
Fisheries and aquaculture	Further investigation	++	+	+	Short	Medium	Co-owned
Livestock production	Watching brief	++	++	+	Short	Medium	Co-owned

Legends and notes

Urgency to act
- Urgent action needed
- More action needed
- Further investigation
- Sustain current action
- Watching brief

Risk severity
- Catastrophic
- Critical
- Substantial
- Limited

Confidence
Low: +
Medium: ++
High: +++

(*) Wide range of evaluations by authors and risk reviewers.

Source: European Climate Risk Assessment, 2024

Risks and vulnerabilities in the EU food supply chain

Risk types

Biophysical and environmental

- Changing climate and weather patterns
- Natural disasters
- Extreme weather events
- Land (lack and degradation of)
- Natural resources and biodiversity (loss and degradation)
- Pests, diseases and invasive species
- Pollution and nuclear contamination
- Water degradation and scarcity

Economic and Market

- Input cost increase and reduced availability
- Labour availability and increased cost
- Financial liquidity (lack of)
- Financial and economic crisis
- Market contraction, concentration and (unfair) competition
- Market instability (price fluctuations, inflation etc.)

Socio-cultural and Demographic

- Change in consumers preferences and public image
- Generational renewal and sector attractiveness
- Pandemic and human health
- Population growth, displacement and migration
- Social disorders and unrest

(Geo)Political and Institutional

- (Geo)Political instability, conflict (war) and terrorism
- Trade barriers and distortions in trade flows
- Policy changes & regulatory requirements

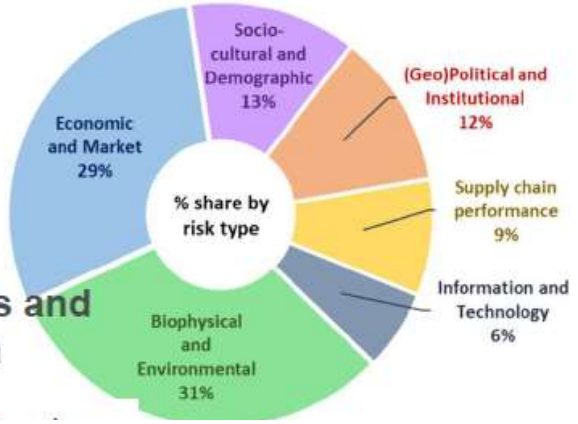
Supply chain performance

- Food contamination and waste
- Transport, infrastructure and logistics (lack of or failure)
- Up-stream supplies (disruption or availability)

Information and Technology

- Information, knowledge and innovation (lack of)
- Technological risk (lack of, new biotechnologies risks, etc.)
- Cyber attacks and internet blackouts

Figure 1. Share of risk types mentioned by respondents



Results per Member States, sectors and stages of the EU food supply chain

Source: European Food Security and Crisis Preparedness and Response Mechanism

foodalert.socialsimulations.org

FOOD ALERT

STRESS TESTING THE EU FOOD SYSTEM

Sponsors > eit Food

Co-funded by the European Union

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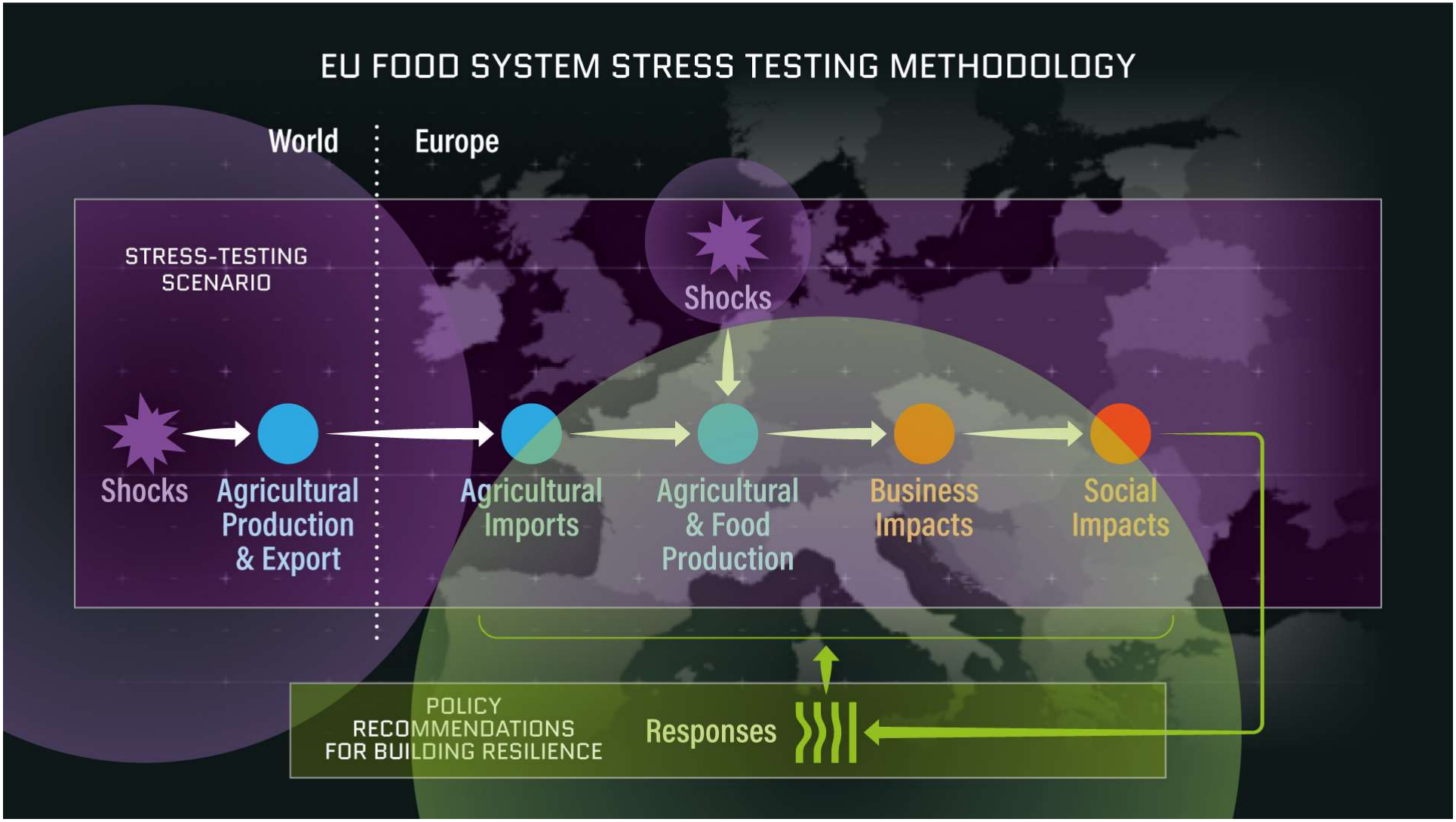
Building on the results of the Cascades, EU Horizon 2020 project

cascades
Cascading climate risks: Towards adaptive and resilient European Societies


EU FOOD SYSTEM STRESS TESTING METHODOLOGY
World
Europe
STRESS-TESTING SCENARIO
Shocks
Shocks
Agricultural Production & Export
Agricultural Imports
Agricultural & Food Production
Business Impacts
Social Impacts
POLICY RECOMMENDATIONS FOR BUILDING RESILIENCE
Responses

eit Food

POLICY IDEAS FOR A MORE RESILIENT EUROPEAN FOOD SYSTEM

Co-funded by the European Union

E **stablish** a EU joint purchasing mechanism

U **phold** subsidies but redirect towards protein crops such as legumes and oilseeds

F **ARM** programme (Food Allocation Reserve Management) to upscale food reserve

O **utreach** to vulnerable populations in times of crisis

O **verall** strengthen European Food Security Crisis preparedness and response Mechanism (EFSCM)

D **eter** excessive speculation in foodstuffs

C **rops** for food and feed rather than biofuels

R **elax** EU environmental standards temporarily for critical food imports

I **ncrease** investment in food innovation, especially protein diversification

S **upport** regional food supply chains for crisis resilience and transparency

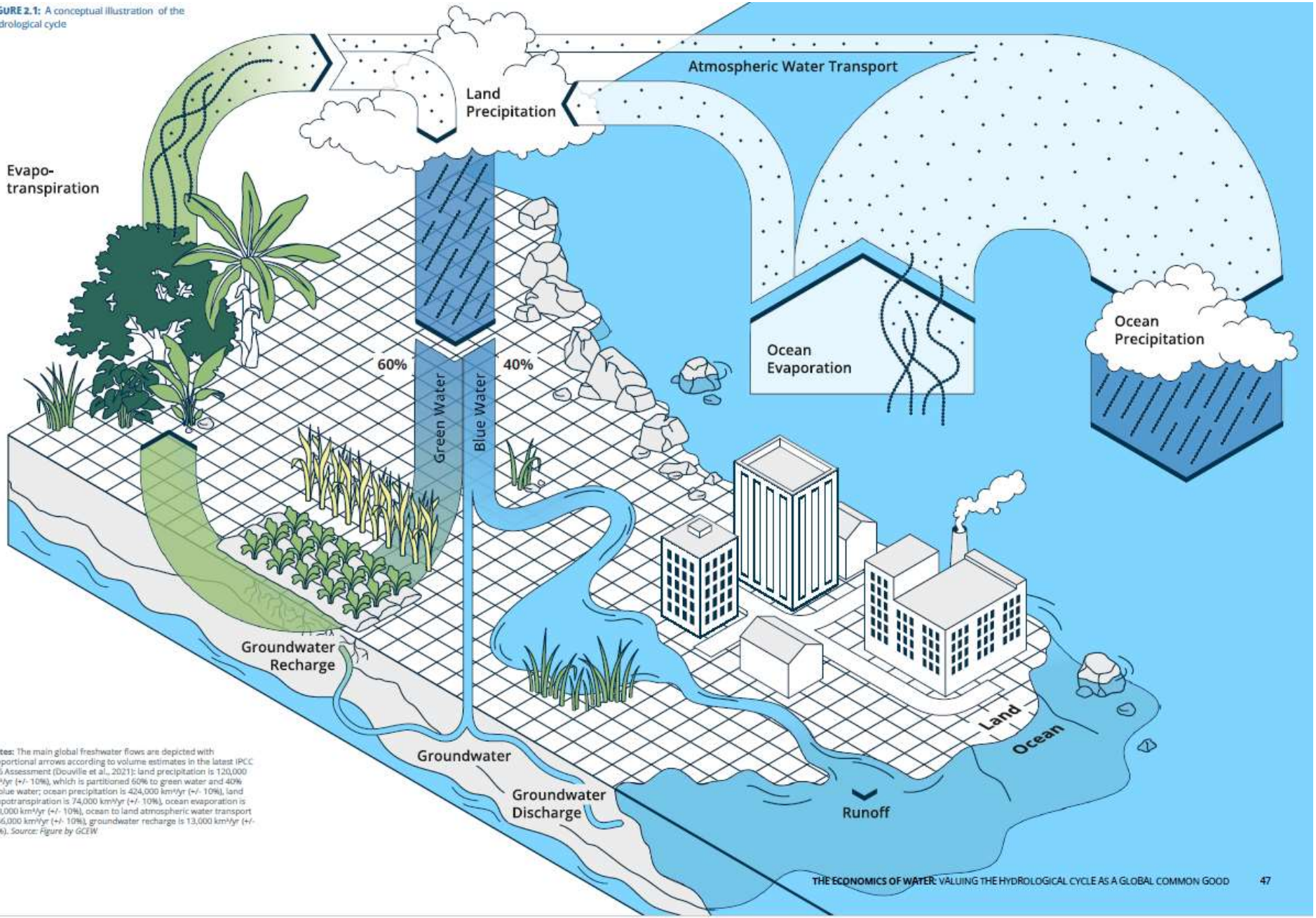
I **dentify** available land and water for protein crop-focused food production

S **hare** risks of EU farmers via an insurance mechanism on climate and supply chain events

Source: Food Alert Workshop Simulation Report

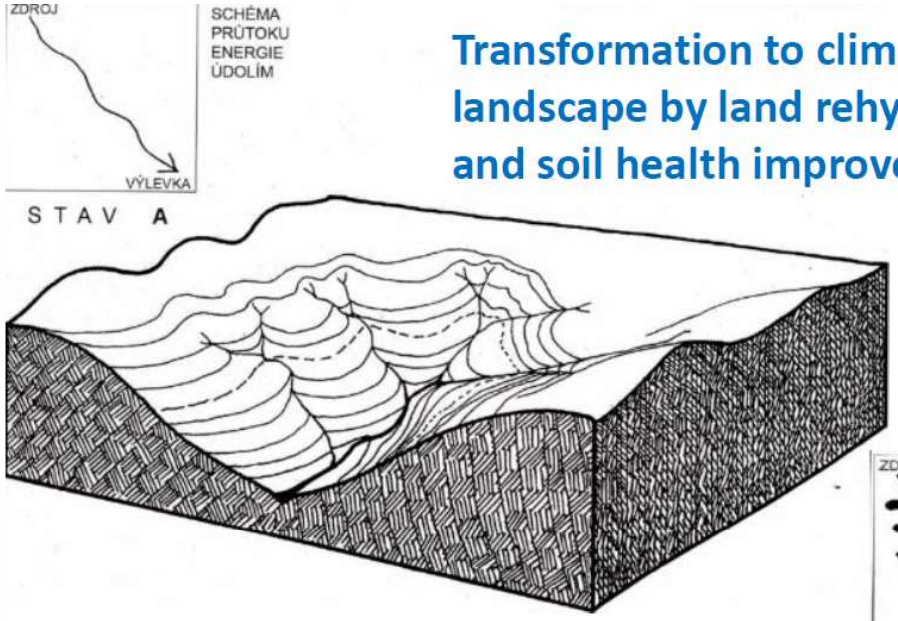
The hydrological cycle as a global common good

FIGURE 2.1: A conceptual illustration of the hydrological cycle



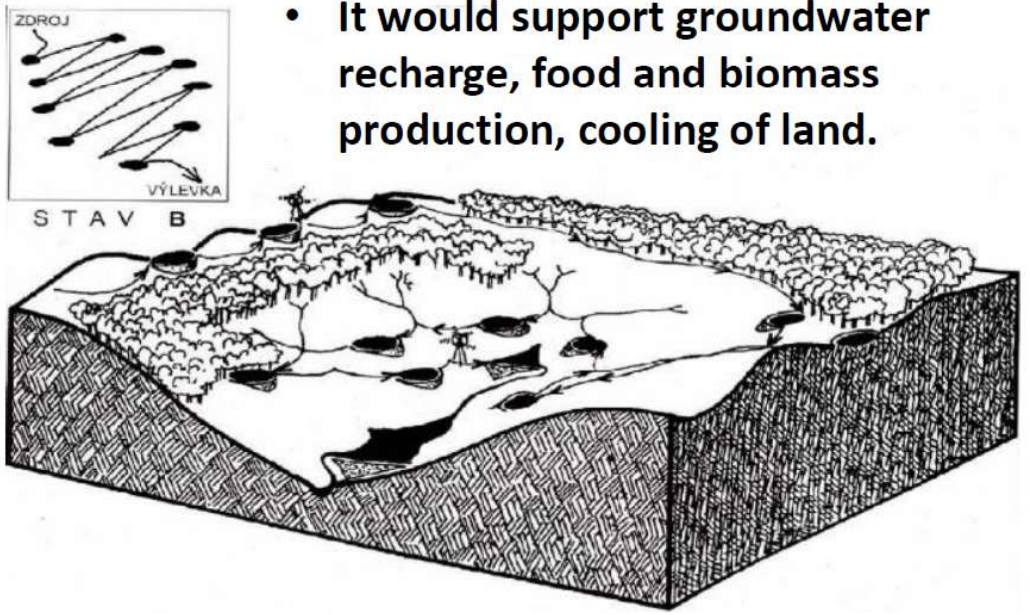
Notes: The main global freshwater flows are depicted with proportional arrows according to volume estimates in the latest IPCC AR6 Assessment (Douville et al., 2021): land precipitation is 120,000 km³/yr (+/- 10%), which is partitioned 60% to green water and 40% to blue water; ocean precipitation is 424,000 km³/yr (+/- 10%), land evapotranspiration is 74,000 km³/yr (+/- 10%), ocean evaporation is 470,000 km³/yr (+/- 10%), ocean to land atmospheric water transport is 46,000 km³/yr (+/- 10%), groundwater recharge is 13,000 km³/yr (+/- 10%). *Source: Figure by GCEW*

Resilience through increased water retention of soils and landscape structures



Transformation to climate-smart landscape by land rehydration and soil health improvement

- **Till 2035 we need to increase water retention capacity of soil and landscape structures!**
- **It is highly decentralised water infrastructure of landscape enabling ecosystem services**
- **It would support groundwater recharge, food and biomass production, cooling of land.**



- **Integrated water and soil planning on local level, good legislation support and rain water budgets!**
- **Every square metre or hectare of soil counts.** It has its share on rise or decline of flood and drought risks.

Source: Martin Kovacs, presentation at the FACCE JPI workshop on food systems shocks

One Water Vision, envisioning solutions to the global water crisis

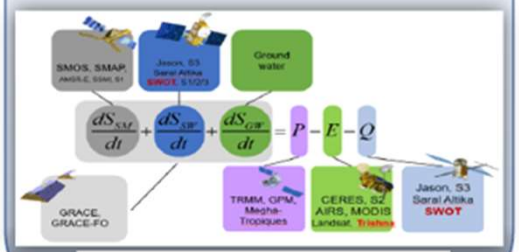
First global survey of Earth's surface waters

Launched Dec 16, 2022

Bilateral programs devoted to WATER
Land, Coastal, Ocean Water

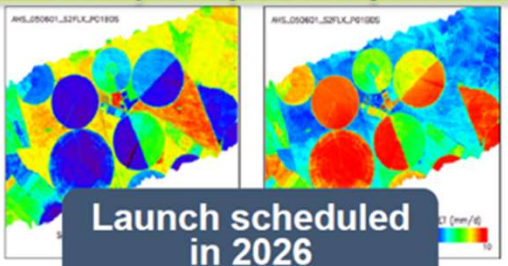
Satellite precursors
LSTM, S3-NG TOPO
Downstream Programs

Science AND
Downstream programs



hydroweb.next

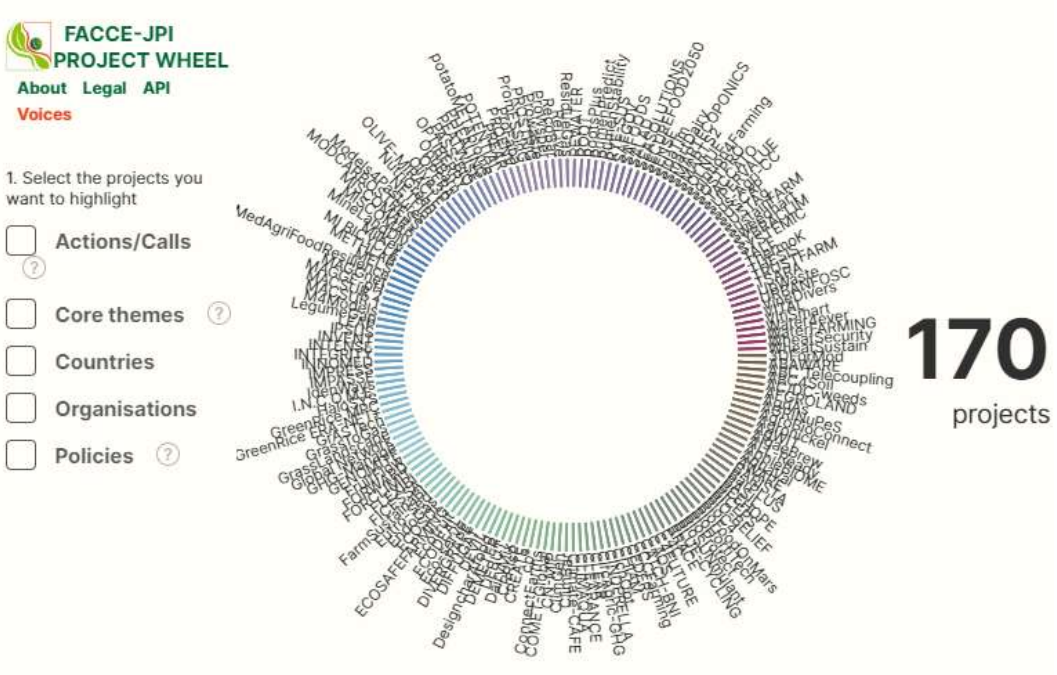
Ground **surface temperature** and daily **evapotranspiration**



Launch scheduled in 2026

Joint Programming Initiative on Agriculture, Food Security and Climate Change (FACCE-JPI)

- Established 2010, uniting 24 countries
- Mission: **Build an integrated European Research Area**
- Address the **interconnected challenges** of food security, agriculture, and climate change
- Amplify European research impact
- **Foster shared vision and align priorities**
- Promote coherence, reduce duplication, increase visibility
- **Enhance impact**, including the contribution on policy formulation based on scientific evidence



Joint Programming Initiative on Agriculture, Food Security and Climate Change (FACCE-JPI)

Key Accomplishments (documented in Project Wheel):

- 21 Joint Research Actions
- 170 Research Projects
- 978 Scientific Publications

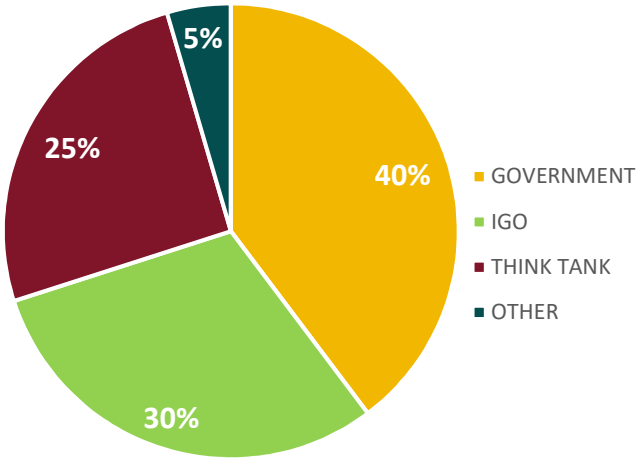
FACCE-JPI's Policy Footprint:

•**34%** of FACCE-funded papers are cited in policy documents.

•Multiple Citations: **68.5%** of cited papers are referenced in **more than one policy document.**

•Geographic Reach: FACCE-funded papers are cited in policy documents across **44 different countries**.

Distribution of Policy Document Types Citing FACCE-funded Publications



Thank you for your attention!

Joint Programming Initiative on Agriculture, Food Security and Climate Change

FACCEJPI

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