Water supply in England and Wales: whose responsibility is it when things go wrong?

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Abstract

The privatisation of the UK water sector in 1989 fundamentally altered the risk landscape. Where previously it was the government's responsibility to ensure that water supply met demand, that quality met standards and that the environment was not harmed, now there is a complex landscape within which risks are managed by a variety of stakeholders. The problem is that water management is an inherently risky business, where although it is in the interest of most stakeholders to minimise the risk of water supply failure it is not the responsibility of most stakeholders. It is not, for example, either in the interest of, or the responsibility of, natural ecosystems to minimise the risk of water supply failure. This paper explores the changing nature of risk allocation and distribution in the management of domestic water supply security in England and Wales. In so doing, it examines the extent to which the institutional arrangements under the British model of privatisation have facilitated a risk redistribution culture in the event that 'things go wrong'.

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1. Introduction

One of the main challenges for the 21st century is how to manage the competing and increasing demands on freshwater resources given the inconsistency in time and space between water availability, human and environmental demands. The management of human demands must necessarily involve the filtering-out of variability such that water resource availability matches...
demand. In so doing, there are potentially adverse impacts on the environment through, for example, low stream flows and reservoir developments. Ultimately, water resource management is about the management of the trade-offs between benefits on the one hand (among which is the risk reduction to humans), and costs on the other (among which is the risk of environmental damage).

These risk trade-offs must be managed under conditions of uncertainty. In particular, we are faced with uncertainties about the likely changes in global, national and regional climates and the likely changes in climate variability. Furthermore, whilst it is recognised that demand is rising, there is uncertainty about the likely impact of population growth, urbanisation and rising living standards on future demand patterns. What is certain is that the future will be different to today, what is uncertain is the nature of this difference. To tackle this uncertainty we need institutional arrangements that facilitate the management of, and anticipate the influence of, competing and conflicting demands. This requires a more explicit understanding of the stakeholders involved and the allocation of risks among these stakeholders. It also requires a more explicit understanding of how institutions and systems function under conditions of stress.

It is not the aim of this paper to establish how institutions and systems function under conditions of stress. Instead, we examine the role of institutional arrangements for the distribution and allocation of risks and how this distribution might change under conditions of stress. In this capacity, we are seeking to 'unpack' the risk landscape. Focusing on the institutional arrangements implemented in the British model of water privatisation, the following questions are addressed:

- Whose responsibility is it to ensure domestic water supply security?
- What are the conflicts between stakeholder interests?
- How might this risk responsibility be redistributed under conditions of stress?

In exploring these questions, we begin by examining what we mean by risk and uncertainty. Next, we explore the uncertainties in run-off variability and the impact of this on water resource availability. This is important because, although it is not the responsibility of all stakeholders to manage climate variability, it is in the interest of most stakeholders that this variability is managed in such a way that domestic water supply security is maintained. It is, however, recognised that there is an inherent risk trade-off between managing the risks to supply and managing the risks to natural ecosystems. Hence, it is not in the interest of natural ecosystems that domestic supply security is maintained.

Next, we examine the changing institutional arrangements in the management of water resources within England and Wales. In particular, we seek to illustrate how, by focusing on regulatory arrangements for managing what is a natural monopoly, the privatisation process did not adequately address the risk responsibilities of the various stakeholders involved. Furthermore, we examine the extent to which this 'risk landscape' has fashioned competing, and often conflicting, responsibilities and demands between the consumers, water companies, regulators and the government. Finally, we explore the extent to which these institutional arrangements have facilitated a risk redistribution culture in the event that 'things go wrong'.
2. Risk and uncertainty

Considering the vast literature on risk and uncertainty it is surprising that no consensus has emerged about how risk and uncertainty ought to be defined. Where uncertainty is treated as a subset of risk, the risk is that we do not know the probability or perhaps the magnitude of the outcome. In this model, analysis of uncertainty tends to focus on ‘outcome uncertainty’; uncertainties as to the probabilities or magnitudes of the outcomes of adopting a particular course of action. This risk-based approach tends to focus on mean values of parameters rather than on variance or extremes.

By contrast, where risk is treated as a subset of uncertainty, the risk is known in the cases where we are lucky enough to be able to make estimates, with greater or less confidence, about the likelihood of some event and its consequences. The central concern under this model is ‘decision uncertainty’; uncertainty as to what course of action to adopt (Green, Nicholls, & Johnson, 2000). This latter perspective is the one adopted in this paper, whereby uncertainty is defined in its broadest sense: as a lack of knowledge about the state of the world now or in the future. Risk is then a subset of this uncertainty and a situation is described as a risk if we can assign probabilities to future states of uncertainty (Cashdan, 1990).

Importantly, this paper adopts the sociological examination of risk which recognises risk as a social concept which cannot be calculated precisely. Thus, risk is a matter of perspective whereby an individuals perception and experience of risk tends to be patterned by social norms, cultural bias and socio-historical location. As a social construct, an individuals exposure to risk can be either imposed by others or self-imposed, and the level of risk deemed acceptable by individuals or society is then a matter of values (Marske, 1991). The management of, and responsibility for, this risk is then part of the political process and the determination of what is, or is not, acceptable is, therefore, a significant policy consideration (Marske, 1991).

3. Supply variability and water resource availability

The very reason for water management in England and Wales, as elsewhere, is to ameliorate water resource variability both spatially and temporally (Price, 1998). Historically, the response has been to engineer-out climate variability with a reliance on supply fix solutions such that variability is not reflected in public water supply provisions. The typical engineering solutions being to increase the redundancy, diversity and interconnection in the storage and distribution system. This conventional approach focuses on designing systems with sufficient ‘headroom’ such that they can operate reliable yields under some desired level of security against system failure.¹ Due to the high cost, reduced opportunities, long lead-time and sustainability concerns over such an approach, contemporary thinking has moved beyond supply augmentation as the only response to managing water supply security (Frederick, 1993, 1997; Boland, 1997). Instead, demand-fix solutions are increasingly regarded as important for sustainable water resource management (Guy & Marvin, 1996; Herrington, 1996; Mitchell, 1999).

¹It is important to note, however, that no uniform standard of supply security currently exists within England and Wales (DoE, 1996).
Across England and Wales there are significant differences in rainfall patterns, storage capacity, geology, land use and water demand. This variation is often depicted along a northwest to southeast gradient reflecting the higher rainfall, lower demand and decreased groundwater storage capacity in the north and west when compared with the lower rainfall, higher demand and increased groundwater storage capacity in the south and east. This is important because, although the rainfall gradient runs approximately opposite to the demand gradient, it is the storage capacity which acts as the buffer between climate variability and human demand (Price, 1998). Thus, water companies in the south and east are less susceptible to annual fluctuations in precipitation to meet demand.² By contrast, water companies in the north and west cannot rely on groundwater storage for managing climate variability. Instead, they rely on surface water resources, making them more susceptible to annual fluctuations in precipitation. The result is immense regional variation in the availability of water, the type of storage facilities and the demand on the available resource. Hence, the management strategies to ensure domestic supply security will also be regionally variable.

Over the past 25 years, the UK has witnessed increased volatility in climatic variability—exaggerating the northwest to southeast rainfall gradient (Mayes, 1995; Marsh, 1996; Marsh & Turton, 1996). These conditions, and the uncertainties over climate change impacts, have raised questions over the resilience of existing water supply arrangements to ensure domestic water supply security (Arnell, 1996; Arnell, Jenkins, & George, 1994; DoE, 1996; Cofe, Slade, Jones, & Gregory, 1991). Likewise, the clustering of droughts over the past 25 years have raised important questions about the validity of using historic data in the estimation of yields for existing and future water resources (DoE, 1996). As Marsh argues: ‘recent patterns of rainfall, evaporative losses and peak water demands suggest the type of water supply stress experienced during 1995 may now be occurring with a greater frequency’ (Marsh, 1996, p. 189).

Added to this are the large uncertainties concerning the magnitude, timing and even direction of climate-induced changes, their impacts on the spatial and temporal distribution of run-off and groundwater recharge (Arnell, 1998; CCIRG, 1996) and the low confidence in the UKCIP climate change scenarios. This latter point is illustrated by the conflicting results for the impact of different scenarios on the water supply demand balance in the northwest (Shackley, 2000).

What is clear is that any increase in the occurrence and severity of droughts within England and Wales has significant implications for all sectors, and for water resources in particular (McKenzie-Hedger, Gweth, Brown, Connell, & Downing, 2000). The challenge is to manage the risk of water supply failure given the regional and temporal variations in water resource availability and the large uncertainties involved. This is the ultimate challenge for the water institutions of England and Wales.

4. The changing nature of risk responsibility

The history of water supply and sewerage in England and Wales has been dominated by successive attempts to implement governance structures that will provide secure water services

²However, in the event that precipitation is depleted for two or more years there is a significantly increased time lag for the restoration of ‘normal’ supplies than would be the case if surface water was the primary source of supply.
without detrimental social and environmental costs. Since the 1960s, water management in England and Wales has been subjected to organisational and institutional overhaul approximately once a decade. On each occasion, the overhaul of the industry has significantly altered the risk allocation and risk responsibilities of the stakeholders concerned. Having set out a brief history of organisational and institutional change, this section elaborates on how the privatisation of the water industry in England and Wales has fundamentally altered the risk landscape (Table 1).

4.1. Risk responsibility in the public domain

In the 19th century water supply was a largely private sector activity, regulated by local governance structures and accountable to parliament. In the late 19th and early 20th centuries a large proportion of these private companies were taken over by local-level municipalities with water supply and sewerage being brought under public control. This was partly due to the perception that private control was not facilitating equitable service provision for all—although others have argued that it was an attempt by local government to increase their power and influence (Millward, 1989; Dracup, 1973; Bakker, 2000). In localising water supply decision-making this created a fragmented approach to water management that was fostered under the 1963 Water Resources Act (Parker & Sewell, 1988). Under this model, risk responsibility was distributed between the 29 River Authorities, local authority agencies, private companies and the Water Resources Board. The Water Resources Board operated at the national level to provide advice to central government and the main water agencies (Parker & Sewell, 1988). At this time, it was the River Authorities which were responsible for the risk of water supply failure, the risks to water quality and environmental risks—although operational responsibility for sewerage was the responsibility of local authorities, and operational responsibility for water supply was the responsibility of local authority agencies and private companies.

This local governance structure remained until 1974 when the introduction of the 1973 Water Act removed the responsibility for water and wastewater services from local authorities to the newly established Regional Water Authorities. These Water Authorities were organised geographically around watersheds and river basins, with responsibility for water supply and distribution, regulatory functions and sewerage functions. In addition, some 29 private water supply companies were retained as 'agents' of the Water Authorities (Parker & Penning-Rowsell, 1980; Parker & Sewell, 1988). This centralised and nationalised responsibility for water supply and sewerage functions, thus altering the risk landscape. Now, the operational responsibilities for managing the risks of water supply failure, water supply quality, pollution, environmental damage and health risks were in the hands of the Water Authorities. Meanwhile, by nationalising the water industry, the ultimate accountability for these risks remained with the central government.

Serious doubts were soon expressed over the acceptability of the Water Authorities to manage the variety of risks for which they were responsible. In particular, it became increasingly clear that there were significant risk trade-offs associated with the seemingly conflicting roles of the Water Authorities as: abstractors and dischargers, regulation enforcers and service providers, polluters and environmental guardians. In addition, short-term political considerations dominated, including significant under-investment to minimise public sector borrowing for macro-economic reasons, and to keep water prices down for electoral reasons (Summerton, 1998). This, in effect,
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<th>Stakeholders</th>
<th>Risk and liability</th>
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<td>Public control with localised decision making (1963 Water Resources Act)</td>
<td>River Authorities</td>
<td>Regulation, Water resources</td>
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<td>Local Authorities</td>
<td>Supply and sewerage operating failures, Design and construction</td>
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<td></td>
<td>Private Companies</td>
<td>Supply operating failures, Design and construction</td>
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<td>Private Companies</td>
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<td>Central Government</td>
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<td>Central Government</td>
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<td>DEFRA</td>
<td>Standard setting, Regulation</td>
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<td>NRA/EA</td>
<td>Environment, Supply and demand Regulation</td>
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<td>DWI</td>
<td>Water quality standards and enforcement, Regulation</td>
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<td>OFWAT</td>
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<td>EU</td>
<td>Define levels of risk and establish standards</td>
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<td>Shareholders</td>
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neglected the environmental and water quality risks for which the Water Authorities were responsible and central government was accountable.

Throughout this period, water as a public good was dominated by equity considerations, whereby access to water as a social right formed the primary contract between the state, society and capital (Graham & Marvin, 1995; Bakker, 2000). Here, the risk of water supply failure was perceived to be the fundamental responsibility of the national government through the operational functions of the Water Authorities. In the end, the poacher-gamekeeper role, plus the significant under-investment, meant that the Water Authorities were neither able to maintain water quality out of the tap nor water quality through the rivers (Kinnersley, 1994).

4.2. Privatisation and institutional change

From the end of 1979, until full-scale privatisation in 1989, the Thatcher government sought to transform water supply from a public service focused on equity to a business organisation focused on efficiency (Parker & Sewell, 1988). Throughout this process, environmental investment was curbed and the government retained responsibility for water supply security. In the end, the Water Authorities faced continuing water quality deterioration because of their unwillingness to self-prosecute. Likewise, they faced continuing infrastructure deterioration due to limited government investment. Although the government managed the risk to customers of increased prices, it failed in the long-term management of environmental and water supply risks because of its failure to invest in the ageing infrastructure and its failure to invest in water quality improvements or environmental standards (Hassan, 1996). Instead, what the government achieved was administrative and economic efficiencies which left the Water Authorities cash-starved and provided the precursor for full-scale privatisation in 1989.

The sale of the ten Water Authorities was one of the most contested parts of the government's privatisation programme (Richardson, Maloney, & Rudig, 1992). Driven by the desire to subject national industries to the disciplines of the market, the government embarked on a large-scale utility privatisation programme including gas, telecommunications, electricity and water. Unlike the other utilities, the privatisation of the water industry was significantly influenced by the governments ratification of EC legislation. In particular, the government sought to find a way to meet the increased environmental obligations under EU law without having to inject large quantities of capital. This they achieved by wiping out the large debts of the public utilities and floating the companies on the stock market. Out of all the utilities, the water industry proved to be the most onerous with the policy process being variously described as 'evolutionary and opportunistic' (Ernst, 1994), as having 'arrived on the agenda suddenly' (Richardson et al., 1992), as 'controversial, turbulent and complex' (Maloney & Richardson, 1995) and as having been 'stumbled into' (Kinnersley, 1994).

In short, the multi-functional approach was abandoned and: the National Rivers Authority (NRA) (Since 1996 the Environment Agency (EA)) was established as the environmental watchdog; the Drinking Water Inspectorate (DWI) was established as the water quality watchdog; and Ofwat was established as the financial watchdog (Table 2). In this way, the government created a unique regulatory framework in an attempt to ensure that customers and the environment were properly protected whilst also promoting private enterprise for service provision and consumer benefit (Summerton, 1998). Without recognition at the time, the
Table 2

<table>
<thead>
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<th>Institution</th>
<th>Responsibility</th>
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<td>National government and DEFRA</td>
<td>Through the Department of the Environment, Food and Rural Affairs (DEFRA) the government is ultimately responsible for policy, standard setting and the regulatory framework. National politicians devolve water risk management to the regulators with DEFRA acting as the mediator between the water companies, consumers, regulators, politicians and the European Union. DEFRA is also responsible for auditing the water company emergency management capabilities.</td>
</tr>
<tr>
<td>Drinking Water Inspectorate</td>
<td>The application, monitoring and enforcement of drinking water standards is the responsibility of the DWI under the guidance of DEFRA (DWI, 2000—www.dwi.detr.gov.uk).</td>
</tr>
<tr>
<td>The Environment Agency</td>
<td>The EA has operational responsibility for water resource management, including water abstractions. Their focus is on integrated catchment management. The EA also has regulatory responsibilities including managing the allocation and enforcement of Drought Permits where abstraction over and above licensed agreements is permitted.</td>
</tr>
<tr>
<td>Ofwat</td>
<td>The economic regulation of the private water companies is the responsibility of Ofwat. Ofwat works to: ensure a reasonable rate of return on company capital; encourage competition; protect the interests of the consumer; promote company efficiency through price limits; and enforce the companies duties to promote the efficient use of water (Ofwat, 1994). This Ofwat achieves by imposing 'price caps'. Ofwat also monitors both the financial and non-financial performance of companies in the application of the Guaranteed Standards of Service.</td>
</tr>
<tr>
<td>Private companies</td>
<td>The provision of water and wastewater services is the responsibility of the ten water and sewerage companies. In addition, there are sixteen water only companies. These operate under a 25 year licensing agreement.</td>
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regulatory framework developed in 1989 further complicated the allocation of risks and the responsibility for managing these risks between a broad spectrum of stakeholders. In particular, it added an important new stakeholder to the equation: shareholders. Thus, the risk landscape in its current form includes governments, regulators, private companies, consumers, shareholders, and numerous non-governmental consumer and environmental groups. All of these stakeholders have an input into the risk management process. The question is, in what capacity?

4.3. Risk responsibility in the privatised era

It is now more than 10 years since the Conservative government rejected public ownership over water supply in favour of total privatisation. To some commentators this has raised significant questions about: the relationship between resource management and institutions (Emel & Brooks, 1988; Emel, 1990; Emel & Roberts, 1995); the form of (re)regulation (Clark, 1992a,b; Cowan, 1994; Hay, 1995; Haughton, 1998; Bakker, 2000); the politics of water privatisation (Richardson et al., 1992; Kinnersley, 1988, 1994; Maloney & Richardson, 1995); and the relationship between market regulation and sustainable development (Rees, 1992). Significant questions have also been
raised about the social impact of privatisation including concerns over disconnection rates, 'social dumping', equity and 'water poverty' (Ernst, 1994; Graham & Marvin, 1994; Graham, 1997). Other commentators have examined the role of financial analysis, accounting and economic regulation (Vickers & Yarrow, 1988; Melville, 1994; Carey, Cave, Duncan, Huston, & Landford, 1994; Schofield & Shaoul, 1996; Shaoul, 1997; Ogden & Anderson, 1999). In addition, much public debate has been focused on the high dividend pay-outs to shareholders, the 'fat cat' salaries of senior water company managers and the over-inflated increases in water bills in the first 10 years of privatisation. More recently, debates have focused on issues of competition, particularly considering the market-oriented focus of privatisation, the monopoly characteristic of the industry and the feasibility of the widespread adoption of inlet appointments and common carriage (Cowan, 1997; Helm & Jenkinson, 1997; Bryan, 1998). Furthermore, public perception of private sector mismanagement, and the favouritism by privatised utilities towards shareholder value at the expense of customer interests, have expanded the debate which includes issues over leakage rates and the environmental impacts of over abstraction. What is surprising is the apparent dearth in this literature of any attempt to explore water privatisation from a risk perspective, except perhaps to recognise the contribution that Judith Rees has made to the understanding of economic rationality in the risk management process (Rees, 1999, 2001). To fill this gap, this section examines risk allocation and risk responsibilities in the privatised era.

As a business venture, the water companies are subjected to the normal commercial risks of business continuity. These include, for example, design and construction risks, operating failures, revenue and financial risks, force majeure risks such as strikes and riots (Rees, 1999), risks of take-overs, fluctuations in share value and the resultant financial risks. However, unlike 'normal' businesses, the monopolistic nature of the water companies means that they are not at risk of any reduction in their market share. Instead, the institutional framework imposes legal, regulatory and political risks on the water companies. These include, for example, changes in political focus, changes in pricing mechanisms, changes in standards of service and changes in environmental legislation. Here, therefore, the recently imposed 'windfall' tax and Ofwat's 1999 Price Review would serve as two illustrations. On top of these types of risk, water companies are also concerned with managing water quality and public health risks, risks to water supply security and environmental risks. In this respect, the water companies have a responsibility to manage the risks from distribution failures, resource contamination and process failures. This they have to achieve within the existing institutional framework which collectively manages the risks associated with climate variability, increases in demand and the environment.

4.3.1. Water quality and public health risks

In England and Wales, consumers expect the quality of water supplied through the networked system to be both safe and aesthetically pleasing. This is because consumers expect to drink the water supplied, thus they expect the product they receive to be free from any risks to their health, for example, short-term microbiological risks such as cryptosporidium or long-term toxic risks such as carcinogens and lead (Summerton, 1998). Thus, there is a real risk to water companies of legal action by consumers where consumer health is negatively affected by unsafe water. Quite apart from these health risks, consumers also expect the product they receive to be of a high quality which, whilst subjectively determined, generally refers to water that is odourless, clear and tastes good.
Whilst the water companies are directly responsible for managing the quality and health risks associated with their product, they are neither responsible for determining the standards to which they must comply nor for monitoring compliance with these standards. Rather, the establishment of standards is the responsibility of the European Union (EU) and the national government, the ratification of these standards is the responsibility of the national government, the implementation of these standards is the responsibility of the water companies, and the monitoring and enforcement of these standards is the responsibility of the DWI under the guidance of DEFRA.

From a risk management perspective, the EU and the elected government collectively determine the level of risk deemed 'acceptable' by society. Therefore, it is the government which ultimately allocates the water quality and health risks to the consumer as illustrated in, for example, the concentrations of iron, nitrates, lead and pesticides deemed 'acceptable' in public water supply provision. Having set these standards, under the guidance of the EU and World Health Organisation (WHO), the water companies are legally required under section 68 of the Water Industry Act, 1991 to 'supply only water which is wholesome at the time of supply' whereby what is regarded as 'wholesome' is stipulated in regulation 3 of the Water Supply (Water Quality) Regulations 1989 (and amended in 1991). Failure to comply with these standards is a failure of the water companies statutory obligations which may result in legal prosecution by the DWI. In 1999, five water companies relating to nine incidents were prosecuted for supplying water unfit for human consumption (Ofwat, 2000). This is a significant improvement to the situation that existed prior to 1989 when the poacher-gamekeeper role of the Water Authorities meant that such prosecutions did not occur.

In addition to deciding on the appropriate 'level' of risk acceptability, decisions also have to be made about who will bear the costs of the remaining risk and risk mitigation. In the case of water quality and public health risks these are largely met by the prices determined by Ofwat and paid for by the customers. It is widely recognised, for example, that improvement programmes to comply with pesticide and iron standards have contributed significantly to the increases in water prices over the past 10 years (Ofwat, 2000). These investments have not, however, influenced the large dividends payable to shareholders. Rather, as Judith Rees has argued, it is the customer who has had to fully bear the costs of some £2 billion to ensure that their supplies comply with pesticide regulations and it is estimated that the removal of lead will cost them a further £6–7 billion (Rees, 2001).

As profit-making enterprises it is in the interest of water companies to invest in mitigative measures which comply with the minimum standard required. There are two main reasons for this. Firstly, the majority of customers have no choice in their water supplier, relying on the regulatory and legal framework to ensure that the water supplied is free from risks to their health. Secondly, the water companies are trading in a non-substitutable commodity which is essential for life; the consumer cannot opt for a different commodity as they could, for example, for energy. This means that whilst it is in the interest of water companies to comply with the quality standards set by the regulators it is not in their interest to supply water over and above this 'imposed' level. Provided the companies meet these standards, there is no risk to the erosion of the water companies market share, nor is there any risk to shareholder value. However, if consumers were to bring legal action against the water companies for supplying unsafe water this risk would then be borne by the water companies, and in turn the shareholders, if the award for damages was to affect the value of the assets and, hence, share prices.
4.3.2. Risk of water supply insecurity

The 10 water and sewerage companies and the 16 water supply companies have an enforceable duty to maintain continuous domestic supplies under their 25 year licensing agreement. There are, however, no uniform standards in England and Wales for assessing water supply security (DoE, 1996). Instead, under the conditions of their operating licences each water company is required by Ofwat to assess its own performance against a broad range of ‘levels of service’ indicators. These indicators serve two purposes; firstly to enable Ofwat to conduct a comparative analysis between the different water companies, and secondly, to enable Ofwat to evaluate the overall performance of the industry.

Supply security indicators are derived from the following often-quoted industry generated criteria:

- Hosepipe bans implemented no more frequently than an average of once every 10 years;
- Drought orders restricting water use implemented no more frequently than an average of once every 50 years;
- Standpipe or rota cuts implemented, on average, no more frequently than once every 100 years (Doe, 1996, p. 33).

In practice, these return rates do not imply that restrictions may not occur much more frequently. Take, for example, the implementation of hosepipe bans which have been executed in 8 out of the last 10 years (1990-2000) (Ofwat, 2000). Rather, what these criteria do is to determine the levels of risk deemed ‘acceptable’ by the consumers. Research conducted in 1993 suggests that the implementation of hosepipe bans is not perceived to be a significantly onerous risk by consumers with 74% of respondents stating that the impact of a hosepipe ban would ‘never be inconvenient’ and 86% stating that it would ‘never be impossible’ (Green, Tunstall, Herring, & Sawyer, 1993). However, this contradicts water company experience:

‘Our reward for imposing the [1995 hosepipe] ban was an intensive and vitriolic outpouring from customers, the media and politicians that we had failed to deliver current expectations. This led to a feeling within Seven Trent of “never again”’ (Brian Duckworth in EA, 1998a).

This ‘never again’ attitude led Seven Trent to adopt a position of zero hosepipe bans, thus effectively eliminating the first short-term demand management response to resource insecurity. By contrast, Ofwat and the EA both consider the implementation of temporary hosepipe bans to be a useful demand management option (Ofwat, 1999), thus illustrative of the different stakeholder attitudes to the level of risk deemed ‘acceptable’ for water supply security.

Known as DG1-7, Ofwat’s level of service indicators can be categorised into four broad bands; physical performance, indices of risk, actual outcomes, and measures relating to customer service performance (Schofield & Shaoul, 1996). Of these seven indicators, DG1-4 relates directly to water supply security (Table 3), raising important analytical considerations for risk management.

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3 This is largely because of the regional variations already explored in the section ‘supply variability and water resource availability’.

4 The theory being that no company would want to be seen to be the ‘worst’ performer.

5 It is worth noting that these criteria are by US standards extremely conservative.

6 Although the average percentage of the population affected is only 14%, over this same period, these figures are indicative of the vagaries of the hosepipe ban criteria of ‘no more frequently than an average of once every 10 years’.
Table 3
Water supply security ‘level of service’ indicators DG1–DG4

DG1: companies own assessment of the adequacy of its water. Dropped in 1996 by Ofwat because of serious inaccuracies. Companies reporting no risk tended to be those imposing restrictions and vice versa (Schofield & Shaoul, 1996).

DG2: companies own assessment of the adequacy of water pressure. Expressed as the number of properties at risk of a defined low water pressure.

DG3: companies own reporting of the number of properties which have had their water supply interrupted and the duration of this interruption. Subdivided into planned and unplanned interruptions.

DG4: proportion of properties subjected to water use restrictions. Four types: voluntary reductions; hosepipe bans; restricting non-essential uses, and standpipes and/or rota cuts. Companies’ behaviour shows that risks to the environment are preferred to risks to consumers.

Firstly, who decides the level of risk consumers should be exposed to? Clearly, the consumer has no direct formal input into this ‘appropriate’ question, other than through their representation on Ofwat’s Customer Service Committees (CSCs). Instead, the consumers undertake a range of informal activities which put pressure on the water industry, as evident in the aftermath of the Yorkshire drought in 1995. Further, consumers are increasingly questioning the acceptability of the effects of failures in water supply security. Of importance, as illustrated with water quality and public health risks, is that the level of ‘acceptable’ risk is decided, implemented and managed by those who do not directly bear the risks. In this case, it was the water companies, the government and Ofwat who decided on, and jointly agreed, the levels of service indicators in the run-up to privatisation.

Unlike water quality, there are no mandatory standards to which the water companies have to perform. One reason for this is that system reliability is highly context specific, reflected in the regional variations in the demand, storage and climates of each discrete water resource system. Nevertheless, it is the water companies statutory obligation to maintain supplies. However, there is clearly a ‘level’ at which it is uneconomic to mitigate the risk of supply failure; there has to be a balance between water availability, water demand and the desired level of security. This requires an assessment of what is the desired level of security, which is itself conditioned by uncertainty (DoE, 1996).

Water supply systems cannot be designed to standards where there is no risk of insecurity, especially considering our uncertainties over the supply–demand balance and the influence of the ageing infrastructure on distribution and process failures. Further, any improved design standard carries a price. Here again it is not the consumers responsibility to determine the balance between supply security and price, this is Ofwat’s responsibility. In responding to this, Ofwat incorporates both the balance between supply and demand and the maintenance of service and quality to

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7This does not mean that consumers are necessarily opposed to short-term demand management measures, such as hosepipe bans, but there was certainly significant public outcry over the proposed use of rota cuts and standpipes in the Yorkshire drought of 1995 (Uff, 1996).
customers, in its price determinations. Ofwat’s assessment is that the reduction of leakage’s and
the maintenance of reliable supplies are the primary customer concerns (Ofwat, 1999). As it
currently stands, the management of these risks is the water companies responsibility. In addition,
the water companies are directly responsible for operational failures including the risks associated
with: distribution failures; resource contamination and process failures (Green, 2000 pers.
comm.).

In the management of supply security risks there is also a role for the EA, whose responsibility
it is to evaluate the uncertainties in water resource management. In particular, the EA has
significant decision-making powers in the assessment of the risk balance between the demands on
water resources and the demands of the environment. Thus, the EA has the ultimate responsibility
for managing the demands of ‘society’ and the demands of ‘consumers’. This it has to achieve in
consultation with the other regulators, water companies, government and consumers.

Clearly, the management of the risks associated with water supply security are immensely
complex. This is because of the scale and quantity of the risks involved, the complex stakeholder
and institutional relationships, the immense uncertainties involved, and the inherent conflicts
between ‘society’ on the one hand and the individual ‘consumer’ on the other. It is, however,
worth mentioning that in all this complexity shareholders remain impervious to the risks of water
supply failure, with share prices remaining strong throughout the 1995 Yorkshire drought
(Bakker, 2000).

4.3.3. Environmental risks

The most fundamental trade-off in water resource management is that between human and
environmental demands. Ultimately, any abstraction, storage and treatment of water to ensure
that water quality and supply risks are minimised, poses a risk to natural ecosystems. For
example, treatment works pose pollution risks, and river abstraction poses risks of low flows with
the resultant impacts on habitats and ecosystems.

The ultimate responsibility for the strategic planning and management of water resources in
England and Wales falls to the EA. This they have to achieve by striking the right balance
between the social, economic and environmental aspects of water resources whilst recognising the
uncertainties in both the short- and long-term. Under the 1991 Water Resources Act, the EA has a
duty to ‘take action, as and when it considers necessary, in order to conserve, re-distribute, or
otherwise augment water resources in England and Wales, and to secure the proper use of water
resources’ (EA, 1998b). Thus, it is the EA’s responsibility to:

- ensure that society’s demands are met without adverse impacts on natural ecosystems or the
demands of future generations;
- manage the rate at which water is abstracted so that ecosystems are not at risk of unacceptable
low flows;
- assess the balance between total available resources and current demand; and
- forecast the balance between demand and available resources including deciding on the
appropriateness of options such as new reservoirs, demand management, leakage control and
metering (EA, 1999a).

The environmental risks deemed ‘acceptable’ by society are largely determined by the
implementation, management and enforcement of environmental legislation. Within the UK,
much of this legislation originates from the EU and is endorsed by the elected government. As with water quality, it is the EU and the national government that determine the 'acceptable' levels of environmental risk. Given the uncertainties and ignorance associated with environmental risks these directives and legislation's are both numerous and constantly evolving.

Once legislated, it is the EA's responsibility to manage these risks through education and the implementation, monitoring and enforcement of standards (EA, 1997). Hence, the EA is responsible for anticipating risks, encouraging precaution, educating the public, risk prevention and the enforcement of standards to ensure that the environment is protected. The EA cannot, however, do this on their own. Instead, it is the integration between Ofwat, the water companies, the EA, the government, the public and the environment—with their often conflicting agendas—that determine the risk trade-offs between cost, supply, demand and environmental protection. This is the essence of real decision-making. On the one hand, decisions are influenced by the formal regulatory institutions characterised as they are by formal decision making techniques such as cost-benefit analysis and multi-criteria analysis. On the other hand, decisions are influenced by the more informal practices of public participation and the political process. Hence, how decisions are made, through the interaction of both the formal and informal processes, ultimately influences how risk is shared.

5. Conflicting agendas

The conflicting agendas between the various stakeholders in the UK water sector can be characterised as arising from two main factors. Firstly, there is the conflict between the desires of consumers and the desires of society (Summerton, 1998), with consumers interested in a high quality water supply at a fair price and society interested in the provision of environmental protection. The result is a risk management conundrum; how to balance 'the interests of people generally against the interests of those same people in their status as customers' (Summerton, 1998, p. 49). Secondly, there is the inherent conflict between minimising the risks of water supply failure and minimising the risks to the environment.

These two conflicts are important not least because the stakeholders involved in the UK water sector tend to focus towards one or other of these arguments. For example, the EA's focus is towards society on the one hand and the environment on the other. By contrast, the water companies' focus is towards consumers/shareholders on the one hand and supply security on the other. Where there is an exception is in the role of Ofwat, whose ultimate responsibility it is to account for the conflicting agendas of the various stakeholders in their economic regulation. Thus, although Ofwat is focused on the protection of the consumer it is also responsible for ensuring that the water companies, the EA, the consumers and the DWI can manage water resources in England and Wales such that environmental, water supply and water quality risks are minimised. As such, Ofwat acts as the linchpin for the risk trade-offs between cost, share value, the environment and water supply security.

One of the fundamental conflicts between stakeholders concerns the appropriateness of the price caps imposed by Ofwat. This is because it is these price caps that determine the product cost to consumers and the levels of investment made by the water companies. In turn, the levels of investment directly influence the water supply, water quality and environmental risks by, for
example, influencing the expenditure on water quality improvements, environmental protection, infrastructure renewal, operation, maintenance and capital expenditure. Likewise, the price caps influence the share value by determining the debt leverage and credit quality of the water companies. Key to this is that any efficiency savings the companies make, over and above Ofwat’s expectations, can be directly transferred to shareholders during each Periodic cycle. The efficiency savings thus made will then be taken into account by Ofwat in determining the next Periodic review, thus transferring the efficiency saving benefits to the customers in the bills that they pay. There are, however, significant differences in what the companies, Ofwat, consumers and the EA regard as ‘appropriate’ price caps.

From the water company perspective, the larger the price cap the greater the return they can provide for shareholders. It is hardly surprising, therefore, that the water companies argued for a need to increase price caps in the 1999 periodic review on the grounds of increased capital investment costs and operating costs. By contrast, Ofwat argued that price caps should decrease because the water companies had consistently out-performed Ofwat’s efficiency expectations and because of the expectation that the costs of capital can be reduced to between 4.25% and 5.25% (Ofwat, 1999, p. 35). Likewise, the levels of expenditure on capital maintenance and investment were projected by Ofwat to be significantly lower than that expressed by the water companies (Ofwat, 1999). In addition, the regulatory capital value was projected to be significantly lower by Ofwat than that expressed by the water companies. Clearly, there is a conflict between what the water companies regard as an appropriate ‘price cap’ to minimise risks to shareholders, and that which Ofwat regards as appropriate.

The EA is concerned that the prices determined by Ofwat account for the long-term investments required by the water companies to ensure that the environment is protected, efficiency is promoted, the demand-supply balance is maintained and leakage is reduced. The DWI requires price caps to reflect the necessary investments to meet water quality standards. The EA, the DWI and the consumers are not, however, overly concerned with the profitability of the water companies or the rate of return for shareholders. Thus, there are risk trade-offs between the bills customers pay, the investment made by water companies and the dividends paid to shareholders.

An illustration of the conflicting interests between the regulators, on the one hand, and the water companies and shareholders on the other, was evident in the contrasting opinions over the Final Determinations for 2000–2005, issued in November 1999. In these determinations Ofwat significantly cut, for the first time, the cost of water to consumers. This led to an endorsement from the EA, a reduction in share value, and criticism from the water companies that their interest had not been adequately addressed. In evidence provided to the House of Commons Environmental Audit Committee enquiry on Ofwat’s price determinations, Water UK concluded that:

‘...following the outcome of the 1999 periodic review there will be increased financial pressures and increased risks which will force the industry to put greater emphasis on short-term objectives’ (Water UK, 2000a, p. 2)

‘The price cuts...[affect]...key public health and safety duties’ (Water UK, 2000a, p. 3).

This concern over the long-term management of risks was echoed by the companies themselves who expressed significant concerns over their ability to meet regulatory targets given the price
tariffs set out by Ofwat (Seven Trent, 1999, p. 1). In two cases, Mid-Kent Water and Sutton and East Surrey Water referred their complaints to the Competitions Commission which concluded, in August 2000, that the price caps for these two companies should be eased. To Water UK, this third party assessment is evidence of the validity of industry criticisms of the regulatory imposed price cuts (Water UK, 2000b). These criticisms were not echoed by the EA who endorsed the results of the 1999 price review, stating that they had:

'...long argued that there was room for price cuts for customers AND a proper investment programme to protect the environment. That position was endorsed by the Government and has now been accepted by Ofwat' (EA, 1999b).

Such price cuts have not, however, been endorsed by shareholders, for whilst the share values remained unaffected during and after the nationwide drought of 1995–1996 they have illustrated a consistent downward trend since the price determinations were announced in November 1999. This is influencing the water companies reliance on debt financing as many companies are trading below their regulatory asset value thus restricting their access to the equity markets for raising new capital. The result is a reduction in share value and a widening of water bond spreads.

6. Risk redistribution—a conceptual argument

So far, this paper has addressed the risk responsibilities of the various stakeholders under 'normal' conditions; where 'normal' refers to the situation when the quantity of water supplied to customers is either of an adequate pressure, uninterrupted, unrestricted and of a quality fit for human consumption, or perceived to be such. Under this 'normal' condition we have explored the roles and responsibilities of the various stakeholders and examined the conflicts which can emerge in the management of key risk trade-offs, using the 1999 price determinations as an example. The question now is; do these institutional arrangements facilitate the redistribution of risk responsibility during a 'crisis'?—where a 'crisis' condition has both a spatial and temporal dimension, dependent as much on the scale, duration and speed of onset as it is on the type and cause.

Both 'normal' and 'crisis' are subjective concepts which are difficult to define when you are in them; thus, they are often defined in retrospect. Likewise, it is not so much that there are 'normal' and 'crisis' conditions but more that there is a continuum through which an event passes from 'normal' to 'crisis'; for a drought there could be a gradual shift whereas for water quality and unplanned interruptions the transition is likely to be much quicker. For simplicity, a crisis condition is deemed to be one where control has been lost by the water company, or where there is a perception that such a loss has occurred. Where operational control has been lost, without any external knowledge of such a risk event, this is regarded as a major incident rather than a crisis. For the purpose of this paper, a 'crisis' refers specifically to a situation when the quantity of water supplied fails to meet demand by a significant margin for a significant period. Under such a 'risk event':

- restrictions may be imposed on water use;
- there may be unplanned interruptions to supply;
• pressure may be problematic; and
• water quality may be unfit for human consumption.

It is not our aim to establish why such a situation may occur. Instead, we are interested in examining how the institutional arrangements currently employed in the management of water supply in England and Wales may facilitate a redistribution in risk responsibility—or put another way, the allocation of blame. Formal risk responsibility legislation may not change, but the informal perception of risk responsibility may change considerably. For example, is it that water companies are able to transfer their responsibility for water supply security onto consumers? What is important is not that risk will be redistributed but that the institutional framework may facilitate such a redistribution. Ultimately, consumers will bear all residual risks, after all it is the consumer who utilises the product. The basic issue, therefore, is the setting of ‘safe minimum standards’.

The institutional landscape has defined the roles and responsibilities of the various stakeholders, but there are still significant inter-relations between the stakeholders concerned. For example, although the EA is directly responsible for environmental protection this is also the responsibility of Ofwat in its economic regulation, the consumers in the water that they use, the politicians in the standards that they legislate, and the water companies in their water supply and sewerage functions. It is this integration that creates the possibility for risk responsibilities to be redistributed during a ‘crisis’.

Through alternative ‘blame’ scenarios it is possible to explore the manner in which risk could be redistributed given the current institutional arrangements for securing domestic supply. This risk redistribution is dependent on whether the focus is on demand, distribution or supply. For example, by focusing on inadequacies in demand management, the water companies may attempt to redistribute risk responsibility onto the consumers. Alternatively, by focusing on inadequacies in the water distribution system, the consumers may attempt to redistribute risk responsibility onto the water companies. Finally, by focusing on supply inadequacies, the water companies may try to redistribute responsibility onto the EA and Ofwat. Under each of these scenarios water insecurity remains the risk event, the difference is the manner in which this crisis is ‘played out’ and the manner in which stakeholders are blamed.

The extent to which stakeholders may allocate or shift blame is expected to change and alter as a crisis develops. At the outset, a co-operative relationship between the regulators and the water companies is anticipated with all concerned working together to manage any risk to consumers and the environment. It is, however, unlikely that there will be any inter company co-operation because of the increasingly competitive nature of the water industry. Instead, the water companies are expected to focus on strategies for the management of risks to shareholders and business continuity. Throughout, the media are expected to represent consumer interests in exploring the role of the water companies and regulators in the risk management process. At this stage, no blame will be allocated per se. However, as the crisis develops, the manner in which different stakeholders act is expected to change.

It is the legal responsibility of the water companies to ensure a continuous high quality water supply. Thus, the regulators, politicians, the media and consumers are all expected to place the blame for a risk event at the door of the water companies. In response, the options for the water company are fivefold; to accept blame, to blame the regulators, to blame the institutional framework, to blame the consumers or to blame natural causes.
The increasing emphasis on demand management, at the household level, provides an avenue for the water companies to allocate blame onto consumers during a water supply failure. Under this scenario, the companies might place the onus for managing shortfalls onto individual consumers. This was the position adopted by Yorkshire Water during the initial stages of the drought of 1995, when the company publicly criticised consumers for being 'complacent about water conservation' and 'culturally ignorant about the value of water' (Haughton, 1998). The result was hostility on the part of consumers and the water company, leading the water company to argue that the consumers were purposefully wasting water and the consumers to argue that the water company was inefficient, mismanaged and more interested in shareholder value than infrastructure investment. In this case, the water company attempted to redistribute risk responsibility onto the consumer, and consumers sought to blame the water company for the water insecurity event.

If companies were to accept blame for the crisis condition this could be tantamount to commercial suicide as such an approach is likely to influence shareholder reaction, customer confidence and regulator scrutiny. The result of which could, for example, be plummeting share values, heavy fines, increased consumer dissatisfaction, hostile takeovers and ultimately a revoking of the water company license. Thus, accepting blame is not an acceptable risk for the water company. Instead, blaming the regulators and the institutional framework are the most likely responses. For example:

- the EA could be blamed for not allowing enough spare capacity in the system or for failing to administer abstraction licenses appropriately;
- Ofwat could be blamed for not allowing enough investment to be made to secure supply reliability;
- DEFRA could be blamed for not facilitating a co-operative institutional framework between the water companies and the regulators;
- the EC could be blamed for imposing expensive and strict regulations; and
- politicians could be blamed for ratifying EC policies or for not integrating water policies within, for example, housing development plans—thus leading to increased demand beyond the capacity of the system.

Whatever the company approach, the response from politicians, DEFRA, the EA, Ofwat and the DWI is likely to be to direct blame back onto the water companies. Hence, whilst these stakeholders may witness increased scrutiny, and possibly negative publicity from the media and consumers, the ultimate responsibility is likely to be retained by the water companies. Nevertheless, other stakeholders are expected to be significantly influenced by the culture of risk redistribution. After all, the water companies are not the only avenue through which the consumer can theoretically attempt to redistribute risk responsibility. For example, as politicians and regulators are ultimately responsible for the regulatory framework, this provides an avenue for the consumers to blame Ofwat, the EA, DEFRA and national politicians for failing to ensure that they are adequately protected from a water insecurity event. In so doing, it is likely that the consumers will seek media and political attention for their perceived or real plight, search for blame and request compensation.

Consumers may blame the regulators due to perceived failures in the implementation, monitoring and enforcement of standards. Further, if the water company focused on inadequacies
in supply this could lead to the appropriation of blame onto the EA. Under this scenario, the water company may attempt to redistribute the risk responsibility of any supply shortfall onto the EA arguing, for example, that the risk event is a result of a failure by the EA to permit and authorise supply augmentation through the development of reservoirs or the timely authorisation of Drought Permits. Similar criticisms could also be levelled before DEFRA whose responsibility it is to authorise Drought Orders. Under this scenario, the water companies could attempt to redistribute their risk responsibility by blaming DEFRA for inadequacies in permitting the timely provision of Drought Orders.

As it presently stands, the institutional arrangements for water supply security also mean that the water companies could theoretically attempt to redistribute risk responsibility onto Ofwat. Under this scenario, the water companies could argue that any failures in its ability to invest in, and maintain, infrastructure is due to the ‘price caps’ imposed by Ofwat. Here, therefore, inadequate resources to secure supplies could be blamed for the water insecurity event. This would then provide the water companies with an avenue to direct the dissatisfaction of consumers directly onto the regulatory system. By blaming the regulatory framework this could provide the water companies with a further avenue of risk responsibility redistribution, namely to politicians for either imposing too strict, or an inappropriate, regulatory framework. This said, it is clearly in the interest of politicians and regulators that public perception of risk responsibility is retained by the companies themselves. As such, each of these stakeholders is likely to cite the legislative duties of the water companies in response to any risk redistribution attempt on the part of these companies.

Ultimately, the complexity and inter-connectivity between the stakeholders in the water sector means that risk responsibility redistribution is a very real possibility. This is not, however, likely to influence all stakeholders equally; water companies are not, for example, likely to redistribute risk responsibility onto shareholders.

7. Conclusions

In examining the role of institutional arrangements for the distribution and allocation of risks, and how this distribution might change under stress, this paper has sought to highlight the manner in which risks are shared in the UK water sector. Having explored the uncertainties in run-off variability, and the impact of this on water resource availability, we highlighted the inherent risk trade-offs between managing the risks to supply, and hence the benefits of human risk reduction, and managing the risks to natural ecosystems. Next, we examined the changing institutional arrangements responsible for the management of these risk trade-offs, recognising in particular the competing, and often conflicting, responsibilities and demands between the consumers, water companies, regulators, shareholders and the government. To highlight the complex manner in which risk, and risk responsibilities, are allocated under ‘normal’ conditions, three key risks were analysed in detail; water quality and public health risks, the risk of water supply insecurity, and environmental risks. This then laid the foundations for the examination of the conflicting agendas that characterise these stakeholder interactions. Finally, the extent to which this complexity has facilitated a risk redistribution culture in the event that ‘things go wrong’ was examined. Ultimately, the institutional arrangements for the management of water
supply in the UK are such that the responsibility for managing risks to this supply is unclear and ambiguous. This has facilitated a risk redistribution culture in the event that 'things go wrong'.

References


