

# JRC PESETA III Science for Policy Summary Series

## DROUGHT AND CLIMATE CHANGE

Droughts diminish soil moisture and affect plant growth, river flows and agriculture. Under a 2°C warming scenario that is line with the Paris Agreement, the majority of Europe experiences no significant change in drought risk from nowadays. However, the Southwest Mediterranean is a region of concern.



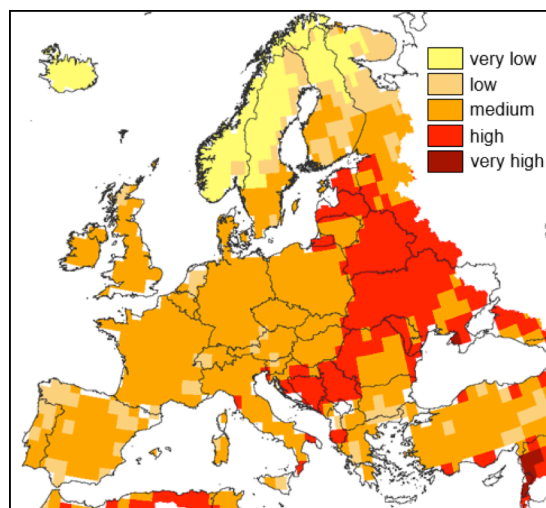
### CURRENT SENSITIVITY TO DROUGHT

Two important factors determine how sensitive an area currently is to drought:

- 1) the population living in the area and the amount of activities undertaken in the area that rely on the land, e.g. livestock farming; and
- 2) the health status, amount of poverty and economic conditions of the area.

Based upon present climate and socio-economic conditions, sensitivity to drought varies across Europe (Figure 1). It is highest in the east of Europe and lowest in Northern Europe. These present-day patterns of sensitivity play a part in determining which areas will be at risk from droughts under climate change.

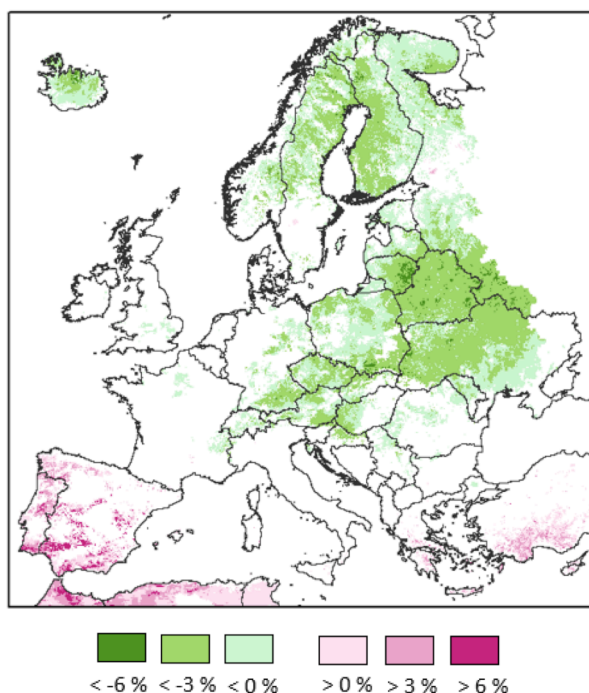
Figure 1. Current sensitivity to drought, based upon present climate and socio-economic conditions.



### IMPACTS ON SOIL MOISTURE

Under the 2°C warming scenario and assuming no change from nowadays in socio-economic conditions, average annual soil moisture declines in the west of the Mediterranean region by up to 6% (Figure 2). A much larger area, mainly in Northern Europe, sees increases in soil moisture of up to 6%. Some regions see no significant change, including much of Belgium, France, Italy, The Netherlands and the UK. The patterns of change suggest a continuation of the drying and wetting trends observed across Europe over the past 50 years.

Figure 2. Significant changes in annual soil moisture under a 2°C warming scenario. Positive values are indicative of drier conditions and negative values are indicative of wetter conditions.

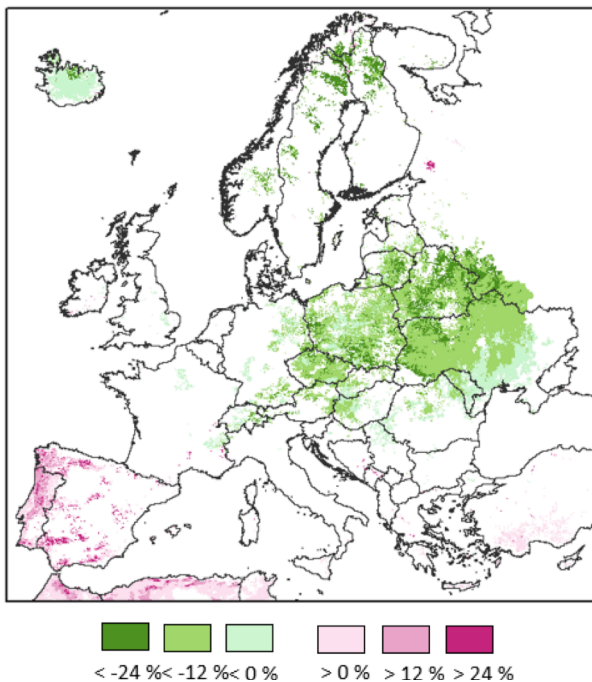


### DROUGHT OCCURRENCE AND SEVERITY

The occurrence and severity of droughts under climate change is a function of soil moisture, rainfall, and air temperature. As changes in soil moisture are a major driver of droughts, the occurrence and severity of droughts under the 2°C warming scenario (Figure 3) looks similar to the projected changes in soil moisture (Figure 2).

Droughts will be more frequent and severe in the west of the Mediterranean, including most of Portugal, Galicia in Spain and Mediterranean Turkey. They will be less so in Central-Eastern Europe (including Czech Republic, Poland, Belarus and most of Ukraine). The majority of Europe sees no significant change in the occurrence and severity of drought.

Figure 3. Spatial distribution of significant changes in drought occurrence and severity. Positive values are indicative of more frequent and severe droughts.



### DROUGHT RISK BY REGIONS

Drought risk is a factor of the sensitivity to drought and the occurrence and severity of droughts. A European picture of drought risk can therefore be obtained by

considering the sensitivity to drought, as mapped in Figure 1, along with the occurrence and severity of droughts under climate change, as mapped in Figure 3.

The regions of Europe that are projected to see more frequent and severe droughts are the same regions that currently have a low sensitivity to drought. On the other hand, the regions projected to see fewer and weaker droughts are the same regions that currently have a high sensitivity to drought. The two driving forces of drought risk therefore effectively cancel each other out, which means the majority of Europe sees no significant change in drought risk from nowadays.

However, the Southwest Mediterranean is an area of concern because in Andalucía, Extremadura, and Algarve (as well as in North Africa), the two driving forces of drought risk do not cancel each other out. Instead they combine: increases in drought occurrence and severity couple with medium levels of current sensitivity to drought. Therefore this region could be adversely affected by droughts under climate change.



#### APPROACH

PESETA III studied drought across Europe under a 2°C warming scenario, which is a level of warming corresponding to one of the goals of the Paris Agreement. A hydrological model, which was used elsewhere in the project to assess water resources and damages from river flooding, was used here to investigate spatial patterns of soil moisture drought. Climate projections from 5 climate models were applied to the hydrological model. The geographical scope of the study was all of Europe.

#### Read more

PESETA III Task 9: Climate change impacts and adaptation in Europe, focusing on extremes and adaptation until the 2030s. Available on our website <https://ec.europa.eu/jrc/en/peseta>