



## **Water use and water availability constraints to decarbonised electricity systems**

Edward Byers (1,3), Meysam Qadrdan (2), Jim Hall (3), Jaime Amezcaga (1), Modassar Chaudry (2), Chris Kilsby (1), Tran Martino (3,5), and David Alderson (1)

(1) School of Civil Engineering & Geosciences, Newcastle University, Newcastle upon Tyne, United Kingdom (edwardbyers@gmail.com), (2) School of Engineering, Cardiff University, Cardiff, United Kingdom, (3) Environmental Change Institute, University of Oxford, Oxford, United Kingdom, (4) International Institute for Applied Systems Analysis, Vienna, Austria, (5) School of Community and Regional Planning, University of British Columbia, Vancouver, Canada

Analysis of numerous low carbon electricity strategies have been shown to have very divergent water requirements, normally needed for cooling of thermoelectric power stations.

Our regional river-basin scale analysis of water use for future UK electricity strategies shows that, whilst in the majority of cases freshwater use is expected to decline, pathways with high levels of carbon capture and storage (CCS) will result in significantly elevated and concentrated water demands in a few key river basins. Furthermore, these growing demands are compared to both current water availability, and our expected regional water availability under the impacts of climate change. We identify key freshwater constraints to electricity strategies with high levels of CCS and show how these risks may be mitigated with higher levels of hybrid cooling and alternative cooling water sources.