The story so far

Evan Dollar, Head of Water Resources for MWH gives his view on the UK Drought and calls for more research and monitoring

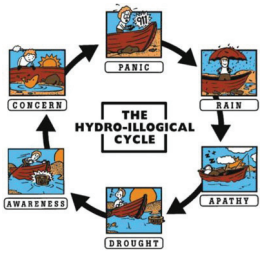
We all saw the headlines, 'UK in drought crisis', 'March hottest, driest month for 30 years', 'Hosepipe bans in South' and then in April we had the wettest and possibly coldest month for 100 years. Drought slipped off the front pages.

So how should we respond as water resource practitioners? In all the hubbub, we need to remain balanced and recognise that drought is a naturally occurring phenomenon which the UK is vulnerable to. This was highlighted in 2006 when the southern parts of the country experienced successive dry winter/spring periods followed by a dry, hot summer. The role of successive dry winters is also clearly evident in our 2012 drought situation. While the UK climate is naturally very variable and each drought event is unique, individual drought clusters provide only limited insight into possible future trends, particularly when considering future climate change impacts where droughts are likely to become more frequent.

From a water resources perspective, the key rainfall period is November to April, when storage reservoirs are re-filled and groundwater replenished. Low winter and early spring rainfall can therefore create supply challenges and lead to ecological stress. There are also clear regional differences: In the southern lowlands, aquatic ecosystems are largely dependent on aquifers (groundwater) during the summer and autumn. In the northern uplands, aquatic ecosystems are largely dependent on surface water. Thus an important factor determining the impact of drought, and the ability of natural systems to recover from drought is timing, or the extent to which drought is aseasonal for that region (i.e. occurs in the normally wetter months when water resources should be replenished), and supraseasonal (i.e. persists over several seasons and years).

The ability to recover to pre-drought conditions is a key concept in impact analysis. Recovery may mean that over medium and long timescales, droughts have no significant impact. However, when certain thresholds are crossed, recovery may not be possible. For example during the 1976 drought some upland blanket peats altered their physical characteristics beyond a threshold from which they could recover, producing a step change in wetland ecosystems.

It should also be recognised that drought is a complex, multi-faceted phenomenon. Accordingly, there is a very wide range of indicators available for characterising drought, with no single indicator likely to reflect the full range of impacts. Nevertheless, droughts can be usefully considered in terms of their category (meteorological, hydrological & agricultural), extent (spatial), duration (short, medium, long, multi-seasonal/year), intensity and range of impact. Droughts exhibit spatial coherence, and meteorological droughts (rainfall deficits) typically affect large areas simultaneously. However, it is known that different parts of the UK are vulnerable to droughts of different typical duration and seasonality, owing to their



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different hydrological responses (as illustrated in regional "drought catalogues" for the UK). The combinations of these factors mean, for example, that a short, intense drought might have a significant impact in the northern uplands, with little or no coincident impact in the southern lowlands. Similarly, longer periods of low rainfall/flows in the southern lowlands pose a bigger threat, as aquifers are not replenished during the winter period. Antecedent conditions are therefore one of the keys to understanding and predicting drought impacts.

Ecosystems and organisms are adapted to drought in varying degrees. There are some naturally intermittent water bodies that become dry almost every year and have distinct communities that are resilient to or even dependent upon drought (e.g. winterbournes). Accordingly, there are regional differences in drought impacts which are expressed spatially and temporally. Further, while low flows/droughts have important ecological functions such as promoting/preventing the spread of some invasive species and the recruitment of coarse fish species, they can also have a profound effect on both the structure and functioning of aquatic ecosystems.

There are, however, a number of complexities in assessing the impacts of drought. First, it is difficult to separate drought/low flow impacts from the impacts of warmer water temperatures as these often go hand in hand. Second, human-induced pressures on catchments, such as abstraction, habitat modification, point-source and diffuse-pollution, excess fine sediment, loss of riparian vegetation, amongst other impacts; modify how aquatic ecosystems respond to drought in ways that are not yet fully understood. Impacts also vary with, for example, river type and scale (e.g. hydraulic geometry characteristics). Hence, drought impact needs to be viewed as a multi-pressure problem where ecosystem resistance and resilience to drought are impaired by multiple anthropogenic factors.

So what next?

We need to avoid reacting to droughts by following the 'hydro-illogical cycle' (see diagram to left). That's to say, a drought happens, is widely reported, people panic, emergency measures like hosepipe bans are implemented and then it rains. The urgency disappears, the story stops being reported and the drought is forgotten until the next time. We need to treat drought like any other natural phenomenon – and understand it better. To do this we need further targeted research and monitoring, focusing on predicting the water resource, ecological and social impacts so we can manage it better into the future. The time for action is now, let's not wait until the next drought when we re-enter the predictable 'hydro-illogical cycle'. Drought needs to be tackled systematically, holistically and rationally.