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# Infrastructural Relations: Water, Political Power and the Rise of a New 'Despotic Regime'

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**ABSTRACT:** It is 60 years since Karl Wittfogel highlighted a key relationship between political power and the ownership and control of water. Subsequent studies have suggested, commensurately, that exclusion from the ownership of essential resources represents a fundamental form of disenfranchisement – a loss of democratic involvement in societal direction. Several areas of theoretical development have illuminated these issues. Anthropologists have explored the recursive relationship between political arrangements and cosmological belief systems. Narrow legal definitions of property have been challenged through the consideration of more diverse ways of owning and controlling resources. Analyses of material culture have shown how it extends human agency, as well as having agentive capacities itself; and explorations of infrastructures have highlighted their role in composing socio-technical and political relations. Such approaches are readily applied to water and the material culture through which it is controlled and used. Drawing on historical and ethnographic research on water in Australia and the UK, this paper traces changing relationships between cosmological beliefs, infrastructure and political arrangements over time. It suggests that a current trend towards privatised, transnational water ownership potentially opens the door to the emergence of new 'despotic regimes'.

**KEYWORDS:** Water ownership, water governance, human-nonhuman relations, UK, Australia

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## INTRODUCTION

In 1957, when Karl Wittfogel proposed, via a study of water and governance in Asia, that there was an intrinsic relationship between the control of water and political power, he had little difficulty in persuading the academy that this was a reasonable supposition. Every human society, throughout history and across cultures, has valorised and often worshipped water as the most essential element and as the generative source of health and wealth. The notion of a key relationship between the material control of water and political power was therefore uncontroversial: how could it not be empowering to direct the most vital of elements? And this potential for political – and sometimes hegemonic – control through water ownership has been further underlined by subsequent work, for example by Worster (1992) and Reisner (1993).

More contentiously, Wittfogel argued that centralised control of water enabled 'despotic regimes'. He suggested that the creation of major irrigation infrastructures had both required and enabled centralised forms of governance, supporting the emergence of hierarchical and despotic states. The idea of a recursive relationship between physical and political structures appealed to those interested in how power is materialised. Marvin Harris (1979), for example, situated infrastructure as the primary mechanism through which societies formulate relationships with environments. Later, STS analyses described technology as 'a political phenomenon' in which specific 'affordances' are promoted by symbolic discourse and ritual, and infrastructures contribute to the composition of social relations (Foucault, 1972; Pfaffenberger, 1992: 282,284; Anand, 2012). Pfaffenberger noted how, in Sri Lanka,

"virtually every aspect of social life, including family life and worship, was designed along with the dams and canals" (Ibid: 291; see also Pfaffenberger, 1990).

But Wittfogel's analysis also sparked considerable criticism, from Sinologists promoting a more nuanced view of Chinese political arrangements (Needham, 1954-2008), and from those with alternate theories about state formation (Carneiro, 1970; Hocart, 1970). In the last 50 years, although scholars have remained broadly in agreement that there is an important relationship between power and the control of water, closer analyses of the ways in which water intersects with social and political relations have revealed a more complex picture recognising that many kinds of power – not just despotic regimes – are enabled through its control and management (Lansing, 1991; Glick 1996).

Similarly, drawing on analyses of material culture exploring the agentic capacities of artefacts (Gell, 1998; Tilley, 2007; Boivin, 2004; Knappett and Malafouris, 2008), others turned these theories towards natural resources and the infrastructural arrangements through which these are controlled (Strang, 2004, 2015; Boivin, 2008; Harvey and Knox, 2010). It is plain that – whether artefacts or elements – the meanings and potential agency of objects can shift with changes in social and political context (Appadurai, 1986). As Caton and Orlove (2010) observe, water flows through and connects many realms of social life, and there are multiple ways to understand and value it (see also Helmreich, 2011). These multiplicities produce a variety of institutions and processes for managing and distributing water resources, all of which express not only social but also political relations.

This paper focuses on the relationship between water and power, addressing in particular the role of infrastructure. It draws on several areas: recent work on the many different ways in which water can be owned; concepts of human-environmental relations; and theories concerned with agency and materiality. It notes that a crucial element – often neglected in analyses of water and power – are the underlying cosmological beliefs and values (religious or secular) which reflect and affirm societal arrangements. For example, it draws attention to an important relationship between the development of large-scale water infrastructures and the euhemerisation (humanisation) of religious deities (Strang, 2014a).

The clearest measure of social and political equality is the distribution of property rights (Widlok and Tadesse, 2005). There are multiple ways in which the ownership and control of essential resources and related material systems can be distributed. Even when these are held by a centralised government, the state may adopt quite different roles. It may (as Wittfogel suggested) act as 'other' to the people and enforce a despotic regime; it may take on a paternal role as a representative 'of' the people; or – underpinned by collective ownership arrangements – it may act more directly 'as' the people (Alexander, 2004). There is also a question about whether centralised control leads, inevitably, to forms of empowerment that alienate those 'in charge', and this potential is nicely illustrated by Herzfeld's analysis of how bureaucracies become 'indifferent' to the populations they are intended to serve. The potential for such alienation – surely a key criterion for 'despotism' – is logically increased when such governance is significantly removed from the social and political networks able to demand accountability.

A process of hierarchy creation and the emergence of governing elites are evident in long-term trends towards the enclosure and privatisation of land, water and other resources, which has brought about a critical shift in property and social relations (Hann, 1998). This hegemony has often subsumed more collective arrangements and I would argue that, in so doing, it has systematically disenfranchised the majority of human as well as nonhuman beings, placing the control of water and power in fewer and fewer hands. There are notable gender issues too: dispossession has tended not only to replace common water ownership with that of elites, but has also favoured male control of water and power (Coles and Wallace, 2005; Lahiri-Dutt, 2006).

In some countries, it has become common to bring private companies into public-private partnerships (PPPs) to handle the operational side of urban water supply and agricultural irrigation,

while public ownership of expensive-to-maintain infrastructure has often been retained. In America, for example, there has been a steady increase in PPPs, and today "more than 2,000 facilities from New York to California are operated in public-private partnership contract arrangements" (National Association of Water Companies, 2012). A number of these involve major transnational water companies such as Veolia, Suez Environment and RWE.

Internationally, The World Bank and The International Monetary Fund have promoted water privatisation as a way of enabling developing countries to address national debt issues (with varied responses), and water companies in industrialised countries have become increasingly attractive to private investors. Thus Wolff and Palaniappan (2004: 1) observe that "the number of people served by private companies has grown from 51 million in 1990 to nearly 300 million in 2002. Six water companies alone expanded from 12 countries in 1990 to over 56 countries by 2002". There are various different formulae for the ownership of water in these full and semi-privatisations, but all focus primarily on the acquisition of rights to abstract, impound, direct and distribute water, thus conferring material control over it.

Given the broad trend towards privatisation internationally, it is useful to consider cases where there has been a notable increase in the acquisition of water rights by transnational corporations. In the UK, the ownership and control of freshwater was sold to major transnational corporations in 1989, through the direct privatisation of the water supply industry. National legislative bodies, the Office of Water Services and the Environmental Agency, have found it difficult to regulate these effectively (Bakker, 2003, 2005; Strang, 2004, in press). In Australia, with *de facto* privatisation (through water trading schemes and the sale of abstraction licences) major irrigation companies have been bought up by large transnational corporations, with similarly ineffective regulatory protection for local, social and ecological needs (Strang, 2013).

Drawing on long-term ethnographic research with water users in river catchment areas,<sup>1</sup> this paper therefore presents two case studies. The first considers the privatisation of domestic water supply companies in England; the second examines the changing ownership of major irrigation companies in Australia. In both cases, it attempts to bridge key gaps between the literature concerned with property and that which deals with material culture and agency, as well as considering how social and political relations are materialised through infrastructural developments. Its central hypothesis is that the transfer of legal or *de facto* ownership and control of water into private hands, coupled with weak regulatory mechanisms, represents a diminution of state power and a concomitant transfer of political direction to an international network of transnational corporations answerable primarily to shareholders and market forces rather than to the populations of these countries.

Aiming to encourage further research and debate on these issues, the paper raises a number of questions. What happens when the control of freshwater is placed in the hands of companies geographically situated outside national and societal boundaries? What kinds of relationships emerge between transnational corporations and local and regional communities and environments? What is the material and social role of water infrastructure in these relationships? And is there a real risk that transferring the control of water and supply infrastructure to external bodies opens the door to 'despotic' behaviours?

Popular images of despotism tend to portray it as evil and absolute. But, properly speaking, despotism simply means unaccountable, unregulated and, above all, undemocratic. Despotism can indeed be evil and uncaring, but it can also be enlightened and seek to benefit society. However, it is always untrammelled. Governments weakened by the loss of democratic ownership of vital resources are poorly placed to regulate privatised water companies, even when these remain within national

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<sup>1</sup> In the UK, the Stour River in Dorset and (focused on OFWAT) in the Thames Region; in Australia, the Mitchell River in Cape York, and the Brisbane River in South Queensland.

bounds. Their capacity to control powerful corporations is weaker still when these are located externally. It is not my intention to demonise such corporations – they are very diverse – but merely to suggest that the emerging trend towards transnational ownership allows them to act, quite literally, without restraint. They can and sometimes do choose to be 'enlightened' in their choices.

But I think there is also a risk that locating the ownership of vital water resources in transnational elites, and failing to regulate their activities effectively, has the potential to lead to 'despotic' behaviours in which local social and ecological rights and interests can be ignored with impunity.

As one of the reviewers of this paper noted, in developing countries the impact of such a lack of restraint can be extreme (see, for example, Mains' (2012) work on privatisation and infrastructure in Ethiopia). But there are social and environmental impacts even in societies largely cushioned by First World economies. Rising water poverty amongst the most disadvantaged has come with the massive price increases that followed water privatisation in the UK (Huby and Bradshaw, 2012),<sup>2</sup> and in Australia the widespread degradation of fragile ecosystems, and pressures on downstream water users due to agricultural intensification and over-irrigation is salutary (Australian Bureau of Statistics [ABS], 2003a).<sup>3</sup>

## MATERIAL PROPERTIES

The link between water and power is an expression of material relations. No exercise of power is possible unless it can be expressed in material form, in this instance through the physical control of water bodies or the capacity to determine (from whatever distance) whose interests will benefit from the flow of water. However, material relations are not just between persons. All regimes of water control are influenced by the physical properties of water and its specific behaviours. The fluidity of water, the difficulty of capturing and containing it, and variability in hydrological flows inevitably challenge certainties of ownership and control (Strang, 2011). Every water regime, however technically proficient, has to face the reality that water has agentive physical capacities that cannot always be directed, and which may at times override human efforts (Edgeworth, 2011). Similarly, the materials from which water infrastructure are composed have their properties and behaviours, which provide opportunities and limitations in their design (Mukerji, 2009). Each managerial regime is therefore a negotiation between sociopolitical arrangements; the material infrastructures that contain and direct water; and the vagaries of hydrological processes.

This usefully highlights an understanding, encapsulated by Actor Network Theory (ANT), that human-environmental relations involve multiple human and nonhuman actors (Latour, 2005). As ANT and related work on social and technical systems (STS) have made clear, all are engaged in fluid processes in which they interact dynamically (Harvey, 2012). This work is complemented by the anthropology of infrastructure, which understands this as both relational and ecological (Star, 1999; see also Niewöhner, 2015). Larkin's definition is useful:

Infrastructures are built networks that facilitate the flow of goods, people, or ideas and allow for their exchange over space. As physical forms they shape the nature of a network, the speed and direction of its movement, its temporalities, and its vulnerability to break down. They comprise the architecture for

<sup>2</sup> Water charges in the UK rose by 60% in the first five years following the 1989 privatisation of the water industry. Twenty years later, Huby and Bradshaw (2012) found that 23.6% of households in England and Wales were experiencing water poverty, as water supply charges continued to rise considerably above inflation and average earnings. They estimate that this number could double by 2033).

<sup>3</sup> In a 2003 survey, ABS found that, 59% of land in Australia (456 million hectares [Mha]) was being used for agriculture, irrigated by 70% of its freshwater. This had resulted in the extinction or decline of many native species; major changes in water flows; and significant impacts on soil and water quality. 10% of farmers reported problems with salinity (ABS, 2003a). Subsequent reports (see case study) have shown increasing agricultural intensification (especially irrigation) and commensurately severe impacts.

circulation, literally providing the undergirding of modern societies, and they generate the ambient environment of everyday life (2013: 328).

Larkin (*ibid*) also highlights the point made by Hughes (1993) that infrastructures amalgamate technical, administrative and financial techniques, and reminds us of Foucault's useful observation that this constitutes "the apparatus of governmentality" (Foucault, 2010: 70; see also Scott, 1998; Mukerji, 2010).

Just as water flows demonstrate fluctuations and changes over time, water infrastructures undergo technical changes and developments,<sup>4</sup> as do the various social groups and their arrangements engaging with these at local, regional, national and now international levels. So, in considering any regime of water governance and control and its infrastructural expressions, there is a need to recognise that all participants – the people, the material culture, the water and the wider environment and its nonhuman inhabitants and material things – are involved in fluid and sometimes transformational processes.

However, as argued elsewhere (Strang, 2011, 2014b), neither social nor material relations are absolutely fluid: all have historical momentum. Water flows are subject to physical laws and seasonal cycles which, though difficult to predict precisely, demonstrate consistent patterns. Social, spatial and political arrangements often have strong momentum and continuity over time. These continuities are supported by their expression in material form, which, as noted above, provides recursive affirmation of specific beliefs, values and practices. Gandy (2011: 58) observes that infrastructure is also a product of symbolic and representational processes, articulating "the interrelationships between visible and invisible domains". This includes the power relations between all of the human and nonhuman participants. As Star says, studying "boring things" can be illuminating: "Study a city and neglect its sewers and power supplies (as many have) and you miss essential aspects of distributional justice and power" (1999: 379).

This deconstruction of infrastructural relations is complemented by the work of material culture specialists. Gell's (1998) depiction of material culture as a 'prosthetic' extension of human agency is readily applied to water infrastructures to illuminate how these form and are formed by prevailing ideas (as well as by the properties of water itself). As he observes (and this is also picked up by Harvey and Knox (2012) in relation to infrastructure), technology has its own capacities for 'enchantment' (Gell, 1992).

Although history has seen regular changes and developments in water infrastructure, major investments of labour and materials mean that many of the systems constructed – such as Victorian sewer systems in London or water tanks in India – have demonstrated considerable longevity, thus carrying earlier materialisations of ideas into new social and political arrangements. But whether perpetuating previous beliefs and values or not, the control of water is integral to people's capacities to exert agency and to compose particular identities. Conflicts between, for example, farmers, conservation groups, recreational water users and indigenous communities emerge from different ways of striving to enact specific group (and individual) identities and values.

At a societal level, there is a continuum of possibilities in the exertion of human agency, ranging from the low-key managerial methods of hunter-gatherer societies, which leave a considerable directive role with nonhuman species and things; through subtle but more compelling forms of environmental control; to more extreme impositions of technologies with major capacities to override nonhuman ecosystem processes (Strang, 2005, 2009). As this implies, increasingly sophisticated developments in water infrastructure have 'prosthetically' enabled new distributions of power and agency, human-environmental relations, and kinds of propertisation.

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<sup>4</sup> This may entail improvements or deterioration, and historically the latter has sometimes been implicated in the collapse of political regimes (Biswas, 1970).

However, infrastructural control can prove to be elusive. For example, the Chinese canals that Wittfogel suggested enabled 'Oriental despotism' formed a central part of this region's social, economic and religious activities until about 1850, when their siltation and decay reached a point where the government could no longer address the country's irrigation problems (Halsema and Vincent, 2006). The dynasty collapsed in 1911. Siltation, decay, and lack of maintenance in politically unstable periods had similarly contributed to the demise of Mesopotamian and Central American irrigation societies, major dynasties in the Indus Region, and other such schemes across Asia (Kahlow et al., 2006).

Nevertheless, each case provided a clear demonstration of the capacity of major water infrastructure to uphold political power and large-scale forms of governance. Following Durkheim (1961), I have argued that there is a related connection between such an increased capacity for instrumental material control and movements towards euhemerisation in religious belief systems (2014a). There are plenty of historical examples: the creation of major irrigation technologies enabled Mesopotamian Pharaohs to achieve a godlike status (Biswas, 1970). Irrigation canals brought Aztec God-Kings similar responsibilities for rainfall (Ferguson, 2000). In China, Yü the Great achieved mythological status as the master hydrologist (though he did not quite displace dragons as manifestations of the power of water) (Pietz, 2006); and in the Levant, and eventually across Europe, lone patriarchal gods replaced animistic pagan deities as the beneficent (or punitive) providers of water (Harrison, 1999).

In each case, movements away from 'nature religions' valorising nonhuman deities, towards humanised pantheons of gods, and single patriarchal monotheisms, intersected with increases in technological capacities to direct events in the material environment. There was a concomitant bifurcation in concepts of nature and culture (Plumwood, 1993). I do not wish to imply some kind of evolutionary progression here – merely to suggest that it is useful to consider the interrelationships between technical and religious trajectories, and the larger patterns that these compose, most particularly when these lead to new (and generally more directive) forms of environmental engagement.

### **EARLY MODERN RELATIONS WITH WATER**

In the early modern period, industrialisation placed some societies on a technological fast track. With new scientific and engineering capacities, European water infrastructure burgeoned rapidly (Tvedt and Oestigaard, 2010). Canals, water power, and the development of major water storage and supply systems enabled rapid urban expansion and industrial growth. There followed, first in European countries and their colonies, and then in other parts of the world, a massive programme of dam building to supply irrigation and, later, to generate electricity. As well as affirming and expanding statehood, this created more diverse forms of water ownership and management: by nations, states, municipalities and landowners. As major technological advancements had done previously, it also widened social inequalities, empowering those able to establish a directive role in the control of water.

While patriarchal monotheism and its notions of dominion continued to provide a backdrop to matching sociopolitical structures, intellectual authority shifted further into science, strengthening a view of the material world as both object and subject of human preeminence. This was reflected in infrastructural systems – canals and diversions, pumps and reservoirs – increasingly able to impose human agency to the extent that normal ecological processes could be heavily overridden.

Thus, in the centuries leading to the present, the rights and interests between human and nonhuman beings were considerably rearranged and redistributed. The prioritisation of human

interests, and the promotion of neoliberal<sup>5</sup> forms of water ownership and governance, opened the pathway towards a logic of instrumentalism in which water and other resources, as well as nonhuman species, could be seen to exist primarily to provide 'ecosystem services' to humankind or, more specifically, to some human groups. As Caton and Orlove (2010) point out, this has produced concepts such as 'Integrated Water Resources Management', which has achieved hegemonic dominance in global debates about water. Thus, while instrumentalism itself is nothing new in human-environmental relations, I would suggest that the increasing dominance of this kind of managerialism is indicative of important changes in beliefs and values, and a key shift in the balance of power between human and nonhuman beings.

The control of water and infrastructure has been central to the composition of modern nation states. Swyngedouw (2015), for example, describes hydraulic state-making in Spain in which conflicts over water ownership and control were dominated by a centralised commitment to engineering the environment, to the extent that the interests of local communities and environments were subsumed by economic and political priorities (see also Garrido, 2014). A pattern through which water rights are centralised and marketised has appeared in diverse forms in many areas (see Sultana and Loftus, 2012; Harris et al., 2013). As Norman et al. (2015) observe, there are critical issues of scale in the abstraction of water rights from local to larger institutions. And this, of course, brings us to the question of globalised, transnational water ownership.

## FLUID FORMS OF GOVERNANCE

### Public and private water in England and Wales

Conflicts over water in the UK in the 19th-20th century highlight tensions that many nation states have experienced in trying to reconcile different views of who should own and control water, while also trying to manage major differences in social, political and material scales. Until the 19th century, agricultural landowners maintained riparian rights over water, though by this stage most of the land was held by a very small segment of society. Industries initially gained access to water by clustering along rivers and abstracting water from them directly. But the mechanisation of agriculture and new forms of production brought most of the population and rapidly expanding industries into the cities, creating pressing needs for piped water supplies to domestic households and industrial activities.

This led to literal ownership rivalry.<sup>6</sup> Victorian industrialists invested in private water supply companies and sometimes reservoirs, partly to support their economic activities and partly to achieve social status and distinction by echoing the role of earlier Christian Abbeys as philanthropic suppliers of water (Himmelfarb, 1995; Gorsky, 1999; Prochaska, 2008). This allowed them to assume paternal responsibility for (and of) a vital common good which – in a Christian society – was still symbolically representative of the spirit. On the other side were municipalities: local government bodies (also populated by wealthy landowners and industrialists) who saw water supply as a *public* political and social responsibility. In both cases, though water itself was still regarded as a commons, the control of water sources and the infrastructure of water supply conferred *de facto* ownership, and the question as to whether this should be public or private therefore carried considerable political weight. The early 1900s brought intense argumentation over this question, with the ownership of water supply infrastructure passing back and forth between private companies and municipalities (Bakker, 2003; Strang, 2004).

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<sup>5</sup> Neoliberalism here is defined as an ideology valorising free market competition and the private ownership of resources, and which constructs personhood in individual terms.

<sup>6</sup> The etymological root of 'rival' is of course 'river'.

Debates over the 'common good' provided by water overlapped with those concerned with democratic rights. The First World War created major pressures for broader democratic enfranchisement which, as voting rights had long been dependent upon property ownership, were linked with debates about the ownership of key resources. Before the war, only 58% of the male population was eligible to vote. The *Representation of the People Act* in 1918, while still excluding women under the age of 30, provided suffrage for all British men over 21 and about 40% of women (British Government, 1918). Continued activism gained all women over 21 the right to vote with the *Representation of the People (Equal Franchise) Act 1928* (British Government, 1928).

WWII further promoted a common national identity and state governance, widening support for democratic inclusion and public ownership and control of resources. A post-war Labour Government provided sufficient impetus for the nationalisation of water supply companies as well as other essential utilities. The government also hoped to drive economic growth by supporting infrastructure developments. Water supply therefore became (primarily) the responsibility of regional water authorities under an increasingly centralised government and national legislation. Though not as locally accountable as earlier municipal authorities, these enjoyed a largely positive relationship with the populace to whom they provided water supplies. As a water company employee in Wessex recalled nostalgically, "gone are the lovely days when I first started. In those days, in the 1960s, the public, the domestic public, they were all for you then" (Strang, fieldnotes, 1999).

However, such democratisation also meant that central and regional governments became responsible for water supply charges. Unsurprisingly, there was reluctance to attract political recrimination by raising the costs of an essential 'common good'. Although water flows and quality were now seen as being within the purview of science and engineering, this biophysical idiom merely affirmed rather than undermined the long-term status of water as the basis of economic, spiritual and physical health and well-being. Perhaps echoing the problems of previous governments assuming responsibility for water, it proved difficult to raise funds for infrastructure maintenance and development. This enabled the Thatcher Government, in 1989, to argue that only privatising the water industry would provide sufficient access to capital for investment in new infrastructure and provide a more 'efficient' system of water delivery (Bakker, 2003, 2005). With this came a conceptual reconstruction of water as a marketised commodity. This was matched by a reframing of water users as 'consumers' and more recently as 'customers', suggesting that water is now the 'cultural' product of the water companies that treat and supply it, rather than a common good or part of 'Nature'.<sup>7</sup>

Overriding furious public protests, water privatisation was pushed through, and other utilities were also sold, with shares in theory democratically available to all, but in practice captured largely by corporate investors (banks, pension funds, investment companies, etc.). Since 1989, more than half of the 21 companies that emerged from the ten water authorities have been bought out by transnational corporations, with only three of the other major companies still functioning as publicly quoted companies with headquarters in Britain.<sup>8</sup>

<sup>7</sup> Although a dualistic concept of culture and nature continues to dominate the majority of discourses on this topic, others and I have argued that this is a problematic theorisation of human-nonhuman relations (Plumwood, 1993, 2002; Strang, 2005, 2015).

<sup>8</sup> Foreign ownership of UK water companies (at the time of writing) is as follows:

Thames Water: Investment consortium led by Macquarie, an Australian banking and finance group, with recent major investments by companies in Abu Dhabi and China.

Severn-Trent: Canadian investment group Borealis, the Kuwait Investment Office and the (UK) Universities Superannuation Scheme.

Northumbrian Water: Cheung Kong Infrastructure Holdings (Hong Kong).

Essex and Suffolk Water: Cheung Kong Infrastructure Holdings (Hong Kong).



Thus, while water governance and management are enmeshed in a complex network of public and private players, the control of key resources and infrastructure is once again held by a small and now more international elite. This differs crucially from that previously composed of Victorian industrialists and landed gentry: for the first time, power and agency in relation to water lie not with people at the apex of a specific society within a shared material environment, but with a transnational network of international corporations whose directorial roles (and shares) are often held by non-residents. National governments and other parties involved in water governance (such as the EU) have limited capacity to regulate the behaviour of these corporations in managing the most essential of resources, and even less to require their acceptance of broader social or environmental responsibilities. The UK's Office of Water Services (OFWAT) regulates water charges, while the Environment Agency carries responsibility for legislation concerned with environmental protection. The extent to which they can exert pressure upon water companies varies with the political climate but, with long-term under-resourcing and a general lack of political will to challenge major corporations, they are rarely assertive.<sup>9</sup> As noted in the introduction, this has resulted in major increases in water charges and rising levels of water poverty (Huby and Bradshaw, 2012).

Despite both droughts and floods in the UK, the privatised water companies have proved reluctant to make investments in major water storages that – if their only purpose is to provide supplementary supplies or ameliorate flood risk – are only needed intermittently. Though they have responded to some EU directives with new treatment plants<sup>10</sup> and pipe renovations to reduce leaks, there has been little effort to move away from fiscally cheap but ecologically expensive upriver abstraction, and they have remained focused on 'end of pipe' solutions. The quality of river water has improved, largely because of the demise of polluting industries, but maintaining normal ecological flows remains problematic. Some legislative efforts were made to address such issues with the 2003 Water Act, which heightened Government responsibilities to ensure sustainable water use (Parliament of the United Kingdom, 2003).<sup>11</sup> Several independent bodies, such as Waterwise, were established to encourage water conservation and more ecologically responsible industry practices. The Environment Agency was given greater powers to demand sustainable industry practices. With further impetus from regulators (OFWAT and EA, 2011) new legislation aimed at discouraging upriver abstraction was introduced in 2014 (DEFRA, 2014). Recent floods have also increased the political pressure for more control over water flows.

However, water companies continue to resist bulk water trading and the reform of abstraction licenses (Walker, 2014: 398). And, purporting to relocate reform pressures in the market, many of these

Cambridge Water: Cheung Kong Infrastructure Holdings (Hong Kong).

Yorkshire Water: Citigroup, HSBC, and the Singaporean sovereign wealth fund GIC.

Affinity Water (formerly Veolia Water Central, Veolia Water East, Veolia Water Southeast): US-based Morgan Stanley and UK-based Infracapital.

Anglian Water: Osprey Acquisitions Limited – a consortium of several companies based in the UK, US and Canada.

Bristol Water: Canada-based Capstone Infrastructure, Spain-based Grupo Agbar and Japan-based Itochu Corporation.

Sembcorp Bournemouth Water (formerly Bournemouth and West Hampshire Water): Singapore-based Sembcorp.

South-East Water: Canada-based CDPQ and Utilities Trust of Australia

South Staffordshire: US-based Alinda Infrastructure Fund.

Wessex Water: Malaysian Corporation, YTL.

[www.lovemoney.com/guides/21023/do-you-know-who-really-supplies-your-water](http://www.lovemoney.com/guides/21023/do-you-know-who-really-supplies-your-water)

<sup>9</sup> During the course of this research, I also served as a member of a regional OFWAT committee (Thames Region) for two years.

<sup>10</sup> These deal primarily with effluent, nitrates and pesticides.

<sup>11</sup> This was further supported by new building codes and campaigns aimed at inducing behavioural changes in water consumption.

legislative mechanisms were dismantled or sidelined by the coalition Government (Castree, 2010). They are unlikely to be reintroduced following the Conservative landslide in the 2015 election, which has generally increased the pressure on OFWAT "to engage more constructively and... to reduce the burden of regulation on the [water] companies" (Gray, 2011: 5).

Even with the development of water-efficient appliances and substantial increases in water charges since privatisation, domestic patterns of water use have proved inelastic. With an eye on revenues and profits, water companies have tended to avoid demand management, although they now have sophisticated technologies to treat and transport water and to measure and monitor flows. Metering has expanded to penetrate over 30% of households (Walker, 2014). Water suppliers can now read individual household and business water meters from centralised computers and, though not permitted to halt provision entirely,<sup>12</sup> can punish the non-payment of water bills by reducing supplies to an agonising trickle. All such material and fiscal technologies reaffirm the commoditisation of water (Kopytoff, 1986).

Metering also allows water companies to trace leaks and vandalism. Illustrating a classic form of 'refusal' (Ortner, 1995) a common form of protest, when water shortages require the installation of standpipes, is that people deliberately open public taps and leave them running. Such individual expressions of resentment contrast sharply with earlier responses to water shortages, such as the 'Save It' campaign of the 1970s, when the public water companies readily persuaded over 90% of households and businesses to reduce their water use by at least 30 and sometimes 40%. By the time of the drought of 1995, "the climate had changed. The public blamed the water companies and the companies blamed the public" (Ward, 1997: 95). Another drought, in 2012, produced equally vituperative exchanges. Neither the water companies nor their 'customers' appear willing to collaborate to manage water sustainably. Walker describes this as a failure of 'meta-governance' caused by the nature of capitalist exchange and its resulting production of nature:

Multilateral agreements now promote the designation of an economic value to water and endorse its economically efficient allocation and consumption in light of competing economic uses (European Parliament, 2000). The economic status of water is increasingly recast from a public to a private good, its scarcity articulated as naturalised and absolute, and its management prescribed in terms of economic efficiency (Walker, 2014: 390).

Environmental groups have recorded the continued destruction of UK's wetland areas through compromised water quality, loss of habitat and consequent loss or endangerment of multiple species (BAG, 1996; English Nature, 1996; RSN, 1992; RSPB, 2011). Martin Spray of the Wildfowl & Wetlands (WWT) Trust points to wider pressures:

The financial crisis has brought cuts and austerity and now the threat to remove legislation that gets in the way of economic development. The environment has become marginalised, viewed as a luxury that we only concern ourselves with in times of prosperity. But the natural environment and wetlands in particular, underpin that prosperity and our well-being (quoted in RSPB, 2011).

The issues outlined above suggest that the abdication of water governance to the market, and particularly to external transnational corporations, is problematic. Such arrangements seem unable to produce sustainable water use practices or the infrastructure that will protect human and nonhuman interests in the longer term. Nor have they provided reliable access to water or functional ecosystems in which the needs of all species are met.

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<sup>12</sup> Until prevented from doing so by a Labour Government elected in 1997, water companies were permitted to cut off supplies if households or businesses failed to pay their bills.

## The abstraction of water in Australia

Similar processes of water commoditisation and concomitant social and environmental impacts have occurred in Australia. The context is quite different of course: Australia has a much lower population density, a far more arid environment, and an economy focused on primary production. But there are some important commonalities with the UK in Australia's direction of travel, towards the privatisation and international ownership of water. Australia's dependence on agriculture is also useful in highlighting the connections between local production and global market forces.

In the two centuries since European colonisation, water infrastructure and governance in Australia have moved a long way away from the low-key forms of management and egalitarian control of water that Aboriginal people maintained (Builth, 2002; Gammage, 2011; Lourandos, 1978; Tibby et al., 2006). One of the European settlers' first acts was to seize key water sources. Refusing to recognise indigenous ownership of land or resources, graziers, farmers and miners established territorial land ownership which, at that time, included riparian rights to abstract water freely, either from rivers or by boring into artesian groundwaters.

Colonial records reveal a worldview characterised by an immutably dualistic view of nature and culture. Although water retained core generative meanings, these were channelled into a view of reproductive capacity as being primarily concerned with material and economic growth. Seeing this unfamiliar environment as 'hostile' and 'untamed' Nature, and determined to establish a new nation, the settlers embarked on an aggressive programme to exert dominion. Forest clearance was rewarded with landownership. Fences imposed territorial authority, and 'homesteads' provided a bulwark against the wilderness (Schaffer, 1988). Affective attachments to the place developed, but land and resources were regarded as alienable commodities, and the sentient landscape of Aboriginal Australians was overlaid with a cultural landscape focused on material opportunities (Strang, 1997). Water was there to be directed into the settlers' economic activities, and its nonhuman inhabitants were seen as dangerous or destructive; as game; or as expendable competition for grazing.

The introduction of an economic mode formed in temperate climes had significant ecological effects. Hard-hooved cattle punished delicate soil structures, degrading freshwater and marine ecosystems. Mining was (and continues to be)<sup>13</sup> detrimental to water quality. Farming intensified rapidly around major rivers, and thousands of bores were drilled into the Artesian Basin. Still the variable water flows of an arid environment remained challenging, and the late 1800s and early 1900s, hoping to achieve both water security and meet a zealous (and indeed semi-religious) desire to 'green the desert', Australia embarked on the construction of massive irrigation schemes, for example in the Snowy River area and in Queensland (Hill, 1965). Under a federal system, water was constitutionally owned by subsidiary states which competed to build the biggest schemes. These were intended, primarily, to serve the interests of a landed 'squattocracy' which largely controlled both state and federal governments. The states disbursed water allocations to farmers based on their land ownership, and for much of the 20th century permitted unlimited abstraction.

This *status quo* pertained until the 1980s, by which time the over-use of water (mostly by farmers but increasingly by other industries as well), was creating significant problems with water flows. Irrigated crop production had been expanding (composing about 70% of freshwater use in Australia) and the 1980s also brought a move towards more profitable but thirstier crops. Cotton farming expanded threefold between 1985 and 1998, and by 2000 was consuming 12% of the water used in Australia. Rice used almost as much (11% of the total) and sugar 8%. The land area irrigated rose from

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<sup>13</sup> Many old mines continue to leach poisonous chemicals into the environment, and although mining companies now claim to have prevented such problems, ongoing alluvial mining and widespread quarrying also continue to pollute waterways.

1,624,186 ha to 2,056,580 ha between 1985 and 1996-97: a 27% increase. In the same decade, water used for irrigation increased by 7700 Gl/yr, i.e., by 75% (ABS, 2005).

Water flows were not the only problem: by the 1990s irrigation had also begun to salinate and thus render useless vast tracts of land (ABS, 2015a).<sup>14</sup> There were growing conflicts between upstream and downstream water users, and population growth and urban expansion had created strongly competing demands. Urban voters wanted not only reliable household supplies but recreational access to water, and therefore supported conservation groups in raising concerns about environmental well-being. For the first time, farmers were required to submit water allocation management plans (WAMPS), and with the Water Act 2000, states began to impose volumetric limits on allocations and made moves to install meters on bores and abstraction pumps (COAG, 2004: 1). Nevertheless, the use of water for irrigation continued to expand: in 2012-13 alone there was a 32% increase in the water used on farms, of which 93% was used for irrigation, with 43% coming from irrigation schemes and 25% directly from rivers, lakes and creeks (ABS, 2014a).

Alongside this expansion was growing pressure to recognise indigenous rights in land and water. The civil rights movement had led to a 1967 constitutional referendum enfranchising Aboriginal Australians and Torres Strait Islanders, and was followed by a Land Rights movement that tried to reconcile Aboriginal Law with that of the Australian settlers (Reynolds, 1987; Attwood and Markus, 1999). These efforts culminated in the *Native Title Act* (1993) which, after 200 years of denial, acknowledged that indigenous Australians had a prior form of land and resource ownership (Toussaint, 2004). However, bringing this Act into law brought down Paul Keating's unusually liberal government, and the subsequent right-wing regime reaffirmed non-Aboriginal water ownership and control. Still, indigenous claims continue to move slowly through the courts, and some have been successful, including a significant seawater rights claim in Arnhem Land (Morphy and Morphy, 2006).<sup>15</sup> Backed by the *Native Title Act*, Aboriginal groups have also regained some rights of (traditional) water use via Indigenous Land Use Agreements.

Aboriginal people's efforts to regain water rights have been driven in part by a concern to reestablish their own environmental values and forms of management. Indigenous communities in Australia, as elsewhere, have made substantial critiques of settler societies' water and land use practices, which often conflict not only with Aboriginal values about 'caring for country', but with traditional beliefs about the proper maintenance of flows in material and spiritual worlds (Barber et al., 2015). One of the most common concerns expressed by Aboriginal Australians in relation to water infrastructures – and dams in particular – is that they disrupt 'proper' water flows. This is not merely a matter of altering seasonal flows and depriving aquatic ecosystems of sufficient water to support nonhuman species: it is also seen to have a deeper impact on sentient ancestral land and waterscapes (Krause and Strang, 2013).

Despite minor restitution of rights in relation to marine areas, the restoration of indigenous control over freshwater has proved elusive (Altman, 2004). This is not readily apparent, as state and federal governments have established 'democratic' forms of water management via regional and local catchment management groups, and these include indigenous people, as well as representatives from conservation organisations. However, most such groups have been effectively captured politically by farming and industry interests that, on the basis of their economic centrality, have resisted subaltern pressures to make major changes to 'business as usual' (see Lawrence, 2005; Strang, 2009). This highlights a critical (and common) separation in water governance. Attempts to achieve environmental

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<sup>14</sup> Salination occurs when the irrigation of shallow-rooted crops raises salts to the surface, leaving the soils unable to support any – even native – vegetation. About 2 Mha of land in Australia were categorised as saline in 2002 and it is thought that this could increase to 17 Mha by 2050 (ABS, 2015a).

<sup>15</sup> This was a significant case in that it was the first to address water rights – albeit marine rights – directly.

sustainability have been devolved to unelected groups in what could be described as an abdication of governmental responsibility, while the ownership and governance of water for domestic and productive use has remained with state and federal agencies and, increasingly, with private corporations.

These realities are evident in the ownership and management of water treatment and supply infrastructure, for which Australian states have retained primary responsibility. The operational aspects of water supply are controlled by Government Owned Corporations (GOCs), restructured to look and act like private companies – some suggest in preparation for full privatisation (Strang, 2009). As in the USA, there has also been a significant shift towards public-private partnerships and today "The private sector is crucial, with private firms meeting an increasingly large proportion of the sector's needs" (AWA, 2013: 21). Such partnerships are common in the construction of major water retention schemes, which are also meant to provide flood mitigation.<sup>16</sup>

More recently recycling and desalination schemes have come to the fore. Though presented in terms of water security and ecological responsibility, these are in part a response to powerful farming and industry groups hoping that (cheap) greywater will be recycled for irrigation use and that desalination will supply urban areas (which have priority for water supply). At a cost of over 2.5 billion dollars (AUD), Queensland recently built a 'Western Corridor Recycling Scheme'. This supplies much of the water needed for energy generation around Brisbane, thus reducing the use of water from the Wivenhoe Dam, which provides irrigation supplies to farmers in the catchment area (Water Technology Net, 2015). Such major infrastructural developments increasingly involve transnational corporations: this scheme was constructed by Veolia, which continues to carry responsibility for the operation of the plants and pipelines. Veolia (originally Vivendi) has operations in over 60 countries and recently announced annual revenues of €23.8 billion (Veolia, 2015). But Australian water companies have also begun to operate transnationally: as the Australian Water Association says, "Australian water sector expertise is in demand internationally and Australian companies are active around the world" (AWA, 2013: 5).<sup>17</sup>

Another key development in Australian water and power relations has been the introduction of water trading, described by Caldecott (2008: 10) as "privatisation by stealth". This allows farmers to sell allocations of water formerly distributed by the state from a common pool. As well as reframing and commoditising water as an 'asset', this has detached water from land, so that in theory (and increasingly in practice) a hard-up farmer can sell water away from his or her land, leaving a 'dry block'. It relies upon a virtual rather than physical market, thus detaching economic activity from its social and material environment (Ladson and Finlayson, 2004; Young and McColl, 2004).<sup>18</sup> The severing of an immediate connection between water abstraction and its impacts on ecosystems has exacerbated long-standing problems with maintaining sufficient 'environmental flows' for the viability of wetlands and other aquatic habitats, as well as creating major tensions between upriver abstractors and downstream farmers. Given that major Australian rivers are also notoriously over-allocated, the awakening of 'sleeper' abstraction licenses as their commercial advantages have risen has added to the problem.

In protecting their interests, farmers and other industries regularly underline their central role as 'primary producers' in the national economy, as well as elaborating a long-running discourse about the 'common good' achieved by such production. They claim simultaneously to be protecting ecological

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<sup>16</sup> As demonstrated by regular major flood events in southeast Queensland, flood mitigation infrastructure has dubious value in a landscape prone to flash flooding.

<sup>17</sup> For example, Transfield Services has more than 28,000 employees in Australia, New Zealand, the United States, the United Arab Emirates, Qatar, New Caledonia, South East Asia, India, Chile and Canada. GHD operates in Australia, the United States, Mexico, Africa and the Middle East.

<sup>18</sup> Similar virtual markets have been created in fish quotas, with not dissimilar effects (Minnegal and Dwyer, 2010). Such virtual assets challenge the claim of Godelier (1986) that property is not real unless it is concrete.

well-being as the 'Guardians of the Land', but the ongoing intensification of their economic activities, and Australia's lack of progress in rehabilitating struggling ecosystems, suggests that this guardianship is primarily directed towards specific interests. And many of these interests are not local: agricultural production in Australia is primarily focused on external markets. While these may enrich some farmers and uphold a national economy, they also exert considerable pressures for highly competitive agricultural intensification. Many farmers acknowledge that this forces them to adopt unsustainable practices but, as they say, "It's hard to be green if you are in the red" (Strang, 2009: 129).

In essence, there are three ways through which material control over water is gained in Australia: through the acquisition of land; through the acquisition of water allocations; and through the capacity to build infrastructure that directs water into particular interests. As in the UK, each of these is subject to government regulation designed to limit negative social and ecological impacts, but such limitations are secondary to a national commitment to economic growth. In each of these forms of water control there has been an expansion of foreign (generally corporate) ownership, and this has been actively encouraged by the farming sector, led by its major lobbying group, Agforce. In its submission on the Federal Government's *Strengthening Australia's Foreign Investment Framework Options Paper*, Agforce's Queensland representatives declared that:

Foreign investment has long been a feature within Queensland agriculture and has contributed significantly to the economic development of broadacre industries within the State. Given the need to drive further economic growth, AgForce has a keen interest in the occurrence of further foreign investment into agriculture in a way that is open and transparent and aligns with our national interests... Our policy position is that we are not opposed to commercially-motivated foreign investment in broadacre agriculture (2015: 1).

Other groups of primary producers, including the National Farmers' Federation (NFF) have been similarly supportive of international investment. Conservation and environment groups were notably absent from the list of 192 submissions responding to the Government paper, but many have been critical of this and the overuse of water in other fora (Strang, 2009). However, one point on which many such groups agree with Agforce and the NFF is in supporting a call for a national register of ownership of water allocations:

A national foreign ownership register for land and water is a critical step in responding to the community concerns around investment in Australian agriculture. The register should provide a robust and accurate database that can be used to monitor and report on trends and developments that are likely to have an impact on the agricultural supply chain in Australia (NFF, 2015: 1).

All parties recognise that this is an issue of power: "Australia is an arid continent and water resources are an incredibly important element to productive and profitable agriculture in our country. With tradable allocations of water goes significant control of productive potential" (Agforce, 2015: 2).

The call for a national register has been given impetus by a rapid rise in foreign ownership of both land and water. Since 1988, Queensland has maintained a State land register which illustrates this expansion. In 2003, "foreign-owned interests in land totalled 1,673,245 ha, and represented 0.96% of the State's land area". There were 127 countries of origin recorded in the database (ABS, 2003b). By 2012, the percentage had risen to 2.9%, and by 2013 to 3.2%. By 2015 foreign-owned interests in land in Queensland (all land uses) totalled 5,881,300 ha, representing just over 3.4% of the state's land area and there were 133 countries of origin recorded in the register (ABS, 2015b). A survey of agricultural land and water ownership observed that "Large businesses continue to account for the majority of foreign owned farm land in Australia; less than 50 businesses accounted for 95% of the total area" (ABS, 2014b).

In Queensland, some of the investment by international corporations has involved major cattle stations, but a primary focus, particularly in New South Wales, has been the acquisition of irrigated farmland and water allocations.<sup>19</sup>

Australia-wide, foreign owners have a share in 11.3 per cent of total agricultural land, and are invested in around 8.5 per cent of agricultural water entitlements... ABS reports show that New South Wales consumes the largest amount of water for agriculture in Australia, followed closely by Queensland... Almost two thirds of Australia's total agricultural water usage is in the Murray-Darling Basin. The reports also show that the volume of water applied to agricultural land in the Murray-Darling Basin has increased by 26 per cent from 2009-2010 levels (Smith, 2012: 1).

State governments in Australia have continued to disburse water allocation licenses to farmers, and in particular to large irrigation companies. In 2014 "11.3 megalitres were entirely Australian owned, whilst 1.8 million megalitres had some level of foreign ownership, an increase of 55 percent on the 2010 level of foreign ownership" (ABS, 2014: 1).

Critically, within regulatory limits on dam height, irrigators can build their own water impoundment and storage structures. This has added considerable infrastructural power to investments in land and water. For example, in the early 2000s, the notorious Cubbie Station on the Queensland-New South Wales border was permitted to buy over 50 water allocation licenses and to build a series of massive water storage reservoirs stretching for 28 kilometres (km) along the Culgoa River and irrigating a 40 km wide area of cotton and wheat fields. So large as to be visible from space, these reservoirs store up to GI 400 of water: approximately two-thirds of Sydney's annual water consumption. They are filled via a massive diversion channel redirecting about a quarter of the water that would otherwise flow into the already radically compromised Murray-Darling Basin. This has led to outraged protests by conservation groups, farmers and local communities, about lost wetlands and water-deprived farming areas downstream. In 2012, Cubbie Station was purchased by a transnational consortium (Dickie and Brown, 2007; Strang, 2013).

What emerges, then, is a picture in which intensified resource use, rising international ownership and related infrastructural development, have combined to shift a substantial degree of control over Australia's water to a transnational elite. It is tempting to conclude that the agency of local human and nonhuman communities has thus been lost both literally and metaphorically in abstraction.

### **CONFLICTING FLOWS OF WATER AND POWER**

Both of these case studies focus on areas where the trend has been towards privatised and increasingly transnational ownership and control of water. Similar efforts have been made elsewhere: water trading was recently introduced in New Zealand, and in 2012 Maori lost a legal battle to achieve recognition of their ownership rights in water and to prevent the government from selling off shares (and thus water allocations) in major hydropower companies (Strang, 2014c). Dam building in Asia and South America continues to replace traditional forms of water control with corporate ownership and management (Shiva, 2002).

However, many such attempts have run into dogged opposition. In the early 2000s, a 'water war' in Bolivia repulsed the attempts of an American company, Bechtel, to privatise water (Albro, 2005). In New Zealand, Maori *iwis* continue to push for recognition of indigenous water rights, and in 2016 the

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<sup>19</sup> Foreign investors have a share in 11.8 per cent of Queensland's agricultural land but only 5.4 per cent of the state's agricultural water entitlements. In New South Wales the trend is the opposite, with foreign owners currently invested in only 2.7 per cent of agricultural land, but 10.6 per cent of the state's total water entitlements (Smith, 2012: 1).

Waitangi Tribunal announced that, despite the 2012 rejection by the Supreme Court, the second phase of the Māori Council's claim would go ahead (Radio New Zealand, April 29th, 2016).

There are vocal countermovements emerging through a multiplicity of organisations, at local, national and international levels. Retaining long-standing ideas about water as a 'common good', these see water rights as a core social justice issue, linked with broader debates about collectivity and political enfranchisement. Such ideas are implicit in the United Nation's 2010 declaration, that all humans have the right to "clean and safe drinking water and basic sanitation" (UN General Assembly, 2010). However, despite some progress in this regard, 663 million humans still lack access to reliably clean drinking water, and over 30% of the world's population is without basic sanitation facilities (UNICEF, 2015).<sup>20</sup>

Proposed solutions to this problem have tended to avoid engaging with its complex and intractable causes – the pressures of intense development and overuse of limited freshwater resources; the displacement of local communities; and environmental change. The solutions generally promoted, for example by McKinsey, still aim to achieve more economic growth; more 'efficient' resource use and management; and 'better' (i.e. more directive) methods of water capture and control (Manyika et al., 2015).

Because water infrastructure supplies the generative stuff of life it is, like food production, difficult to see in anything other than positive terms. The representational efforts of aid organisations are full of images of new wells and happy children dousing themselves in sprays of sparkling clean water. Invisible in these images is an underlying reality that Water Aid – while providing very real and immediate benefits to some communities – is largely funded by the UK water industry. According to water company employees, one of their most profitable activities is the international marketing of expertise in water privatisation and the building of water infrastructures (Strang, 2004). The aim is not merely to ensure a profitable sideline, but more broadly to enlarge international water markets. For example, Wessex Water, bought by Asurix (owned by Enron) in 1998, then sold to a Malaysian energy group YTL in 2010, has sent multiple experts to Central America. Thames Water has provided the Australian Government with a number of advisers: purchased by German company RWE shortly after being privatised, it was sold in 2006 to a consortium led by the Australian bank Macquarie, which has interests in about 80 companies worldwide. These efforts to enlarge the international water market have not been entirely successful (Christine Bichsel, pers. comm). Nevertheless, they have involved transnational companies in the water flows of many countries, enabled them to gain significant control over some (such as in England and Australia), and have created a nascent international water market.

As anthropologists studying aid and development have made plain, such activities are often underpinned by assumptions that economic growth is the desired outcome, and the major aim is to create new markets and gain access to resources. Their analyses have highlighted the potential for both altruistic and self-serving development activities to compose new forms of economic colonialism (Arce and Long, 1999; Mosse and Lewis, 2005). The infrastructures funded and constructed by water companies and development organisations carry not only water but also ideas, values and practices. They enable the forging of links between industry experts and powerful political actors, and this serves to support specific national and international regimes of water governance and management.

## BIOETHICAL ISSUES

The lack of water available to some human populations raises particular dilemmas for countermovements attempting to uphold the rights of nonhuman species and the material

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<sup>20</sup> "In 2015, 663 million people still lack improved drinking water sources, 2.4 billion lack improved sanitation facilities and 946 million still practice open defecation" (UNICEF, 2015).



environment.<sup>21</sup> Although both ecological and social justice activists frame their concerns in terms of rights, their claims are not always compatible. Groups concerned with providing water to disadvantaged human communities may seek infrastructural developments that will take water away from ecosystems and their dependent nonhuman species; conservation groups have therefore been critical of such schemes.<sup>22</sup>

The difficulty in taking a critical view of water infrastructure providing supplies to disadvantaged human communities is obvious. But a similar difficulty also discourages ecologically oriented practices in wealthy societies. Because water holds such powerful positive meanings in terms of generative capacity, health and well-being cross-culturally, generous flows of water are almost invariably symbolically linked with images of wealth and status, security and, of course, power and agency (Strang, 2004, 2009). But such assumptions also tend to give primacy to human interests and less priority to the impact of such infrastructure on nonhuman species.

Such concerns are far from new: they emerged in Romantic anxieties about the well-being of Nature, and gained momentum in the 1960s and 70s as part of powerful social justice movements in which feminists and other social activists noted widening human and nonhuman inequalities. But since that time the green movement has fragmented and become increasingly detached from organisations concerned with human rights. It has been 'adopted' by government and corporate interests, brought under the purview of scientific authority, and significantly deradicalised (Berglund, 1998; Milton, 1993; Greer and Bruno 1996; Doherty, 2002). With the exception of activism specifically concerned with animal rights, and outliers such as Greenpeace, few conservation organisations articulate explicit discourses about nonhuman rights or the politics of overriding these.

So let us be clear. All water infrastructures have direct impacts upon material environments and their nonhuman inhabitants. The extent to which such infrastructures override nonhuman needs and divert water to support human communities, rather than supporting nonhuman wellbeing, is a direct measure of relations between human and nonhuman worlds. Societal engagements with water that accommodate the needs of nonhuman beings, or accord them agentive positions and some degree of social and political equality, are now extremely rare. As the overview of patterns of change in water ownership and control demonstrates, the direction of travel has largely been in the opposite direction, towards dualistic division between humans and others; towards hierarchical social and political arrangements, affirmed by infrastructures assertive of human agency; and towards cosmologies reflective of these ideas and practices. After centuries of human 'dominion', culminating in the successful global promotion of short-termist and plainly unsustainable modes of environmental engagement, alternative approaches are frequently presented as romantic, quixotic, and above all unrealistic, and even serious debates about degrowth economics have to push back against such categorisations (Daly, 1996; Harvey, 2010; Jessop, 2012).

However, it cannot be any more realistic to persist with growth-oriented practices that have produced existentially threatening levels of environmental change; a mass species extinction rate previously matched only by major planetary crises; rising levels of human deprivation; and multiple social and political conflicts. But change can only occur if it takes place conceptually, socially, and materially, and this means dealing with the challenges of long-term historical momentum in each of these areas.

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<sup>21</sup> For example People for the Ethical Treatment of Animals, the Animal Defense League, the Humanitarian League, the Farm Animal Rights Movement.

<sup>22</sup> A parallel could readily be drawn with the many – and equally difficult to reconcile – conflicts over conservation, where animal rights (and/or the rights of a few people to benefit from tourism) frequently conflict with the rights and interests of traditional landowners (Homewood, 2015).

## **Cosmological change**

In anthropology, efforts to articulate new ways of conceptualising human-environmental relations have led to a useful dialogue with philosophy about bioethics and the need to consider the agency of nonhuman beings and things. This builds on multispecies ethnographies examining human-animal interactions (Haraway, 2008; Kirksey and Helmreich, 2010) and research with social and environmental countermovements (Milton, 1993; Berglund, 1998). Also relevant are theories about material culture (Tilley et al., 2006; Boivin, 2008; Knappett and Malafouris, 2008), and material relations more generally (Bennett, 2009; Coole and Frost, 2010). This confluence of ideas has helped to encourage new theories comprehensively encompassing human and nonhuman beings as well as material objects and processes (Strang, in press; Tsing, 2004).

Anthropologists also have the advantage of working with diverse cultural communities whose cosmological belief systems may not conform to predominant views of human-nonhuman relations. Worldviews and relations of indigenous communities with 'the other' have not merely been the inspiration for many environmental groups; they have made a substantial contribution to the development of anthropological theory and its capacity to imagine multiple lifeways and alternatives to prevailing norms (Hirsch and Strathern, 2004; Strang, 2006). Indigenous and anthropological theories therefore combine usefully to promote a critique of human assumptions of dominion and the commoditising reduction of the nonhuman world to a set of material assets. Perhaps most critically, they open up ways to reintegrate fragmented thinking about social, economic and ecological processes, and provide a bridge across the intellectual gulf between the social and natural sciences.

## **Social and political change**

If societies reconstituted ways of thinking that do not separate economic activity from social and ecological processes, such conceptual reintegration would demand expression in political and material arrangements. It would tackle, for example, the crucial structural separation between agencies responsible for supporting economic activities and those focused on protecting ecosystemic well-being, which allows the costs of economic activities to be externalised to nonhuman beings. It would produce similarly integrative legislation and regulatory mechanisms, and it would reveal the separation between (human) economic and social interests and (nonhuman) ecological systems and their inhabitants as an uneven prioritisation of rights and interests.

## **A critical disconnection**

Water infrastructures can express multiple forms of agency, including that of far-off transnational corporations and their shareholders. In a world of abstract water markets and non-resident water and irrigation company ownership, the elite international networks benefiting from the control of the Earth's freshwater are often geographically distant from the ecosystems from which it is abstracted.<sup>23</sup> They are also distant from local economies, able to avoid paying tax in countries where they are making considerable profits. For example, there was widespread outrage in 2013 when Thames Water avoided paying any UK corporation tax, despite a rise in water charges of 6.7%, revenues of £1.6 billion, and operating profits of £549 million (BBC, 2013). This of course resonates with Karl Polanyi's (1944) classic vision of how markets create a process of 'disembedding' and growing recognition that market forces are not the panacea imagined in a neoliberal utopia (Dale, 2010).

Polanyi's view implies that the lack of shared location and immediate involvement detaches the members of international consortia from the interests of local human and nonhuman residents. This is

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<sup>23</sup> In this sense, virtual water markets and absentee ownership challenge the claim of Godelier (1986) that property is not real unless it is concrete.

challenged by the assertion of Granovetter (1985: 504) that economic action is embedded in social relations, and that "most behaviour is closely embedded in networks of interpersonal relations". However, both may be right. Transnational corporations do not function outside social relations: they are, on the contrary, highly effective social networks. But they operate at least semi-independently, outside the countries (and societies) whose water they control. Whether altruistic in intention or merely self-serving, they are disconnected: like generals far behind the battle lines, exercising control without personal consequences. Their actions are to some degree limited by local material and social conditions, but ultimately they decide where and how water flows are directed and who (or what) benefits or carries the costs of these choices. In this sense, the international social networks to which they belong potentially compose a new 'despotic regime': a transnational locus of power combining a lack of accountability with considerable capacity to affect human and nonhuman lives.

This poses a related question about water and power, which I have raised elsewhere (2011). If the ownership of water and other essential material resources, and the infrastructural wherewithal to manage these, are not held democratically by the State, who owns the State? How does it exercise power? Does it even exist? Walker (2014: 390) reminds us that "the state, as coordinator of collective action and as an intermediary between the public and private spheres, has significantly changed in nature". He describes this as a shift from *government* to *governance* (see also Tortajada, 2010). This point is also underlined by Stiglitz (2002) in his work on globalisation, in which he notes the potential for global governance without global government.

Such governance is enacted primarily through legislation: this includes the international and national laws theoretically upholding people's basic rights to water and protecting the environment, and the regulatory arrangements bringing such principles to bear at a national level. However, both international and national legislation has proved ineffective in achieving these aims. As noted previously, millions of people lack basic access to water supply and sanitation; water charges in countries where the supply industry has been privatised have invariably increased radically; and across Europe fewer than 1% of rivers meet the standards of the *EU Water Framework Directive (2000)* (European Environment Bureau, 2010).

It is unsurprising, therefore, that the acquisition of water supply and irrigation companies by transnational corporations continues to generate concern. Along with anxieties about potential social and ecological impacts, the handing over of the control of water to transnational corporations, and more generally to 'the market', has contributed to rising doubts about democracy itself – about the extent to which governments (of any hue) are representative 'of' the people or able to protect human or nonhuman interests. These concerns are expressed in protests against privatisation; in battles for water rights; and in demands that governments register and monitor all foreign ownership of land and resources.

## CONCLUSION

What emerges, then, is a rather alarming picture of water and power moving away from societies, upwards and outwards to a largely undemocratic, unaccountable and untouchable transnational and potentially 'despotic' regime. Holding water and other key resources, international networks, linked by economic and social relations and common ideology, are well placed to influence national governments and to some extent render them impotent. Meanwhile cynicism, and a sense of powerlessness to effect change, has radically reduced people's willingness to limit their own resource use and protect the commons.

Water infrastructures themselves are ineluctably local and material, concretising and perpetuating specific beliefs and values and the practices that express these. They are not readily deconstructed, and are therefore intrinsic to historical momentum. But, as noted earlier, like any form of material culture, infrastructures – and water – have social lives in which their meanings and usages can change (Wagner,

2013). Carrying what many people see as the substance of life itself,<sup>24</sup> they readily provide a focus for social and political action. They may become subject to a 'despotic regime'. But they may equally support desires to change political arrangements and the human and nonhuman relationships that these compose.

There is an untapped well of consumer power. In the broadest sense, having control over water is partly a matter of having the purchasing power to acquire food and other products containing it. While debates about water ownership focus on infrastructure and supply, it is important to remember that wealthy societies often depend heavily on imported goods and thus embodied water from poorer countries (Allan, 2011). Water in arid areas is used to produce goods that require major amounts of water, to be shipped to markets in more temperate climes. German water users, for example, have an international water footprint extending across 400 different countries (Meissner, 2012; see also Hoekstra and Chapagain, 2007). As Wichelns (2015: 397, 401) points out, mapping water flows between different parts of the world excludes the complexities of comparative advantage which is "a fundamental tenet of trade theory", as well as the many variables that determine "the optimal use of land and resources". Nevertheless, consumers are implicated in a process that moves water around the world, and which underpins specific regimes of water ownership and supply. This also means that they have some capacity to influence water governance and use regimes by adopting different patterns of consumption.

As noted at the outset, there are many subaltern ways to own and appropriate water. River catchment management groups and local communities can work directly on the physical environment as well as campaigning for better water management. Experts with the authority of specialised knowledge can participate in decision-making about infrastructural developments. Countermovements and water users can lobby for new political and material arrangements. And, though I would certainly not condone this, the vulnerability of major water infrastructures makes them an obvious target for radical political action, and this potential is certainly something that policy makers should consider as populations become increasingly unhappy with their disenfranchisement.

There is potential for such countermovements to coalesce sufficiently to reestablish shared local ownership and control of water. We cannot assume that such communities would necessarily adopt more sustainable social and ecological practices. Even small-scale place-based societies are capable of collapse, and history is littered with examples of unsustainable patterns of growth (Diamond, 2005). However, there are also examples of long-standing common property regimes (Godden and Tehan, 2010; Ostrom, 1990, 2010), and such arrangements have the significant advantage of investing all actors in a shared outcome.

There are also important questions as to whether it is possible to regulate a global market effectively. As one of the reviewers of this paper observed, the relocation of ownership and control is not the only potential solution, and there may be other ways to "impose the recognition of responsibility in long value chains". The performance of the EU Water Framework Directive is not encouraging, and current debates about the Union demonstrate the challenges in trying to extend notions of community beyond national boundaries, but this does not mean that such efforts should be abandoned.

However, laws mediate relations between persons and between persons and things, and they need to be expressible in material terms. Legislation at an international scale therefore has to rest on a real understanding of the complex material relations through which (human and nonhuman) rights and interests are realised at local levels. Without at least national ownership and control of water, it is difficult to see how an international legislative regime would engage sufficiently with local social and

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<sup>24</sup> There are multiple, culturally diverse secular and religious visions of water as the substance of life, and of the spirit. This undoubtedly lends emotional force to conflicts about control over water (Krause and Strang, 2013).

material realities. And we lack, at present, sufficiently effective mechanisms for enacting democracy at a global level. But perhaps a (much) stronger UN, combined with democratic resource control at national and local levels, might provide a better outcome than that which is likely to be sparked by more volatile political forces.

There are, therefore, multiple ways of owning and controlling water which have some potential to change how it is used and managed. Whether these can effect real political and material change, and thus reform human-nonhuman relations, remains to be seen. And humans do not hold all of the cards. In the end, the environment itself, impartially and inexorably, will continue to respond to human expressions of agency and power through water: if these are unsustainable they will, quite simply, cease to be sustained.

## REFERENCES

- Agforce. 2015. Submission on the 'Strengthening Australia's Foreign Investment Framework' Options Paper. Brisbane: Agforce Queensland.  
[www.treasury.gov.au/~media/Treasury/Consultations%20and%20Reviews/Consultations/2016/National%20Register%20water%20access%20entitlements/Submissions/PDF/AgForce.ashx](http://www.treasury.gov.au/~media/Treasury/Consultations%20and%20Reviews/Consultations/2016/National%20Register%20water%20access%20entitlements/Submissions/PDF/AgForce.ashx)
- Alexander, C. 2004. Value, relations and changing bodies. Privatization and property rights in Kazakhstan. In Verdery, K. and Humphrey, C. (Eds), *Property in question. Value transformation in the global economy*, pp. 251-73. Oxford, New York: Berg.
- Albro, R. 2005. The water is ours, carajo! Deep citizenship in Bolivia's water war. In Nash, J. (Ed), *Social movements. An anthropological reader*, pp. 249-268. London: Blackwell.
- Allan, J.A. 2011. *Virtual water. Tackling the threat to our planet's most precious resource*. London: I.B. Tauris.
- Altman, J. 2004. Indigenous interests and water property rights. *Dialogue* 23(3): 29-34.
- Anand, N. 2012. Municipal disconnect: On abject water and its urban infrastructures. *Ethnography* 13(4): 487-509.
- Appadurai, A. 1986. *The social life of things. Commodities in cultural perspective*. Cambridge: Cambridge University Press.
- Arce, A. and Long, N. (Eds). 1999. *Anthropology, development, and modernities. Exploring discourses, counter-tendencies, and violence*. London: Routledge.
- ABS (Australian Bureau of Statistics) 2003a. *Environmental impact of agriculture*, Canberra: ABS.  
[www.abs.gov.au/ausstats/abs@.nsf/46d1bc47ac9d0c7bca256c470025ff87/3319eb4d2d14bd2dca256cae0015bad3!OpenDocument](http://www.abs.gov.au/ausstats/abs@.nsf/46d1bc47ac9d0c7bca256c470025ff87/3319eb4d2d14bd2dca256cae0015bad3!OpenDocument)
- ABS. 2003b. *Annual Report on administration of foreign ownership of Land Register Act 1988*. Canberra: ABS.
- ABS. 2005 *Water use on Australian farms 2002 – 03*. Canberra: ABS.  
[www.abs.gov.au/AUSSTATS/abs@.nsf/allprimarymainfeatures/E780C7632FC1A867CA2570A600763E5E?open=document](http://www.abs.gov.au/AUSSTATS/abs@.nsf/allprimarymainfeatures/E780C7632FC1A867CA2570A600763E5E?open=document)
- ABS. 2014a. *Water use on Australian farms 2012-13*. Canberra: ABS.  
[www.abs.gov.au/AUSSTATS/abs@.nsf/allprimarymainfeatures/F21596640D138568CA257E53001C8C30?open=document](http://www.abs.gov.au/AUSSTATS/abs@.nsf/allprimarymainfeatures/F21596640D138568CA257E53001C8C30?open=document)
- ABS. 2014b. *Agricultural land and water ownership*. June 2013. Released 19.6.14. Canberra: ABS.  
[www.abs.gov.au/ausstats/abs@.nsf/mf/7127.0](http://www.abs.gov.au/ausstats/abs@.nsf/mf/7127.0)
- ABS. 2015a. *Salinity*. Canberra: ABS.  
[www.abs.gov.au/ausstats/abs@.nsf/Lookup/by%20Subject/1370.0~2010~Chapter~Salinity%20](http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/by%20Subject/1370.0~2010~Chapter~Salinity%20)
- ABS. 2015b. *Annual Report 2014-2015 on administration of foreign ownership of Land Register Act 1988*. Canberra: ABS.
- Attwood, B. and Markus, A. 1999. *The struggle for Aboriginal rights. A documentary history*. St Leonards, New South Wales: Allen and Unwin.
- AWA (Australian Water Association). 2013. *Australia's dynamic water industry*. Canberra: Australian Water Association, Australian Trade Commission.

- BAG (Biodiversity Action Group). 1996. *High and dry – The impacts of over-abstraction of water on wildlife*. London: Biodiversity Challenge.
- Bakker, K. 2003. *An uncooperative commodity. Privatizing water in England and Wales*. New York: Oxford University Press.
- Bakker, K. 2005. Neoliberalizing nature? Market environmentalism in water supply in England and Wales. *Annals of the Association of American Geographers* 95(3): 542-565.
- Barber, M.; Jackson, S.; Dambacher, J. and Finn, M. 2015. The persistence of subsistence: Qualitative social-ecological modeling of indigenous aquatic hunting and gathering in tropical Australia. *Ecology and Society* 20(1): 60.
- Bennett, J. 2009. *Vibrant matter. A political ecology of things*. Durham, NC: Duke University Press.
- Berglund, E. 1998. *Knowing nature, knowing science. An ethnography of environmental activism*. Knapwell, Cambridge: The White Horse Press.
- Biswas, A. 1970. *History of hydrology*. Amsterdam, London: North-Holland Publishing Company.
- Boivin, N. 2004. From veneration to exploitation. Human engagement with the mineral world. In Boivin, N. and Owoc, M. (Eds), *Soil, stones and symbols. Cultural perceptions of the mineral world*, pp. 1-30. London: UCL Press.
- Boivin, N. 2008. *Material cultures, material minds. The impact of things on human thought, society, and evolution*. Cambridge, New York: Cambridge University Press.
- BBC News. 2013. Thames Water paid no UK corporation tax for the year, June 10th 2013. [www.bbc.co.uk/news/business-22844952](http://www.bbc.co.uk/news/business-22844952)
- British Government. 1918. *Representation of the People Act 1918*. Parliamentary Archives, HL/PO/PU/1/1918/7&8G5c64. [www.parliament.uk/about/living-heritage/transformingsociety/electionsvoting/womenvote/parliamentary-collections/collections-the-vote-and-after/representation-of-the-people-act-1918/](http://www.parliament.uk/about/living-heritage/transformingsociety/electionsvoting/womenvote/parliamentary-collections/collections-the-vote-and-after/representation-of-the-people-act-1918/)
- British Government. 1928. *Representation of the People (Equal Franchise) Act 1928*. Parliamentary Archives, HL/PO/PU/1/1928/18&19G5c12. [www.parliament.uk/about/living-heritage/transformingsociety/electionsvoting/womenvote/parliamentary-collectionsdelete/equal-franchise-act-1928/](http://www.parliament.uk/about/living-heritage/transformingsociety/electionsvoting/womenvote/parliamentary-collectionsdelete/equal-franchise-act-1928/)
- Builth, H. 2002. The archaeology and socioeconomy of the Gunditjmarra. A landscape analysis from south-west Victoria, Australia. PhD thesis, Flinders University.
- Butzer, K. 1976. *Early hydraulic civilisation in Egypt. A study in cultural ecology*. Chicago, London: University of Chicago Press.
- Caldecott, J. 2008. National water market. Privatisation on the Murray Darling. *Australian Options Magazine* 54: 9-13.
- Carneiro, R. 1970. A theory of the origin of the state. *Science* 169: 733-738.
- Castree, N. 2010. Neoliberalism and the biophysical environment. What 'neoliberalism' is, and what difference nature makes to it. *Geography Compass* 4(12): 1725-1733.
- Caton, S. and Orlove, B. 2010. Water sustainability. Anthropological approaches and Prospects. *Annual Review of Anthropology* 39: 401-415.
- Coles, A. and Wallace, T. (Eds). 2005. *Water, gender and development*, Oxford, New York: Berg.
- Coole, D. and Frost, S. (Eds). 2010. *New materialisms. Ontology, agency and politics*. Durham, NC, London: Duke University Press.
- COAG (Council of Australian Governments). 2004. *Meeting Report*. 25 June. [www.coag.gov.au/meetings/250604/index.htm](http://www.coag.gov.au/meetings/250604/index.htm)
- Dale, G. 2010. *Karl Polanyi: The limits of the market*. Cambridge: Polity Press.
- Daly, H. 1996. *Beyond growth*. Boston: Beacon Press.
- DEFRA (Department for Environment, Food and Rural Affairs). 2014. *Water bill upstream competition and abstraction reform*. March 2014. London: DEFRA Publications.
- Diamond, J. 2005. *Collapse: How societies choose to fail or succeed*. New York: Viking.

- Dickie, P. and Brown, S. 2007. *The rise and rise of Cubbie Station*. Melaleuca Media.  
[www.melaleucamedia.com.au/01\\_cms/details.asp?ID=257](http://www.melaleucamedia.com.au/01_cms/details.asp?ID=257)
- Doherty, B. 2002. *Ideas and actions in the Green movement*. London: Routledge.
- Durkheim, E. 1961. *The elementary forms of the religious life*. New York: Collier Books.
- Edgeworth, M. 2011. *Fluid pasts: Archaeology of flow*. London: Bloomsbury Academic Press.
- English Nature. 1996. *Impact of water abstraction on wetland SSSIs*. Peterborough: English Nature.
- European Environmental Bureau. 2010. *10 years of the Water Framework Directive: A toothless tiger?* Brussels: European Environmental Bureau.
- European Parliament. 2000. *Water Framework Directive (2000)*. Brussels: European Parliament.
- Ferguson, D. 2000. *Tales of the plumed serpent: Aztec, Inca and Mayan Myths*. London: Collins and Brown.
- Foucault, M. 1972. *The archaeology of knowledge and the discourse on language*. New York: Harper and Row.
- Foucault, M. 2010. *The birth of biopolitics. Lectures at the College de France, 1978-1979*. New York: Picador.
- Gammage, W. 2011. *The biggest estate on Earth: How Aborigines made Australia*. Crows Nest, N.S.W: Allen and Unwin.
- Gandy, M. 2011. Landscape and infrastructure in the late-modern metropolis. In Bridge, G. and Watson S. (Eds), *New Blackwell companion to the city*, pp. 57-65. Oxford; Blackwell Publishing.
- Garrido, S. 2014. Water management, Spanish irrigation communities and colonial engineers. *Journal of Agrarian Change* 14(3): 400-418.
- Gell, A. 1992. The technology of enchantment and the enchantment of technology. In Coote, J. and Shelton, A. (Eds), *Anthropology, art and aesthetics*, pp. 40-63. Oxford: Clarendon Press.
- Gell, A. 1998: *Art and agency. An anthropological theory*. Oxford, New York: Berg.
- Glick, T. 1996. *Irrigation and hydraulic technology. Medieval Spain and its legacy*. Aldershot, Hampshire: Variorum.
- Godden, L. and Tehan, M. (Eds). 2010. *Comparative perspectives on communal lands and individual ownership. Sustainable futures*. London, New York: Routledge.
- Godelier, M. 1986. *Territory and property in some pre-capitalist societies*. In Godelier, M. (Ed), *The mental and the material*, pp. 71-121. London: Verso.
- Gorsky, M. 1999. *Patterns of philanthropy. Charity and society in nineteenth-century Bristol*. Woodbridge: Boydell.
- Granovetter, M. 1985. Economic action and social structure: The problem of embeddedness. *American Journal of Sociology* 91(3): 481-510.
- Gray, D. 2011. *Review of OFWAT and consumer representation in the water sector*. London: HMSO.
- Greer, J. and Bruno, K. 1996. *Greenwash. The reality behind corporate environmentalism*. Penang, Malaysia: Third World Network.
- Halsema, G. and Vincent, L. 2006. Of flumes, modules and barrels. The failure of irrigation institutions and technologies to achieve equitable water control in the Indus Basin. In Tvedt, T. and Jacobsson, E. (Eds), *A history of water*, pp. 55-91. London: I.B. Tauris.
- Hann, C. (Ed). 1998. *Property relations: Renewing the anthropological tradition*. New York: Cambridge University Press.
- Haraway, D. 2008: *When species meet*. Minnesota, MN: University of Minnesota Press.
- Harris, M. 1979. *Cultural materialism: The struggle for a science of culture*. Walnut Creek, California: AltaMira Press.
- Harris, L.; Goldin, J. and Sneddon, C. 2013. *Contemporary water governance in the global South. Scarcity, marketization and participation*. London: Routledge.
- Harrison, P. 1999. Subduing the earth. Genesis 1. Early modern science, and the exploitation of nature. *The Journal of Religion* 79(1): 86-109.
- Harvey, D. 2010: *The enigma of capital*. Oxford, New York.

- Harvey, P. 2012. Knowledge and experimental practice. A dialogue between anthropology and science and technology studies. In Fardon, R.; Harris, O.; Marchand, T.; Nuttall, M.; Shore, C.; Strang, V. and Wilson, R. (Eds), *A handbook of social anthropology*, pp. 115-129. London: Sage Publishers.
- Harvey, P. and Knox, H. 2010. Extraction, materiality and the 'science of the concrete' in engineering practice. In Bennett, T. and Joyce, P. (Eds), *Material powers. Cultural studies, history and the material turn*, pp. 124-141. London: Routledge.
- Harvey, P. and Knox H. 2012. The enchantments of infrastructure. *Mobilities* 7(4): 521-36.
- Helmreich, S. 2011. Nature/Culture/Seawater. *American Anthropologist* 113(1): 132-144.
- Herzfeld, M. 1991. *The social production of indifference. Exploring the symbolic roots of Western bureaucracy*. New York: Berg.
- Hill, E. 1965 [1937]. *Water into gold. The taming of the mighty Murray River*. London, Sydney: Angus and Robertson.
- Himmelfarb, G. 1995. *The de-moralization of society. From Victorian virtues to modern values*. New York: Albert Knopf.
- Hirsch, E. and Strathern, M. (Eds). 2004. *Transactions and creations. Property debates and the stimulus of Melanesia*. New York: Berghahn Books.
- Hocart, A. 1970 [1936]. *Kings and councillors. An essay in the comparative anatomy of human society*. Chicago, London: University of Chicago Press.
- Hoekstra, A. and Chapagain, A. 2007. Water footprints of nations. Water use by people as a function of their consumption pattern. *Water Resources Management* 21(1): 35-48.
- Homewood, K. 2015. "They call it Shangri-La". Sustainable conservation, or African enclosures? Paper presented at the Centre for the Anthropology of Sustainability, Inaugural Conference, *Anthropological visions of sustainable futures*. University College London, 12th -14th February 2015.
- Huby, M. and Bradshaw, J. 2012. *Water poverty in England and Wales*, Family Resources User Survey. London. Royal Statistical Society.
- Hughes, T. 1993. *Networks of power: Electrification in Western Society, 1880-1930*. Baltimore, MD: Johns Hopkins University Press.
- Jessop, B. 2012. Economic and ecological crises: Green new deals and no-growth economies. *Development* 55(1): 17-24.
- Kahlow, M. Khan, A. and Azam, M. 2006. The world's largest contiguous irrigation system. Developments, successes and challenges in the Indus Irrigation System in Pakistan. In Tvedt, T. and Jakobsson, E. (Eds), *A history of water. Volume 1: Water control and river biographies*, pp. 35-54. London, New York: I.B. Taurus.
- Kirksey, S. and Helmreich, S. 2010. The emergence of multispecies ethnography. *Cultural Anthropology* 25(4): 545-576.
- Knappett, C. and Malafouris, L. (Eds). 2008: *Material agency. Towards a non-anthropocentric approach*. New York: Springer Science.
- Kopytoff, I. 1986. The cultural biography of things: Commoditization as process. In Appadurai, A. (Ed), *The social life of things: Commodities in cultural perspective*, pp. 64-91. Cambridge: Cambridge University Press.
- Krause, F. and Strang, V. (Eds). 2013. Living water. The powers and politics of a vital substance. Special issue *Worldviews: Global Religions, Culture and Ecology* 17(2).
- Ladson, T. and B. Finlayson. 2004. Specifying the environment's right to water. Lessons from Victoria. *Dialogue* 23(3): 19-28.
- Lahiri-Dutt, K. (Ed). 2006. *Fluid bonds. Views on gender and water*, Kolkata: Stree.
- Lansing, S. 1991. *Priests and programmers. Technologies of power in the engineered landscape of Bali*. Princeton, N.J.; Oxford: Princeton University Press.
- Larkin, B. 2013. The politics and poetics of infrastructure. *Annual Review of Anthropology* 42(1): 327-43.
- Lawrence, G. 2005. Promoting sustainable development. The question of Governance. In Buttel, F. and McMichael, P. (Eds), *New directions in the sociology of global development. Research in rural sociology and development*. Vol. 2, pp. 145-74. London: Elsevier.



- Latour, B. 2005. *Reassembling the social: An introduction to Actor-Network-Theory*. Oxford: Oxford University Press.
- Lourandos, H. 1987. Swamp managers of southwestern Victoria. In Mulvaney, D.J. and White, J.P. (Eds), *Australians to 1788*, pp. 292-307. Sydney: Fairfax, Syme and Weldon.
- Mains, D. 2012. Blackouts and progress. Privatization, infrastructure, and a developmentalist state in Jimma, Ethiopia. *Cultural Anthropology* 27(1): 3-27.
- Meissner, S. 2012. Virtual water and water footprints. Global supply and production chains and their impacts on freshwater resources. In Hahn, P.; Cless, K. and Soentgen, J. (Eds), *People at the well. Kinds, usages and meanings of water in a global perspective*, pp. 44-64. Frankfurt, New York: University of Chicago Press.
- Milton, K. (Ed). 1993. *Environmentalism. The view from anthropology*. ASA Monographs 32. London, New York: Routledge.
- Minnegal, M. and Dwyer, P. 2011. Appropriating fish, appropriating fishermen: Tradable permits, natural resources and uncertainty. In Strang, V. and Busse, M. (Eds), *Ownership and appropriation*, pp. 197-215. Oxford, New York: Berg.
- Morphy, H. and Morphy. F. 2006. Tasting the waters: Discriminating identities in the waters of Blue Mud Bay. *Journal of Material Culture* 11(1/2): 67-85.
- Mosse, D. and Lewis, D. (Eds). 2005. *The aid effect. Giving and governing in international development*. London: Pluto.
- Manyika, J. Woetzel, J.; Dobbs, R.; Labaye, E. and Jordan, A. 2015. *Global growth. Can productivity save the day in an aging world?* McKinsey Global Institute.
- Mukerji, C. 2009. *Impossible engineering. Technology and territoriality on the Canal du Midi*. Princeton and Oxford: Princeton University Press.
- Mukerji, C. 2010. The unintended State. In Joyce, P. and Bennett, T. (Eds), *Material powers. Cultural studies, history and the material turn*, pp. 81-101. London: Routledge.
- National Association of Water Companies. 2012. Public-Private Partnerships. [www.nawc.org/our-solutions/public-private-partnerships.aspx](http://www.nawc.org/our-solutions/public-private-partnerships.aspx)
- NFF (National Farmers' Federation (Australia)). 2015. *Submission to the strengthening Australia's foreign investment framework – Options Paper*. Australia: NFF. [www.treasury.gov.au/~media/Treasury/Consultations%20and%20Reviews/Consultations/2015/Strengthening%20Australia's%20foreign%20investment%20framework/Submissions/PDF/National%20Farmers%20Federation.ashx](http://www.treasury.gov.au/~media/Treasury/Consultations%20and%20Reviews/Consultations/2015/Strengthening%20Australia's%20foreign%20investment%20framework/Submissions/PDF/National%20Farmers%20Federation.ashx)
- Needham, J. 1954-2008. *Science and civilization in China*. Taipei: Caves Books.
- Niewöhner, J. 2015. Anthropology of infrastructures of society. In Wright, J. (Ed), *International Encyclopedia of the Social and Behavioral Sciences*, 2nd edition, Vol. 12, pp. 119-125. Oxford, Elsevier.
- Norman, E.; Cook, C. and Cohen, A. (Eds). 2015. *Negotiating water governance. Why the politics of scale matter*. London: Ashgate.
- OFWAT (Office of Water Services) and EA (Environment Agency) (UK). 2011. *The case for change: Reforming water abstraction management in England*. Birmingham: HMSO.
- Ortner, S. 1995. Resistance and the problem of ethnographic refusal. *Comparative Studies in Society and History* 37(1): 173-193.
- Ostrom, E. 1990. *Governing the commons*. Cambridge: Cambridge University Press.
- Ostrom, E. 2010. Beyond markets and states. Polycentric governance of complex economic systems. *American Economic Review* 100(3): 641-672.
- Parliament of the United Kingdom. 2003. *The Water Act 2003*. UK: Parliament of the United Kingdom.
- Pfaffenberger, B. 1990. The harsh facts of hydraulics. Technology and society in Sri Lanka's colonization schemes. *Technology and Culture* 31: 361-397.
- Pfaffenberger, B. 1992. Technological dramas. *Science, Technology and Human Values* 17(3): 282-312.
- Pietz, D. 2006. Controlling the waters in twentieth-century China. The nationalist state and the Huai River. In Tvedt, T. and Jacobsson, E. (Eds), *A history of water*, pp. 92-119. London: I.B. Tauris.

- Plumwood, V. 1993. *Feminism and the mastery of nature*. London, New York: Routledge.
- Plumwood, V. 2002. *Environmental culture. The ecological crisis of reason*. London, New York: Routledge.
- Polanyi, K. 1944. *The great transformation*. New York: Farrar and Rinehart.
- Prochaska, F. 2008. Victorian England. The age of societies. In Cannadine, D. and Pellew, J. (Eds), *History and philanthropy. Past, present and future*, pp. 19-32. London: Institute of Historical Research.
- Reisner, M. 1993. *Cadillac desert. The American west and its disappearing water*. Harmondsworth: Penguin Books.
- Reynolds, H. 1987. *The law of the land*. London, New York: Penguin.
- RSNC (Royal Society for Nature Conservation). 1992. *Dying of thirst: A response to the problem of our vanishing wetlands*. Newark: The Wildlife Trusts.
- RSPB (Royal Society for the Protection of Birds). 2011. Wetland loss threatens wildlife and people. [www.rspb.org.uk/news/details.aspx?id=283477](http://www.rspb.org.uk/news/details.aspx?id=283477)
- Schaffer, K. 1988. *Women and the bush. Forces of desire in the Australian cultural tradition*. Cambridge, Melbourne: Cambridge University Press.
- Scott, J. 1998. *Seeing like a State. How certain schemes to improve the human condition have failed*. New Haven and London: Yale University Press.
- Serpell, J. 1996. *In the company of animals. A study of human-animal relationships*. Cambridge, New York: Cambridge University Press.
- Shiva, V. 2002. *Water wars. Pollution, profits and privatization*. London: Pluto Press.
- Smith, C. 2012. *Uneven water entitlements for local and foreign farm owners*. <http://citizenj.edgeqld.org.au/uneven-water-entitlements-for-local-and-foreign-farm-owners/>
- Star, S. 1999. The ethnography of infrastructure. *American Behavioral Scientist* 43(3): 377-391.
- Stiglitz, J. 2002. *Globalization and its discontents*. New York: W.W. Norton.
- Strang, V. 1997. *Uncommon ground. Cultural landscapes and environmental values*. Oxford, New York: Berg.
- Strang, V. 2004. *The meaning of water*. New York, Oxford: Berg.
- Strang, V. 2005. Knowing me, knowing you. Aboriginal and Euro-Australian concepts of nature as self and other. *Worldviews* 9(1): 25-56.
- Strang, V. 2006. A happy coincidence? Symbiosis and synthesis in anthropological and indigenous knowledges. *Current Anthropology* 47(6): 981-1008.
- Strang, V. 2009. *Gardening the world. Agency, identity, and the ownership of water*. Oxford, New York: Berghahn Publishers.
- Strang, V. 2011. Fluid forms. Owning water in Australia. In Strang, V. and Busse, M. (Eds), *Ownership and appropriation*, pp. 171-195. Oxford, New York: Berg.
- Strang, V. 2013. Dam nation: Cubbie Station and the waters of the Darling. In Wagner, J. (Ed), *The social life of water in a time of crisis*, pp. 36-60. Oxford, New York: Berghahn.
- Strang, V. 2014a. Lording it over the Goddess. Water, gender and human-environmental relations. *Journal of Feminist Studies in Religion* 30(1): 83-107
- Strang, V. 2014b. Fluid consistencies. Meaning and materiality in human engagements with water. *Archaeological Dialogues*. Cambridge University Press 21(2): 133-150.
- Strang, V. 2014c. The taniwha and the crown. Defending water rights in Aotearoa/New Zealand. *WIREs Water* 1: 121-131.
- Strang, V. 2015. *Water, nature and culture*. London: Reaktion Books, University of Chicago Press.
- Strang, V. (in press). Re-imagined communities. A bioethical approach to water policy. In Conca, K. and Weinthal, E. (Eds), *The Oxford handbook on water politics and policy*. Oxford, New York: Oxford University Press.
- Strang, V. and Busse, M. 2011. (Eds). *Ownership and appropriation*. Oxford, New York: Berg.
- Sultana, F. and Loftus, A. (Eds). 2012. *The right to water. Politics, governance and social struggles*. Earthscan Water Text Series, London and New York: Routledge.
- Swyngedouw, E. 2015. *Liquid power. Contested hydro-modernities in 20th century Spain*, Cambridge: MIT Press

- Tibby, J.; Kershaw, P. Builth, H.; Philibert, A. and White, C. 2006. Environmental change and variability in south-western Victoria. Changing constraints and opportunities for occupation and land use. In David, B.; Barker, B. and McNiven, I. (Eds), *The social archaeology of Australian indigenous societies*, pp. 254-269. Canberra: Aboriginal Studies Press.
- Tilley, C.; Keane, W.; Küchler, S.; Rowlands, M. and Spyer, P. (Eds). 2006. *Handbook of material culture*. London, Thousand Oaks, New Delhi: Sage.
- Tilley, C. 2007. Materiality in materials. *Archaeological Dialogues* 14(1): 16-20.
- Tortajada, C. 2010. Water governance. Some critical issues. *Water Resources Development* 26(2): 297-307.
- Toussaint, S. (Ed). 2004. *Crossing boundaries. Cultural, legal, historical and practice issues in Native Title*. Carlton: Melbourne University Press.
- Tsing, A. 2004. *Friction. An ethnography of global connections*. Princeton: Princeton University Press.
- Tvedt, T. and Jakobsson, E. (Eds). 2006. *A history of water, Volume 1. Water control and river biographies*. London, New York: I.B. Tauris.
- Tvedt, T. and Oestigaard, T. (Eds). 2010. *A history of water. Volume 3. The idea of water from antiquity to modern times*. London. I.B. Tauris.
- UNGA (United Nations General Assembly). 2010. *The human right to water and sanitation*. Resolution 64/292. Paris: United Nations.
- UNICEF (United Nations Children's Emergency Fund) 2015. *UNICEF's latest data on water, sanitation and hygiene*. [www.unicef.org/wash/index\\_statistics.html](http://www.unicef.org/wash/index_statistics.html)
- Veolia. 2015. *Discover Veolia*. [www.veolia.com/en](http://www.veolia.com/en)
- Wagner, J. (Ed). 2013. *The social life of water*. Oxford, New York: Berghahn.
- Walker, G. 2014. Water scarcity in England and Wales as a failure of (meta)governance. *Water Alternatives* 7(2): 388-413.
- Ward, C. 1997. *Reflected in water. A crisis in social responsibility*. London and Washington: Cassell.
- Water Technology Net. 2015. *Western Corridor Recycled Water Project, Australia*. [www.water-technology.net/projects/western-corridor/](http://www.water-technology.net/projects/western-corridor/) (last accessed 03.07.2015)
- Wichelns, D. 2015. Virtual water and water footprints: Overreaching into the discourse on sustainability, efficiency, and equity. *Water Alternatives* 8(3): 396-414.
- Widlok, T. and Tadesse, W. (Eds). 2005. *Property and equality, Volume II. Encapsulation, commercialisation, discrimination*. New York, Oxford: Berghahn Books.
- Wittfogel, K. 1957. *Oriental despotism. A comparative study of total power*. New Haven: Yale University Press.
- Wolff, G. and Palaniappan, M. 2004. Public or private water management? Cutting the Gordian Knot. *Journal of Water Resources Planning and Management* 130(1): 1-3.
- Worster, D. 1992. *Rivers of empire: Water, aridity, and the growth of the American West*. USA: Oxford University Press.
- Young, M. and J. McColl. 2004. Parting the waters. *Frontiers in water management*. *Dialogue* 23(3): 4-18.

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