Extreme drought events

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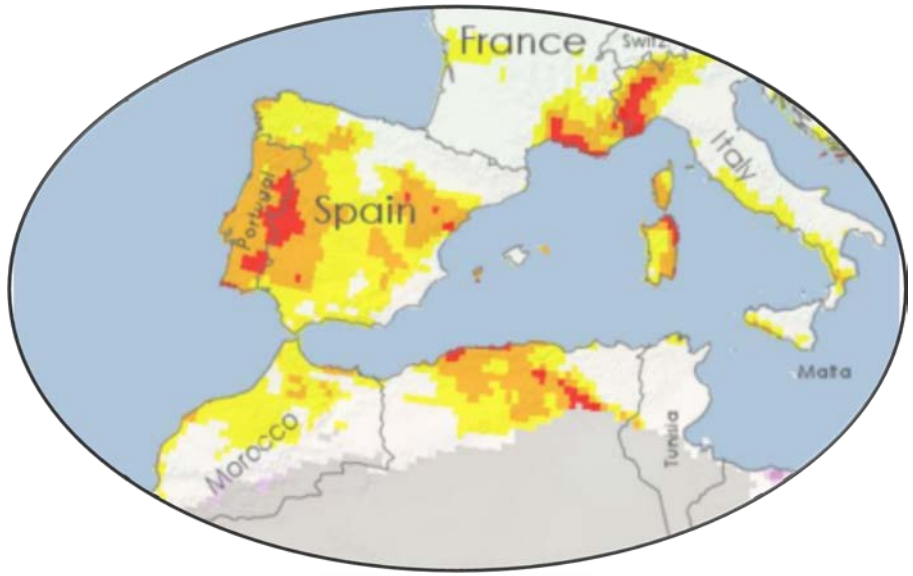
Introduction

Climate extremes pose a threat to socio-economic and natural systems

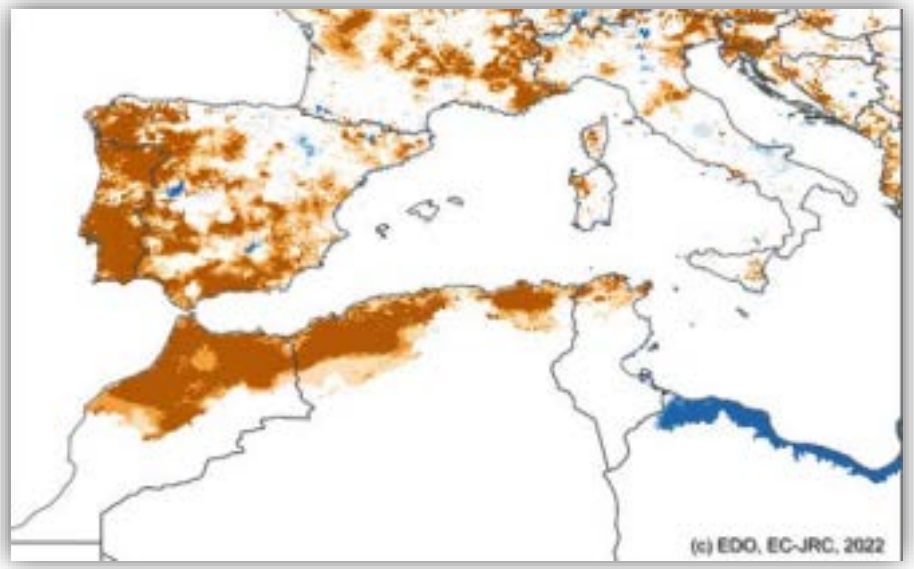
This year, Europe and several other regions of the world have been affected by extreme events such as drought and heatwaves

2022

In some areas of Europe, the drought started already at the end of 2021



SPI-1 January 2022



Soil Moisture Anomaly - end of January 2022

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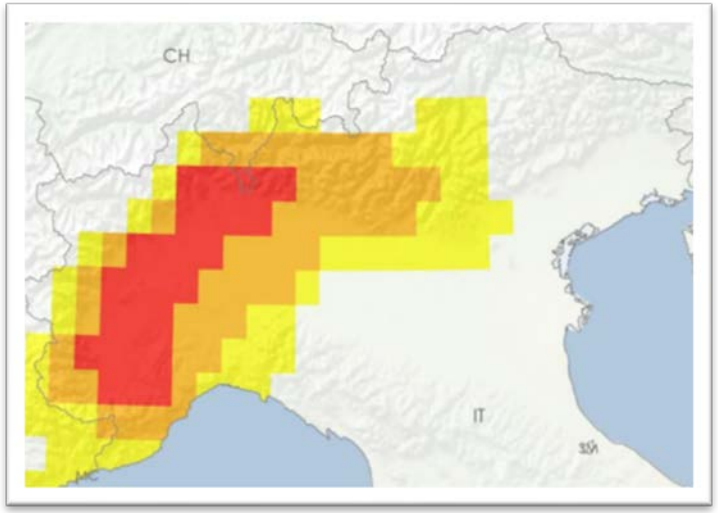
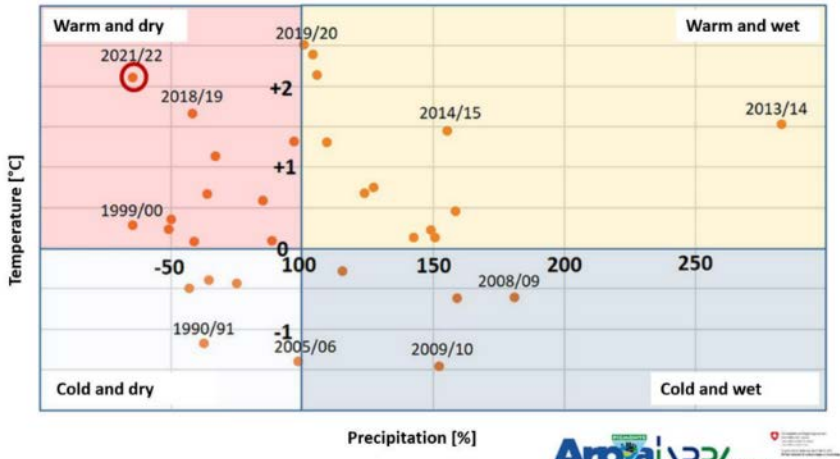
2022



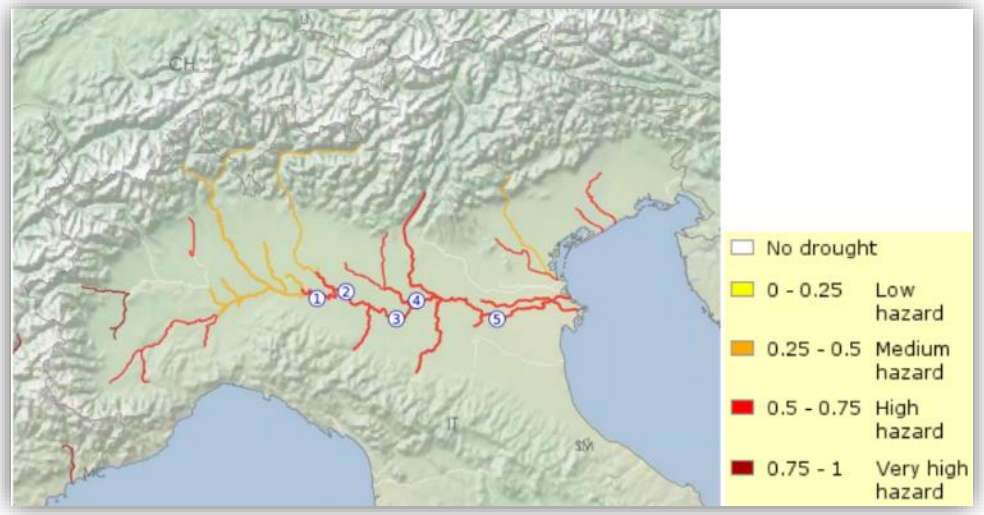
SPI-3 February 2022

Ensemble soil moisture anomaly, beginning of March 2022

Severe precipitation deficit affecting water resources and hydropower systems

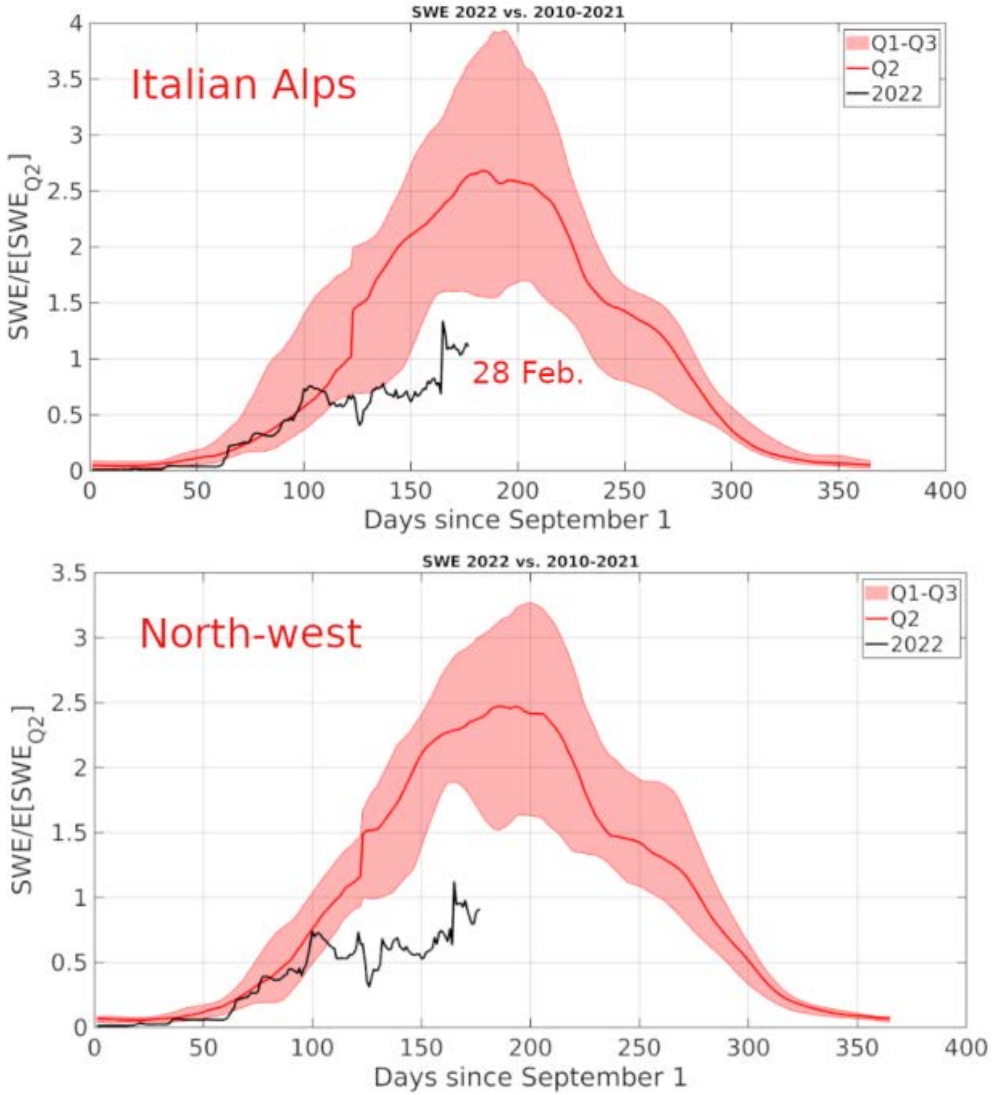


2022



Low Flow Index, beginning of March 2022

Critical rivers' conditions and poor snowfall accumulation



Normalised Snow Water Equivalent.

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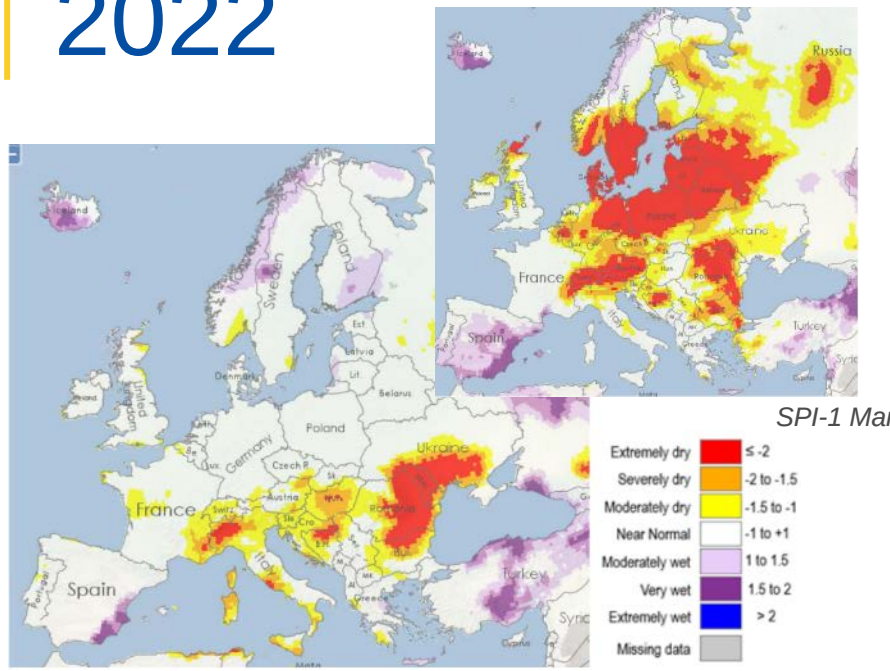
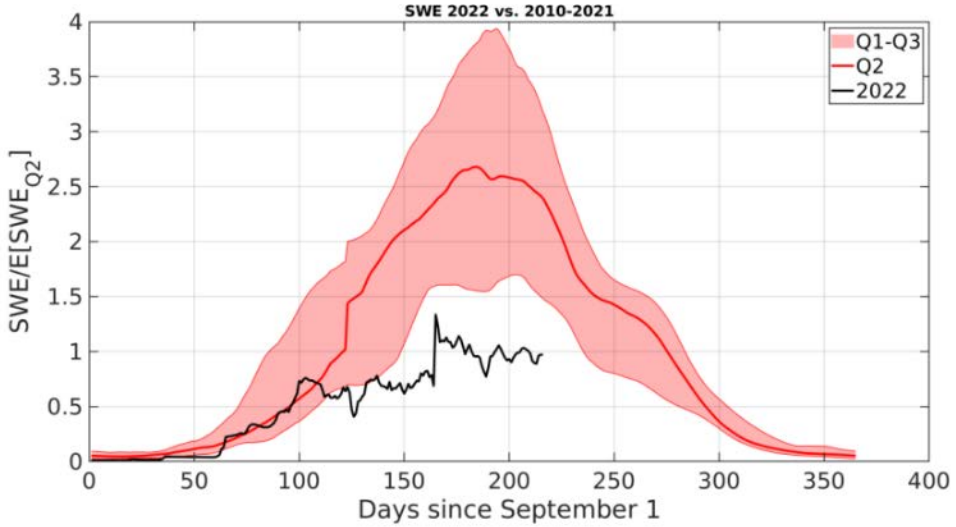
2022

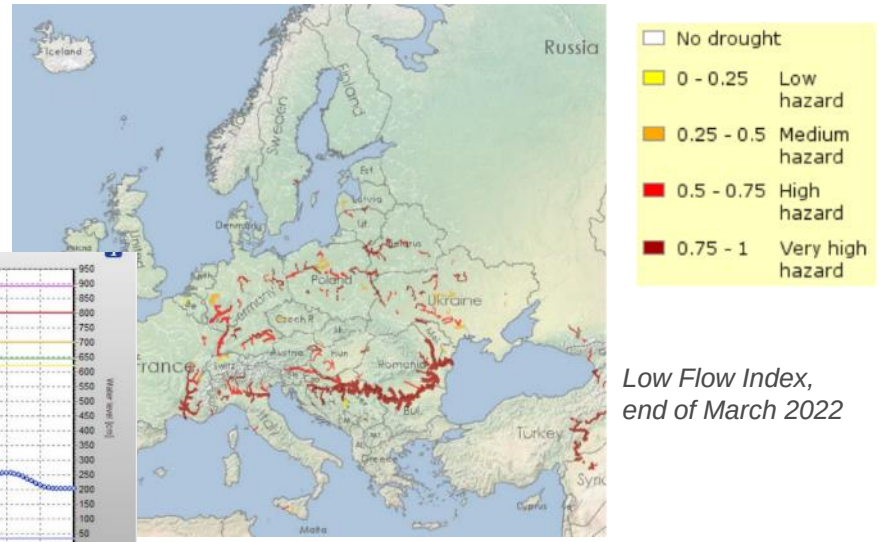


SPI-1 March 2022

SPI-3 March 2022

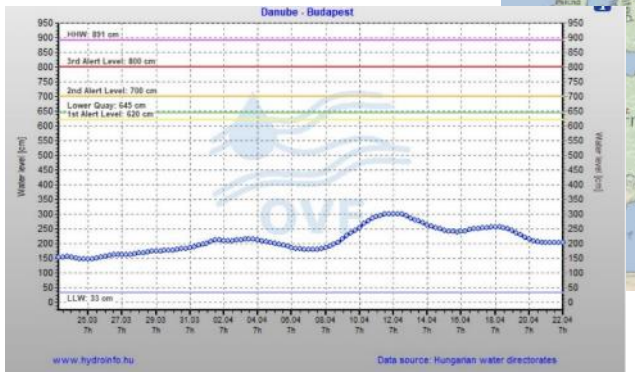


Normalised snow water equivalent



Low Flow Index, end of March 2022

Po and Danube severely affected. Snow water resources extremely poor (approx. 60% deficit)



Water level Danube (Budapest) 25.03 - 22.04. Source Hungarian Hydro Forecasting Service.

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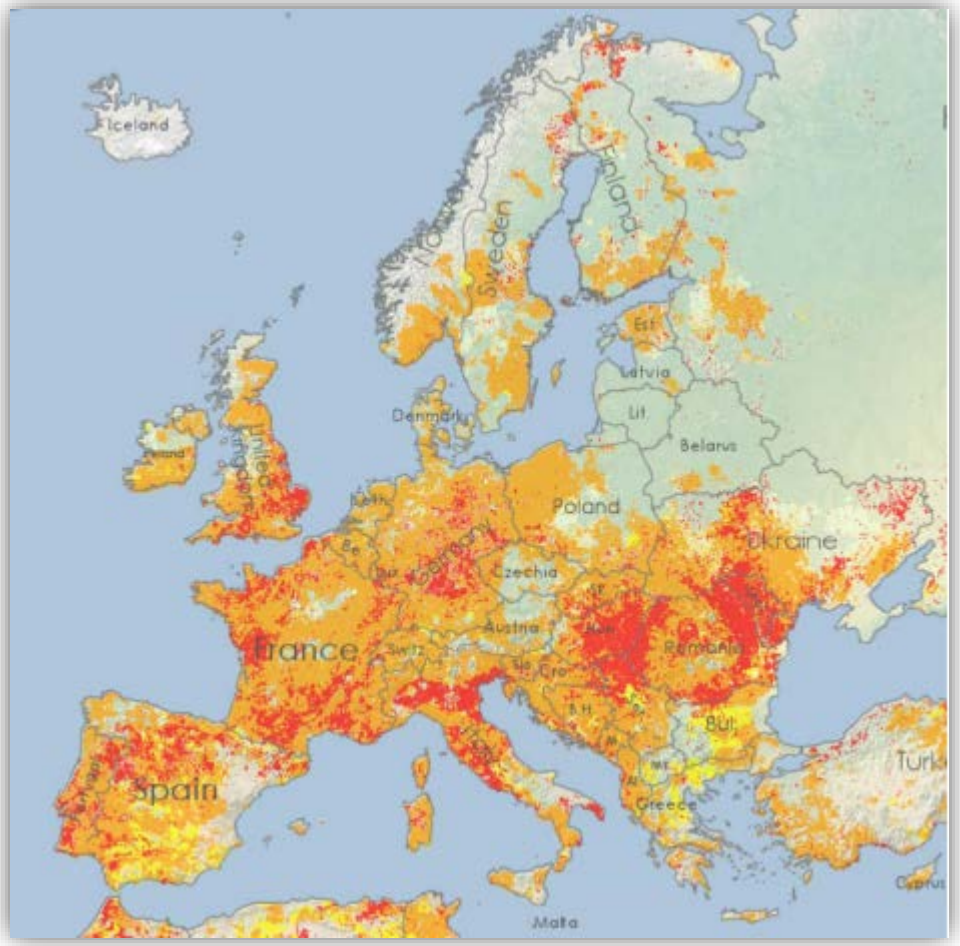
2022



> 60% of the EU affected

Sea-water intrusion

Water supply issues

Dike stability

River transport

Energy

…

Agriculture

Grain maize Soybean Sunflower Rice …

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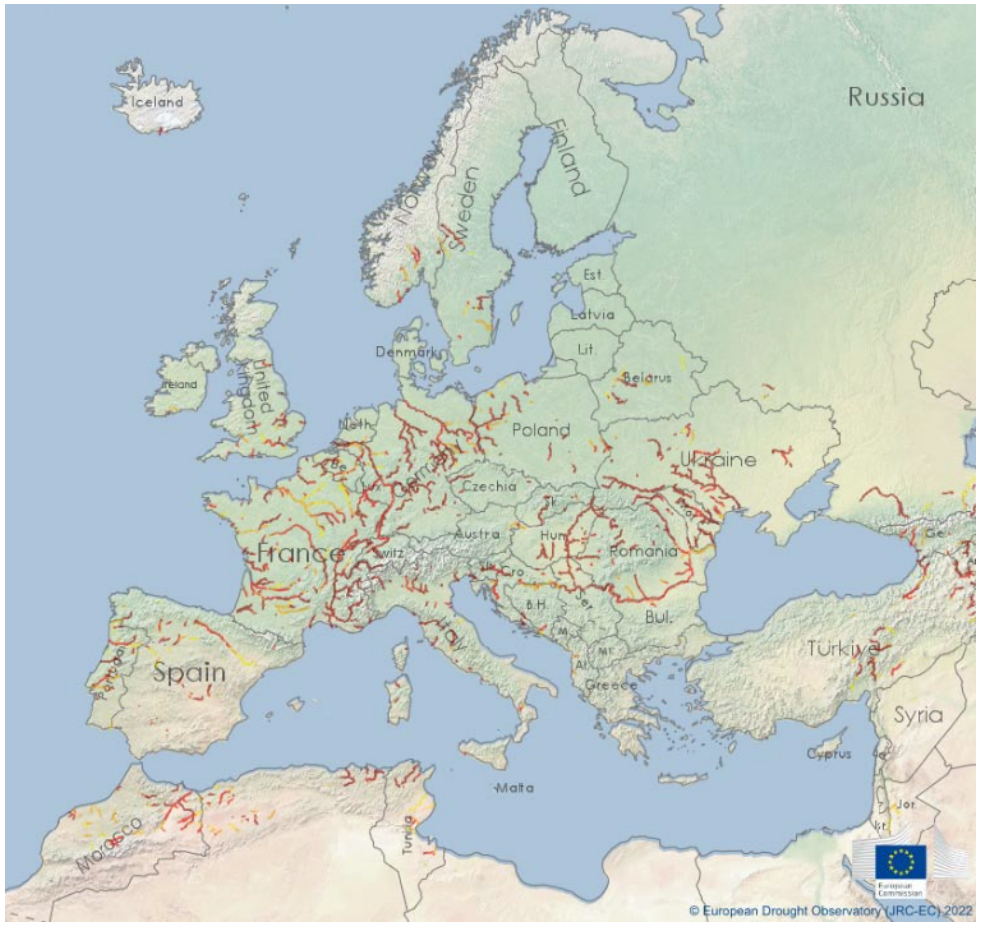
2022



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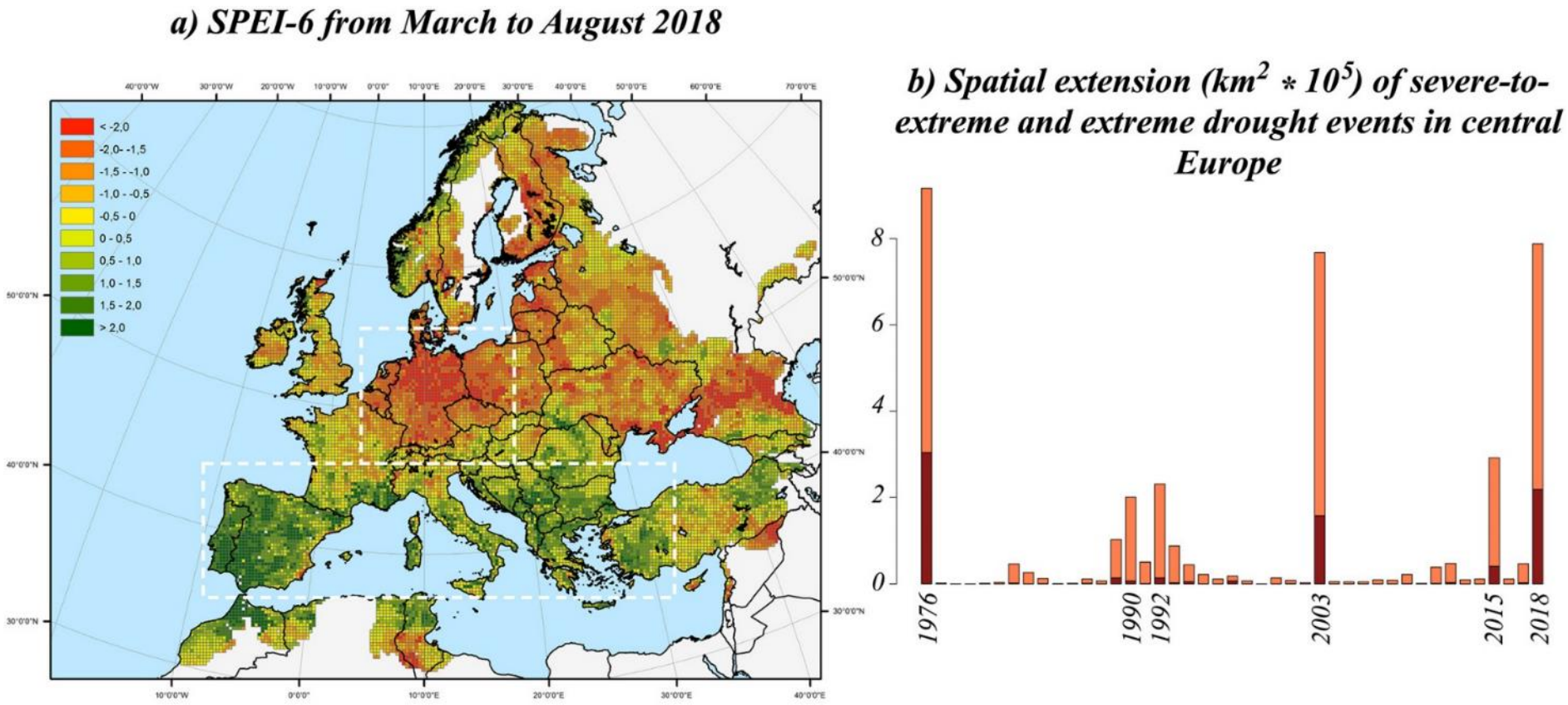
Drought events in the past



Source: Toreti et al., 2019

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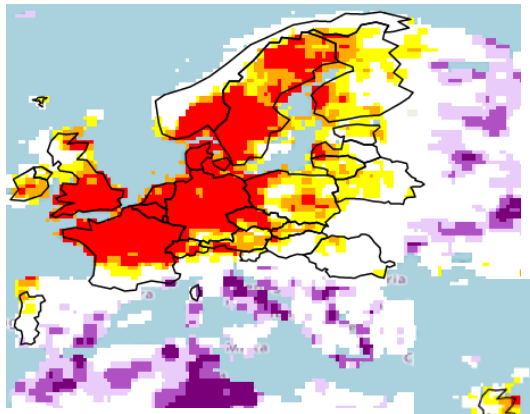
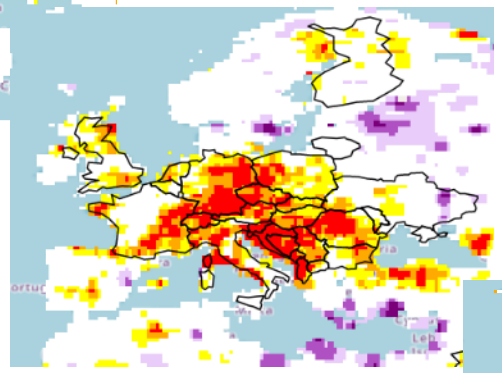
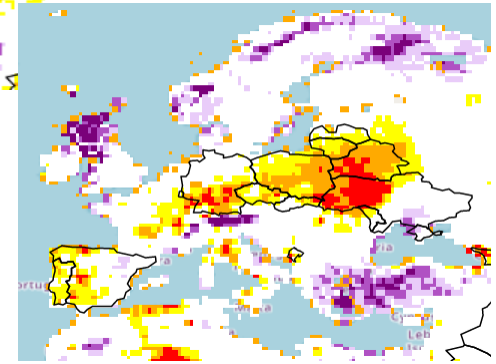
Drought events in the past



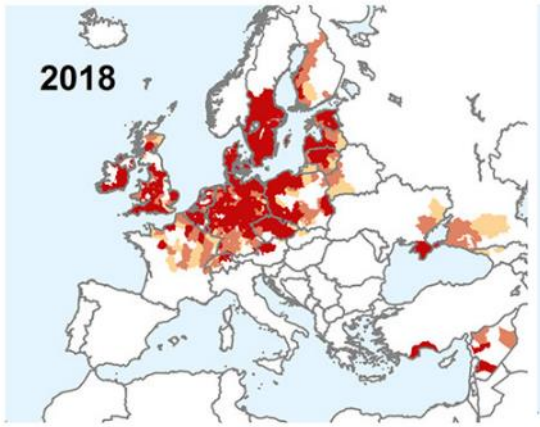
1976 SPI-6 August

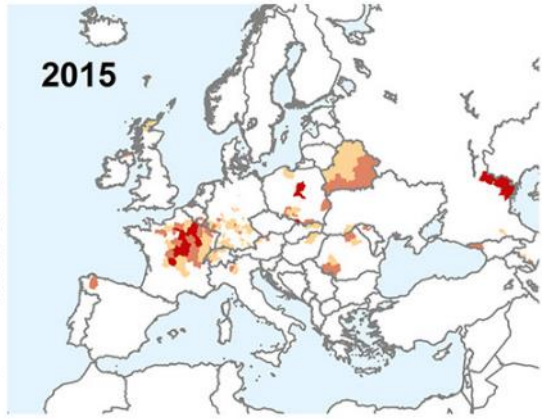


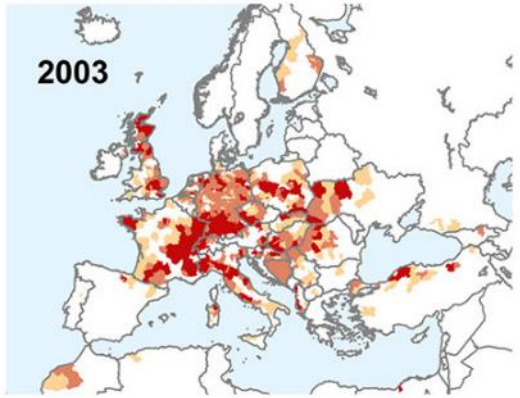
2003 SPI-6 August



2015 SPI-6 August

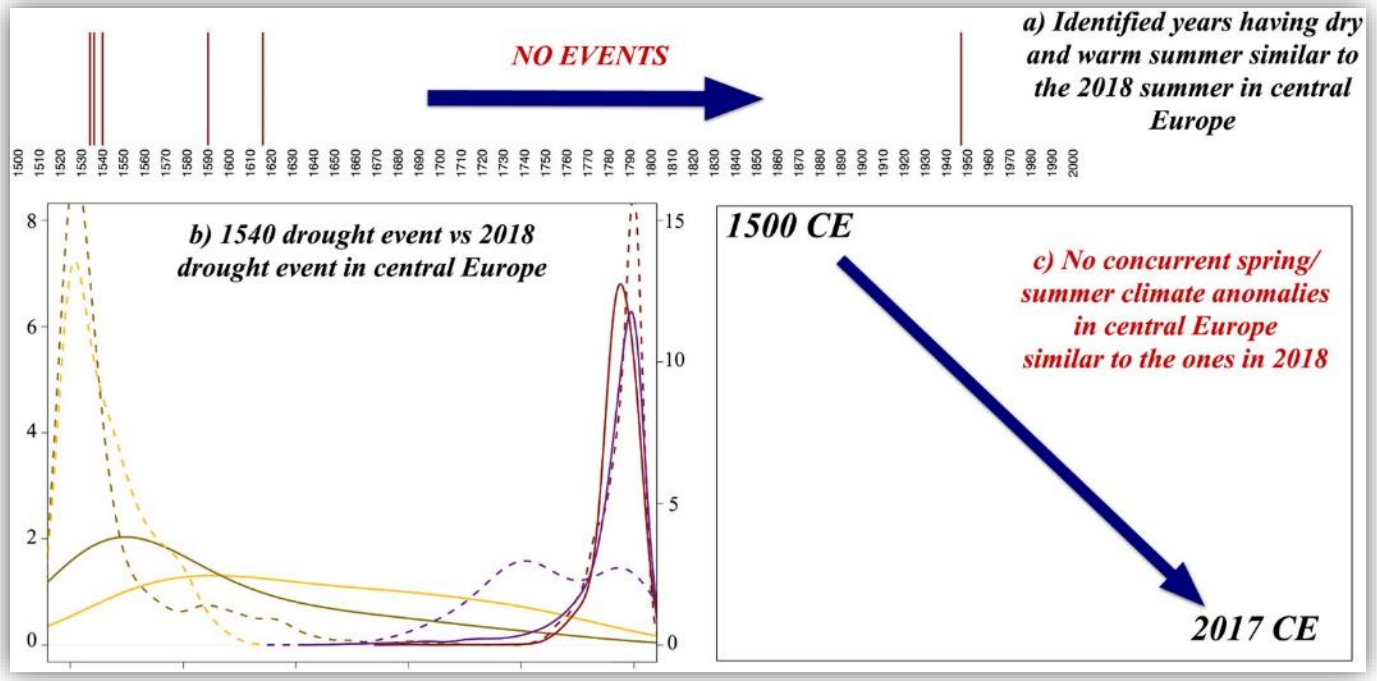






Source: Toreti et al., 2019

Drought events in the past

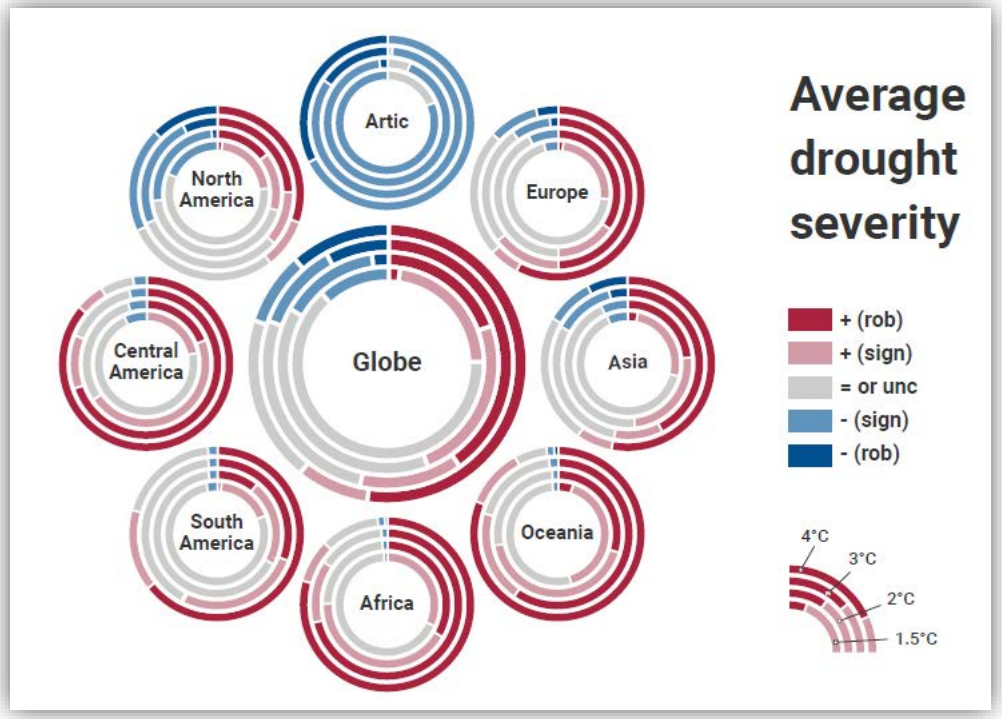


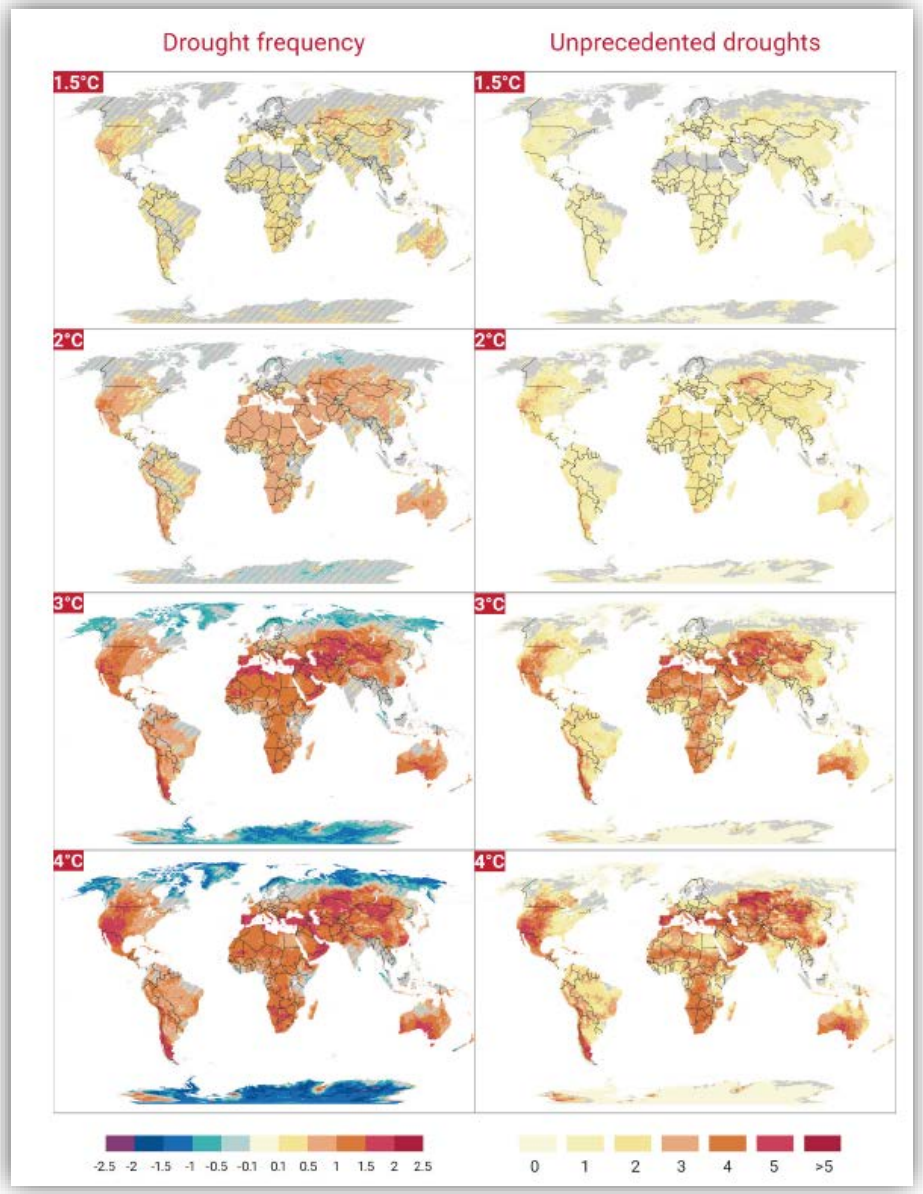
Source: Toreti et al., 2019

In early August, the rivers Elbe, Saale, and Eger in Saxony could be crossed in the dry by stepping from one stone to the next. The Rhine had become a runnel […] most rivers in France could be waded […] the grapes were like roasted and the leaves of the vines had fallen […] Cattle all over Europe died of thirst and hunger.

Source: Pfister, 2017

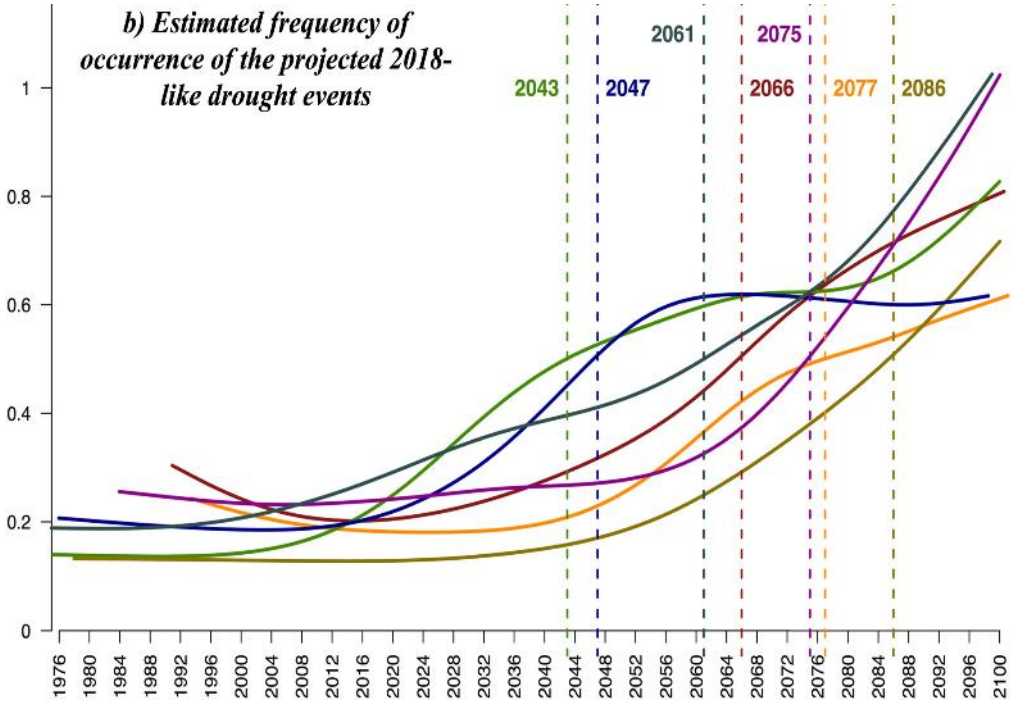
Future drought risk

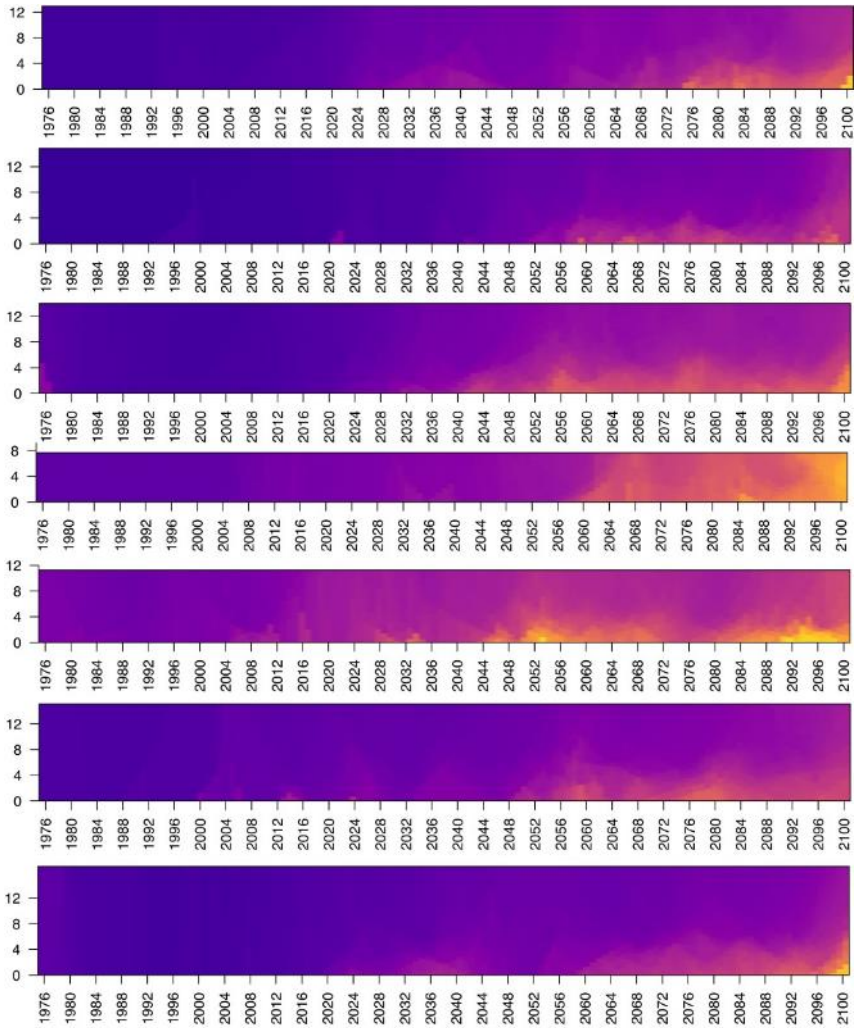




Source: GAR 2021

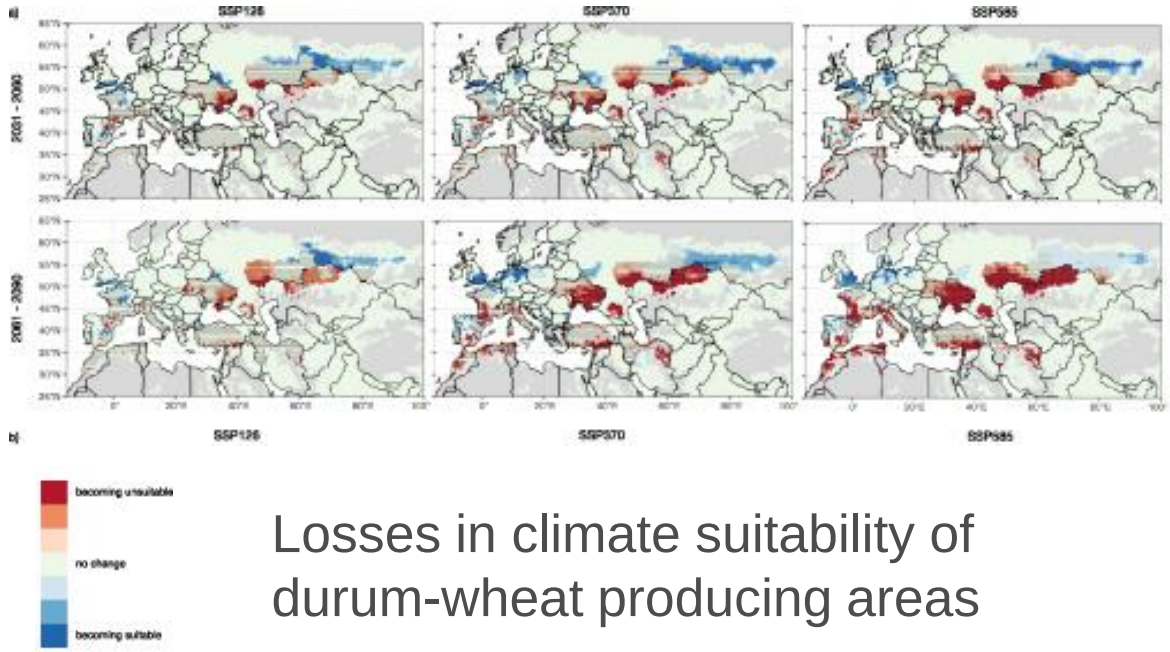
Future drought risk



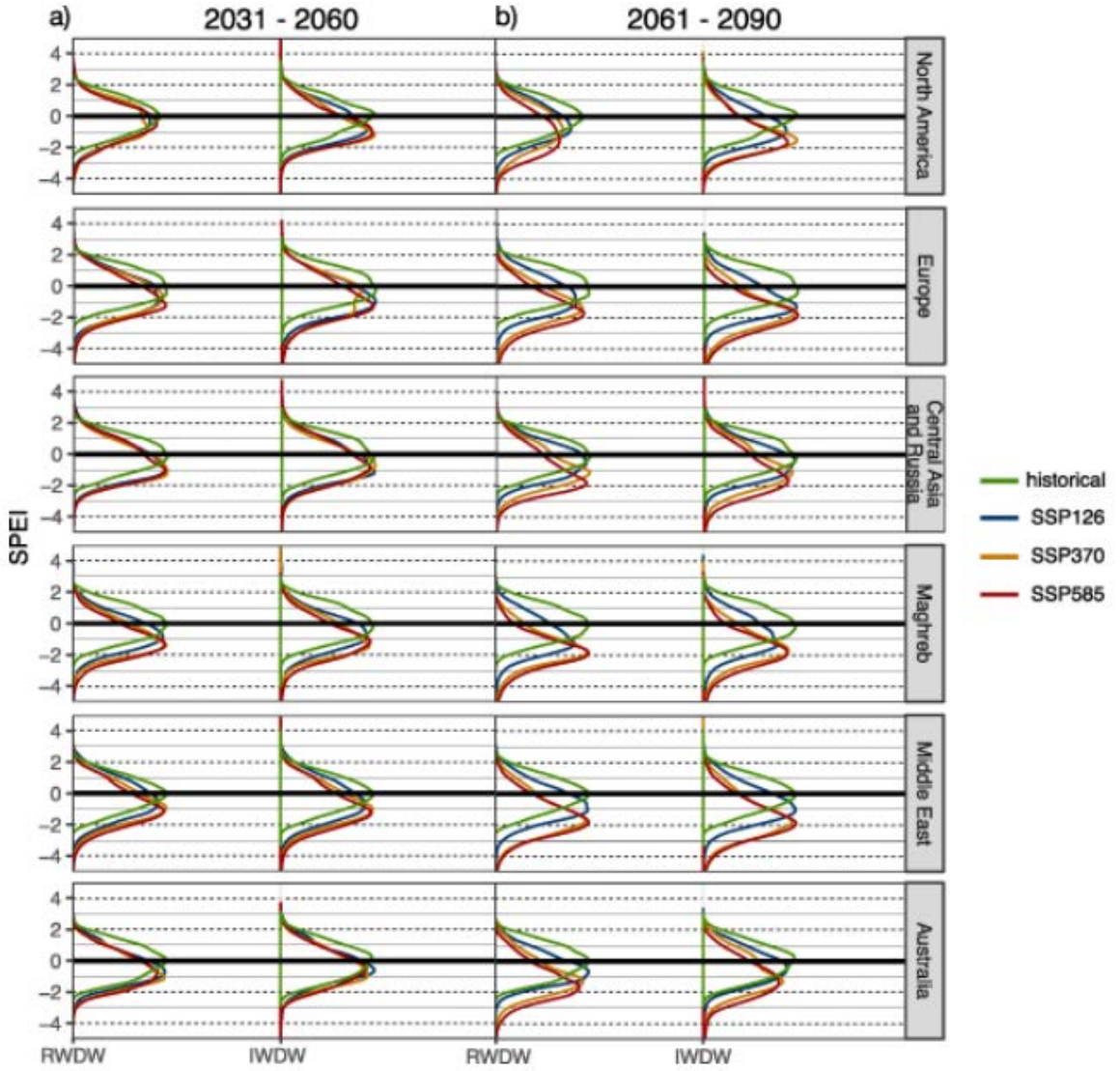


Source: Toreti et al., 2019

Future drought risk



Losses in climate suitability of durum-wheat producing areas



Source: Ceglar et al., 2021

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Conclusions

- 2022 drought event: persistent, severe and broad
- Heatwaves *amplified* the drought
- The extreme 2022 drought-heatwave event seems to be the worst on record (TBC!)… Ongoing analysis
- Drought in the future: global risk
- Extreme drought events may become the norm if no effective mitigation and adaptation will take place

Thank you

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