



Future changes to high impact weather in the UK

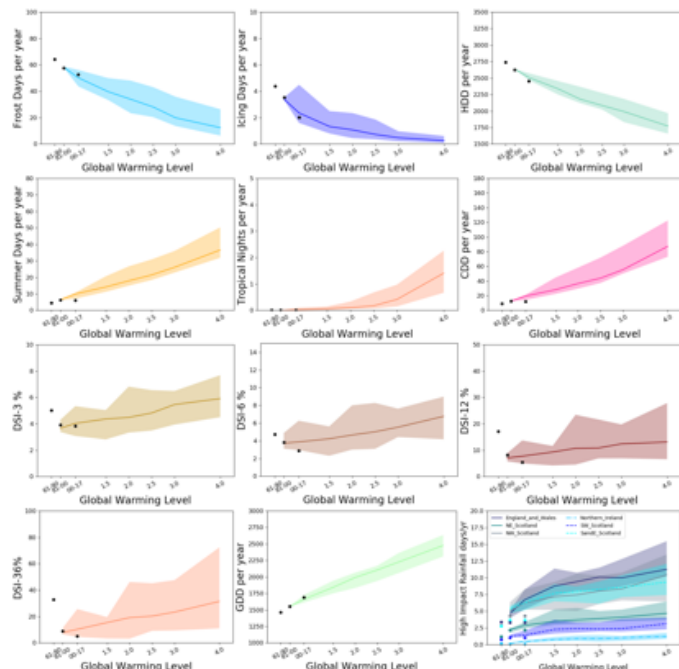
Why this is important: High impact weather events such as extreme temperatures or rainfall can cause significant disruption across the UK affecting sectors such as health, transport, agriculture and energy. Whilst it is clear extreme weather events can cause impacts in the UK, it is also now clear that the UK is experiencing different impacts due to its changing climate.



As the climate continues to change in response to human activities, the UK will be subject to different frequency, severity and duration of various climate hazards and high impact weather. In order to develop effective plans to reduce the impact of these it is important to first characterise the future changes. This will enable the characterisation of climate risks and ultimately be able to better inform adaptation planning in different sectors to support the increase in resilience of the UK to future climate variability and change.

What the UKCR programme is doing: A study has been undertaken drawing on the latest set of UK Climate Projections (UKCP18 12km regional climate model projections) to examine metrics relating to high impact weather over the UK and how these change with different levels of future global warming from 1.5°C to 4°C above pre-industrial levels. Metrics included in this study have been chosen to relate to flooding and severe weather risks highlighted in the UK National Risk Register and of relevance to UK adaptation.

Results so far: The changes to these hazards show significant increases in the frequency of extremely hot days and nights, with a UK average increase in hot days of between +5 and +39 days per year for 1.5°C to 4°C of global warming and extremely hot nights, which are currently rare, emerging as more common occurrences. Whilst increases in the frequency of high daily temperatures and rainfall increase systematically, the frequency of very cold conditions (based on days where temperatures fall below 0°C) is shown to decrease by 10 to 49 days per year between 1.5°C and 4°C of warming.



Evolution of each impact index with increasing global mean temperature averaged over the UK. The ensemble range is shown as a plume with the ensemble median average (solid line). The mean average index is computed with observations for baseline periods 1961-1990, 1981-2000 and 2000-2017 (black dots).

Levels of daily rainfall are shown to increase across the country, with increases of days with high impact

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levels of rainfall occurring by +1 to +8 days per year between 1.5°C and 4°C of warming suggesting more frequent river flooding having widespread severe impacts across the UK. Average drought severity based solely on rainfall deficit is also projected to increase, especially so in the south and east of the UK, for 3, 6, 12 and 36-month drought indicators. The largest increases in severity were for the longer-term 12-month (-3 to +19%) and 36-month (12 to +54%) droughts between 1.5°C and 4°C of warming. This suggests that for England and Wales, adaptation of water management practices can expect to be required to cope with increased severity of drought.

What is next? The results of this study have been written up and submitted to the Climatic Change journal for publication and the draft paper also circulated to Climate Change Risk Assessment (CCRA) chapter leads. Authors are also working with the BBC to include some of this work in a Panorama documentary on climate change (broadcast date TBC). A future paper translating hazards into risks with socioeconomic projections from the CCRA is intended to also be submitted for publication by the end of FY20/21. Infographics are being developed to communicate these important results more widely. UKCP18 Local simulations at 2.2km have now been released and further analysis, particularly on rainfall, will be studied with these 2.2km simulations.

Reference: Hanlon, H., Bernie, D., Carigi, G., Lowe, J., 2021, Future Changes to high impact weather in the UK, *Climatic Change*. <https://doi.org/10.1007/s10584-021-03100-5>