



# Drought planning as a proxy for water security in England

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In many jurisdictions the condition of water scarcity (or water stress), either seasonally or continually, is occurring more frequently due to development pressures, increased water usage, and climate change. In England drought is a growing and central concern for public water supply security such that drought planning by water companies has become a major feature of water resources planning. In this regime, water companies develop drought triggers — based in part on customers' stated preferences (willingness to pay) — as a decision-making tool to guide the implementation of particular drought management options. The article finds that the strong link between levels of service and drought-trigger curves produces an emphasis on supply over demand management. And, it finds The regulatory framework makes drought planning a proxy for water security.

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## Introduction

The 1989 privatization of water authorities in England and Wales eventually resulted in a patchwork of water-only and water and sewerage service companies as well as three regulators of distinct aspects of water supply and use — economic (Water Services Regulation Authority, known as Ofwat), environmental (Environment Agency), and quality (Drinking Water Inspectorate). As a neoliberal exercise the result has been described as an incomplete implementation of market environmentalism with the quasi-commodification of water [1<sup>••</sup>]. As Bakker notes, certain environmental improvements have been

accrued, namely the 'greater legitimacy and protection for an expanded environment have been embedded in water regulation and management' [1<sup>••</sup>]. Largely by 'addressing and mobilizing water scarcity' market environmentalism has created the opportunity to pursue economic growth alongside environmental improvements [1<sup>••</sup>]. Indeed, since privatization significant improvements in water quality, sewerage treatment, and river flows have been recorded (see [2]).

From the early 2000s water availability, due to drought and water scarcity, became an increasing concern in Europe and the UK, perhaps most marked by the European heatwave of 2003. In 2012, the EU Commission reaffirmed an earlier determination that the management of water scarcity and drought could be done through the EU Water Framework Directive [3–5]. In its two most recent white papers on water, The Department for Environment, Food and Rural Affairs (Defra) has indicated that security of water supplies is under threat from both a growing population and climate change [6<sup>•</sup>,7]. In 2011, the environmental regulator for England, the Environment Agency (EA, or the Agency) declared that the water resources in the south-east of the country were water stressed — 'at high risk of environmental impacts as a result of overexploitation from abstraction' [8]. At the same time, Defra expressed confidence in the likelihood that average temperatures in the UK would increase and noted that although the effects on rainfall are less easy to predict Defra expected changes in seasonal precipitation patterns [7]. The most recent UK Climate Change Risk Assessment reports that 'rainfall projections are uncertain and a change in the likelihood of drought in the UK has not been detected' [9]. Despite the absence of a clear signal, the uncertainty around the impacts of climate change on precipitation retains drought planning as an important activity for water companies and regulators.

In England,<sup>1</sup> managing water availability for the environment is, for the most part, the work of the EA; managing water availability for the public is primarily the work of water companies who have a statutory duty to ensure public water supply is secure [[10, s. 37]]. Water security has been variously defined and remains a contested concept [11<sup>••</sup>]. A broad definition of water security as

<sup>1</sup> The regulatory framework in England and Wales is largely the same, but increasingly diverging, particularly in policy as with the creation of Natural Resources Wales in 2013. The focus of this paper is on England.

‘sustainable access, on a watershed basis, to adequate quantities of water, of acceptable quality, to ensure human and ecosystem health’ [12]. Although they are not explicitly framed as water security such a broad definition arguably fits the combined and overall goals of 21st century water resource management in England for water companies and regulators.

Since 2005, as a result of amendments to the Water Act 2003, English and Welsh water companies have been obliged to produce water resources management plans<sup>2</sup> and drought plans.<sup>3</sup> Maintenance of adequate and wholesome public supply during drought is a statutory obligation of water companies achieved through water company drought plans and operational practise [10]. Although focussed on public supply, water companies must assess the potential environmental impacts of their water resources management. The paper next explains some key features of water company water resource planning before considering the implications for water security in England of a particular feature — Levels of Service — of the current regulatory framework for drought planning and management.

### Levels of service in water resources planning

As in most jurisdictions, in England water resources management and drought planning call on expertise from across a variety of agencies that could be better aligned [13]. Recent statutory amendments have synchronised the timescales of water resources management plans (WRMPs) and drought plans in that each is to be updated at least every five years [[14, s. 28]], but the plans are still prepared in separate processes. Some water managers suggest the two plans ought to be one because the WRMP sets the strategic plan for the next twenty-five years within which the drought plan details the company’s likely operational responses under the conditions of drought [personal communications with water resource managers at English water companies December 2014]. Nonetheless, the data, information and assumptions that go into WRMP are necessarily imported into drought plans.

At the core of both the WRMP and the drought plan is the concept of Levels of Service (LoS) (Figure 1). According to the WRMP guidance prepared by water industry

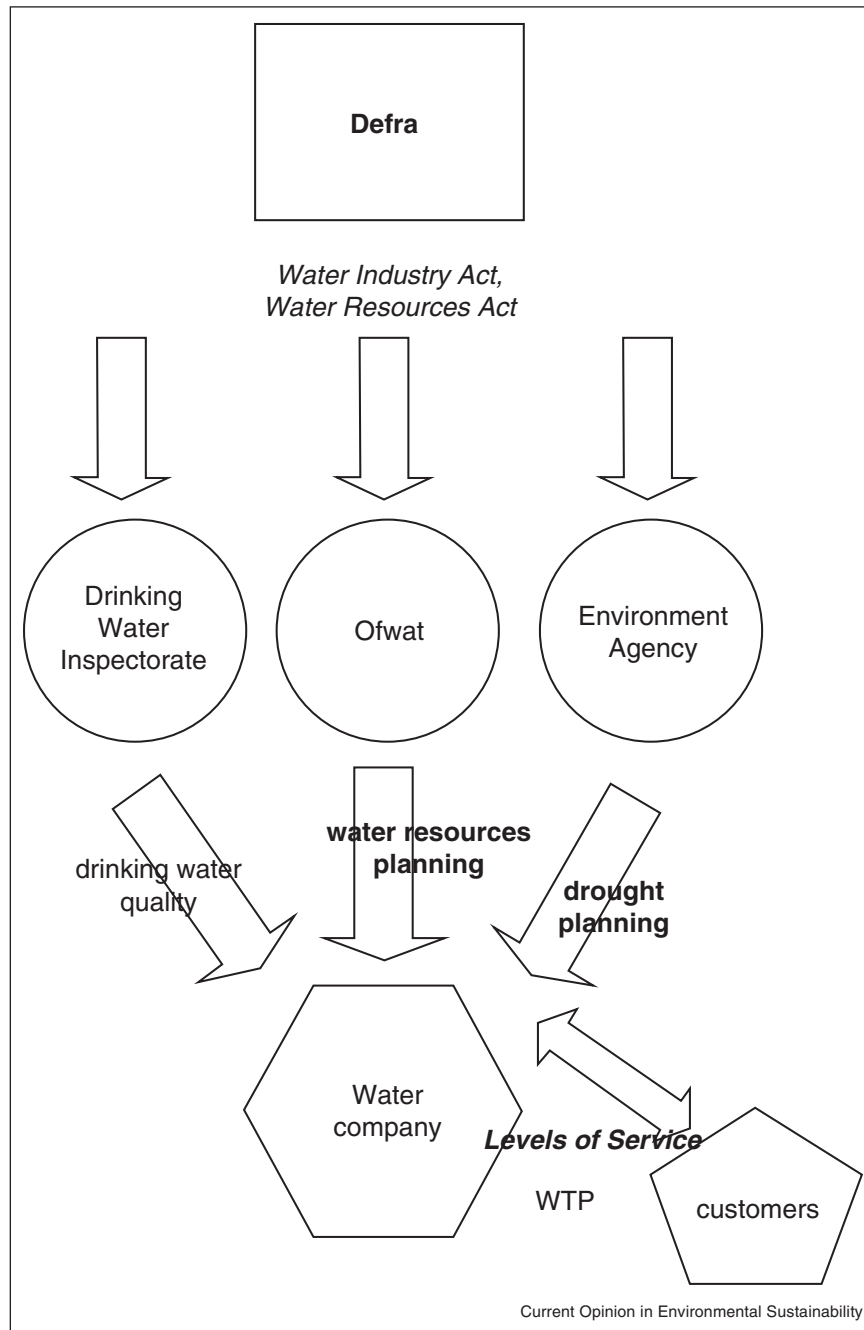
regulators, LoS ‘are a contract between a water company and its customers, setting out the standard of service that customers can expect to receive from a water company’ [15]. The legislative obligation that a water company will ‘supply *adequate* quantities of wholesome water’ during drought periods [[10, s. 39B(2)]] underlies the contractual relationship between a water company and a customer and supports the engagement of customers in determining LoS. Further, LoS ‘describe the average frequency that a company will apply restrictions on water use to its customers’ [15], or otherwise put ‘set out the standard of service that customers receive or can expect to receive from their water company’ [16]. The guidance obligates water companies to engage customers through research and communications to ‘find out what levels of service customers expect’ [15]. The engagement of customers is critical because LoS underpin the management activities specified in WRMPs, drought plans and business plans, including how often a water company will implement particular drought management options.

The WRMP guidance, prepared by the EA, suggests five different methods that water companies can use to determine the preferred water management options for their plans [15]. The three methods developed by UKWIR, the water industry’s research organization, include two economic methods — *The economics of balancing supply and demand* and *Carrying out Willingness to Pay Surveys (WTP)* — as well as the *Guidance on Strategic Environmental Assessment and Habitats Regulations Assessment of Water Resources Management plans*. The fourth method is Ofwat’s *customer engagement policy statement*. The fifth method is the EA’s *Benefits assessment guidance*. UKWIR’s WTP method is the only method of the suggested five that canvasses customer opinions and therefore could be used to develop LoS as they are currently understood. Indeed, WTP is the main method used by the water industry to ask customers how much they are willing to pay for better levels of service, in other words, to lower the frequency with which drought management options are applied by improving supply [17]. Companies and their consultants use a variety of tools — stakeholder workshops, focus groups, and online surveys — to engage with customers in order to establish customer priorities for services and views on bills [15,16]. The use of Cost Benefit Analysis (CBA) and, particularly, contingent valuation studies as Willingness to Pay (WTP), is widespread in environmental policy and widely critiqued [18,19]. Two main arguments against the use of WTP for environmental policy are first, that CBA is flawed for technical reasons that belie its apparent simplicity and objectivity and, second that it ought to measure economic efficiency and never equity [19]. Companies are aware of the weaknesses of WTP. For example, in its 2015–2040 WRMP Thames Water, as directed by Defra, makes specific reference to the potential shortcomings of WTP surveys, especially with regard

<sup>2</sup> Water Industry Act s.37(1) ‘It shall be the duty of every water undertaker to develop and maintain an efficient and economical system of water supply within its area and to ensure that all such arrangements have been made — (a) for providing supplies of water to premises in that area and for making such supplies available to persons who demand them; and (b) for maintaining, improving and extending the water undertaker’s water mains and other pipes, as are necessary for securing that the undertaker is and continues to be able to meet its obligations under this Part.’

<sup>3</sup> Water Industry Act s.39B(2) ‘a plan for how the water undertaker will continue, during a period of drought to discharge its duties to supply adequate quantities of wholesome water.’

Figure 1



Interconnections of Drought Planning Institutions and LoS in England.

to survey design and prior knowledge held by customers [20]. Nonetheless, for now, WTP is the main way in which water companies determine LoS that are then used to plan drought management interventions (e.g., customer awareness campaigns, engineering works, drought permits and orders) which are written into drought plans.

Currently, most water companies use the company's stated LoS and historical data to create, for each water

resource, drought curves with drought-trigger zones. In turn, the zones, each of which represents conditions from normal, to various levels of drought, are associated with particular drought management actions. For example, United Utilities has categories of normal, increased drought risk, possible drought, drought alert, and drought [21]. The normal operating curve, or baseline, against which drought curves are drawn is usually developed from the historical record of drought experience; here the

baseline represents ‘a storage ‘target’ to ensure security of water supply should the reservoir experience a drought equivalent in severity to any that has occurred’ over the course of the company’s historical record [22]. For some companies the record may be as long as 120 years (e.g., Wessex) while others have shorter records of perhaps 40 or 50 years (e.g., Welsh Water).

Water companies undertake to make particular drought management interventions when drought-trigger zones are crossed; in other words, when supplies in water resources are measured and found within a particular drought-trigger zone then a corresponding action (demand or supply side), as set out in the drought plan, will be taken (e.g., lowering of pumps, increased attention to repairing leaks in the network, or application for a drought permit). Water companies must include all possible drought permits and orders that they may want to subsequently apply for — in the course of a drought — in their drought plan. Both drought permits and drought orders require approval by the appropriate agency prior to implementation. The EA has authority to approve drought permits which typically grant a licence modification that increases the amount of water available for abstraction. The Secretary of State for Defra (SOS) has authority to grant ordinary and emergency drought orders which either water companies or the EA may apply for. Ordinary drought orders may restrict non-essential water use (demand side) or impact abstractions and discharges under existing licences (supply side); emergency drought orders will restrict essential uses (demand side). In application for both drought permits and orders, water companies must prepare a report detailing likely environmental impacts<sup>4</sup> and explain the arrangements for environmental monitoring and mitigation that might be required for the requested permit or order [23]. The appropriate agency (EA or SOS) must be satisfied that due to an exceptional shortage of rain a serious deficiency exists or is threatened before it grants either a drought permit or a drought order [24].

At least one water company, Southern Water, no longer relies on the historical record, but instead uses a ‘stochastic water resource modelling approach...to examine how the interventions and triggers described in the Drought Plan...interact with severe droughts and the lead into severe droughts in order to develop design scenarios that reflect the Levels of Service stated [herein]’ [16]. In December 2015, the EA published updated drought planning guidelines for water companies, which suggest that the Agency is moving toward adoption of statistical approaches for modelling drought: ‘You should at least

plan to be able to provide supplies through a repeat of historic droughts in your company records. However we strongly encourage you to plan for drought events that are of longer duration and lower rainfall than those in the historic record. If you choose not to, you should explain why’ [25]. With this move the EA has recognized that relying on the historical record is insufficient for planning under the uncertainty that exists today. However, keeping drought planning tightly connected to LoS is likely to drive a greater focus on supply management because the narrow construction of LoS and subsequent translation into drought triggers on supply curves serves to emphasize supply-side interventions. Put simply, that connection to and reliance on LoS for drought management serves to limit the framing of the very broad problem of drought in highly uncertain times.

### Implications of levels of service

All drought permits and orders have effectively passed a first screening when they are included in a final drought plan approved by Defra. The need to make application before implementing permits and orders allows decision makers (the EA or the SOS) the opportunity to reconsider; in theory, they can make a real-time determination that balances economic and environmental needs as they are then, not as they were when the drought plan was written. However, drought permits and orders are rarely refused and minimally modified ([26]; personal communication with water manager of English water company January 2016; see also statutory instruments). Drought permits and orders are rarely refused or modified because to do so is a great economic risk: it threatens public water supply security (as determined by LoS). In effect, the decisions made by water companies about drought planning to ensure public water supply security operate as a proxy measure for overall water security.

So what if water companies rely on WTP and LoS for drought planning that effectively determines national water security? In the current framework of water resources planning, using WTP methodology, however well executed, to determine the service contract focusses attention on finding the balance between cost and improved service and supply. Embedding the LoS determined from this process into water resources planning serves to frame public water supply security around the maintenance of a particular level of supply rather than a broader vision of water security that includes quality and quantity for humans and ecosystems (of which humans are part). Moreover, the dominant focus on supply rejects Defra’s earlier vision (2008) for a twin-track approach to water security (an approach not mentioned in Defra’s 2011 White Paper) and academic commentary (see [3,7,8]). A better approach would require a more holistic vision for water security. Methods to do this include scenario tools such as backcasting and the soft path [27<sup>••</sup>,28<sup>••</sup>]. The engagement of customers in the

<sup>4</sup> Environmental impacts include the expected changes in flow/level regime, the likely impacts on sensitive features, and mitigation options to prevent or reduce impacts of the proposed drought order or permit; and monitoring requirements during and after the drought.



