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Focus Area 2: Water Scarcity

Water Demand Management in a Changing Climate

A NERC CCN Water Scarcity Workshop

Introduction

Enda O'Connell

School of
Civil Engineering and Geosciences



Newcastle
University



Factors that can induce Water Scarcity

- Lack of the resource (U)
 - High per capita water consumption (C)
 - Inefficient usage induced by low pricing/a lack of metering (C)
 - High leakage rates (C)
 - Poor institutional performance (C)
 - WFD and over-abstraction: environment needs more water (C)
- (U: uncontrollable C: controllable)



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- WFD and over-abstraction: environment needs more water (C)
- Overarching threat of climate change (U)**

(U: uncontrollable C: controllable)



Climate Change: UKCP09 Projections

- Under Climate Change, Water Scarcity is expected to become a serious issue in the UK in the coming decades, particularly in the South East
- UKCP09 scenarios provide the latest generation of climate information for the UK: probabilistic projections of climate change based on quantification of the known sources of uncertainty.
- **Key issue: How to incorporate CP09 projections into Water Resources Management Planning (WRMP) ?**



Sustainable Water Resources Management

- With high uncertainty over resource availability, need to focus more on controllable factors
- Supply-led approaches not sustainable in long term: **Water Conservation and Demand Management** (WCDM) must be implemented within a sustainable approach to managing the supply-demand balance



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February 2010 Workshop: **Water Resources Assessment in a Changing Climate**

Focussed on the supply side, in particular:

- Climate change uncertainties and their inclusion in headroom calculations
- The challenge and opportunities presented by the widespread use of UKCP09 Weather Generator (WG) outputs

Workshop looked beyond the UKCP09 scenarios towards 'transient' WG outputs that deal with variability on a range of time-scales, including long term trends due to climate change and other processes



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February 2010 Workshop:
**Water Resources Assessment in a
Changing Climate**

**Towards risk-based water resources planning in
England and Wales
under a changing climate**

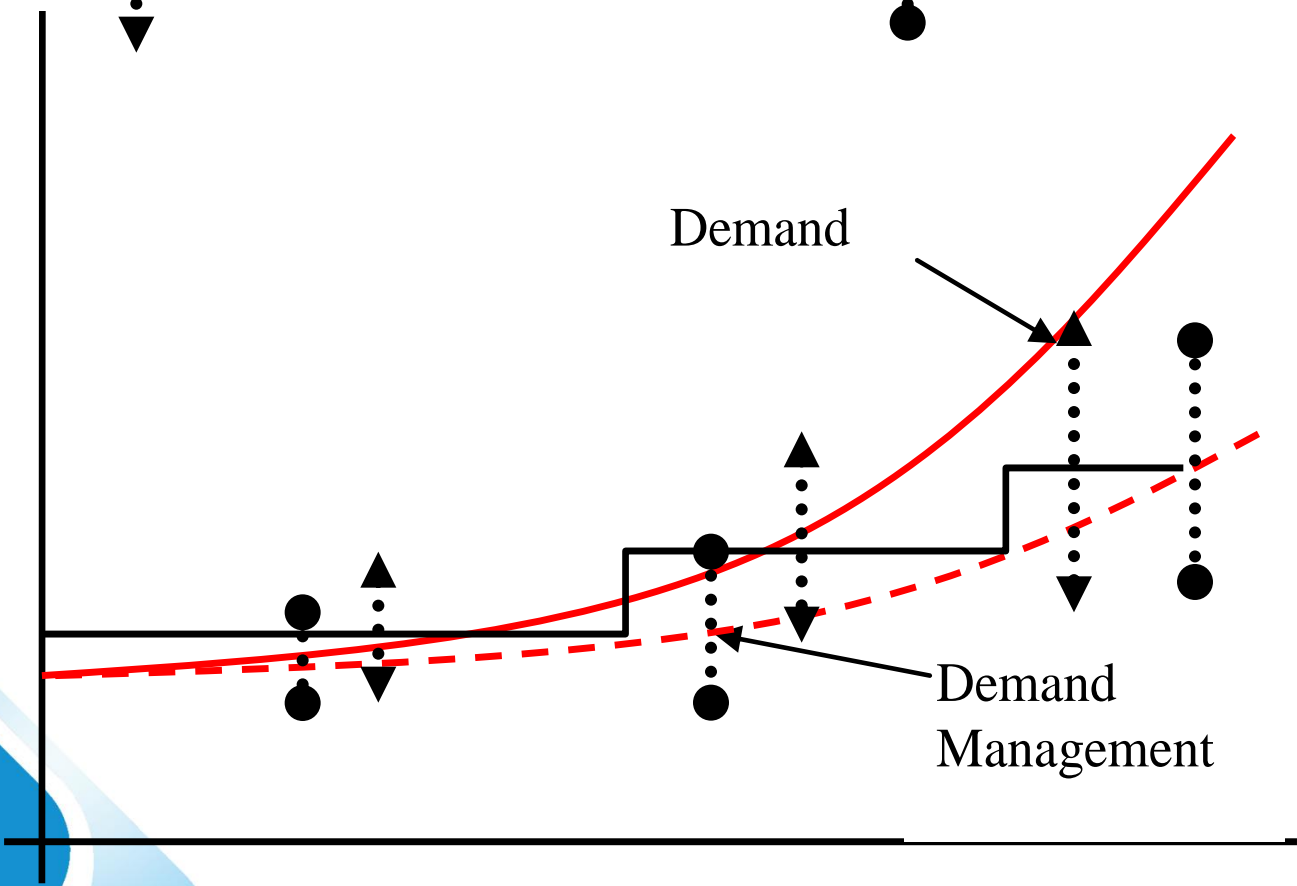
J.W. Hall* (Newcastle University), G. Watts
(Environment Agency), M. Keil (Ofwat),
L. de Vial (Wessex Water), R. Street (UK Climate
Impacts Programme),
K. Conlan (Cascade Consulting), P.E. O'Connell
(Newcastle University),
K.J. Beven (Lancaster University), C.G. Kilsby
(Newcastle University)

CIWEM Journal. under review



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Uncertainty in Supply

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Uncertainty in Demand





Estimating probabilities of restrictions

- Stochastic simulation of n years of rainfall (UKCP09 WG) and/or flows and groundwater levels
- Simulated demand (including demand reduction during restrictions) with uncertainty
- Continuous simulation of water resource system (abstractions, reservoir levels, transfers, water supplied) and restrictions where necessary
- Count of number of occasions in which different restrictions are required during simulation

$$f(R_i) \approx \frac{\text{\#years in } R_i \text{ restriction is required}}{\text{total number } n \text{ of years in simulation}}$$

- Compare $f(R_i)$ with Level of Service for restrictions of severity i

