SCIENCE FOR ENVIRONMENT POLICY

Hydrological drought forecasts now outperform meteorological drought forecasts

18th November 2020 /
Issue 553

[Subscribe](#) to free bi-weekly News Alert.

Source:
Sutanto, S. J., Wetterhall, F. and Van Lanen, H. A. J. (2020) Hydrological drought forecasts outperform meteorological drought forecasts. *Environmental Research Letters*, 15: 084010. https://doi.org/10.1088/1748-9326/ab8b13

Contact:
samuel.sutanto@wur.nl

At present, droughts are primarily predicted using meteorological forecasts. However, technological developments in hydrological forecasting mean that the latter presents an increasingly promising option. An evaluation for the pan-European region has demonstrated that hydrological drought forecasts (groundwater, river flow) now outperform their meteorological counterparts. This study provides evidence in favour of updating current water-management policy and practice to include dynamical hydro-meteorological models — that combine hydrological and meteorological forecasts — and so minimise future drought impacts.

Drought is one of the world's most severe weather-related events, capable of causing significant losses and damages. To reduce drought impacts, an effective early warning system (EWS) is essential. Until now, accurately forecasting drought hazard has been a challenge. Current EWSs tend to forecast meteorological drought (drought caused by dry weather) but not hydrological drought (drought caused by low groundwater and river flow), despite the fact that the latter is more relevant for severally impacted sectors. However, recent technological developments in hydrological forecasting have led to the development of dynamical hydro-meteorological drought forecasts that predict drought hazard in groundwater and river flow at the sub-seasonal (monthly forecasts generated with a range of up to 32 days) to seasonal level (up to about seven months).

To evaluate hydro-meteorological drought-forecasting skill for the pan-European region, this study was conducted as part of the EU-funded ANYWHERE project[1]. The study used historical and reforecast (retrospective forecasts for many dates in the past — also known as 'hindcast') precipitation, evapotranspiration, river flow and groundwater data spanning several years, gridded at a detailed spatial scale (5 km) to create drought forecasting scores, based on differences in drought classes, that are easy to use.

European Commission

SCIENCE FOR ENVIRONMENT POLICY

Hydrological drought forecasts now outperform meteorological drought forecasts (continued)

First, historic drought events were identified and classified by severity, ranging from mild to extreme. Next, reforecasted hydro-meteorological variables (including precipitation, precipitation minus evaporation) were used to reforecast groundwater and river flow droughts. These were then compared with forecasts produced using Ensemble Streamflow Prediction (ESP), a long-term drought forecast based on historic hydro-meteorological data that is widely used in many forecasting studies. All forecasts were assigned a forecasting score based on their similarity to the observed data, allowing for the comparison of forecast performance.

The results showed that hydrological drought forecasts (groundwater and river flow) outperform meteorological forecasts, with a predictive power beyond two months ahead. Moreover, by comparing the drought-forecasting scores obtained from the dynamical forecast with those derived from the ESP, it was revealed that dynamical forecasts derived from seasonal forecasts have higher predictability than the ESP. This finding suggests that seasonal hydrological drought-forecasting systems have the potential to provide added value to end users such as water managers.

Taken together, these results demonstrate the superiority of seasonal hydrological drought- forecasting systems compared to the corresponding meteorological drought forecasting systems that are mainly used today, while also making a case for the further development of seasonal hydrological drought-forecasting systems, posit the researchers. Such technologies have the potential to improve drought-forecasting capacity, and thereby reduce the adverse impacts of drought events. Since droughts are expected to become more frequent and severe in many parts of the world as a consequence of climate change, this may represent an opportunity for water managers and policymakers to update current practice and policy and increase reliance on hydrological as well as meteorological forecasting.

Read more about:
Innovation and new technologies, Natural hazards, Water

To cite this article/service:
"Science for Environment Policy": European Commission DG Environment News Alert Service, edited by SCU, The University of the West of England, Bristol..

1. The ANYWHERE project (www.anywhere-h2020.eu) is funded within EU's Horizon 2020 research and innovation programme. Hydro-meteorological data came from the European Flood Awareness System (EFAS) computational centre, which is part of the Copernicus Emergency Management Service (EMS) and early warning systems (EWS) funded by the European Commission.