



LNEC Conference 2023

Floods, Water Scarcity and Extreme Events

Research Strategies and Challenges

A view from the European Commission Joint Research Centre

Jann Martinsohn

Lisbon, 19 October 2023

Floods, Water Scarcity and Extreme Events

A view from the EC Joint Research Centre

Water – an undervalued gem

The European Commission Joint Research Centre

The triple crisis (One example. – Of many to come?)

Scientific policy support: building a holistic view

Extreme events

Towards water resilience



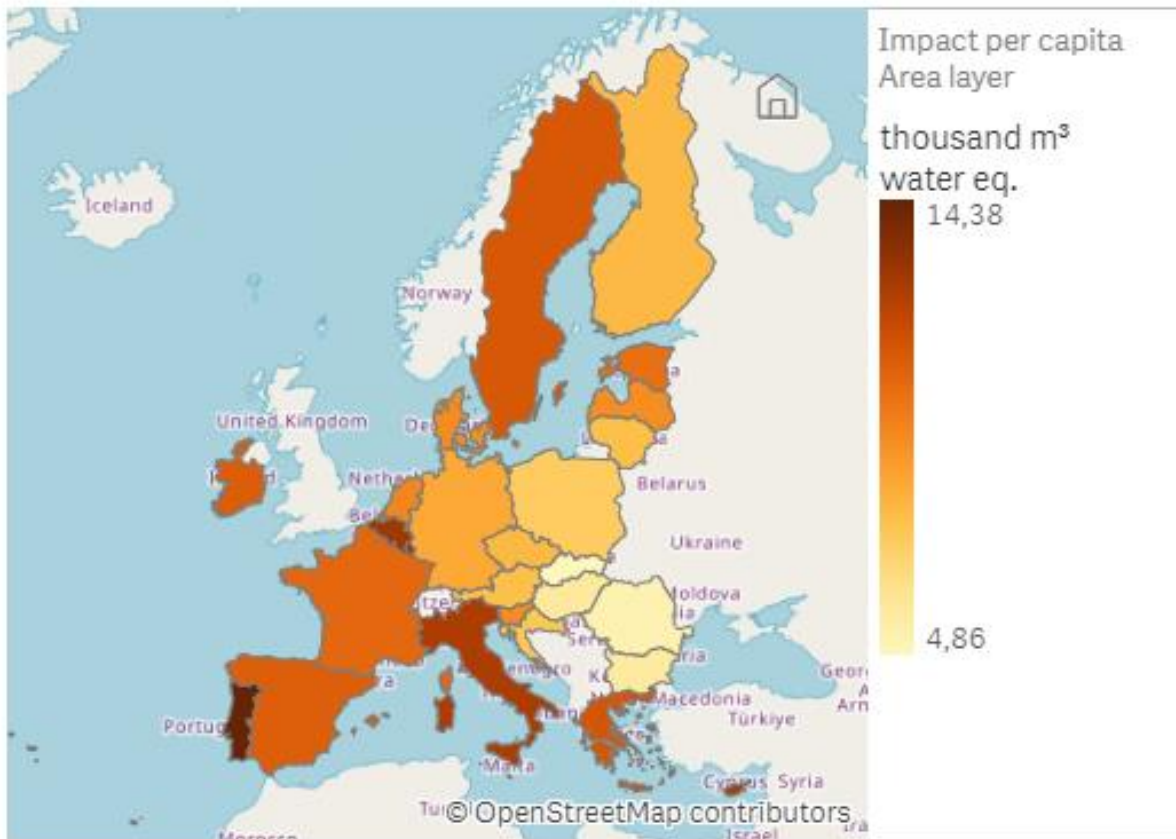
**No water, no life.
No blue, no green.**

Sylvia Earle

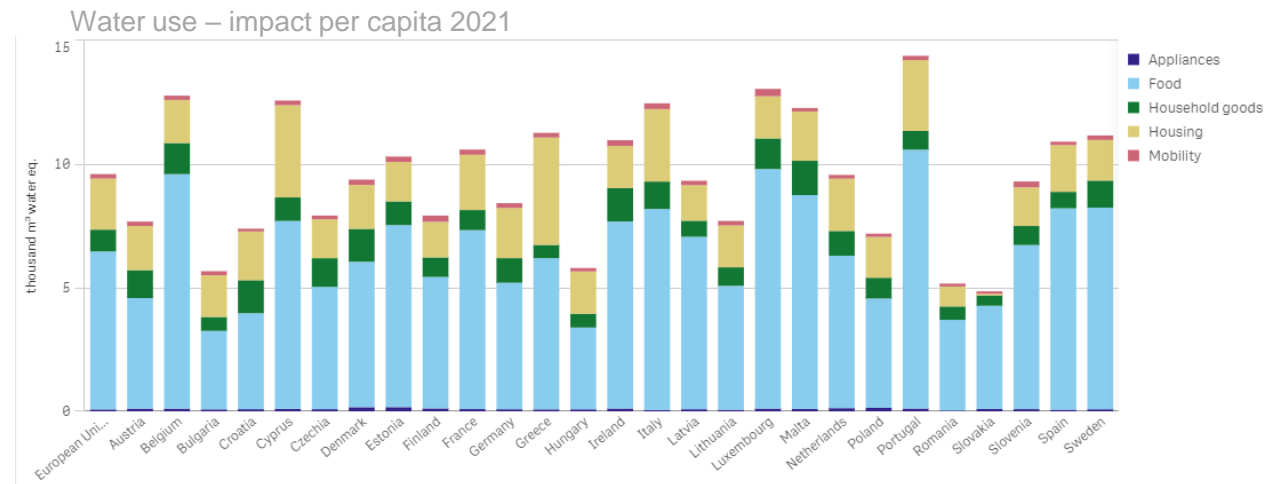
EU-27 Consumption Footprint 2021



Water use – impact per capita 2021



Contribution per area of consumption



Country:

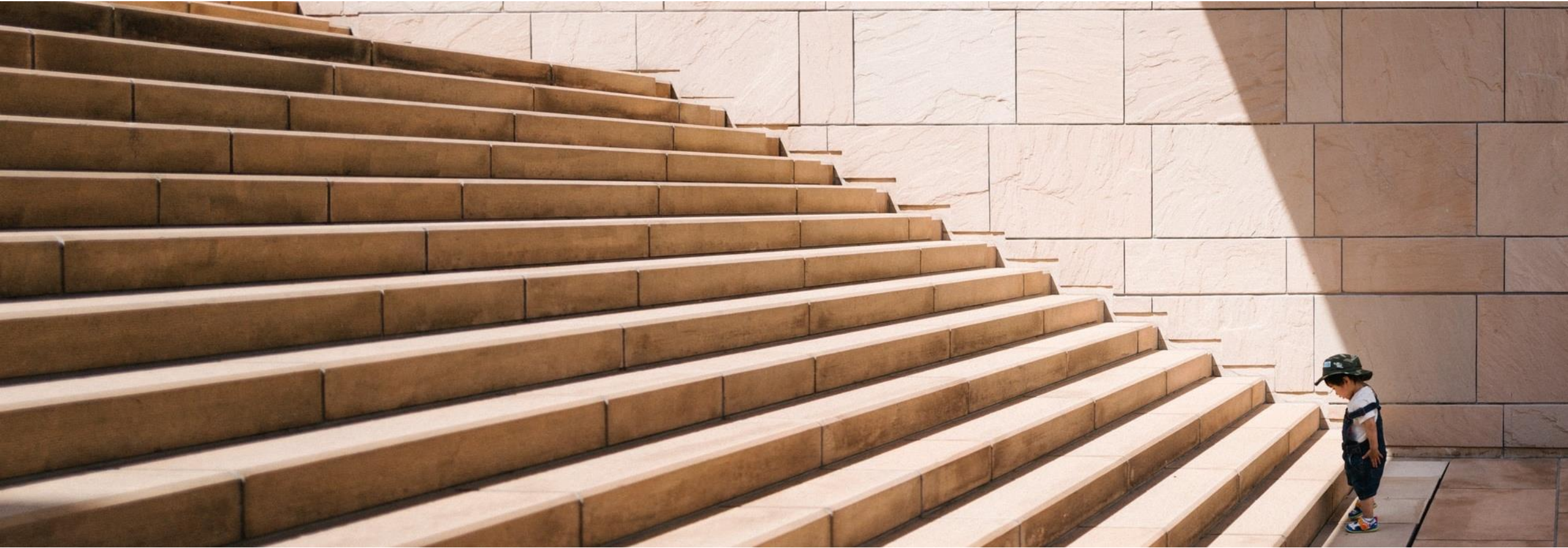
Impact category:

Initial year:

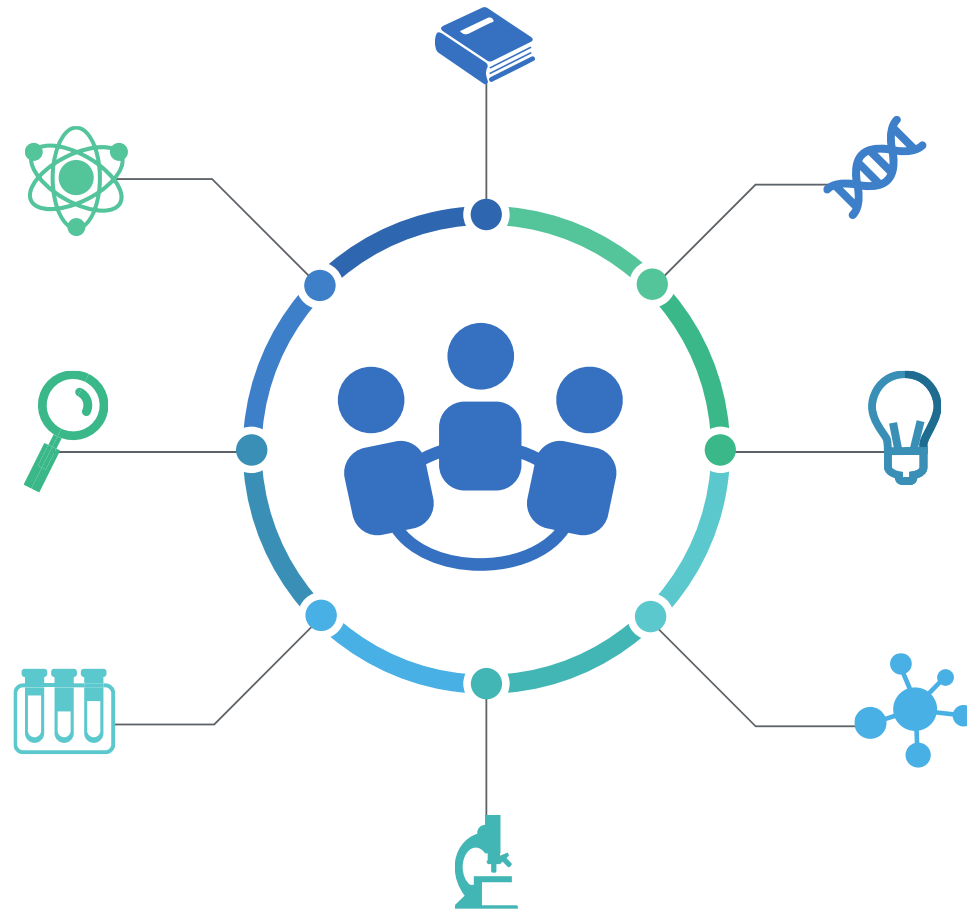
Final year:

Single year:

We are facing many challenges



We need evidence to inform policy



Science for policy



ANTICIPATE



INTEGRATE



IMPACT

Our purpose

The Joint Research Centre provides independent, evidence-based knowledge and science, supporting EU policies to positively impact society.

JRC sites

Headquarters in **Brussels**
and research facilities located
in **5 EU Countries:**

Belgium (Geel)

Germany (Karlsruhe)

Italy (Ispra)

The Netherlands (Petten)

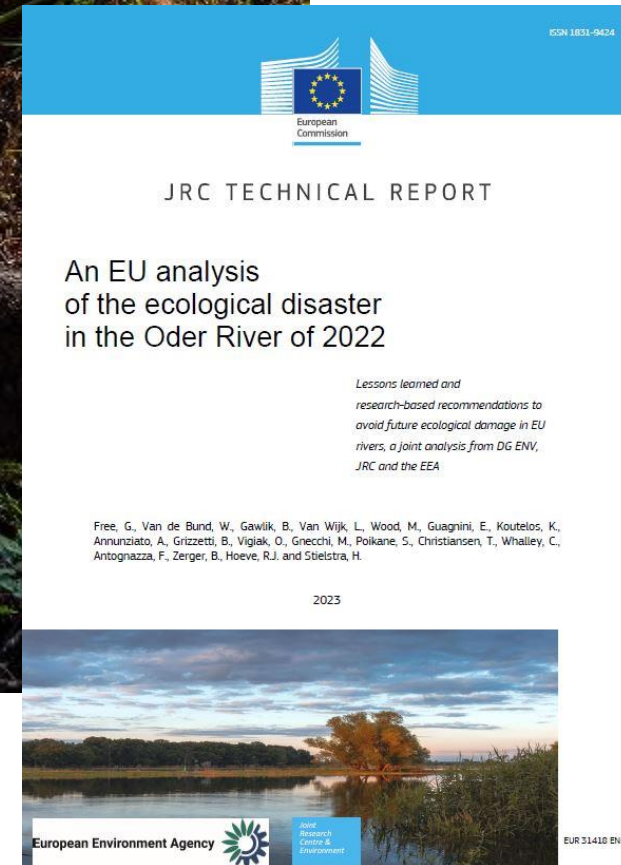
Spain (Seville)



The big three: Pollution – Climate Change - Biodiversity

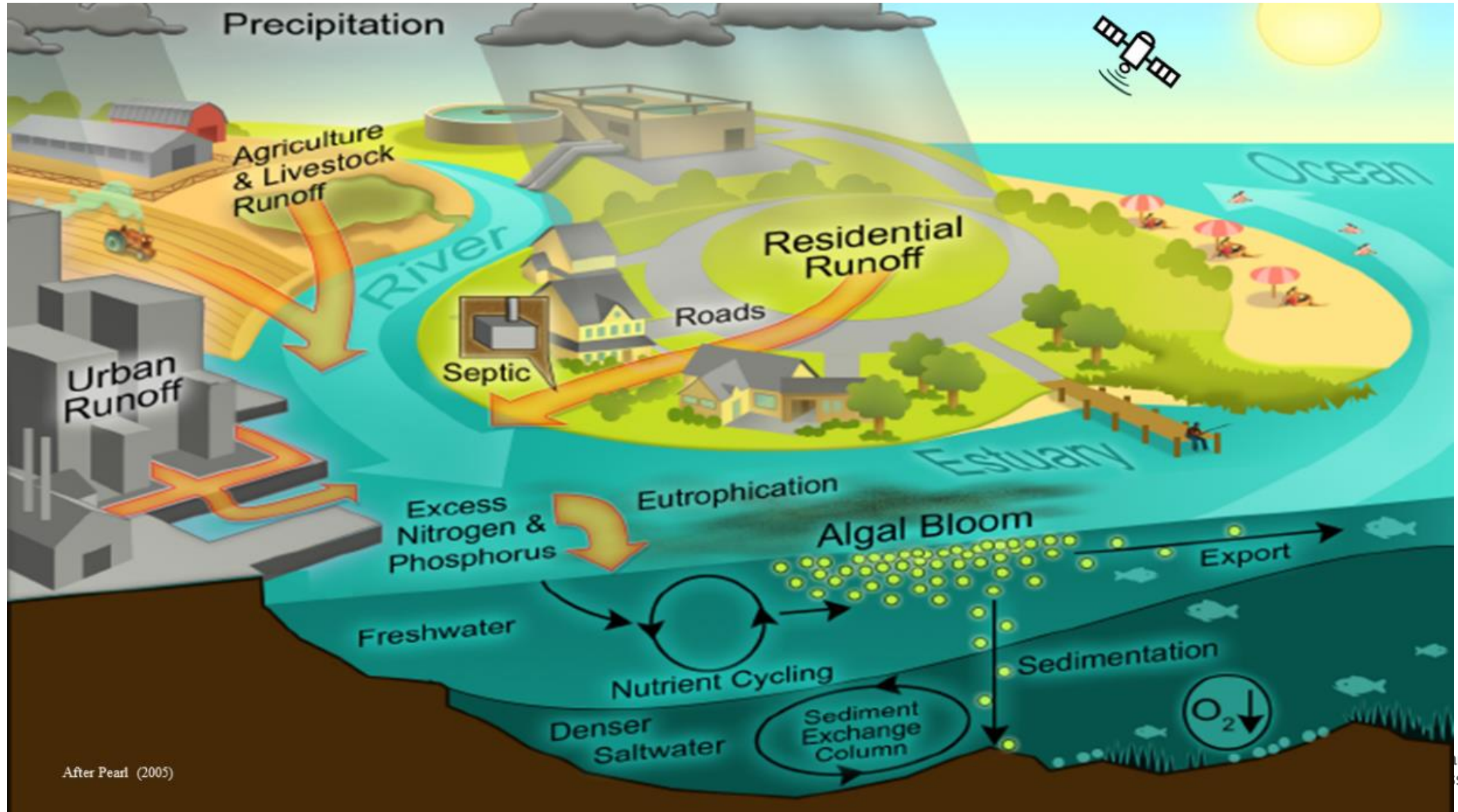


the Oder river disaster (2022)



JRC Ocean and Water & Disaster Risk Management

Holistic and integrated support: freshwater - coast - sea



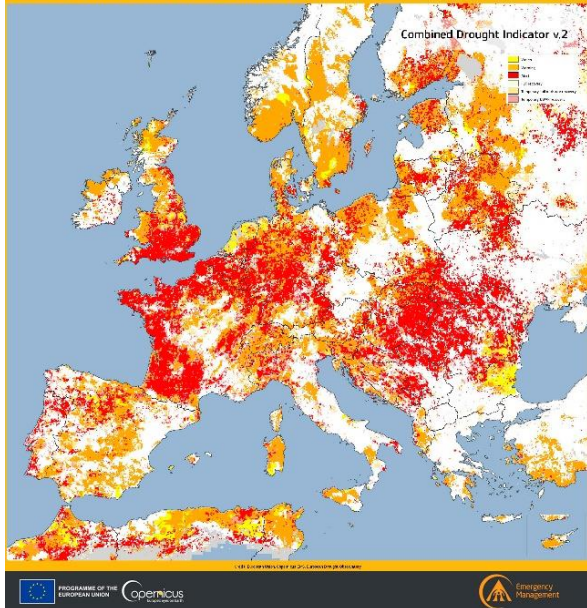
Extreme Events



Floods & droughts: the need for further action

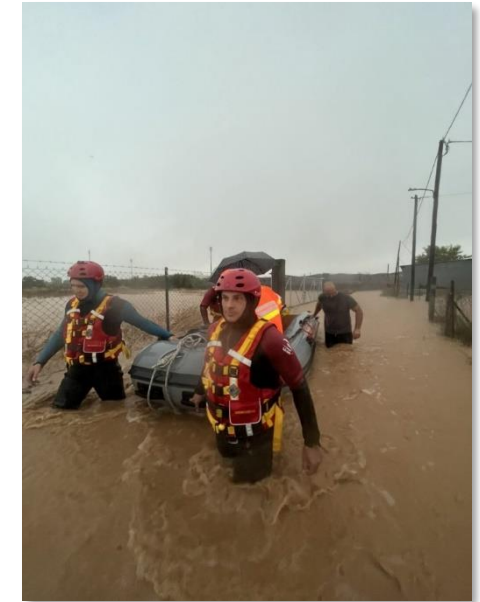
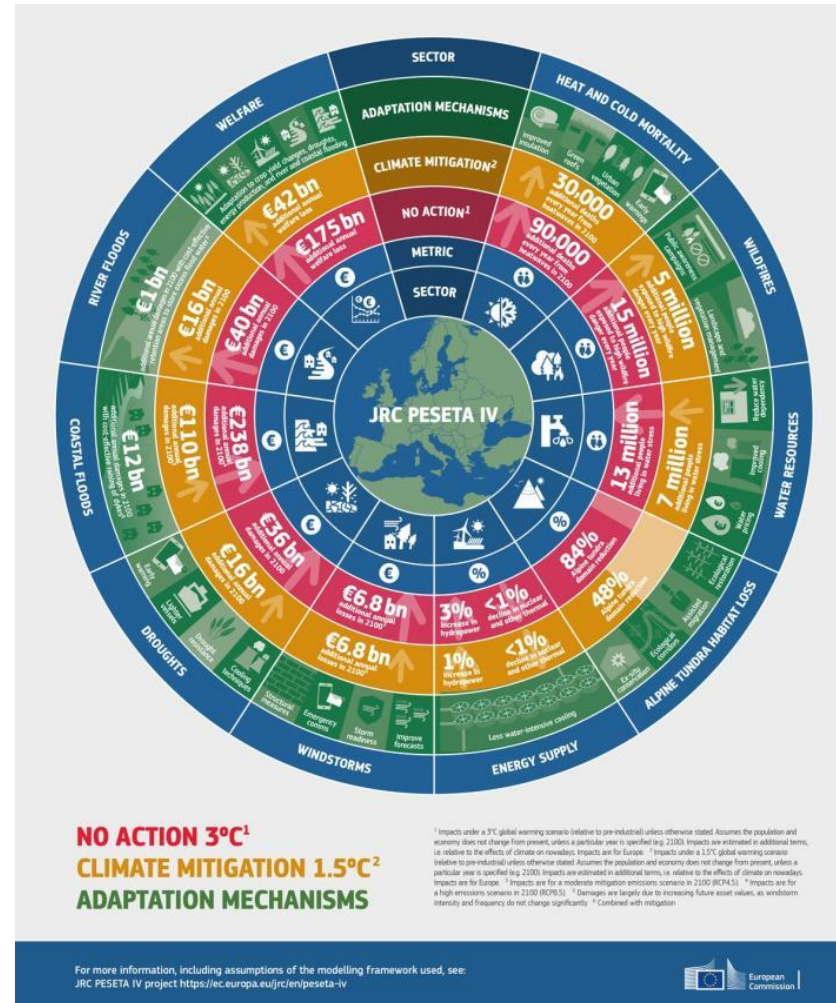


Situation of the Combined Drought Indicator in Europe - 2nd ten-day period of September 2022

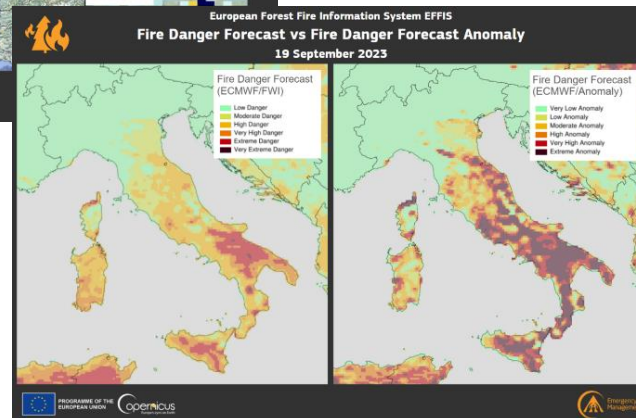
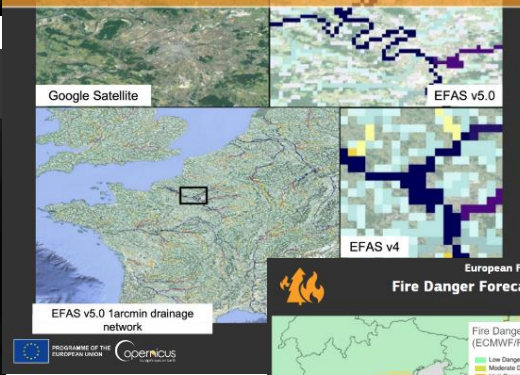
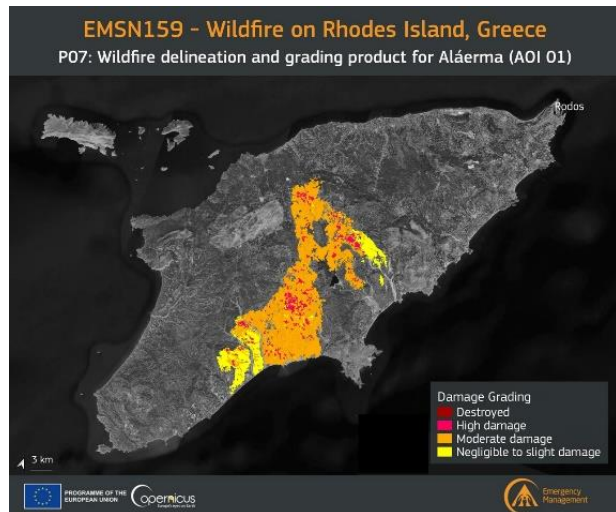
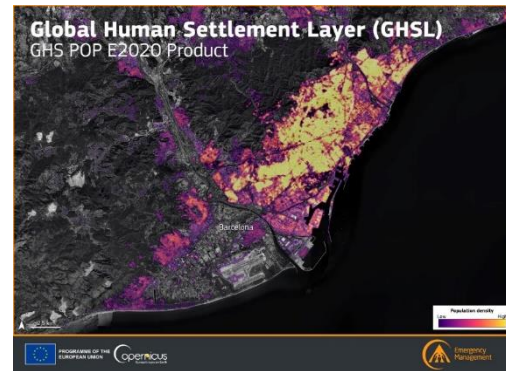
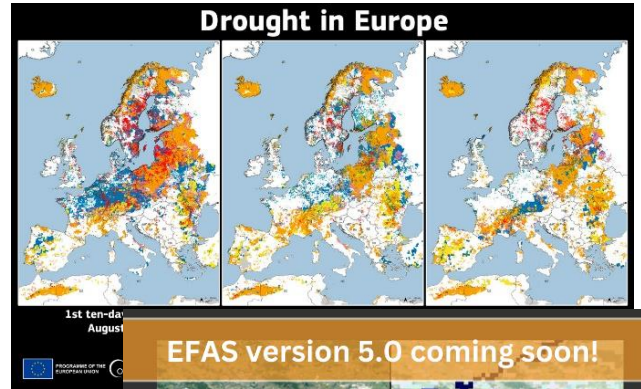
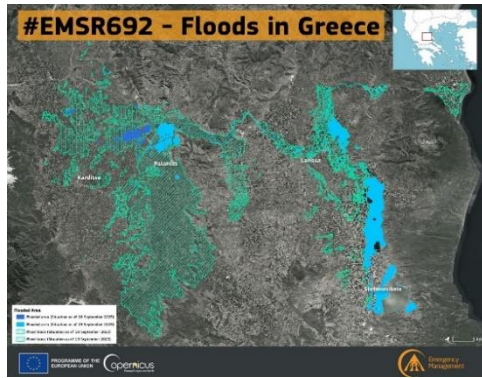


JRC PESETA IV study: climate change impacts and adaptation in Europe

Climate mitigation can considerably lower the impacts of future climate change in Europe. But not all the impacts will be avoided by mitigation. Adaptation can further reduce climate change impacts in a cost-efficient way.



Copernicus Emergency Management Service

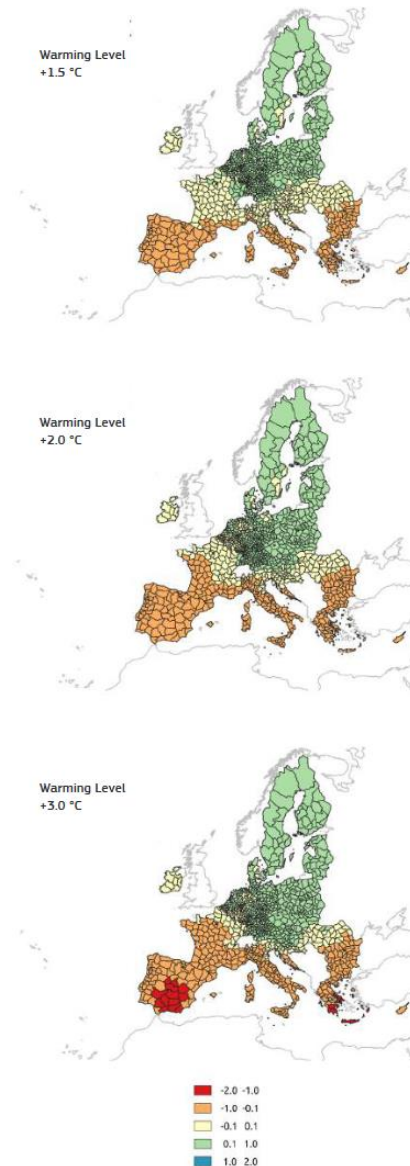


- Part of the EU Space program and one out of six Copernicus services program
- CEMS provides **timely and accurate geospatial information** (using satellite data in combination with models and in situ observations).
- CEMS is managed by the **Joint Research Center** of the European Commission in close coordination with DG DEFIS and DG ECHO.
- CEMS is a fully operational service (i.e. 24/7/365) and addresses **all phases of the disaster management cycle!**
- Bringing science into operations

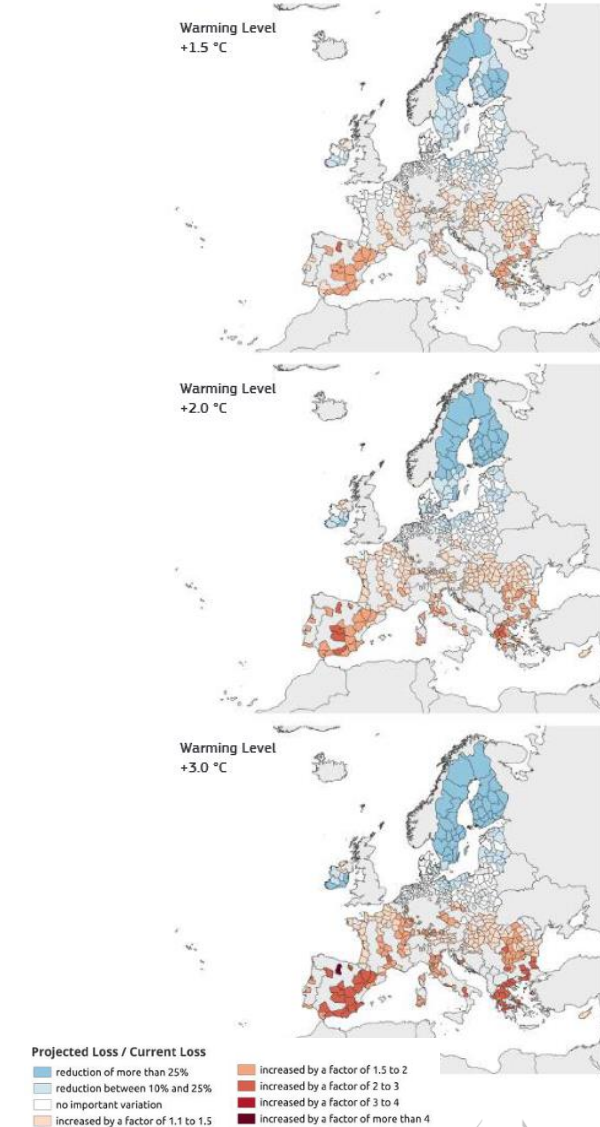
Drought Risk Atlas



Change in Standardized Precipitation Evaporation Index (SPEI)



Variation of drought risk for freshwater ecosystems between current and projected conditions.



EDORA - European Drought Observatory for Resilience and Adaptation

Newsletter

[Newsletter July 2022](#)

[Newsletter April 2023](#)

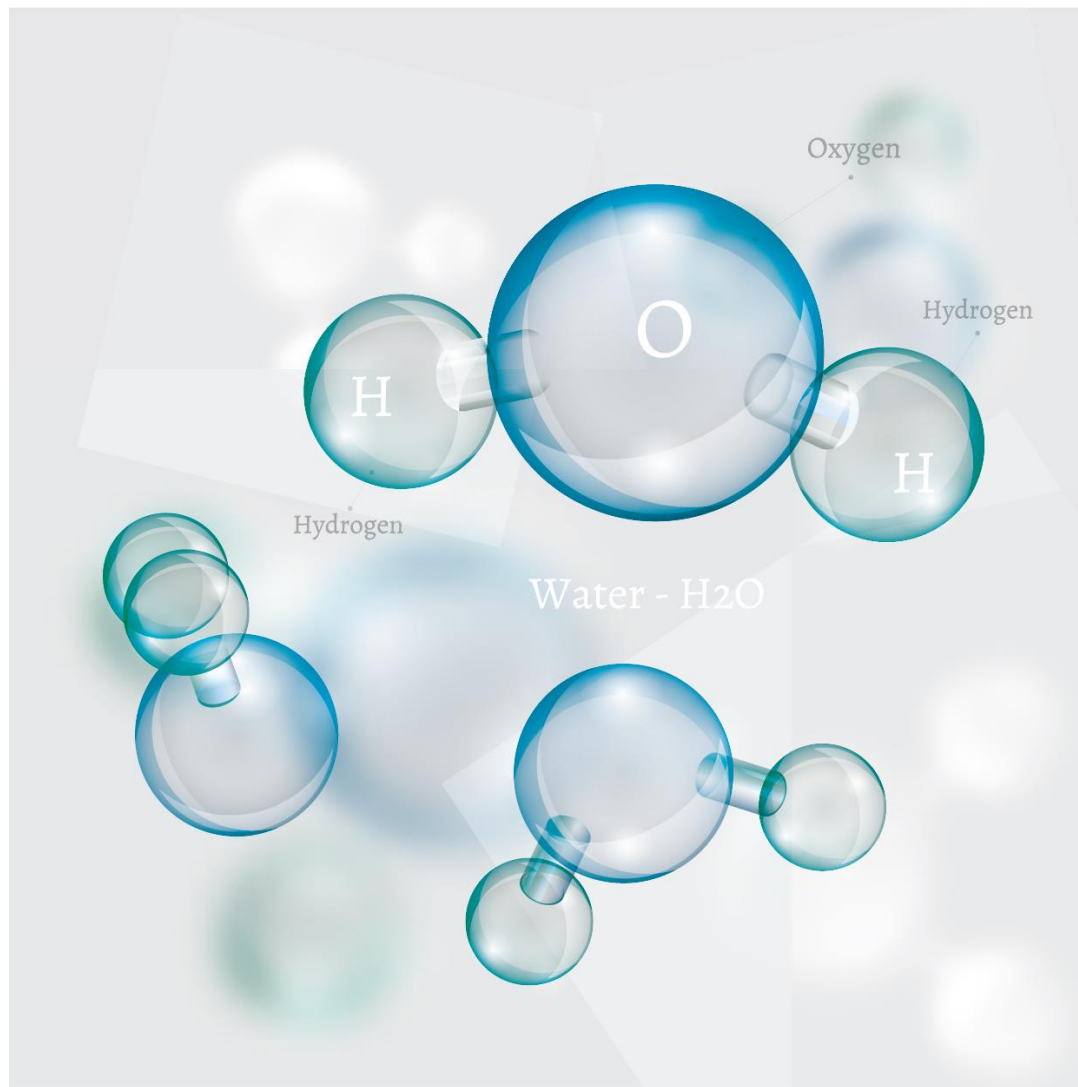
Event

[Kick-Off of the Network of Drought Observatories in the EU June 16th-17th 2022](#)

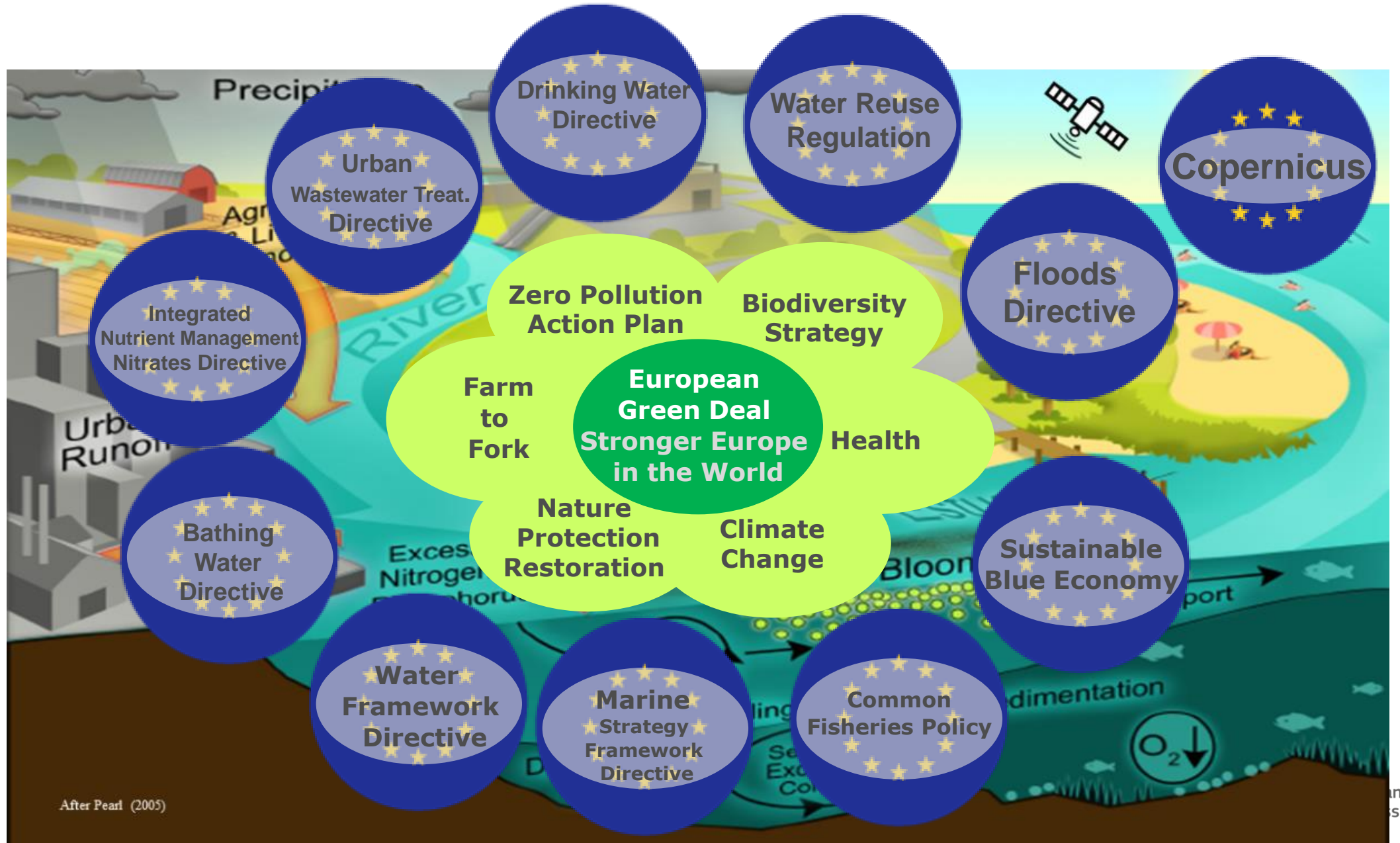


Droughts and water scarcity are an increasing problem in many parts of Europe. Climate change is expected to increase drought hazard, affecting both the frequency and magnitude of droughts. Changes in precipitation, combined with rising temperatures, will significantly worsen existing stresses on the quality and quantity of freshwater resources. **Economic development, human health and ecosystems are inseparably linked to sufficient availability of freshwater.** The European Green Deal and its initiatives now provide the necessary framework and momentum to move forward with an ambitious agenda on water quantity management, along with an increasing awareness and the application of new water legislation.

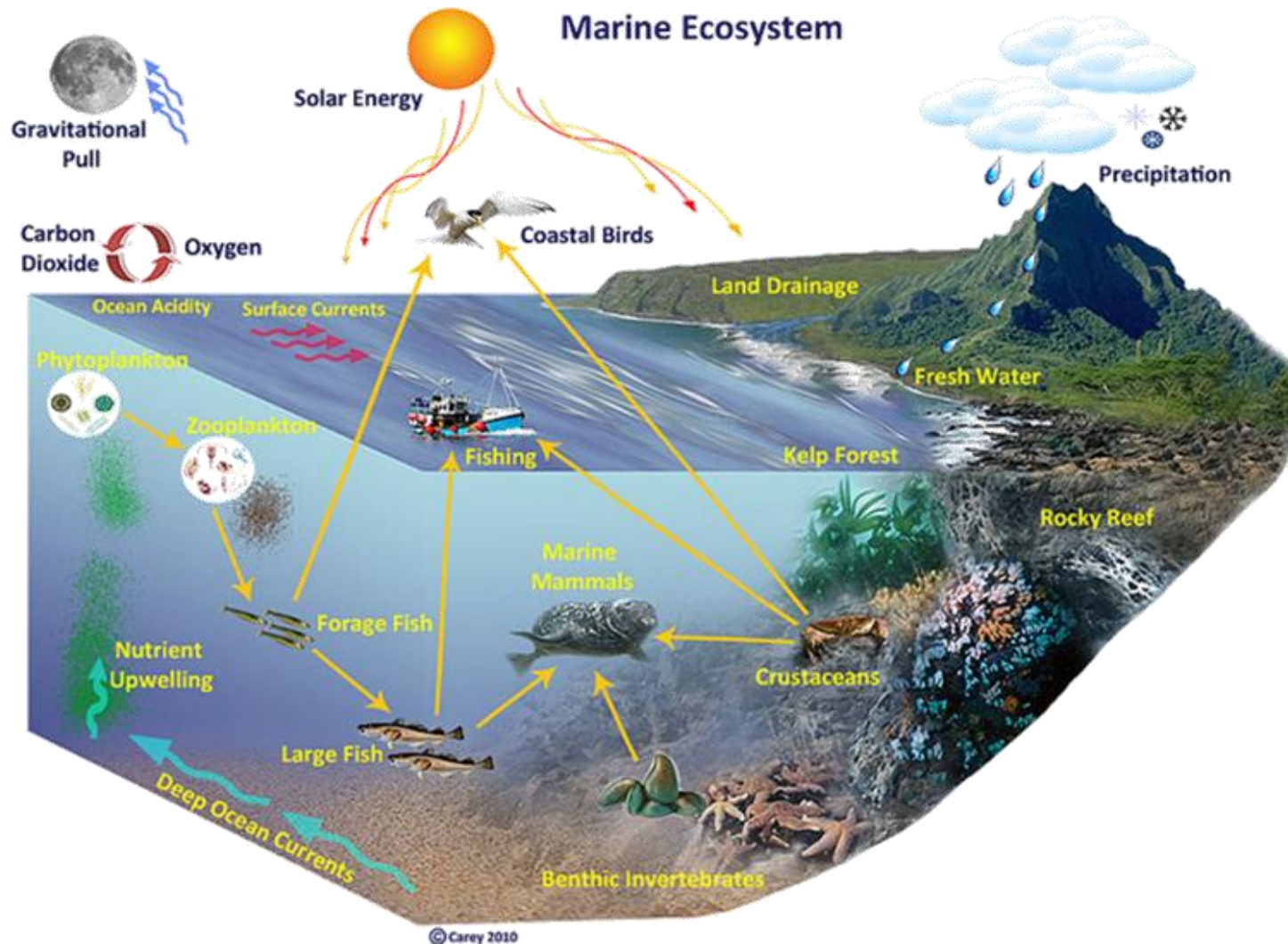
Towards Water Resilience



The EU Water Acquis (extended)

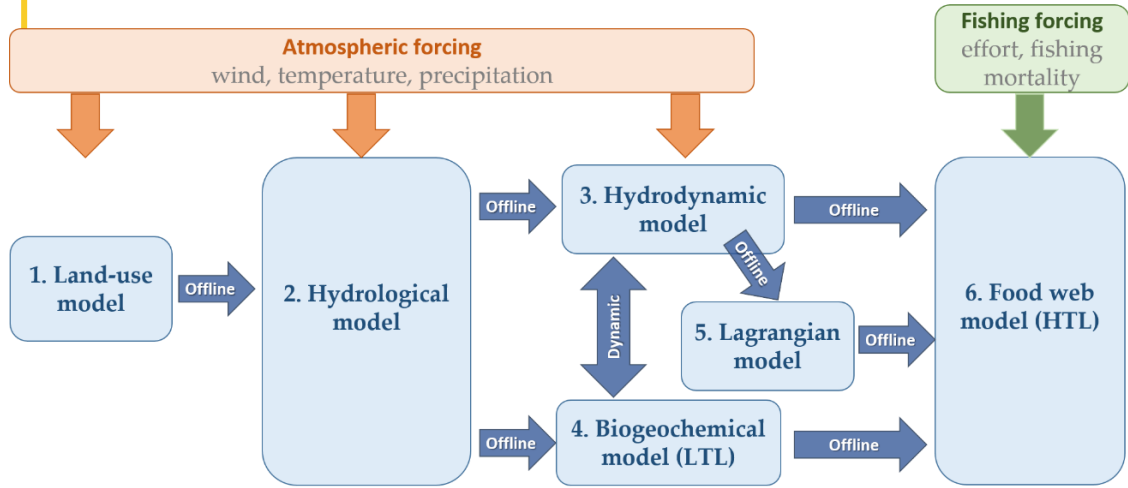


Blue2 - Modelling framework for policy support



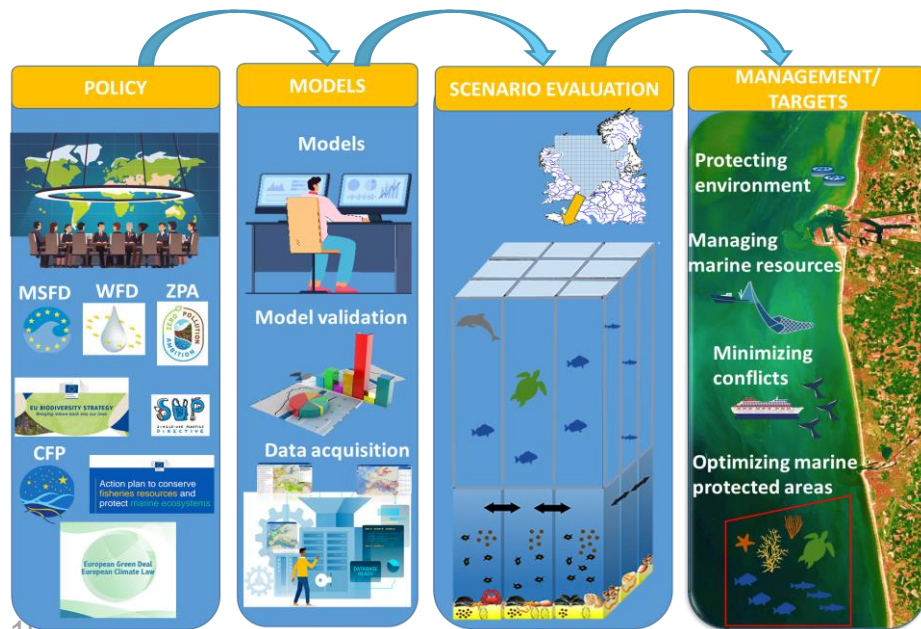
Blue2 - Modelling framework for policy support

- a digital twin of the hydrosphere to evaluate policy options -



Integrated modelling tool to simulate the impact of management options on the environmental status of EU water/marine ecosystems:

- land use and water use
- diffuse and point source of pollution
- atmospheric forcing
- hydrologic models
- marine hydrodynamic-biogeochemical and food-web models

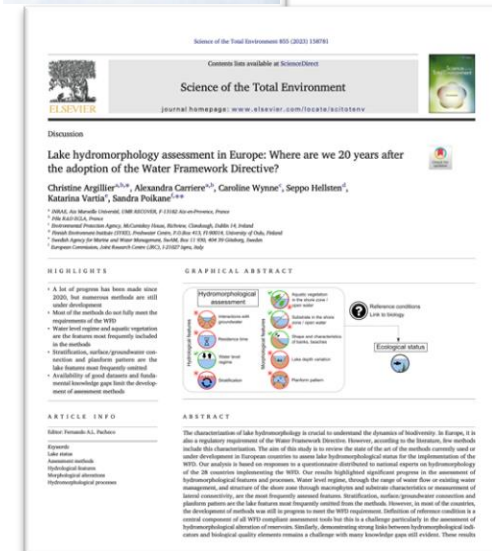
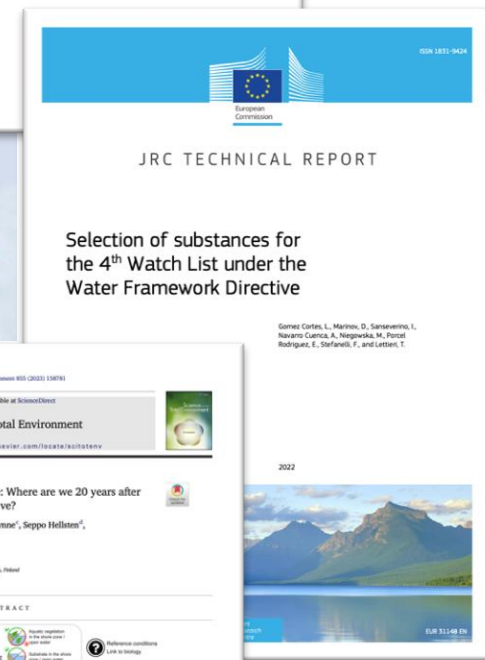


Supporting EU water policies

- EU water legislation is key for European Green Deal
- JRC: focus on environmental objectives of existing and new water legislation
 - Ecological status
 - Chemical status
 - Nutrient standards
 - Free-flowing rivers
 - Microbiological parameters
 - Reuse of water

⇒ guidance documents, scientific publications, input to evaluations and legislative proposals

⇒ collaboration with Commission DG's, Member States, stakeholders, agencies.



The EU Knowledge Hub for Water









Home

Knowledge Hub for Water



Water is a key resource for several sectors: agriculture, energy production, domestic supply, industry. Aquatic ecosystems are also home to a rich biodiversity and offer many cultural and recreational opportunities.


The Knowledge Hub for Water provides scientific evidence and data tools developed in JRC projects to support EU water policy and its integration with other sectoral policies, such as agriculture, energy, climate, with a focus on environmental and health protection, as required by the EU Green Deal, in the Farm to Fork, Biodiversity, and Zero Pollution Strategies.

Browse site by topic

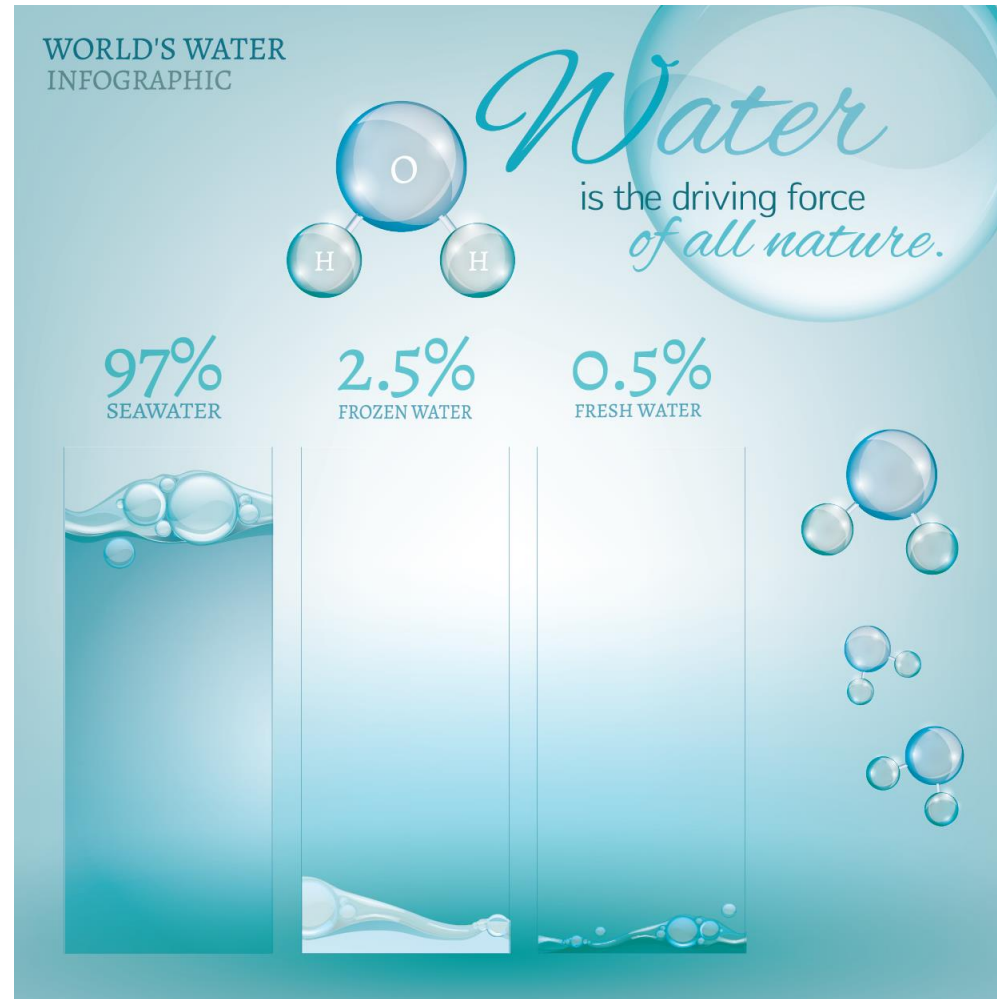
 <p>Knowledge Hub on water and agriculture Data and analysis on major impacts of agriculture on water resources and possible solutions</p>	 <p>Integrated nutrient management Nitrogen and phosphorus flows across air, soil, water in Europe</p>	 <p>Nature-based solutions Potential to apply nature-based solutions in Europe and evidence from case studies</p>
 <p>Nutrient toolkit Best practices for establishing nutrient concentrations to support good ecological status of water bodies in Europe</p>	 <p>Sewage and SARS-CoV-2 EU Sewage Sentinel System for SARS-CoV-2 and its Digital European Exchange Platform Building an EU Wastewater Observatory for Public Health</p>	 <p>The Nitrates Directive Assessment of the implementation of policy to protect European waters against agricultural nitrate pollution</p>

Explore spatial data and tools

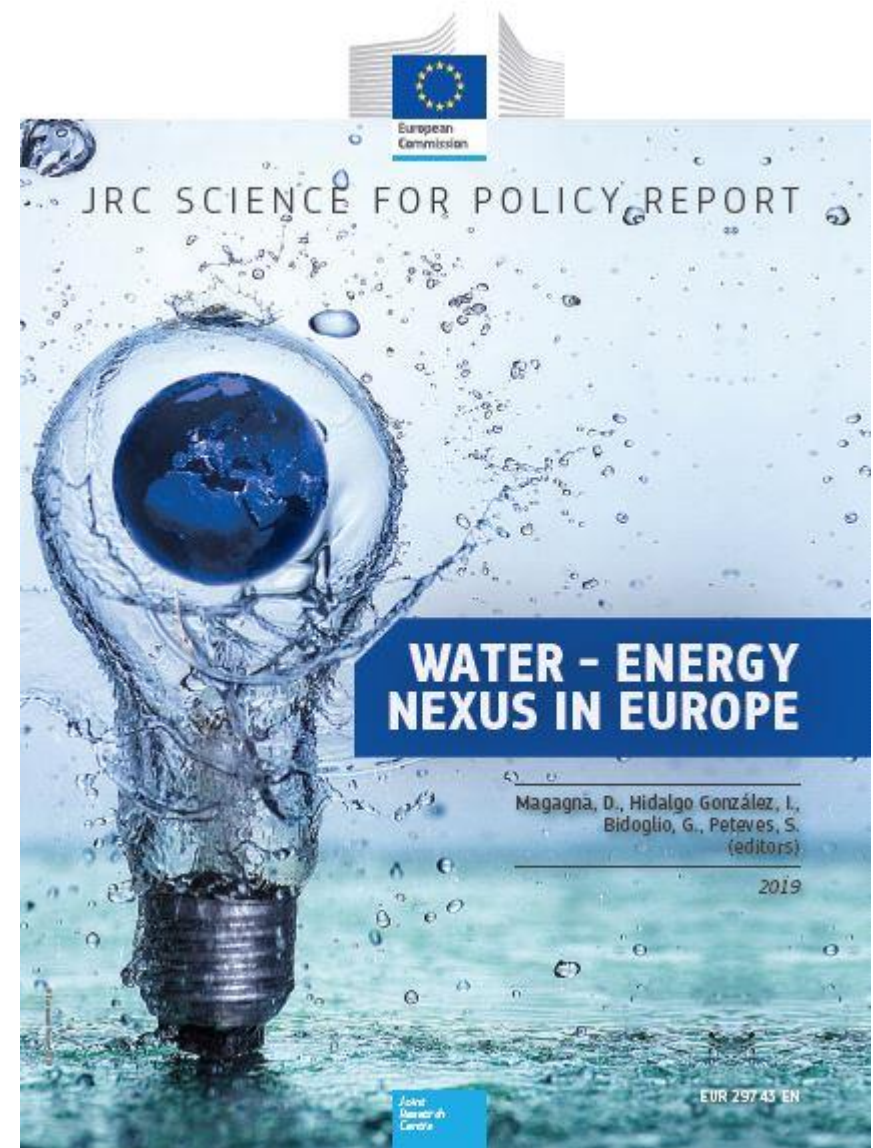
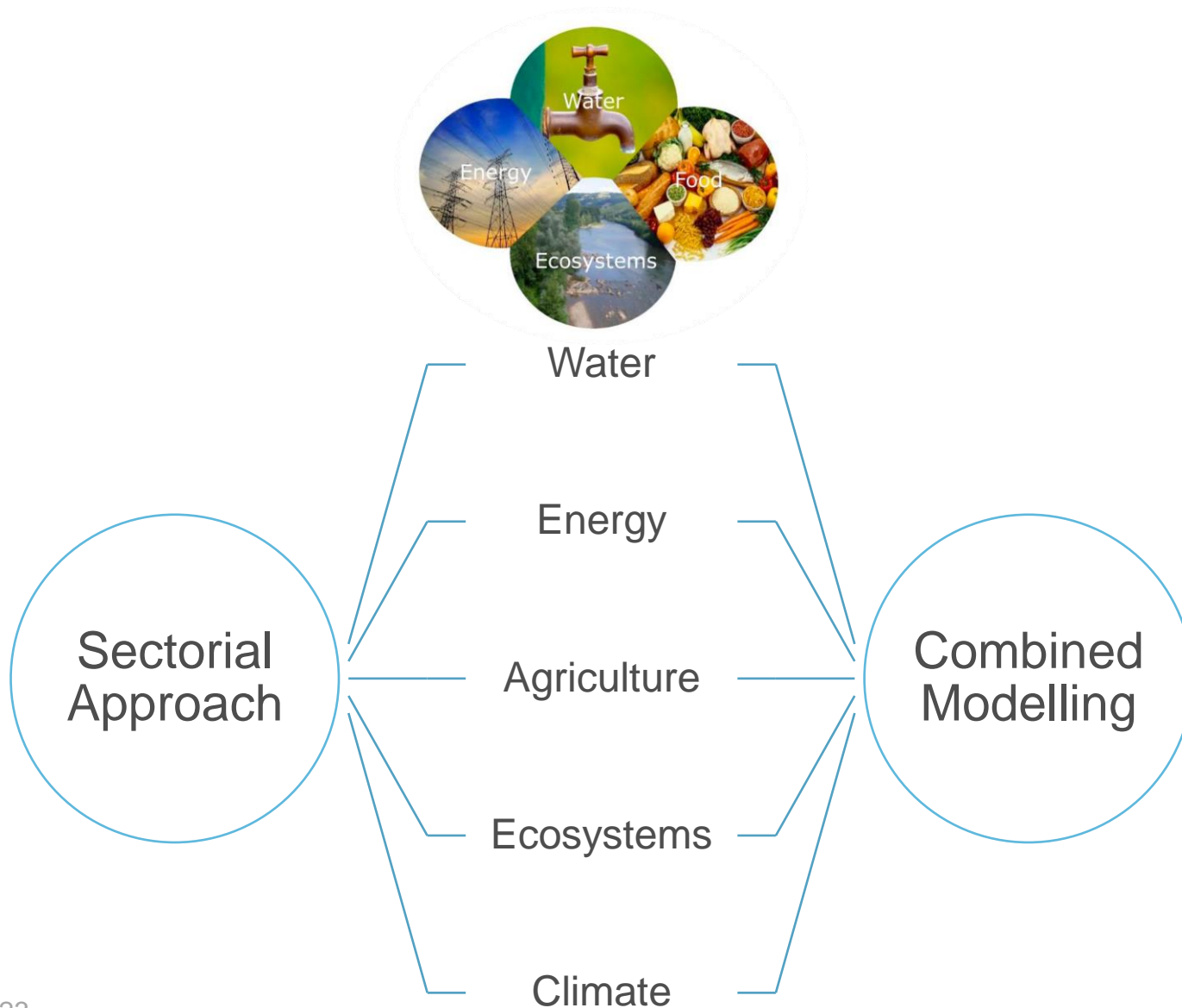
 <p>How to ensure sustainable food production while protecting water resources and aquatic life? Discover more in the story maps</p> <p>Fertilisers and water in EU Irrigation Nature-based solutions</p>	 <p>Explore data on agricultural pressures, water quality and ecological status across Europe. Discover more in the data information system</p> <p>Water and Agriculture Information Tool The Nitrates Directive</p>
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<p>Knowledge Hub for Water</p> <p>This site is managed by the Joint Research Centre</p>	<p>Contact us</p> <p>How to get us eu-hub-water-agriculture@ec.europa.eu</p>	<p>About us</p> <p>Joint Research Centre</p>
<p>More information on: Energy, Climate change, Environment</p>		
<p> European Commission</p> <p>European Commission</p>	<p>Contact the European Commission</p> <p>Follow the European Commission on social media</p> <p>Resources for partners</p>	<p>Languages on our websites</p> <p>Cookies</p> <p>Privacy policy</p> <p>Legal notice</p>

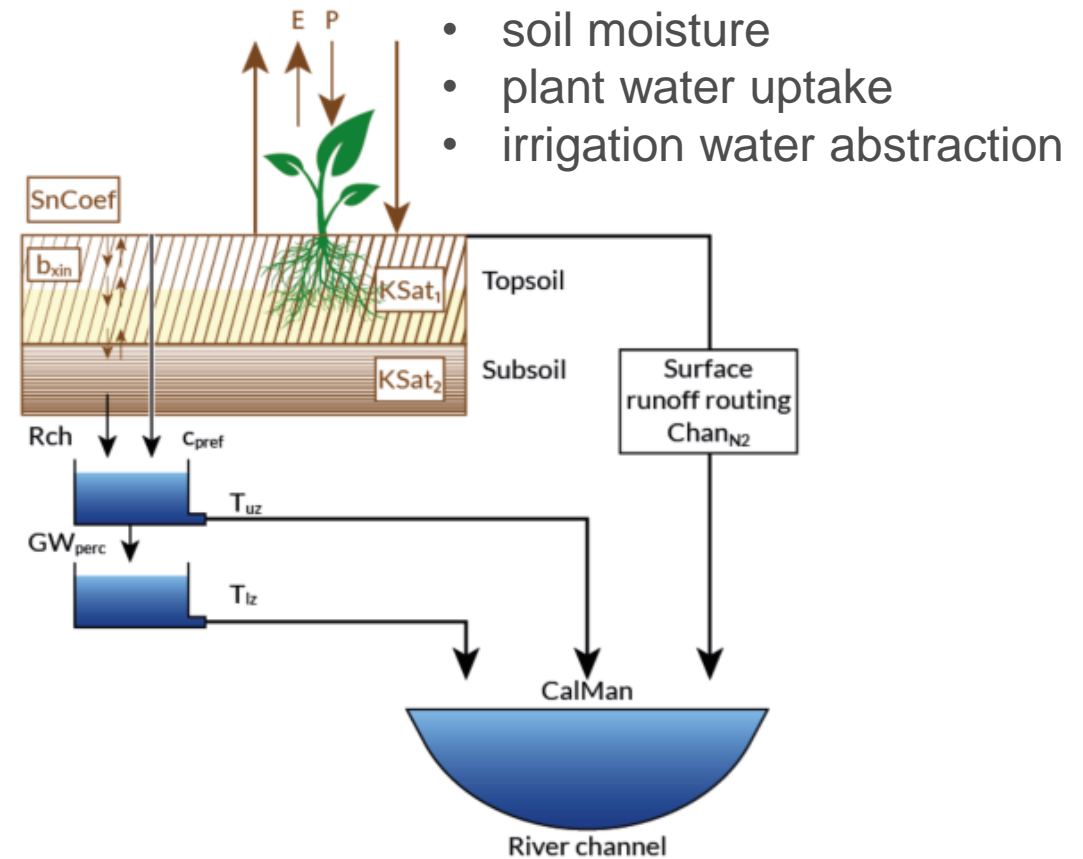
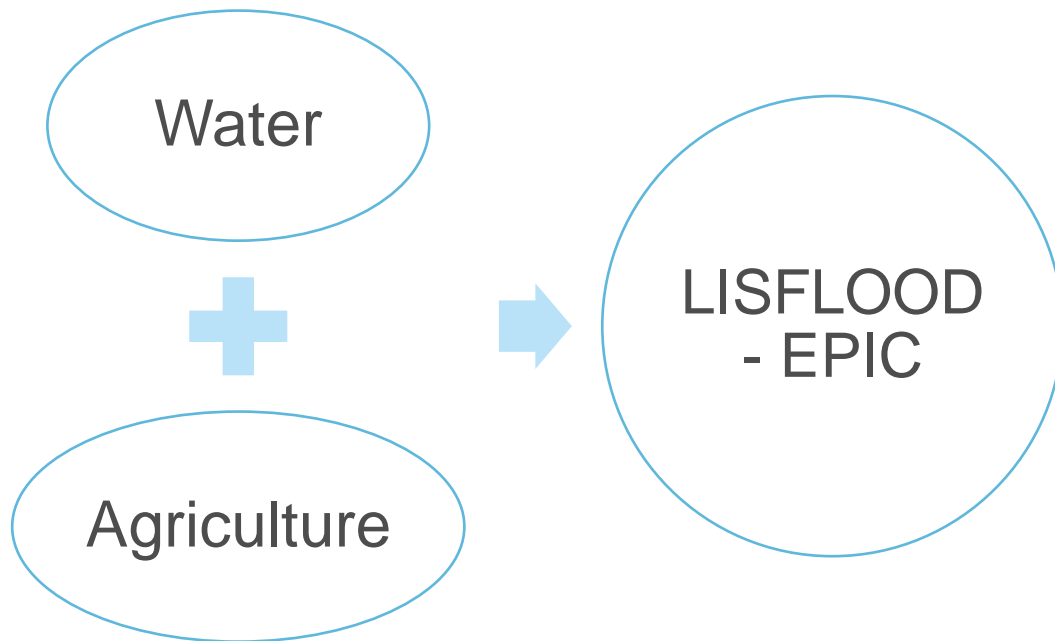
Proposing solutions



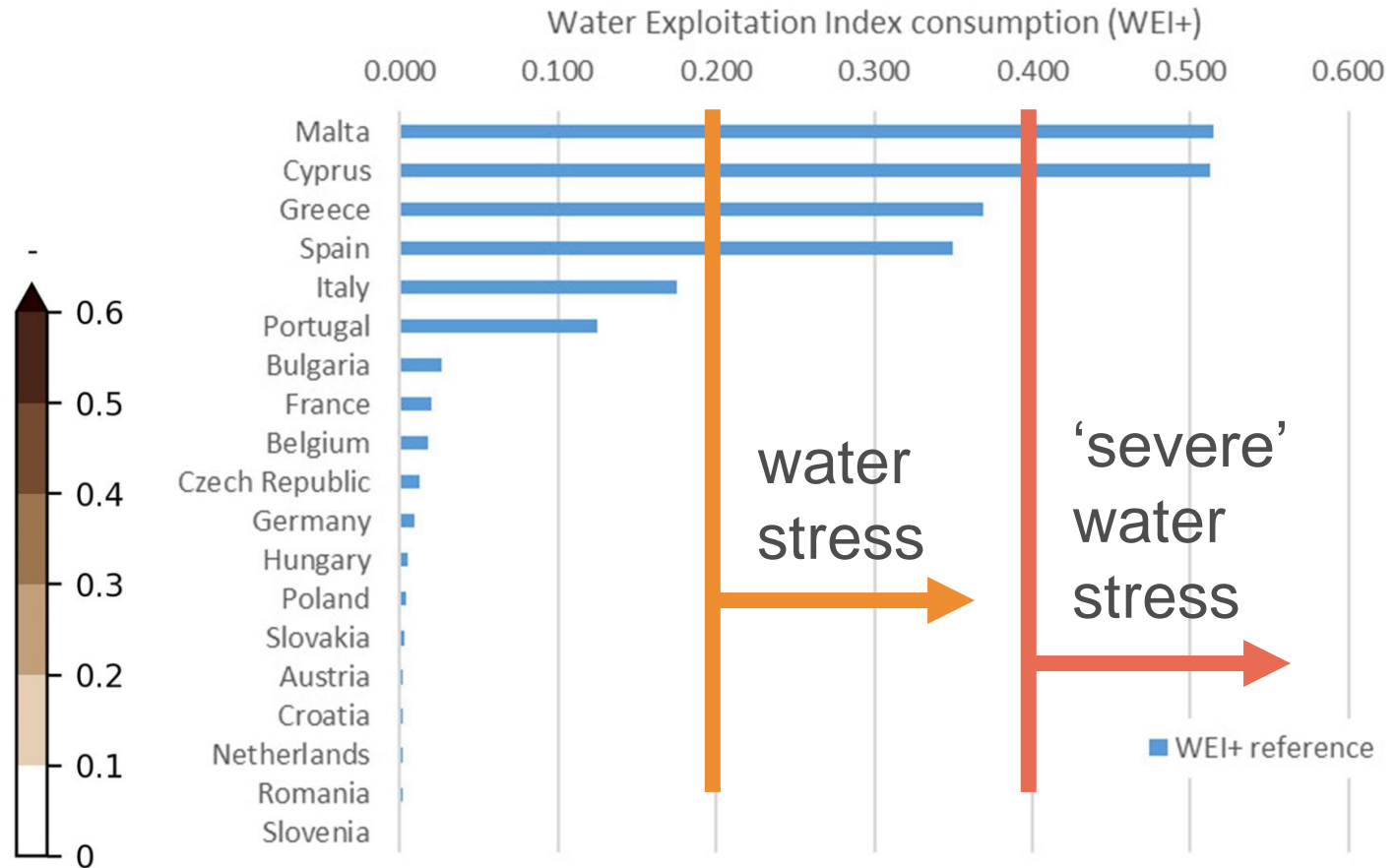
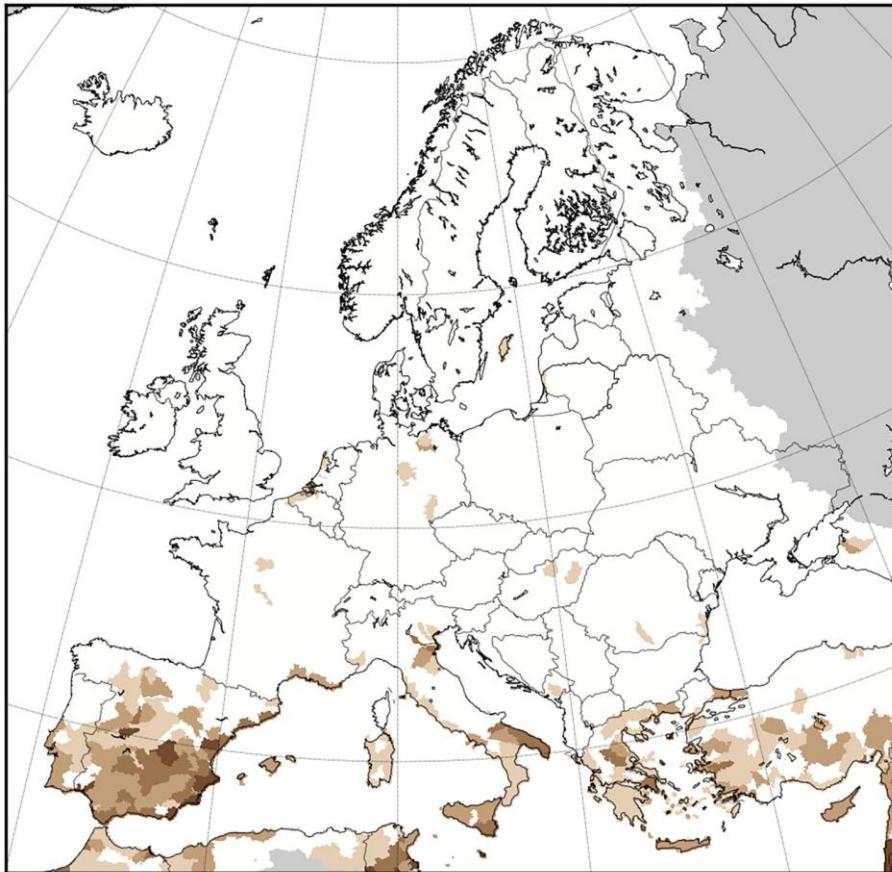
Water-Energy-Food-Ecosystem (WEFE) Nexus



Water & Food



Water Exploitation Index (WEI+) → Current Climate

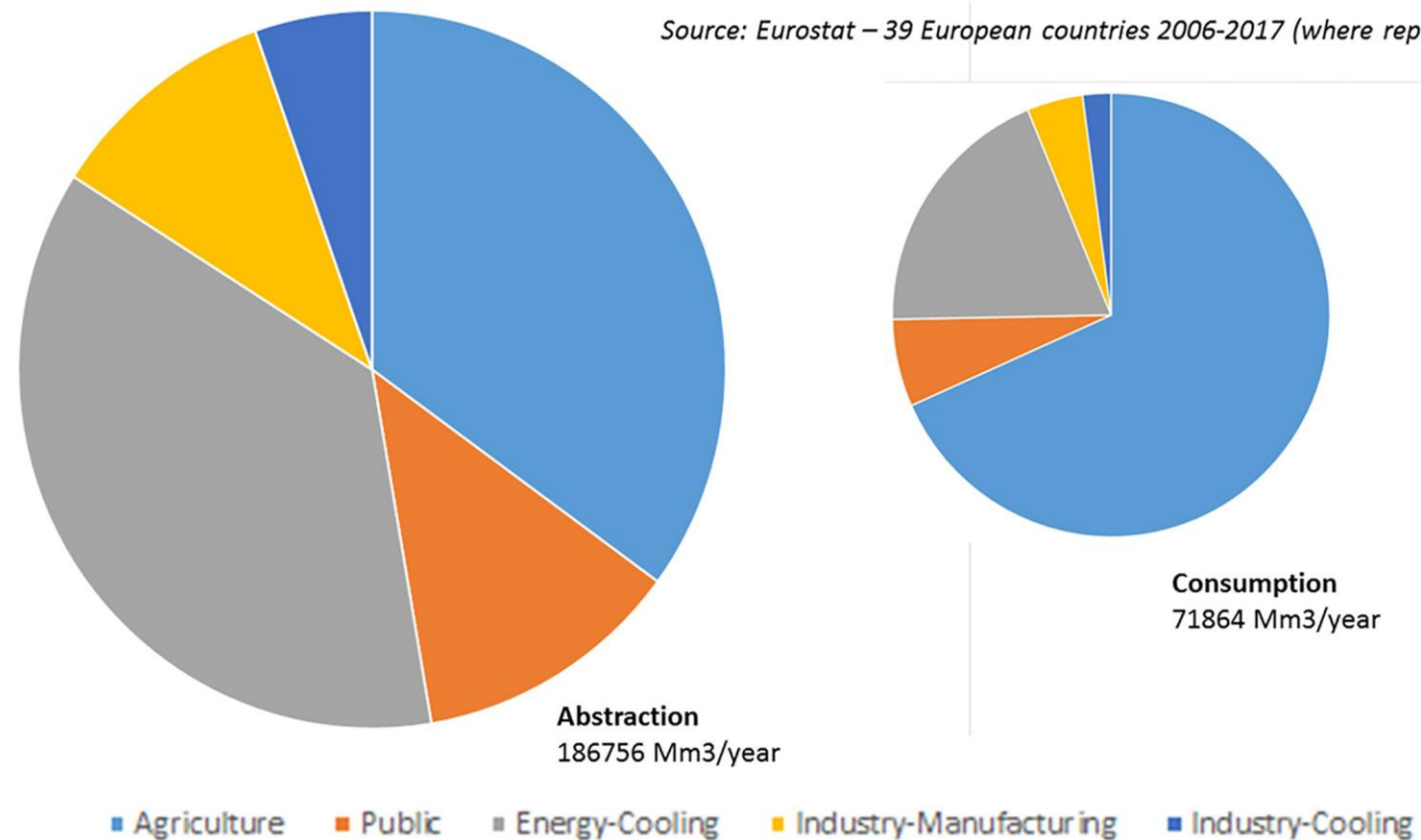


WEI+ > 0.2 → water resources under stress

WEI+ > 0.4 → 'severe' water stress

Reported Abstraction, Estimated Consumption & Proposed Measures

Source: Eurostat – 39 European countries 2006-2017 (where reported)



Measures of Water Savings

- Increased irrigation efficiency
- Re-using wastewater
- Reducing leakage
- Desalination

Water Reuse Regulation



In the EU

At least 11 %
of Europeans are
affected by water
scarcity

1 billion m³
of treated urban
wastewater is
reused annually

6 times more
treated water could
be reused than
current levels

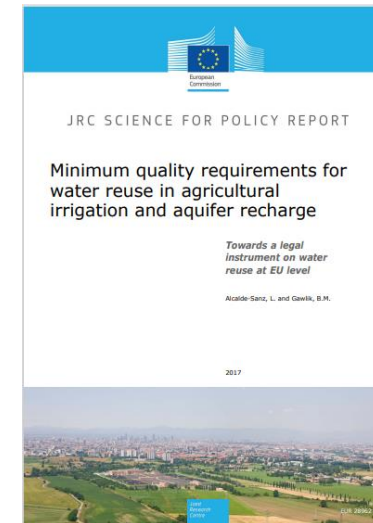
Water Reuse Regulation 741/2020 (applies from 26 June 2023):

- sets harmonised minimum quality and monitoring requirements for agricultural irrigation
- sets risk management provisions to assess potential health and environmental risks
- promotes circular economy via recovery of nutrients and reuse in urban, environmental and industrial applications

Supporting the implementation of Water Reuse Reg. 741/2020

JRC supports on water reuse

- advised on requirements for water quality
- provided guidelines on risk management plan
- organised technical workshops on water reuse
- participated in drafting of regulation and of technical parts of implementing acts
(Commission notice and delegated acts)



EUROPEAN COMMISSION

COMMISSION NOTICE

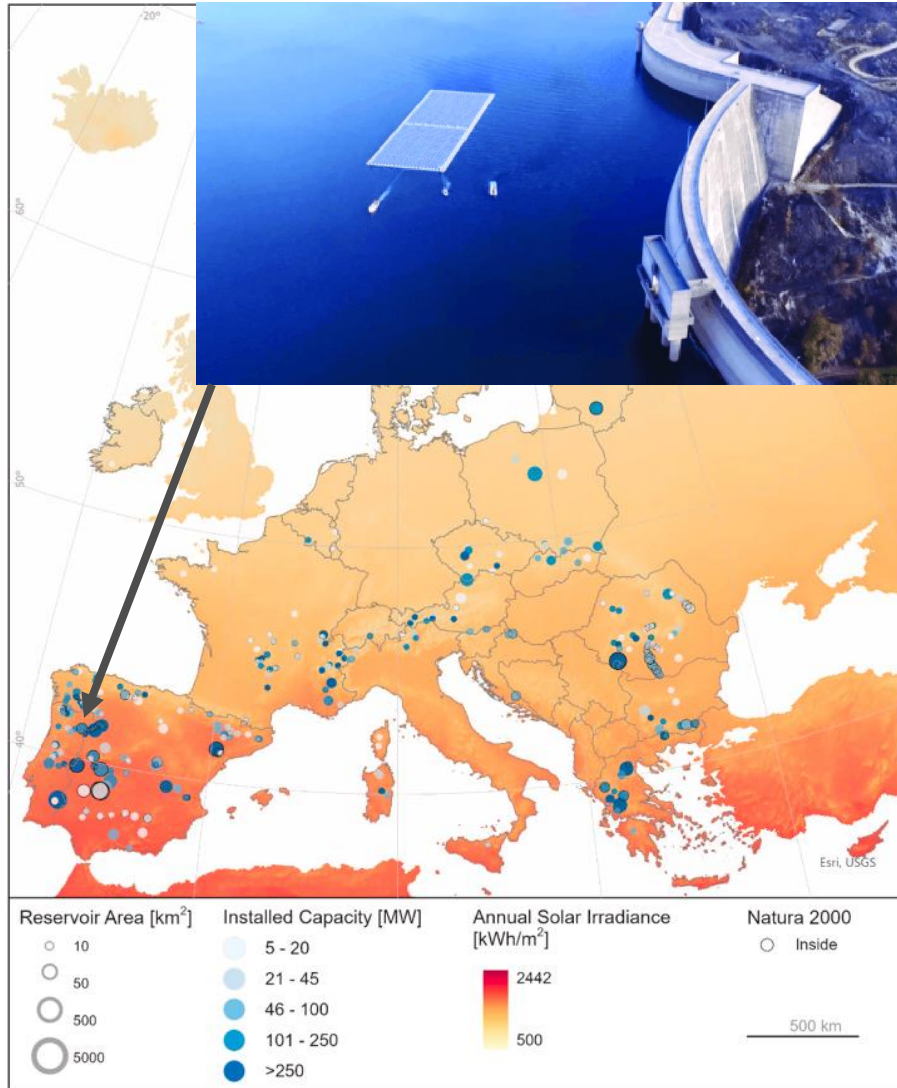
Guidelines to support the application of Regulation 2020/741 on minimum requirements for water reuse

(2022/C 298/01)

Water reservoirs in the EU: sustainable operation under the WEFE Nexus

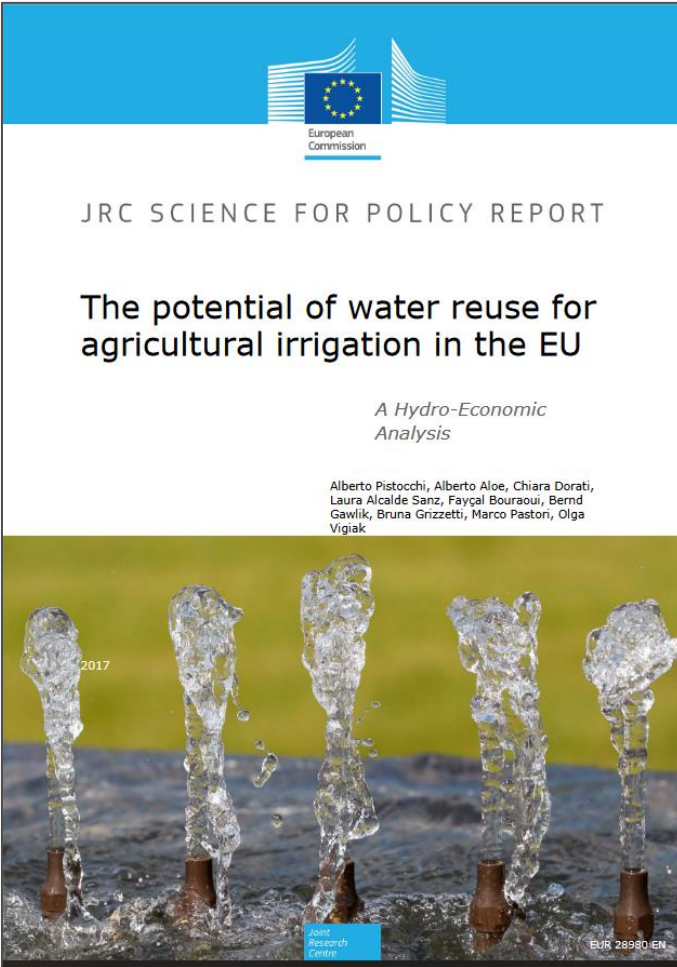


Floating Photovoltaics (FPV)



“The world’s first combined floating solar and hydroelectric plant was installed in Alto Rabagao reservoir (Portugal), in 2017, with 840 panels covering an area of 2500 m² and an installed capacity of 22 MWp with an estimated electricity output of 300 MWh.”

Technical and economic appraisal of management options (examples)



European Commission

JRC SCIENCE FOR POLICY REPORT

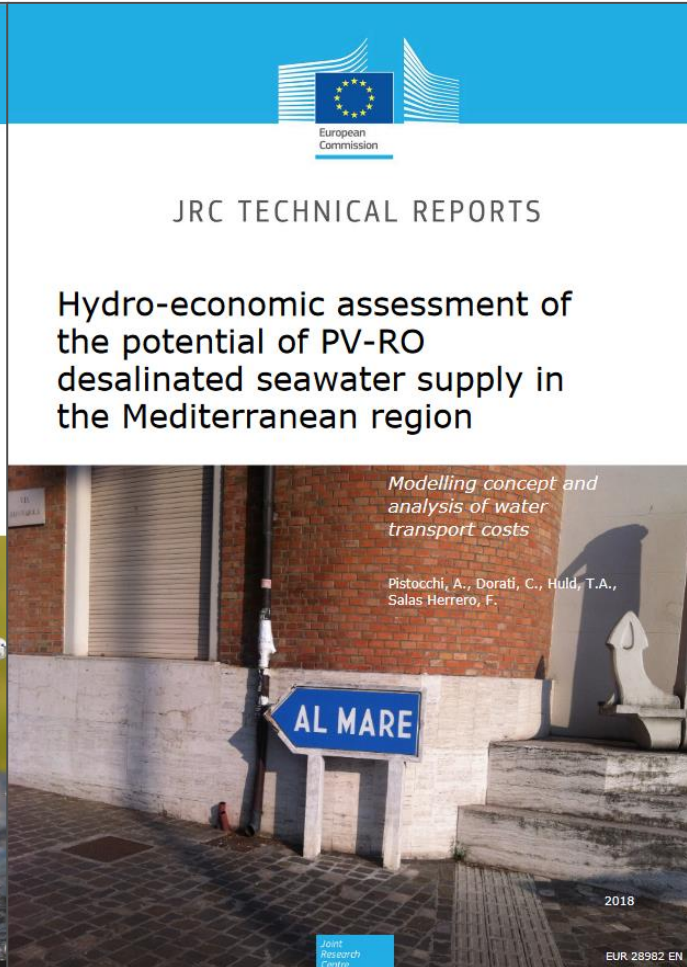
The potential of water reuse for agricultural irrigation in the EU

A Hydro-Economic Analysis

Alberto Pistocchi, Alberto Aloe, Chiara Dorati, Laura Alcalde Sanz, Fayçal Bouraoui, Bernd Gawlik, Bruna Grizzetti, Marco Pastori, Olga Vigiak

Joint Research Centre

EUR 28980-EN



European Commission

JRC TECHNICAL REPORTS

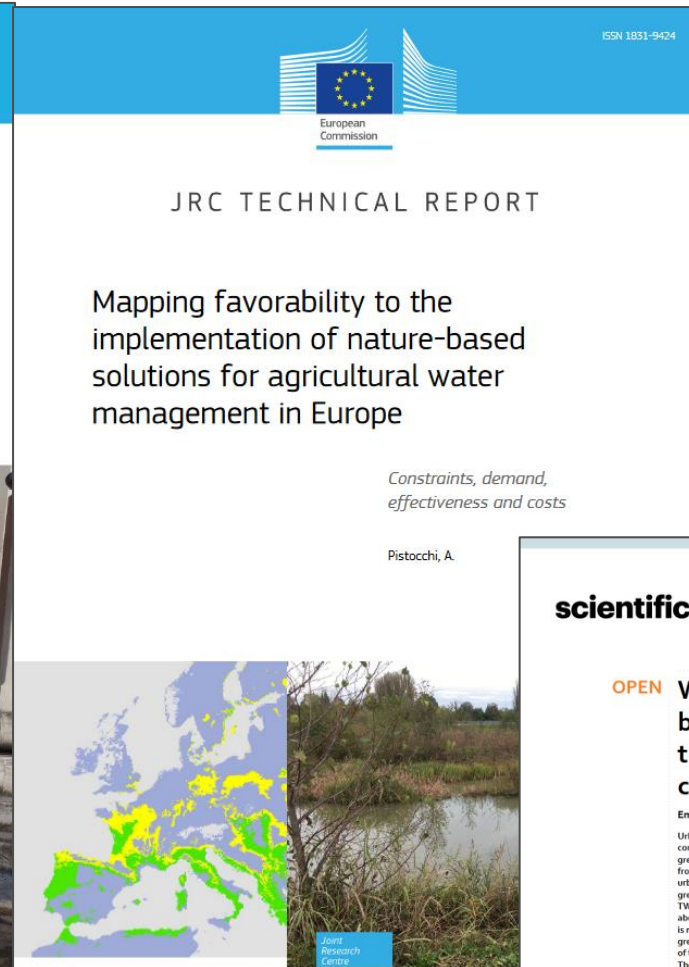
Hydro-economic assessment of the potential of PV-RO desalinated seawater supply in the Mediterranean region

Modelling concept and analysis of water transport costs

Pistocchi, A., Dorati, C., Huld, T.A., Salas Herrero, F.

Joint Research Centre

EUR 28982-EN



European Commission

ISSN 1831-9424

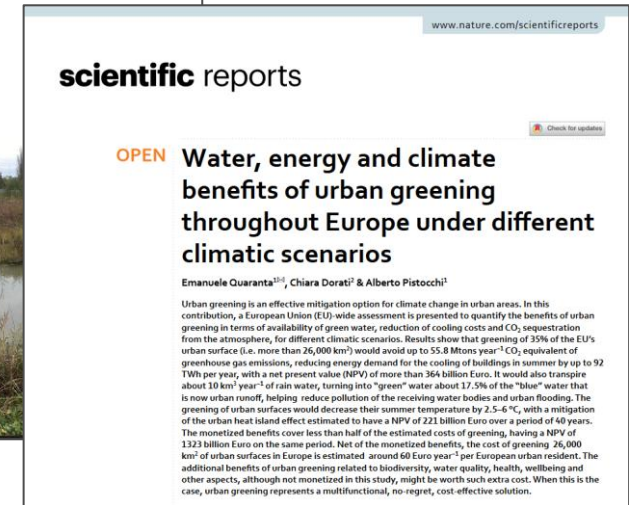
JRC TECHNICAL REPORT

Mapping favorability to the implementation of nature-based solutions for agricultural water management in Europe

Constraints, demand, effectiveness and costs

Pistocchi, A.

Joint Research Centre



www.nature.com/scientificreports

scientific reports

OPEN **Water, energy and climate benefits of urban greening throughout Europe under different climatic scenarios**

Emanuele Quaranta^{1,2}, Chiara Dorati² & Alberto Pistocchi¹

Urban greening is an effective mitigation option for climate change in urban areas. In this contribution, a European Union (EU)-wide assessment is presented to quantify the benefits of urban greening in terms of availability of green water, reduction of cooling costs and CO₂ sequestration from the atmosphere, for different climatic scenarios. Results show that greening of 35% of the EU's urban surface (i.e. more than 26,000 km²) would avoid up to 55.8 Mtons year⁻¹ CO₂ equivalent of greenhouse gas emissions, reducing energy demand for the cooling of buildings in summer by up to 92 TWh per year, with a net present value (NPV) of more than 364 billion Euro. It would also transpire about 10 km³ year⁻¹ of rain water, turning into "green" water about 17.5% of the "blue" water that is now urban runoff, helping reduce pollution of the receiving water bodies and urban flooding. The greening of urban surfaces would decrease their summer temperature by 2.5–4 °C, with a mitigation of the urban heat island effect estimated to have a NPV of 221 billion Euro over a period of 40 years. The monetized benefits cover less than half of the estimated costs of greening, having a NPV of 122 billion Euro on the same period. Net of the monetized benefits, the cost of greening 26,000 km² of urban surfaces in Europe is estimated around 60 Euro year⁻¹ per European urban resident. The additional benefits of urban greening related to biodiversity, water quality, health, wellbeing and other aspects, although not monetized in this study, might be worth such extra cost. When this is the case, urban greening represents a multifunctional, no-regret, cost-effective solution.

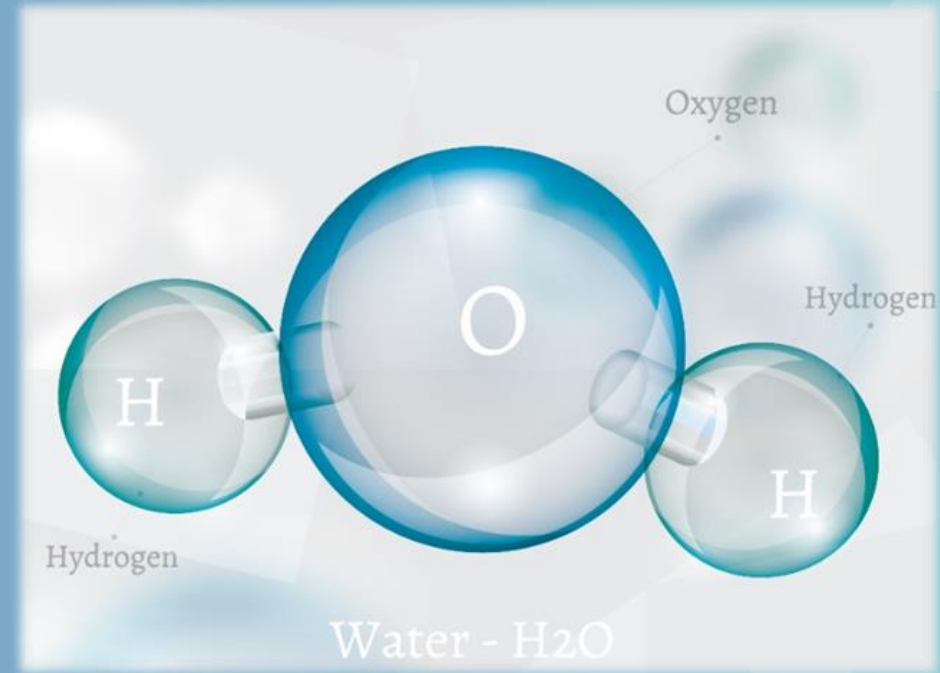
Wrap-up: Challenges for water management

- Climate, biodiversity and pollution crises.
- Diagnosis clear, therapies identified: Science and evidence-based.
- It is now urgent to help make things happen.
- From top-down: the EU adopting common goals and strategies, setting harmonized rules, distributing funds and checking they are well spent.
- From bottom-up: local communities implementing projects to the direct benefit of people, and by involving all relevant socioeconomic actors.

Wrap-up: JRC Support Activities

- Analysis of water quality and quantity, using EU-scale modelling: impacts of climate and socioeconomic changes.
- Technical and economic appraisal of management options, thinking beyond disciplinary and organisational silos (the “water-energy-food-ecosystems (WEFE) nexus”).
- Technical support to the definition and implementation of EU legislation.
- Analysis and dissemination of good practices at the local level.
- Support to EU strategic thinking and foresight.
- Cooperation with Member States.

Thank you and keep in touch






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