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*Yorkshire Water and Yorkshire's water:
Flows of water/capital in the drought of 1995*

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Abstract

This paper explores the regulatory and ecological dimensions of socio-economic restructuring through a study of the Yorkshire drought of 1995. Privatisation in 1989 and the subsequent development of water management strategies are explored. Insights from regulation theory are employed, together with discourse analysis, to detail three interrelated storylines: climate modelling; demand forecasting; and corporate restructuring. This rereading of environmental crisis raises questions not only about the implications of utility privatisation for sustainable water management, but also about the need to account for the role of the state and the intricacies of ‘real’ regulation in analyses of after-Fordist environmental management.

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Introduction: The Yorkshire Drought

During the hot, sunny summer of 1995, reservoirs in West Yorkshire ran dry. Despite restrictions on water consumption, demand soared to record levels. Yorkshire Water Services (YWS), the privatised water company in charge of water supplies, obtained emergency permission to increase abstraction from local rivers. Amidst concerns over deteriorating water quality and low flow levels, the environmental regulator of the industry carried out ‘fish rescues’ and artificially aerated some rivers (Environment Agency 1996b). Local schools, hospitals, and councils made contingency plans in the event of a failure in water supply. Local officials warned of health epidemics and fire hazards. Trial standpipes were erected, and YWS warned of rota cuts. Amidst the ensuing public outcry, a large-scale water tankering operation and a hastily instituted programme of infrastructure improvements were implemented. YWS narrowly avoided cutting off the water supply to several districts in West Yorkshire, but this did little to salvage its reputation as accusations of company mismanagement and under-investment in water resources were borne out by two independent inquiries into the drought (Uff 1996; OfWat 1996a).

The end of the drought was officially declared by YWS in November, 1996, with the lifting of all restrictions on domestic water use. The chairman and group managing director of YWS were replaced. However, the parent company’s share price remained healthy during and after the drought, consistent with investors’ confidence in the water industry’s ‘gilt-edged’ shares. YWS declared record profits in late 1995, and again in 1996. Shareholders, it seems, remain happy with the company’s performance, despite its negative public image.

Theorising Drought: Socio-economic transformation and discursive strategies

The Yorkshire drought raises questions about the discursive and ecological dimensions of socio-economic restructuring. The privatisation of water in England and Wales in 1989 has inserted the flow of water into the circulation of capital and its associated relations of social power (Swyngedouw 1997). Post-privatisation, the development of the water industry embodies many elements of the classic after-Fordist tale of the withdrawal of the state, glocalisation, and flexible accumulation. Yet a close reading of the Yorkshire drought of 1995 reveals the shortcomings of a simplistic ‘ideal-type’ characterisation of the post-privatisation mode of regulation. As evidenced by the ongoing debate over the reregulation of the industry, water circulation in England interweaves with socio-economic restructuring in a more complex and conflictual manner than before privatisation, raising questions of scarcity, equity, sustainability, and access. The drought

continues to figure in this debate as a discursive emblem of a crisis in the water industry, a leitmotif of the failure of private management of a resource essential for life.

In this paper I build on recent attempts to bring discourse theory into regulation theory (Haughton 1995; Hay 1995), and explore how a more epistemologically dialectical regulation theory could be used to jump scales, link both human and non-human actors, and engage with 'real' regulation in a political ecological approach to understanding contemporary crisis and change. In the first part of the paper, I explore historical socio-economic transformation in the English and Welsh water industry and its regulation, focusing on the privatisation of the industry in 1989. I then discuss the discursive dimensions of the Yorkshire drought, and its implications for the reregulation of the water industry post-privatisation, and in so doing retheorise regulation and the role of the state. In the narration of the Yorkshire drought that follows, I bring discourse analysis to bear on the simultaneous flows of water and capital during 1995 and 1996, drawing out the ecological and discursive dimensions of water management by the newly-privatised water company. Rather than a crisis in water management, the drought can be read as the outcome of a structured web of discursive, financial, regulatory and scientific practices with politically intelligible, if unintended effects. As such, the drought evokes questions not only about the implications of private ownership for water management, but also about the repositioning of 'citizens' as 'consumers' under the logic of environmental economics, and about the political and discursive strategies deployed around climate science and demand forecasting. In the concluding section, I flesh out some implications of this analysis for the water industry, consumers, and the environment.

The English and Welsh Water Industry - A Regulationist Reading

Prior to privatisation in 1989, public ownership of utilities was underpinned by a Keynesian model of social welfare, under which state provision of 'merit goods' -- non-substitutable, essential goods necessary for both production and reproduction -- was in the general economic and social interest (Ernst 1994; Graham 1997). To a greater degree than any other merit good, provision of water was thought to be characterised by the market failures inherent in natural monopoly, as evidenced by the performance of private water companies in England in the 19th century (see Millward 1989). Competition amongst privately owned water companies in the larger industrial towns was thought to mitigate against universal and equitable provision; this was one of the reasons for the growth in public ownership of the water industry in the late nineteenth and early twentieth centuries.¹

¹ Other readings of the municipal take-over of water supply function from private companies in the late 19th and early 20th century would point instead to the desire of municipalities to increase local power and influence (Hassan and Taylor, 1996; Millward, 1989).

Nationalisation and the subsequent consolidation of responsibility for both water supply and sewerage under 10 large regional water authorities entailed a gradual loss of local control of water supply and sewage services (Dracup 1973). Universal access to water was regarded as a social right and a necessary element of the Fordist social contract between state, citizen and capital (Graham and Marvin 1995). Yet nationalisation threw up related financial and ecological conflicts at both national and regional scales, evident in the interrelated crises of both capital and quality in the late 1980s. Organised geographically by watersheds, water authorities were required to play both 'poacher' and 'gamekeeper' roles within their boundaries, monitoring, policing and prosecuting themselves over water quality (Kinnersley 1994). The water authorities raised capital for investment mainly by borrowing from the central government, and to a limited extent through customers' bills, which were linked to rateable property value and maintained at relatively low rates. With the Thatcher government unwilling to authorise an increase in the public sector borrowing requirement and little political acceptance of dramatic increases in water bills,² the water authorities faced a cash crisis. Unwilling to self-prosecute and with limited scope for investment, both water and infrastructure quality deteriorated significantly across England and Wales. From the neo-liberal perspective, this was evidence of the inefficiency of public water companies; privatisation was the remedy (Vickers and Yarrow 1988). More pragmatically, privatisation would raise revenue for the government,³ and deliver another blow to the power of public service unions (Saunders and Harris 1994) whilst allowing the government to distance itself from public displeasure over rate increases necessary to fund needed capital expenditure.

Privatisation and the creation of a new regulatory framework would, it was hoped, resolve some of the conflicts of the late 1980s. With the creation of an economic regulator of the water industry, the Office of Water Services (OfWat), a new mode of regulation was implemented. Characterised by price-cap regulation and simulated or 'yardstick' competition (Armstrong et al 1994; Helm and Yarrow 1988; Littlechild 1988), the new style of economic regulation was designed to encourage increased efficiency and distance the management of water companies from hitherto frequent political interference. Control of water resources and responsibility for water quality standards were kept in the public domain with the creation of

² Water bills did increase to a degree; under the Yorkshire Water Authority, rate increases were well above RPI by the mid-1980s (L. Davies, personal communication, July 96).

³ In the case of the water industry, the government made a loss on the privatisation sale. The £6.4 billion 'green dowry' consisting of £4.9 billion in debt write-off and a £1.5 billion cash injection (1989 prices) was not completely recovered (OfWat, 1997b, 10, footnote 3). The companies were deliberately priced low (Kinnersley, 1994); the 10 WaSCs sold for £5.2 billion, but the total value of shares rose to £6.2 billion at the end of the first day of trading (Ernst, 1994).

another regulatory body, the Environment Agency.⁴ With this separation of poacher and gamekeeper roles, and with freedom to raise private capital for the massive investment programme required,⁵ it was hoped that water and infrastructure quality would improve. Although water quality has improved since privatisation, infrastructural quality was neglected; both important factors in the Yorkshire drought.

At first glance, the new regulatory framework bears several hallmarks of the ideal-type after-Fordist settlement (Peck and Tickell 1994). The glocalisation of regulation is evident in the partial ‘hollowing out of the state’ with the reallocation of responsibility for setting some water quality standards to the EU, whilst implementation and enforcement devolved to the regional level. At the level of individual water companies, more flexible forms of management and operation have been introduced, with outsourcing, job-shedding, the introduction of hydro-informatics technologies, and the spin-off of non-regulated firms in non-core areas of the business resulting in dramatic reductions in the labour force, continuing a downsizing trend initiated in the 1980s (O’Connell-Davidson 1993; Ogden and Glaister 1996). Within the constraints of the regulatory environment, cherry-picking and social dumping and a respatialisation of charging mechanisms are evident (Graham and Marvin 1994; Guy, Graham and Marvin 1997). From being almost exclusively demand-led, both industry and regulators now emphasise supply-side policy measures, most notably with the introduction of demand-side management strategies and the statutory duty to encourage conservation on the part of consumer (OXERA 1997).

In this reading, the Yorkshire drought can be theorised as a form of ‘governance failure’ (Jessop 1995), emerging from contradictions in the uneasy after-Fordist institutional compromise between accumulation strategies of the newly privatised, re-regionalised water industry and the regulatory strategies of the new, quasi-autonomous regulatory bodies. This new institutional fix contained within itself the seeds of the Yorkshire drought: namely the contradiction between the duty to provide a public good and the desire to maximise profit, embodied in the dual identity of water as both public good and commodity. Shareholder pressure to keep profits and dividends high, and to move capital into more profitable areas resulted in under-investment in the water supply system; pipes leaking as much as 30% of the water put into supply, poorly maintained reservoirs, and an insufficiently flexible water delivery system were the result of under-investment, and the cause of the crisis in the water supply system. Responses to the drought, such as the new Labour government’s Water Summit, the introduction of a windfall tax on privatised

⁴ The Environment Agency was created in 1996, under the Environment Act, 1995, uniting Her Majesty’s Inspectorate of Pollution and the Drinking Water Inspectorate with the National Rivers Authority, the latter created at the time of water privatisation.

⁵ The projected 10 year capital investment programme was estimated at £26 billion in 1989 prices (Ernst, 1994, 77).

utilities, and the increasingly prescriptive regulatory framework, represent contested and, to a degree, experimental attempts to reach a (temporarily) stable, albeit internally contradictory, containment of structural contradictions; attempts, in other words, to protect capital against itself.

Rethorising Regulation

The ideal-type regulationist reading overlooks several key dimensions and scales of the changing dynamic of capital, water, and the state post-privatisation (Gandy 1997). In failing to problematise the relationship between capital and nature, and in neglecting the intricacies of 'real' regulation, the discursive and ecological dimensions of socio-economic restructuring remain unexplored.⁶ The abstractions of ideal-type regulation theory break down when confronted with what Murray (1993) terms the 'logic of immediacy' – the logic of the empirically observable, of the everyday, the immediate, and the particular.

An examination of accumulation and regulation of the post-privatisation water industry in England and Wales highlights the continuing importance of the state, and the relevance of public perception and political legitimacy to ongoing debates over socio-economic restructuring. Ironically, although privatisation was intended to remove companies from regular political interference and vigorous regulation, perceived company mismanagement and regulatory failings, together with a more open and participatory policy process have resulted in greater public and government scrutiny (Maloney and Richardson 1995; Richardson, Maloney and Rudig 1992). The regulatory framework is more complex and conflictual, and government and regulatory intervention no less frequent than that before 1989 despite designs at the time for 'regulation with a light touch'.

With this, the state has repositioned itself with respect to the English and Welsh water economy. Ad hoc and politicised regulation by government is no less frequent than before 1989; post-privatisation however, as the Labour Government's May 1997 Water Summit demonstrated, this ad hoc regulation continues even though the government has officially divested many of its regulatory functions. Privatisation has not entailed deregulation; the government has divested control over the financial management of the water industry, but maintained control over regulatory functions concerning health, environment and resource management, functionally separating the regulation of 'market' and 'consumer' interests. Where the inevitable contradictions between the 'logic of capital' and the 'logic of citizenship' were once addressed within a few government departments,⁷ the creation of quango regulators and the multiplication of

⁶ There is an extensive literature on socio-economic restructuring and evolving patterns of governance since the 1980s. See, for example, Amin (1994), Boyer (1990), Jessop (1992), Tickell and Peck (1995).

⁷The Treasury and the (then) Department of the Environment.

regulatory bodies has diffused responsibility and delegated accountability. Given the wide and ill-defined remit of the regulators, regulatory interventions have been more detailed and more frequent than had been envisioned at privatisation; accountability has not only been delegated but regulation personalised (Management Today 1996).

Along with a new institutional framework has come the introduction of rigorous economic and environmental economic analysis to the water industry, marking a shift from command-and-control regulation to a more market-based approach; regulatory contracts or licenses are established and the use of market-based instruments to achieve compliance is encouraged.⁸ This emphasis on regulation via market-based instruments is expressed in both regulatory decision-making and water management techniques (Marvin and Guy forthcoming). Efficiency of water systems from production, through distribution, supply and use is being more closely scrutinised, in part as a result of OfWat's introduction of long-run marginal cost analysis as a basis for planning the appropriate future mix between leakage reduction, DSM, and new resource expansion (OfWat 1997c; Yorkshire Water 1997). The Environment Agency requires water companies to achieve economic levels of leakage and metering before new abstraction licenses are granted for strategic developments, and has a duty to consider costs and benefits of any recommended environmental schemes. Evaluation of resource and demand options within a single economic framework is being adopted across the industry in the run-up to the next periodic review in 1999, when the economic regulator approves strategic business plans for the next 5 to 10 years (OXERA 1997).

Viewed as a "complex ensemble of institutions, networks, procedures, modes of calculation and norms as well as their associated patterns of strategic conduct" (Jessop 1990, 209), the state and its regulatory functions have undergone both structural and normative transformations since privatisation. The Yorkshire drought has figured in this transformation as an emblem of a crisis in privatised water management. As a symbolic event repeatedly invoked by all stakeholders in the current debate over England's water supply system, the drought functions as a metonym which mobilises bias in debates of water regulation and management (Hajer 1995). Put simply, the perceived failings of YWS have become the "issue in terms of which people understand the larger whole" (Hajer 1995, 20), in light of which the water industry, regulators and government have re-examined management of and accordingly re-regulated water resources and industry (DOE 1996a; House of Commons Environment Committee 1996; NRA 1994a, 1995a; WSA 1997). Criticism centres around privatisation, the regulatory framework, and the

⁸These trends were, to a limited degree, initiated before privatisation; the 1983 Water Act was decisive piece of legislation with respect to the introduction of economic analysis to the water industry.

resulting disjuncture between corporate and consumer interests, and between perceptions of water as a private commodity or public good (Letza and Smallman 1996; Haughton 1997).

The emblem of drought thus functions and is contested at multiple scales, whilst serving multiple purposes. As an emblem of revelatory crisis, arising from ‘structural contradictions’, drought provides a pretext for the legitimisation of innovation with normative codes and regulatory, management, and institutional frameworks (Allan and Karshenas 1996; Day 1987; Schramm and Kluge 1994; Solway 1994; Nevarez 1996; West and Smith 1996). At the local level, these structural contradictions were simultaneously revealed by the drought and concealed by YWS, as the company attempted to evade responsibility by arguing that the drought was natural and unforeseeable. Simultaneously, and partly as a result of the failure of YWS’ dissembling, the drought-as-emblem figures in national debates as solutions to the crisis are sought, not in extensions to the regional water resources network, but in alterations to the national managerial and regulatory framework of the privatised water industry.

Revisiting Discourse Theory

Theorising drought as a discursive emblem addresses questions of political legitimacy and public perception, and thus enables an analysis of resistance to new accumulation strategies, as articulated through crisis narratives at various scales (Haughton 1997). In so doing, discourse analysis allows for an exploration of the transition from one mode of social regulation to the next (Hay 1995). However, bringing discourse analysis into regulation theory forces us to ask *where* the boundary is to be drawn between the discursive and non-discursive. Why interrogate consumers and water managers, but not rainfall patterns and statistics? The discursive emblem of crisis serves analytically as a convenient boundary-marker; by identifying ‘emblems’, the researcher demarcates the discursive sphere, and limits the extent to which the work of discourse analysis is required.

This boundary work requires a theoretical simplification. Identified as an ‘emblem’, discourse becomes a “language of legitimation” (Hay 1995) or “articulated perceptions” (Zimmerer, 1993), a means by which societal conflict is portrayed by the media, and perceived by firms, governments, and interest groups (Day 1987; Haughton 1997; Nevarez 1996; Solway 1994). But discourse is more than narratives, stories, and tropes, and operates at levels other than that of mere self-interest and public dialogue. All representations of reality, not just narratives, are guided by discursive practices that mediate between our perceptions and the ‘hard kernel’ of the Real. Discourse is constituted by practices through which concepts and categorisations, as well as narratives, are (re)produced and transformed (Hajer 1995); it is also imbricated in complex and contradictory material conditions (Emel, Roberts and Sauri 1993; Peet and Watts

1993). Discourse does not exist in isolation; it is embedded within particular institutions.⁹ These institutions comprise configurations of (heterogeneous, polyglot) power, knowledge, and accepted authority. Discourse simultaneously circulates within, and is both constituted by and constitutive of institutional frameworks; and in so doing, it “produces the effects of power within the self, as a form of *discipline*” (Burke 1996, 31). As discourse enacts this form of discipline, it shapes the production of knowledge and in turn has material effects.

Bringing discourse theory into regulation theory requires not only an expansion of the regulation research programme, but also a rethinking of regulation itself. A mode of social regulation is, in part, a discursive process. Regulation and the making of policy entail the distillation of manageable problems from often overwhelmingly complex issues; an interpretative act, involving problem-definition as well as problem-solving (Hajer 1995; Litfin 1994). Regulation occurs within a dynamic institutional framework embodying rules that define knowledge and legitimise authority. It is also enacted by and through people, as groups of individual actors unite around what Hajer terms ‘storylines’ -- sets of ideas which, although sometimes highly contested, nevertheless unite actors in a particular way not only of talking and thinking *about* an issue, but also producing knowledge *of* an issue. Discourse analysis of (re)regulation thus requires an exploration of the social and cognitive bases of problem-definition, and a genealogy of the institutions and practices through which actors are mobilised around specific storylines.

A Political Ecology of Drought

In its theorisation of crisis as the outcome of a series of contradictions within and between things, and in its recognition of the transformative behaviour that results, regulation theory invokes, at least implicitly, a dialectical ontology. An assumption of the creative potential inherent in contradiction rests on the assertion that the world is characterised by change and flux rather than stasis and stability (Ollman 1993); this constant flux is an inevitable outcome of the ‘interpenetration of opposites’ by which all entities are understood to be constituted by an unstable unity of contradictions. Stability, rather than change, must be explained.

Regulation theory is, however, less explicitly epistemologically dialectical. Dialectical epistemology implies a focus on processes rather than (or as well as things), the interpenetration of multiple scales, a limited use of cause and effect argument, and a reliance on education rather than deduction or induction (Harvey 1993, 1995, 1996). In its focus on processes rather than events, its use of scale-straddling storylines, and its reflexivity, discourse analysis partially

⁹Here I use ‘institutions’ in the sociological sense of nested sets of rules, practices and codified social relations.

recovers a dialectical epistemology. This partial recovery is deliberately unfaithful to the dialectics of Marx, or Hegel, or even that of Harvey's historical-geographical materialism (Castree 1996). Deployed strategically, a dialectical epistemology enables a "political-ecological thick description" (Peet and Watts 1993, 248) that simultaneously invokes and interrupts Marx's problematic as recast by regulation theory.

This dialectical political ecology inverts and recasts drought as an object of study. Most importantly, it is not drought that should be studied, but water scarcity. Climate is variably variable; droughts, in this sense, are not 'abnormal'. What should be studied are assumptions of and technologies reliant on stability. This examination of stability must combine an examination of flows (of capital, information, water), as well as things (water scarcity, water supply infrastructure), for water is simultaneously a process (circulation through the water supply system) and a thing (a commodity). Water and capital, in other words, are interpenetrated. This interpenetration occurs at multiple scales, as water is both spatially localising (in use, abstraction, supply and exchange) and globalising (through the hydrological cycle and the global circulation of capital). Following this simultaneous financial and hydrological cycle requires penetrating beyond the boundaries of the firm and regulatory bodies, and following not only the twists and turns of 'real' regulation but also flows of water and capital as they moved around the region in 1995.

Flows of water/capital: a chronology of the drought

The winter of 1994/95 was extremely wet; much of West Yorkshire, the region which would be worst hit by the drought, experienced rainfall well above the long term average (LTA) in early 1995 (Uff 1996); localised flooding occurred in some areas. Groundwater levels were well above average; reservoir stocks were close to 100%. In accordance with accepted practice, YWS began supplying demand through its regional network of trunk mains (the 'Grid') from upland reservoirs in West Yorkshire early in the summer; this gravity-fed source represented a much cheaper source of water than that abstracted from rivers, which incurred pumping costs. A year earlier, the environmental regulator had raised concerns over this practice, and advised the company to undertake conjunctive use of reservoir and surface water sources so as to delay drawdown of reservoirs. It admitted, however, that operating the resource system "to obtain the maximum yield may be more expensive than operating to a lower yield because this may entail higher treatment or pumping costs" (NRA 1994b, 21). YWS began conjunctive use in 1994, to a limited degree, but there appeared to be no reason to deviate from standard practice. Demand forecasts predicted that water use would not rise greatly in the years following privatisation; industrial demand was predicted to decline and domestic consumption to remain fairly flat.

Although there was a fairly narrow margin between supply and demand, it was assumed there would be no cause for concern until the turn of the century (NRA 1994b).

Like all of the water and sewerage companies, YWS had been performing well financially since privatisation; in the summer of 1995, it paid a £50m special dividend to its parent company, Yorkshire Water plc. In its inquiry into the drought in 1996, OfWat noted that “in retrospect, the distribution of this special dividend to its parent company was not appropriate in the circumstances. The company may need to borrow more than was assumed...or it may wish to consider asking its parent for a cash injection in order to finance its functions” (OfWat 1996a, 1.10). The functions of most relevance to the drought -- leakage and addressing the narrow margin between supply and demand -- received relatively little attention or investment during early 1995. As OfWat later noted:

Leakage problems were not being resolved at a sufficient rate, monitoring of leakage was not as comprehensive as it should have been, and priority placed on leakage control prior to 1995 was inadequate. The high rate of leakage progressively undermined the company’s ability to keep within its distribution input forecasts...on any reasonable interpretation... leakage in [West Yorkshire] was significantly higher than that perceived by the company (OfWat 1996a, 2.7).

Without meters installed at the household or even local level,¹⁰ YWS had scant information on distribution and amount of leakage (OfWat 1996a, 2.6). Leakage was indeed higher than the company had forecast; at the height of the drought, the volume of leakage was approximately equal to the volume of domestic consumption (Uff 1996).

Under usual circumstances, this substantial increase in leakage might not have mattered. However, rainfall in April fell below the LTA and again in May, and then June, and on into July (NRA 1995c). Rainfall was unusually low in West Yorkshire, normally the wettest part of the region. As the summer progressed and record high temperatures were recorded, demand¹¹ rose to unusually high levels, despite a public campaign to encourage water conservation. Leakage and consumer unwillingness to conserve water in light of perceived company mismanagement and a series of public relations disasters (Gill, 1995) were frequently cited as causes of high demand; however, YWS had little precise information on where and when the water was being used.¹²

¹⁰ The majority of domestic consumers in Yorkshire, as in England and Wales, are unmetered.

¹¹ ‘Demand’ includes leakage and unaccounted for water as well as water delivered to customers, and is perhaps better captured by the term favoured by the regulators, ‘distribution output’.

¹² Interview. Environment Agency, Leeds. December, 1997.

Demand remained high throughout the summer, and reservoir levels fell rapidly. The most severe problems were experienced with the small reservoir sources supplying the cities of Bradford and Halifax and other areas of the Pennines in West Yorkshire. The small size of the reservoirs - typically, total storage in these reservoirs represents 120 days normal supply - renders them inherently vulnerable to drought conditions (Uff 1996). In the dry summer of 1995 reservoirs were not replenished by summer rainfall.

By July, levels in some reservoir groups in West Yorkshire had fallen to dangerously low levels. By August, several reservoir groups were at 25% capacity or less. As the Grid was set up to pump water in only one direction - from the normally wet west to the dry east - there was no mechanism available to supply water to areas needing it most (Uff 1996; NRA 1996a). YWS then imposed hosepipe bans in the west and north of the region, in which more than half of its 4.5 million customer live. The company also applied for drought orders¹³ allowing increased river abstraction above license conditions, 6 weeks later than should have been the case under YWS' own guidelines (OfWat 1996a). As yet, YWS had not yet declared an extensive leakage reduction programme, nor were major improvements to Grid flexibility planned. Instead, in the first of many public relations debacles, the company continued encouraging customer conservation through a series of advertisements and a letter to business customers asking them to consider relocating outside of the Yorkshire region (Yorkshire Post 1995). The following month, the company sent a cheque for £10 to all domestic customers, a refund from company's 'efficiency savings since privatisation'; the 'dividend' to 1.8 million households cost the company about £20 million (Farrar 1996).

September rainfall was close to the LTA, and YWS held off on the implementation of emergency measures. But rainfall fell below the LTA in October and November; reservoir recharge, which conventionally begins in the autumn, was not taking place. YWS had realised it was facing ongoing difficulty with water supplies even if winter rainfall returned to average levels (NRA 1995b). The company announced that cuts in supplies would be necessary, applied for the necessary drought orders (Rofe and Hampson 1995a, 1995b; Nixon 1995) and erected trial standpipes in West Yorkshire; amidst public outcry and vandalism of the standpipes, rota cuts were decided upon instead (Lazenby 1995). In an attempt to avert rota cuts, YWS had begun tankering water by road in September, filling tankers from rivers in east Yorkshire and even beyond the region in an attempt to refill reservoirs in West Yorkshire. At the height of the

¹³ As laid out in the Water Resources Act (1991), water companies are required to make applications for drought orders or permits when a "serious deficiency of water supplies" exists or is threatened by an exceptional shortage of rain. Drought orders cover fixed periods, and give the water undertakers the power to alter their normal conditions of operation, by, for example, permitting companies to abstract additional water, to reduce compensating flows from reservoirs, or to restrict non-essential use by domestic consumers.

tankering operation, over 700 tankers were in use across Yorkshire, 24 hours per day. Tankering ceased in January as reservoir levels improved; YWS withdrew its application for rota cuts (Barkas and Walker 1996).

The tankering operation cost YWS approximately £47 million (Uff 1996). Costs from infrastructure improvements also began accruing in the autumn; a £50 million package of emergency measures was announced in September, with a further £50 million expenditure announced in October (Uff 1996). Five time-limited abstraction licenses were granted, allowing the company to abstract water from the rivers Ouse, Ure, and Wharfe,¹⁴ reducing flows in some areas to all-time lows with “clearly detectable” changes to riparian ecology (Environment Agency 1996a). A further series of infrastructure works were implemented under Emergency Drought Schemes aimed at reducing leakage, increasing pumping capacity, and improving transmission links.

However, by February of 1996, reservoir recovery had still not occurred in West and South Yorkshire; with below average rainfall across the region, the Pennine reservoir groups remained at critical levels (NRA 1995c). Customers experienced problems with low pressure and poor-quality water. In the same month, and with considerable public resentment, YWS announced an annual price rise of 5.6% in water bills for the year, the maximum allowable increase under the investment plan agreed by OfWat (Buckley 1996).¹⁵ Nonetheless, the utility’s financial health did not appear to have been affected by the ongoing supply problems; in April, the company announced a better-than-expected 14% increase in pre-tax profits (Martinson 1996a), with profits of £162.2m (Lazenby 1996) and dividends rising accordingly. In the same month, drought orders were extended across the entire Yorkshire region, and the company announced a £70m “emergency package” to combat water shortages and “win back its customers’ confidence” (Boulton 1996). Further improvements to the Grid were made, and despite concerns about environmental impacts, an emergency pipeline was built that could, if necessary, allow for the importation of water to Yorkshire from the wetter region to the north.¹⁶

¹⁴ Interview. Environment Agency, Leeds. December 1997.

¹⁵ Allowable increases on the tariff basket of water charges are calculated using a price-cap system of regulation for all privatised utilities. RPI- K is the standard formula, where RPI is the retail price index, and K represents other price factors such as efficiency gains. Given the anticipated large capital expenditure required at the time of privatisation, the price formula for the water industry is calculated on the basis of RPI + K. The K value negotiated by YWS in 1994 was 2.5 %, and was intended to remain in place from 1994 to the next Periodic Review in 1999.

¹⁶ The 13 km Tees-Wiske pipeline will form part of a larger water transfer system crossing the watershed between Northumbria and Yorkshire. Water from the large Kielder reservoir, built in the 1970s to meet forecast industrial capacity that never emerged, will be released into the R. Tyne, then pumped into the Tees. From Tees water will move via the pipeline to the R. Wiske, down the R. Swale into the R. Ouse, where it can be pumped into the Yorkshire Grid at Moor Monkton (MacGuire, 1996).

In May, YWS applied for an extension of existing drought orders, and the Environment Agency (1996a) noted with concern that resources were even more fragile than at the same time the preceding year. The capital expenditure programme was expanded. By early summer of 1996, YWS had spent well over £100 million laying an extra 63 miles of mains pipes and building 11 pumping stations (Bunyan 1995; NRA 1996b). A further financial penalty arose in June as OfWat, in an unusual step, directed the company to reduce its price increases in subsequent years, costing the company approximately £40 million in revenue.¹⁷ In addition, the company was ordered to provide compensation for homes or businesses whose water supply had been cut off,¹⁸ and further pledged to spend another £50 million on further reducing supply interruptions and leaks (Lascelles and Martinson 1996). Responding to shareholder concerns, the company scaled down its activities overseas and in the property market (Martinson 1996b, 1996c).

And then it began to rain -- a relatively average summer rainfall for Yorkshire. With water consumption restrictions still in place, and with the continued licensing of increased abstraction possible from rivers, reservoirs slowly began to refill. By late autumn of 1996, supplies were close to 'normal', and YWS declared an end to the drought with the lifting of all restrictions on domestic water use. Despite the fact that two independent inquiries into the drought concluded YWS had mismanaged water resources and supply, share prices had remained healthy throughout the drought. With predicted annual profits of over £200m during this period, low gearing, and an under-utilised balance sheet, YWS was still a reasonable investment. This was borne out in November, as YWS' parent company announced a 10% increase in interim pre-tax profits to £109.4m (Martinson 1996d).

Managing the Yorkshire Drought

Throughout the drought, YWS invoked precipitation measurements and, in its wildest moments, the vagaries of climate change in arguing that this drought was exceptionally severe and simply unforeseeable. After an exceptionally wet winter, the rainfall gradient in Yorkshire had 'flip-flopped', leaving the normally wet West of the region abnormally dry; for this, the company could not be blamed. As the drought progressed, however, regional and national lobby groups criticised YWS water management strategies, arguing that the drought was human-made rather than natural (Hughes 1996; Waterwatch 1996). Downsizing and the involvement of YWS in

¹⁷ Rate increases will be limited to RPI in 1997/98, and then fall lower than the originally agreed-upon K value up to the year 2000 (OfWat, 1996a).

¹⁸ £10/day for domestic customers, £50/day for businesses (OfWat, 1995, 1996c).

national and international business ventures after privatisation in 1989 were criticised for drawing needed attention and knowledgeable employees away from the core business (Uff 1996). The loss of water through leaky pipes and short-sighted, profit-motivated mismanagement of the water supply grid were cited as the main causes of the crisis in the water supply system (Waterwatch 1996).

Accusations of mismanagement do not explain, however, why the main regulatory bodies of the water industry failed to anticipate the drought, despite warning signals that have been identified with hindsight. Both the company and regulators failed to recognise that there was an overall supply deficit within the Yorkshire region which had existed for several years prior to 1995. Secondly, demand forecasts had consistently underestimated actual demand. An increase in leakage to more than 30% of water put into supply¹⁹ and perhaps the “key factor responsible for higher than expected [demand] over the period, and particularly in 1995” (OfWat 1996a). Another factor was the unexpected spatial distribution of the drought, which was not of similar intensity over the entire region, but was restricted to the normally wet West Yorkshire. Several factors, including the frequency of drought orders and hosepipe bans in the years following privatisation, might have indicated that past climate trends were no longer reliable indicators of present patterns. Yet it was not recognised until 1994 that the Grid was insufficiently flexible to supply West Yorkshire (Uff 1996; NRA 1995c). If demand had remained stable, if the companies’ own leakage reduction targets had been met, and had the improvements to the Grid been implemented even six months earlier, there would have been sufficient water to avert rota cuts and tankering (Uff 1996, 89).

Three interrelated storylines, of central importance in framing debates about water management since privatisation, run through the Yorkshire drought. The first is a set of techniques clustered around a conception of climate as a stable phenomenon; the second is a web of scientific and regulatory practices involved in demand forecasting. The third storyline concerns the framing of debate in the water industry in the early 1990s, with its near-exclusive focus on improving efficiency, ameliorating water quality, and corporate restructuring. Given a stable climate and (supposedly) sufficient resources given present demand, water resources issues were considered by neither the regulators nor the water utilities to be as critical as the task of

¹⁹ Leakage increased by 46 MI/d from 1989/90 to 1994/95. Various percentage figures for leakage have been quoted, the highest being the EA estimate of 36.7% of distribution input (Water Briefing, 57, p.7). Leakage is notoriously difficult to calculate, and figures expressed in leakage mask important variables, including number of households supplied per unit length of pipe. The industry accordingly favours measurement in MI/d (million litres per day), or l/prop/day (litres per property per day). By these figures, YWS did not have the highest leakage in England and Wales (OfWat, 1997a), although in percentage terms it was certainly among the highest, if not the highest.

improving water quality and corporate efficiency. The drought was an unintended effect of these discourses, yet nonetheless proved useful and, in a limited sense, economical for YWS.

Climatic Stability: Is the past a guide to the future?

The privatisation of the water industry in 1989 coincided with a period of volatile climatic patterns, of which 1995, containing the driest five month period on record following the wettest 30-month sequence in the entire British rainfall series (which extends back to 1869), was the most dramatic (Marsh 1995). This recent volatility has led meteorologists to question whether “the historical rarity of drought [is] a reliable guide to their contemporary frequency” (Marsh 1995), and whether current water management techniques are appropriate in the context of an increasingly volatile climate (Marsh and Turton 1996). More specifically, in the last two decades, there has been an exaggeration in the north-west to south-east rainfall gradient across the British Isles, a more distinct partitioning of annual rainfall totals between the winter and summer half-years; and exceptionally mild weather encouraging “exceptionally high rates of evaporation” (Marsh 1996). These tendencies, which show a broad consistency with a number of climate change scenarios (Arnell et al 1994; DOE 1996b), have raised questions regarding the resilience of contemporary water resource management strategies:

In the context of historical rainfall and temperature records, the level of risk adopted by the water industry is shown to be of the right order. However, 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 greater frequency. The recent clustering of hot, dry summers - together with the associated surge in water demand - implies that the water industry should direct more attention to contingency planning based on substantially lower return periods²⁰ than those reported for drought events over the last 20 years (Marsh 1996).

This newly recognised volatility of environmental change “tests the conventional wisdom that depicts nature as tending toward stability or near constant balance” (Zimmerer 1994). This assumption, however, forms the basis for demand projections and industry design standards. Before 1995, for example, YWS’ records ran from the 1930s to the mid-1970s (leaving out the

²⁰ A ‘return period’ is the average interval between the occurrence of events of a specific magnitude. With reference to droughts, the return period is normally expressed in years, for a given level of rainfall, over a certain number of months, with a specified start date.

1974 drought²¹); a relatively quiescent hydrological period. Since 1995, in a gradual process of updating and extending rainfall records, YWS has extrapolated rainfall data sets back to the 1920s, now including the 1929, 1933 and 1994 droughts. YWS has moved to a longer record period, using data from the 1970s to 1994, a 20-year record period which takes into account most of the major recent droughts.²²

That YWS' hydrologists did not feel the need to update rainfall records in early 1990s is perhaps surprising considering that the company applied for hosepipe bans and drought orders in nearly every year since privatisation. Company standards specified that hosepipe bans should be applied no more than 1 in 8 years; and drought orders implemented no more than 1 in 40 years; however, hosepipe bans were applied for in 5 years out of 7, and drought orders in every year but 1993. From the company's perspective, however, this did not entail a breach in design standards. Standards based on return periods imply nothing about the year-to-year recurrence of events, but express the average interval between events of a given magnitude, where that average is determined over a much longer period than that since privatisation. Although the independent inquiry found that YWS did breach standards on both hosepipe bans and DOs "and that these breaches are entirely consistent with the shortcomings both in the supply-demand balance and the distribution system" (Uff 1996, 7.26), YWS' staff still do not believe they breached design standards. Unluckily, but unforeseeably, several 1 in 8 and 1 in 40 year events occurred in a relatively short period of time. Climate patterns were assumed to be stable, and thus extrapolation to the present from past rainfall records reliable.

This assumption of stability was critical to interpretations of rainfall data and drought severity by YWS hydrologists, sanctioning acceptable and disallowing unacceptable data. The statistical method²³ used by YWS to calculate the severity of a drought, upon which the granting of drought orders depends, produced results indicating greater event rarity for droughts in the early 1990s than methodology subsequently adopted by the environmental regulator. Company managers defined the drought as 'exceptionally severe', and also excluded evidence to the contrary; during the drought, for example, a rain gauge reading that showed higher than average levels of rain was deliberately changed because it "didn't look right" (Yorkshire Wildlife Trust 1996). With assurance that droughts were 'severe', and no evidence to the contrary, the yearly shortages in the water supply system could be ignored, and no supply deficit was perceived to

²¹ Interview. Yorkshire Water, Leeds. December, 1997.

²² Interview. Environment Agency, Leeds. December, 1997; Interview. Yorkshire Water, Bradford. December, 1997.

²³ The method used by YWS for calculating drought severity was the Tabony Tables, a statistical method for calculating return periods of rainfall events.

exist in Yorkshire. This was perhaps part of the reason by YWS had added little reservoir capacity since the 1970s, relying mainly on increasing abstraction from rivers to increase distribution input, and operating with the insufficient margin of supply over demand revealed only in 1995.

Lies, Damned Lies, and Demand Forecasts

The assumption of a stable climate might not have mattered had demand not risen so sharply in 1995. This, too, had not been anticipated by YWS, in spite of the fact that distribution input had been “consistently and significantly higher than the company had forecast over the period 1989 to 1995” (OfWat 1996a). Most critically, public perception of company performance played an important role in consumer’s response to appeals to conserve water (Research by Design 1996). YWS discursive mediations of the drought failed to convince the public that the drought had not resulted “from water agencies’ technological mediation of the drought through their own unsustainable operations” (Nevarez 1996, 259). The “tactics of hegemony” employed so successfully by water managers in southern California during its 1985-91 drought failed to convince Yorkshire consumers (Research by Design 1996), and the company’s attempt to generate public consent by excluding the public from decision-making arenas backfired. Not only did YWS, as in the Californian case, attempt to insulate itself from interference by portraying itself and its strategies as ‘technical’ rather than ‘political’, YWS also acted decisively to exclude a customer advocate, backed by a number of large institutional shareholders, from its board of directors.²⁴ Whilst the discursive production of the recent Californian drought as an “environmental crisis” served to justify expansion of the water supply system as ‘drought insurance’, the discursive production of the Yorkshire drought as a regulatory crisis enabled resistance to the privatised water company (Haughton 1997).

But issues of public perception and consumer resistance did not figure in YWS’ demand forecasts. In the years following privatisation, YWS made use of central-value, average-weather demand forecasts, which used ‘most likely’ assumptions about population growth, lifestyle change, and economic activity in constructing demand scenarios, to which an empirically derived ‘peak factor’ was added to cover the possibility of extreme dry weather events. These forecasts were consistently, although only slightly, lower than actual demand. Arguably, the small proportion of capital expenditure on water resources from 1989 to 1995 (five percent of capital expenditure) was due to the focus in the industry on meeting water quality requirements, as required under new EU water quality directives. Source control (OfWat 1996a, 2.7) and leakage received little attention.

²⁴ Interview. WaterWatch, Leeds. July, 1996.

In 1994, however, a new forecasting guideline was introduced and implemented across the industry (UKWIR/NRA 1995). Based on this methodology, YWS produced a series of upper/central/lower forecasts and dry/normal/wet forecasts, taking into account various economic as well as climatic scenarios. Demand forecasts serve a variety of purposes: planning investment in the distribution system; planning water resources and demand management; forecasting revenue for internal purposes and for the Strategic Business Plan submitted to OfWat at the periodic price review. Based on assumptions about declining industrial demand, relatively flat domestic demand, and declining leakage rates, the 1994 Strategic Business Plan predicted a fairly dramatic reduction in demand well below that of the early 1990s and then a flat demand profile well into the next century (Uff 1996).

Under the current price-cap system of economic regulation, in which company business plans are reviewed and price increases awarded every 5 years, incentives for efficiency gains are provided, in theory, through the ability to make profits by achieving savings on forecast expenditure programmes. In practice, however, expenditure programmes are negotiated between the utility and the regulator in a complex 'regulatory game' (Melville 1994). Briefly, by maximising forecast capital and operating expenditure, and by minimising forecast revenue, companies maximise the predicted shortfall between their projected income and expenditure. This shortfall must be met through increases in water bills above inflation; thus, maximising predicted revenue shortfall in turn maximises the price increases the regulator will allow for a utility's the basket of water tariffs. In 1994, demand forecasts were one pressure point in the regulatory game. Predicting a small increase or even a decrease in distribution output in 1994 allowed water companies to predict flat revenues. Given that the bulk of expenditure was expected to be on quality improvements, which entailed a large predicted capital expenditure, water companies asked for greater K values and thus greater price increases than would have been the case had demand forecasts matched the higher, actual demand curve in the 1990s.²⁵

With the awarding of K values, a second phase of the regulatory game begins. With turnover from customers' bills increasing at a predictable rate each year, companies have incentives to achieve savings on predicted expenditure programmes, through, for example, efficiency gains or delaying capital expenditure. By 1995, YWS was slightly under its expenditure targets²⁶ (Uff 1996). The drawback to this two-phase strategy was revealed in the

²⁵ This might be termed a variation of the well-known Averch-Johnson effect, in which utilities subject to rate-of-return regulation inflate capital expenditure forecasts in order to maximise revenue (Averch and Johnson, 1962; Helm and Yarrow, 1988).

²⁶ OfWat later publicly warned all water companies about the discrepancies between the investment programmes proposed in 1994 -- on the basis of which price increases were awarded -- and their actual investment programmes (OfWat, 1996b).

Yorkshire Drought. YWS hadn't planned for what could have been an anticipated increase in demand, and as a consequence of their own demand projections had under-invested in water resources, as inquiries into the drought later concluded.

Privatisation, Quality, and Efficiency: Ecological Modernisation and its consequences

This 'underinvestment' in water resources can only be viewed as such with hindsight. The capital programme in the water industry is subject to the approval of the economic regulator. In the early 1990s, water resource issues were low on the regulatory agenda; ameliorating quality, given new EU directives (and the willingness of the EU to prosecute offending countries) was prioritised. Neither considerations of climate change nor planning with a margin of supply over and above predicted demand (planning with 'headroom') were allowed in OfWat's 1994 Periodic Review; few submissions for resource expansion received approval.²⁷ This focus was reflected in the relative proportion of capital expenditure on quality improvement, as opposed to resource expansion, across the industry as a whole. YWS is typical of the industry in having spent 66% of its capital programme from 1990 to 1995 on water treatment, sewerage and sewerage treatment, and only 4% on water resources (Uff 1996).

In addition to quality improvements, corporate restructuring and diversification absorbed large proportions of managerial time and energy in the early 1990s. The management structure of YWS in 1995 was radically different to that prior to privatisation. Whereas the water authority was not permitted to diversify beyond its core business, Yorkshire Water Services, the privatised utility, became one of a group of associated companies under the umbrella of a parent plc (Yorkshire Water 1995). The three other firms – an environmental services and engineering group, an overseas water and wastewater services contractor, and a property business -- have, to some degree, been hived off from the original water authority in a concerted effort to diversify the business both geographically and functionally.

Privatisation also marked the beginning of significant restructuring within the utility. Until 1992, the basic unit of organisation was geographical, based loosely on watersheds within the region. With the creation of the water authority in 1975, water resource functions were consolidated with sewerage functions; the water authority took over more than one hundred sewage undertakings. By the late 1970s, there were seven operation divisions and a rivers division, subsequently further consolidated. The goal remained the allocation of responsibility to a 'Mr. Water' intimately familiar with the system in a defined geographical area.

This geographical division of labour was dismantled three years after privatisation, with the institution of a functional rather than geographical system of organisation. Along with

²⁷ Interview. Yorkshire Water, Bradford. July, 1996.

restructuring, both before and after privatisation, came downsizing, offering substantial cost savings for the company, given that labour was the biggest single expenditure category for the water authority. From a peak of more than 6000 employees in 1975, staff numbers reduced to 4900 in 1989, and further reduced to 3,300 in 1995 (Uff 1996); much of the later downsizing resulted from out-sourcing of non-core functions such as cleaning and engineering consulting services (O'Connell-Davidson 1993). Since privatisation, the employee profile of YWS changed, with more movement into the company of professional managers, "people who knew what the world was like outside a monopoly". In 1994, management consultants were recruited, mandated to examine YWS systems and identify possible cost-savings and efficiency gains. Notably, major investments were made in information technology in operational, modelling, and assessment functions.²⁸

Corporate restructuring and diversification, while resulting in recognised efficiencies,²⁹ altered information flows and both actors and scales implicated in decision-making within the company. Functional specialisation "impaired the flow of information and hence [YWS'] ability to recognise the connection between issues in geographical areas" (OfWat 1996a, 7.3). Outsourcing further altered this flow of information. Leakage and pipe maintenance, for example, was out-sourced to local contractors, with resulting cost efficiencies but with the loss of "labour intensive methods used up to the 1970s with locally based teams which possessed a seemingly intimate knowledge of the system" (Uff 1996). With top managers preoccupied with IT, restructuring, and diversification, "there was little evidence of a management culture in which [resources] were at the top of the company's management agenda. Consequently the quality of decision-making [in 1995] appeared inadequate" (OfWat 1996a, 7.2). By the time managers did realise the seriousness of the drought, it was almost too late.

Changes in management culture, outsourcing, job-shedding and restructuring are not unique to YWS, but have occurred across the water industry since privatisation (Ferner and Colling 1993). This restructuring rests on changing assumptions about the accepted bases of decision-making and regulation post-privatisation (Ernst 1994; Martin and Parker 1997). Water is considered a commodity no different than any other economic good, which can be priced and sold; market-based interactions are accepted as the primary mechanism for satisfying an individual's need for water. The production of the Yorkshire drought is compatible with, and to some extent the result of state policies desirous of low-capital and high-revenue company investment programmes that minimise price increases to consumers. In this limited sense, the

²⁸ L. Davies. Interview. July, 1996.

²⁹ The scale of these efficiencies is disputed. See, for example, Hunt and Lynk (1995).

1995/96 water shortage in Yorkshire was cost-effective, and the drought a least-cost solution to constraints on the hydrosocial cycle.

Conclusions

Scientific, regulatory, and managerial practices and discourses clustered around climate, demand forecasting, and corporate restructuring in Yorkshire in the early 1990s structured the Yorkshire Grid such that water supply could not be sustained during the dry summer of 1995. The restructuring of YWS post-privatisation entailed changing flows of information and reconfiguring of resource and quality management techniques, altering not only decision-making practices but also the sanctioned actors and information involved in decision-making. Discourses of climatic stability and demand forecasting produced a set of understandings about the environment and consumption patterns that simultaneously concealed or even rejected contradictory evidence – the ‘warning signals’ of the early 1990s.

The drought, in this sense, was produced in nature, yet unintended; an authorless, dialectical coupling of a structured set of discourses and institutions with a water supply Grid and an extended period of lower than average rainfall. Nonetheless, it had a kind of economic intelligibility; the drought was, in a limited sense, the least-cost option for YWS given the constraints of the post-privatisation regulatory ‘game’. The shift to private ownership of the industry in 1989 is only one dimension of this game. Equally important were the concurrent introduction of a new mode of regulation of the industry that diffuses responsibility and accountability while shifting the cost burden to consumers, and the adoption of a set of economic and environmental economic techniques that shaped not only financial decisions but also methods of information-gathering and water supply system management.

Although the water supply system did not fail in Yorkshire in 1995, the drought brought issues of equity and access to the fore, largely through consumer resistance and the work of self-appointed and vocal water industry watchdogs. Political legitimacy and public perception, as much as managerial and technical issues, are elements of ongoing debates over the reregulation of the privatised water industry. This debate will decide how water moves around England and Wales in the future, whether we are to engage in large-scale hydrodevelopment, whether we will sanction further imports of water from the north and west to the south-east, and to what extent demand management, water-sensitive land-use planning, and alternative technologies will allow communities to meet their needs for water within the boundaries of local watersheds.

Taking discourse theory seriously in a regulationist approach to the ecological dimension of socio-economic restructuring requires a scale-hopping exploration of the intricacies of ‘real’ regulation which penetrates beyond the boundaries of the firm. More fundamentally, it requires a

move away from analytical reliance on the concept of crisis, which masks the organic, diffuse nature of change. Retelling the Yorkshire drought as a series of intertwined storylines foregrounds those ecological and socio-economic processes which “operate [not] by way of some sudden catastrophe but through a steady, multi-dimensional dislocation of social practices and frustration of human purposes” (Benton 1994, 49). Focusing on storylines rather than narratives of crisis focuses on (re)regulation as a transformative process, raising questions of political legitimacy and public perceptions as well as of the nature of socio-economic restructuring.

In attempting to “locate the intelligibility of a series of events and transformations not in the intentions guiding the actions of one or more animating subjects, but in the systematic nature of the social reality which results from those actions” (Ferguson 1996, 18), a discursively informed regulation theory offers political ecology another means of inquiry into the problematic of the production and commodification of nature. In approaching a resource as a partially discursively constructed dialectic between production and nature, analysis shifts focus from the management of unproblematised ‘natural’ resources to sociopolitical struggle within a dynamic natural resource landscape (Roberts and Emel 1992). In so doing, political ecology provides an alternative reading to that of reformist environmentalism which may provide ideological legitimation for the commodification of nature and infrastructural conditions (Benton 1996, 192). For in seeking to understand the dynamics of change, reflexive discourse analysis is also a means of uncovering the creative potential inherent in current debates over environmental conflict.

References

- Allan J A and Karshenas M A** 1996 Managing Environmental Capital: The case of Water in Israel, Jordan, the West Bank and Gaza, 1947 - 1995 in **Allan J A** ed. *Water, Peace and the Middle East: Negotiating Resources in the Jordan Basin* Tauris Academic Publishers, Oxford 75 - 119.
- Amin A** ed. 1994 *Post-Fordism: a Reader* Oxford Blackwell.
- Arnell NW Jenkins A and George D G** 1994 *The Implications of Climate Change for the National Rivers Authority* NRA Research and Development Report, 12. NRA, Bristol.
- Armstrong M Cowan S and Vickers J** 1994 *Regulatory Reform: Economic Analysis and the British Experience* MIT Press, Cambridge and London.
- Averch H and Johnson L** 1962 Behaviour of the Firm under Regulatory Constraints *American Economic Review* 52 1052 - 1069.
- Barkas E and Walker C** 1996 Yorkshire Water faces £150m bill for drought *Yorkshire Post* 29 February.
- Benton T** 1994 Biology and Social Theory in the Environmental Debate in **Redclift M and Benton T** eds. *Social Theory and the Global Environment* Routledge, London and New York 28 - 50.
- Benton T** 1996 ed. *Greening Marxism* Guildford Press, New York and London.
- Boyer R** 1990 *The regulation school: a critical introduction* Columbia University Press, New York.
- Boulton L** 1996 Yorkshire Water in £70m drought fight *Financial Times* April 27, 4.
- Buckley C** 1996 Yorkshire Water counts the cost of supply hitches *The Times* 29 February.
- Bunyan N** 1995 Drought firm plans second £50m pipeline *Yorkshire Post* 15 December.
- Burke T** (1996) *Lifebuoy Men, Lux Women: Commodification, Consumption and Cleanliness in Modern Zimbabwe* Duke University Press, London.
- Castree N** 1996 Birds, mice and geography: Marxisms and dialectics *TIBG* 21 342 - 362.
- Day D** 1987 An Australian perspective on drought and water management objectives for regional development *Water Resources Development* 3(4) 267 - 283.
- DOE** 1996a *Water Resources and Supply: Agenda for Action* The Stationery Office, London.
- DOE** 1996b *Review of the Potential Effects of Climate Change in the United Kingdom* HMSO, London.
- Dracup S** 1973 Water Supply in Great Britain: A Brief History in Six Parts *British Water Supply* January - June.
- Emel J Roberts R and Sauri D** 1992 Ideology, property, and groundwater resources *Political Geography* 11(1), 37 - 54.

- Environment Agency** 1996a *Review of Water Company Plans to Safeguard Summer Water Supplies: Environment Agency Report to the Secretary of State for the Environment* Fourth report of a series. Environment Agency, Bristol.
- Environment Agency** 1996b *Interim Report on the Environmental Impacts of the Drought on Yorkshire's Rivers: April 1995 - April 1996* Environment Agency, Leeds.
- Ernst J** 1994 *Whose Utility? The Social Impact of Public Utility Privatization and Regulation in Britain* Open University Press, Milton Keynes.
- Farrar C** 1996 Yorkshire Water stuns customers with its latest letter: Because we're been so efficient, here's a cheque for £10 *Yorkshire Post* 16 September.
- Ferguson J** 1996 *The Anti-Politics Machine: "Development", Depoliticization and Bureaucratic Power in Lesotho* University of Minnesota Press, Minneapolis.
- Ferner A and Colling T** 1993 Privatization of the British Utilities: Regulation, decentralization and industrial relations in **Clarke T and Pitelis C** eds. *The Political Economy of Privatization* Routledge, London 125 - 141.
- Gandy M** 1997 The making of a regulatory crisis: restructuring New York's water supply *Transactions of the Institute of British Geographers* 22 338 - 358.
- Graham S** 1997 Liberalized utilities, new technologies, and urban social polarization -- the UK experience *European Urban and Regional Studies* 4(2) 135 - 150.
- Graham S and S Marvin** 1994 Cherry-picking and social dumping: Utilities in the 1990s *Utilities Policy* 4(2) 113 - 119.
- Graham S and S Marvin** 1995 More than Ducts and Wires: Post-Fordism, Cities and Utility Networks in **Healey P Cameron S Davodi S Graham S and Madani-Pour A** eds. *Managing Cities: The New Urban Context* John Wiley & Sons, London 169 - 180.
- Gill A** 1995 Digging a Watery Grave *Yorkshire Post* 6 September.
- Guy S Graham S and Marvin S** 1997 Splintering Networks: Cities and Technical Networks in 1990s Britain *Urban Studies* 34(2) 191 - 216.
- Hajer M A.** 1995 *The Politics of Environmental Discourse: Ecological Modernization and the Policy Process* Clarendon, Oxford.
- Harvey D** 1993 The Nature of Environment: The Dialectics of Social and Environmental Change *Socialist Register* Merlin Press, London 1 - 51.
- Harvey D** 1995 A Geographer's Guide to Dialectical Thinking in **Cliff AD and Haggett P** eds. *Diffusing Geography: essays presented to Peter Haggett* Basil Blackwell, Oxford 2 - 21.
- Harvey D** 1996 *Justice, Nature and the Geography of Difference* Blackwell, Oxford.
- Hassan J and Taylor P** 1996 The Politics of Water in Early and Mid Victorian Britain Discussion Paper in Economics and Economic History 96 - 01. Manchester Metropolitan University.

- Haughton G** 1997 Private profits - public drought: the creation of a crisis in water management for West Yorkshire. Sustainable Urban Development Working Paper Series CUDEM, Leeds.
- Hay C** 1995 Re-stating the problem of regulation and re-regulating the local state *Economic and Society* 24(3) 387 - 407.
- Helm D and G Yarrow** 1988 The Assessment: The Regulation of Utilities *Oxford Review of Economic Policy* 4(2) i - xxxi.
- House of Commons Environment Committee** 1996 *Water Conservation and Supply: Interim Report* HMSO, London.
- Hughes S** 1996 *Report for the Yorkshire Wildlife Trust on the Independent Commission of Inquiry into Water Supply in Yorkshire* Yorkshire Wildlife Trust, York.
- Hunt L and Lynk E** 1995 Privatisation and efficiency in the UK water industry: an empirical analysis *Oxford Bulletin of Economics and Statistics* 57 (3) 371 - 388.
- Jessop B** 1990 Regulation theories in retrospect and prospect *Economy and Society* 19(2) 153 - 216.
- Jessop B** 1992 Fordism and post-Fordism: a critical reformulation in **M Storper and Scott A** eds. *Pathways to Industrialization and Regional Development* Routledge, London 46 - 69.
- Jessop B** 1995 The regulation approach, governance, and post-Fordism *Economy and Society* 24(3) 307 - 333.
- Lascelles D and Martinson J** 1996 Yorkshire Water hit by £40m revenue penalty: Price curb agreed as regulator attacks 'serious failures' *Financial Times* 4 June 22.
- Lazenby P** 1995 Water stocks continue to fall as cut-offs loom *Yorkshire Post* 21 September.
- Lazenby P** 1996 Water watchdog anger as profits hit £162m *Yorkshire Post* 5 June 1.
- Letza S and Smallman C** 1996 Is Water Thicker than Blood? Overcoming the Conspiracy of Profit over Social Responsibility in Privatised Utilities in **Montanheir L Rebelo E Owen G and Rebelo E** eds. *Public and Private Sector: Partnerships Working for Change* Pavic Publications, Sheffield 289 - 303.
- Litfin K** 1994 *Ozone Discourses: Science and Politics in Global Environmental Cooperation* Columbia University Press, New York.
- Littlechild S** 1988 Economic Regulation of Privatised Water Authorities and Some Further Reflections *Oxford Review of Economic Policy* 4(2) 40 - 68.
- MacGuire F** 1996 The Environmental Threats of the Kielder Transfer Scheme. FOE Briefing Sheet. Friends of the Earth, London.
- Maloney W and Richardson J** 1995 *Managing Policy Change in Britain: The Politics of Water* Edinburgh University Press, Edinburgh.
- Management Today** 1996 Regulator's power failure November 40 - 43.
- Marsh T J** 1996 The 1995 UK Drought - A Signal of Climatic Instability? *Proceedings of the Institution of Civil Engineers: Water, Marine and Energy* 118, 189 - 195.

- Marsh T** 1995 Drought returns to the United Kingdom *Drought Network News* 7(3) 5 - 6.
- Marsh T and Turton P S** 1996 The 1995 Drought – a water resources perspective *Weather* February 47 - 53.
- Martin S and Parker D** 1997 Privatisation: The conceptual framework in **Martin S and Parker D** eds. *The Impact of Privatisation: Ownership and Corporate Performance in the UK* Routledge, London 1 - 30.
- Martinson J** 1996a Companies and Finance: Yorkshire Water moves to restore its reputation *Financial Times* 6 June.
- Martinson J** 1996b Companies and Finance: Yorkshire hopes tide has turned *Financial Times* 24 July.
- Martinson J** 1996c Companies and Finance: Yorkshire chief faces grilling *Financial Times* 26 July.
- Martinson J** 1996d Companies and Finance: Yorkshire still ‘very keen’ to return value *Financial Times* 30 November 30.
- Marvin S and Guy S** (forthcoming) Consuming Water: Changing Logics of Water Management in Britain *Journal of Urban Technology*.
- Melville A** 1994 Power, strategy and games: Economic regulation of a privatized utility *Public Administration* 72(3) 385 - 408.
- Millward R** 1989 Privatization in historical perspective: the UK water industry in **Cobham, D., Harrington, R., and G. Zis** eds. *Money, Trade and Payments: Essays in Honour of D.J. Coppock* Manchester University Press, Manchester 188 - 209.
- Murray P** 1993 The necessity of money: How Hegel helped Marx surpass Ricardo’s theory of value in **Moseley F** ed. *Marx’s Method in Capital* Humanities Press, New Jersey 37 – 62.
- Nevarez L** 1996 Just wait until there’s a drought: Mediating environmental crises for urban growth *Antipode* 28(3) 246 - 272.
- NRA** 1994a *Water: Nature’s Precious Resource* National Rivers Authority, Bristol.
- NRA** 1994b *Regional Water Resources Strategy: Northumbria and Yorkshire* National Rivers Authority, Leeds.
- NRA** 1995a *Saving Water: The NRA’s Approach to Water Conservation and Demand Management* National Rivers Authority, Bristol.
- NRA** 1995b *The Drought of 1995: A Report to the Secretary of State for the Environment* National Rivers Authority, Bristol.
- NRA** 1995c *Measures to Safeguard Public Water Supplies: A Second Report to the Secretary of State for the Environment on the Drought of 1995* National Rivers Authority, Bristol.
- NRA** 1996a *Refill Prospects: A Third Report to the Secretary of State for the Environment on the Drought of 1995/96* National Rivers Authority, Bristol.

- NRA** 1996b *Review of Water Company Plans to Safeguard Water Supplies* National Rivers Authority, Bristol.
- Nixon J S** 1995 *Yorkshire Water Services Ltd: Applications for Emergency Drought Orders* Department Of the Environment, London.
- O'Connell-Davidson J** 1993 *Privatisation and Employment Relations: The Case of the Water Industry* Mansell, London.
- OfWat** 1995 *Compensation for Customers: A consultation paper on the issues raised by the 1995 drought* Office of Water Services, Birmingham.
- OfWat** 1996a *Report on conclusions from OfWat's enquiry into the performance of Yorkshire Water Services Ltd* Office of Water Services, Birmingham.
- OfWat** 1996b *Customer Benefits, Investments and Dividends* Letter to Managing Directors of all Water and Sewerage Companies and Water Only Companies. Office of Water Services, Birmingham.
- OfWat** 1996c *Compensation for Customers: review of the Guaranteed Standards Scheme* Office of Water Services, Birmingham.
- OfWat** 1997a *1996-97 Report on leakage and water efficiency* Office of Water Services, Birmingham.
- OfWat** 1997b *1996-7 Report on the financial performance and capital investment of the water companies in England and Wales* Office of Water Services, Birmingham.
- OfWat** 1997c *Water Pricing: The Importance of Long Run Marginal Costs* Prepared for OfWat by London Economics.
- Ogden S and Glaister K** 1996 The Cautious Monopolists -- Strategies of Britain's Privatized Water Companies *Long Range Planning* 29(5) 663 - 674.
- Ollman B** 1993 *Dialectical Investigations* Routledge, London.
- OXERA** 1997 "Water Resources Demand." OXERA Briefing Paper 6/97 Oxford Economic Research Associates Ltd., Oxford.
- Peck J and Tickell A** 1994 Searching for a New Institutional Fix: the *After* - Fordist Crisis and Global-Local Disorder in **Amin A** ed. *Post-Fordism: a Reader* Blackwell, Oxford 280 - 315.
- Peet R and Watts M** 1993 Introduction: Development Theory and Environment in an Age of Market Triumphalism *Economic Geography* 69 227 - 253.
- Research by Design** 1996 *The Drought of 1995: The Customers' Perspective in Bradford* Research study conducted on behalf of the Office of Water Services. Research by Design, Solihull.
- Richardson J Maloney W and Rudig W** 1992 The dynamics of policy change, lobbying and water privatisation *Public Administration* 70(2), 157 - 175.
- Roberts R S and Emel J** 1992 Uneven Development and the Tragedy of the Commons: Competing Images for Nature-Society Analysis *Economic Geography* 68(3) 249 - 271.

- Rofe B H and Hampson E** 1995a *Yorkshire Water Drought Orders 1995: Independent Assessment Report* Department of the Environment, London.
- Rofe B H and Hampson E** 1995b *Yorkshire Water Drought Orders 1995: Second Assessment Report* Department of the Environment, London.
- Saunders P and Harris C** 1994 *Privatization and Popular Capitalism* Open University Press, Philadelphia.
- Schramm E and Kluge T** 1994 The German Water Crisis: A Socio-Ecological View *Capitalism, Nature, Socialism* 5(1) 99 - 113.
- Solway J S** 1994 Drought as a 'Revelatory Crisis': An Exploration of Shifting Entitlements and Hierarchies in the Kalahari, Botswana *Development and Change* 25 471 - 495.
- Swyngedouw E** 1997 Power, nature and the city. The conquest of water and the political ecology of urbanization in Guayaquil, Ecuador: 1880 – 1990 *Environment and Planning A* 29 311 – 332.
- Tickell A and Peck J** 1995 Social regulation *after* Fordism: regulation theory, neo-liberalism and the global-local nexus *Economy and Society* 24 357 - 386.
- UKWIR/NRA** 1995 *Demand Forecasting Methodology - Main Report* UK Water Industry Research Ltd., London.
- Uff J** 1996 *Water Supply in Yorkshire: Report of the Independent Commission of Inquiry* Yorkshire Water Services Ltd., Leeds.
- Vickers J and Yarrow G** 1988 *Privatization: An Economic Analysis* MIT Press, London.
- WaterWatch** 1996 *Submission of evidence to the House of Commons Environment Select Committee Inquiry into Water Conservation and Supply* Waterwatch, Rotherham.
- West B and Smith P** 1996 Drought, discourse and Durkheim -- A research note *Australian and New Zealand Journal of Sociology* 32(1) 93 – 102.
- WSA** 1997 *Water: Meeting the Challenge: The vision of the Water and Sewerage Companies of England and Wales* Water Services Association, London.
- Yorkshire Post** 1995 Firms hit by water shortages...should move. 29 August.
- Yorkshire Water** 1995 *Annual Report and Accounts* Yorkshire Water plc., Leeds.
- Yorkshire Water** 1997 *Establishing the Economic Level of Leakage* Yorkshire Water plc., Leeds.
- Yorkshire Wildlife Trust** 1996 *Yorkshire Wildlife Trust Objection to the River Hull Drought Permit Application by Yorkshire Water Services Ltd* Yorkshire Wildlife Trust, York.
- Zimmerer K** 1993 Soil Erosion and Social (Dis)courses in Cochabamba, Bolivia: Perceiving the Nature of Environmental Degradation *Economic Geography* 69 312 - 328.

