Norwegian Meteorological Institute

DET NORSKE VIDENSKAPS-AKADEMI

factsheet 5

Extreme weather events in Europe: preparing for climate change adaptation

Factsheet 5 Droughts and dry spells

Key messages

- Droughts and prolonged dry spells are relatively rare events that exhibit a large natural variability in frequency and intensity. Consequently, by definition it takes a long time for a potential trend to be detected.
- However, although increasing summer dryness has been observed in Central and Southern Europe since the 1950s, no consistent trends can be seen over the rest of Europe.
- For the future, summer dryness is expected to increase further in Central and Southern Europe, during the 21st century, leading to enhanced risk of drought, longer dry spells and stronger soil moisture deficits.

Future droughts and dry spells

Based on the balance of evidence coming from multi-model experiments, the following changes in summer dryness are expected in the course of the 21st century.

- Mediterranean, Southern and Central Europe: dryness is expected to increase during the 21st century, with longer dry spells and stronger soil moisture deficit.
- Northern Europe: no major changes in dryness are expected before the end of the 21st century.

Past droughts and dry spells

Globally, very dry areas have more than doubled – from 12 % to 30 % of the land area – since the 1970s. However, over Europe the trends are less clear.

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post@met.no
www.met.no

Figure 1 Drought warning, Bridport, UK, 1976
Source: Frank Barratt/Getty Images.

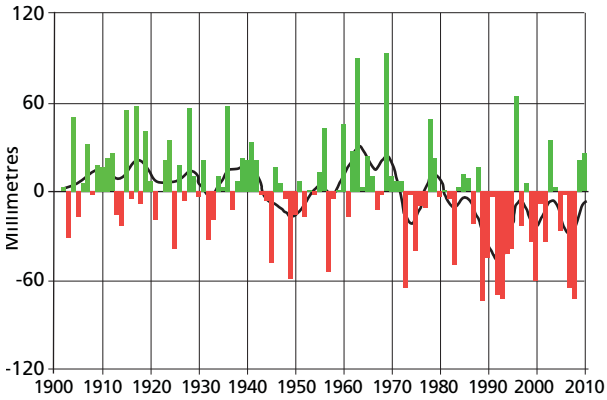
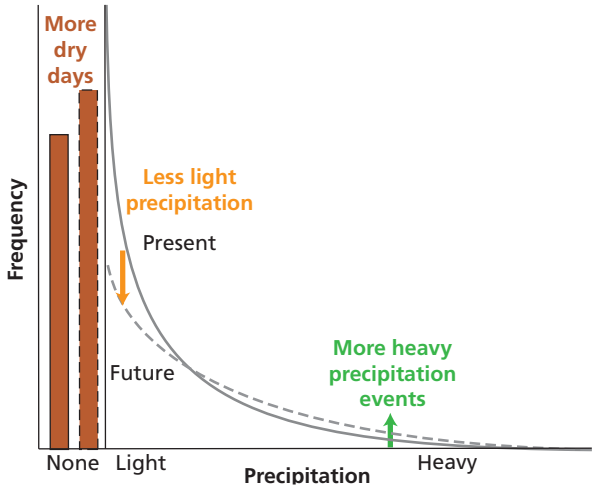


Figure 3 Mediterranean cold season precipitation for the period 1902–2010
Source: Hoerling *et al.*, 2012.

- Increasing dryness has been observed in Central and Southern Europe since the 1950s. The land area surrounding the Mediterranean has experienced 10 of the 12 driest winters since 1902 in just the past 20 years.
- In other regions, including Northern Europe, observations show either no change or inconsistent trends.

On the basis of an understanding of the physical process involved, increasing atmospheric greenhouse-gas concentrations are expected to lead to enhanced evaporation and earlier snow melt and vegetation onset, three factors contributing to enhanced summer drying. Thus, a long-standing result from global-coupled models has been a projected increase in summer drying in the mid-latitudes in a future, warmer climate, with an associated increased likelihood of drought. Regionally, this response can be substantially modified by potential changes in atmospheric circulation.

Figure 2 Potential changes in frequency and intensity of precipitation extremes in a changing climate
Current and potential future distributions are depicted with full and dashed lines, respectively.
Source: after CH2011, 2011.



The winter rainfall has decreased over Southern Europe and the Middle East, and has increased further north. The latter increase has been caused by a poleward shift of the North Atlantic storm track and a weakening of the Mediterranean storm track. At the same time, related to this, there has been a poleward expansion of the subtropical dry zones driven by an expansion of the Hadley cell.

Description

Drought is one of the most damaging types of natural disasters over long periods, with severe potential impacts on agriculture, food production and water supply. Examples of prolonged European droughts include that of 2004/2005 over the Iberian Peninsula, the dry conditions associated with the 2003 heat wave and the 1975/1976 drought over the southern British Isles and northern France.

Definition

Drought is a temporary dry period and is often classified into the following three types:

- meteorological drought, defined as prolonged, abnormal deficit of precipitation;

- agricultural drought (also soil-moisture drought), a precipitation shortage during the growing season that affects agriculture or ecosystem functions;
- hydrological drought, below-normal streamflow, lake and groundwater levels.

A lack of precipitation (meteorological drought) often triggers agricultural and hydrological droughts. However, other factors, including more intense but less frequent precipitation, poor water management, and erosion, can also cause or enhance these droughts.

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