

A HISTORY OF WATER

THE POLITICAL  
ECONOMY OF WATER

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## Introduction: Water as a Unique Commodity

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Throughout much of the world there is a growing, almost triumphalist, assumption that private ownership, market forces and a competitive economy will lead to the most rational allocation of goods and resources. Following the collapse of the Soviet economy and the dismantling of command economies allied to it, and the encroachment of private enterprise and east–west economic synergies in China, little remains of the socialist projects that stood in opposition to free market capitalism for much of the twentieth century. Coincidental with the collapse of the command economy was the rise of new right economics in the west. The advent of deregulation in the USA and privatisation in Britain led the world in the acceptance of the primacy of market forces ideology. Water as a resource – whether for domestic consumption, irrigation, power generation, industrial processes, leisure or a myriad of other uses – may be viewed as subject to this same process. As epitomised by the World Bank’s guiding philosophy, it now seems axiomatic that water resources should be privately controlled in order to maximise exploitation.<sup>1</sup>

However, water has been, and remains, the most controversial commodity (perhaps alongside military goods) in terms of the application of economic ‘laws’. Bakker has recently described water as an ‘uncooperative commodity’, for example.<sup>2</sup> There is something emotive – essential – in the nature of water, in the *idea* of water, which militates against it being owned and controlled for profit. The authors have given up counting the number of published articles that carry the phrase ‘water is life’ as an introduction. Bearing this notion of the exceptionality of water in mind, this introduction will examine the ways in which water has been owned and controlled throughout history. It will present examples of public and private ownership and highlight the rationale behind these forms of control. In doing so we will reveal that there are many different waters and historically many different motivations behind the quest for their control.

Water is many things and political economy also exists in many forms, often tied to the inertias of historical development. One way to represent this maybe to construct a matrix. Along one axis we might place the spectrum of control ranging from private enterprise, through public influence, regulated private enterprise and on to the public corporation, reflecting the variety of direct and indirect forms that national or local state intervention may take. Along the other axis, we might place the different forms that water might assume: power source, irrigation, industrial process, domestic consumption, leisure component, etc. We could then place each particular form of ownership and control in its appropriate box in the grid.

There is a problem with this approach, however, when we attempt to break water down into its various uses – to turn water into *different* goods or commodities. Part of the difficulty here lies in the overlapping or interconnected nature of the uses of water in many circumstances. Impounded water, for example, can be used for irrigation and flood control, to provide a domestic water supply, to generate power, to establish a fishery, to provide recreational space, establish an environmentally protected zone, be part of a manufactured aesthetic and much more besides. In addition, it can also exist in all these functions simultaneously. Conversely of course it can also exist as any one of these functions singly, or at least take one of these as a primary function, with other uses as a by-product, inconsequential in terms of initial economic motivations.

## WATER AS POWER IN THE ANCIENT WORLD

One motivation behind the control of water resources, or indeed the *creation* of water resources in many respects (if, for example, we take impounded water to be a new form with properties differing from flowing water) goes beyond simple economic considerations. Control of water has, in many places and moments of history, been equated with the control of society. Water can provide and sustain political power. Debates continue about the extent and nature of such control in ancient civilisations, but it seems clear that the ownership and control of water in some societies was central to some form of political power. Prediction and management of the Nile flood, for example, gave the ruling regime its legitimacy and support in a society almost totally dependent on the river as its main economic resource. More complex and controversial are the cases of authority in Asia which may have been built upon the control of water resources.<sup>3</sup> Marx, and later Wittfogel, identified these 'hydraulic societies', as existing around a polity that relied on its monopoly of the control of irrigation for its general political control.

Wittfogel's general theory comes under scrutiny in two chapters in this book. Kang outlines the apparently appealing way in which his hydraulic politics seemed to function. Large-scale irrigation works gave rise to the need for water scheduling (calendrics), planning, construction and labour control (administration) and the protection of works and rights (military organisation), hence the development of centralised, bureaucratic societies, which devolve into despotic power. However, Kang's detailed examination of the irrigation systems in ancient Korea point to a dynamic which is running in the opposite direction. Examination of a wide range of epigraphic, archaeological and documentary evidence supports the evidence that large-scale bureaucracy was a pre-condition to the formation of large-scale irrigation works. In other words the political system was formed first, enabling subsequent water control regimes. Wittfogel is also challenged in the chapter by Brown, in an equally fundamental way, when his blanket assumptions are tested against a wide range of historical settings as diverse as ancient Mesopotamia and the Khmer civilisation. The author stresses the importance of climatic and ecological change and its impact on social and economic development. These factors, which Wittfogel never took into account, are shown to be central to many explanations of change and diversity in both systems of water use and economic and political regimes. Underpinning Brown's thesis is the notion of complexity – of multivariate forms of technological development and resource use and an array of possible political forms. We also need to be wary of interpretations of centralised societies and forms of 'oriental despotism' in history when those interpretations are written in the context of the Cold War.

Accepting these critiques of Wittfogel, it is still clear that the control of water resources in countries such as ancient China and Egypt can be seen to be coincidental with a tendency towards centralisation; perhaps the beginnings of an argument for economies of scale begin to emerge, though it is by no means clear that such technical economies exist – rather these systems are based on the overall agglomeration of smaller scale technology grouped into an interconnected system. Real scale economies begin to emerge (or at least the arguments begin to emerge more strongly) in the case of more recent historical developments in industrialised societies, as we shall see below.

## FLOWING RIVERS

One of the most complex histories of ownership and control of water resources is that of flowing water. Flowing water has had a myriad of economic uses, changing from period to period and varying by region.

Water mills, for example, were the central industrial technology in many places until the twentieth century. Rivers also formed the transport networks vital to communities, industries and in some cases whole nations and provide the basic support for a range of economic activities such as fishing and agriculture, water for domestic or industrial use, and facilities for a variety of leisure activities. The latter is by no means inconsiderable. For much of the nineteenth and twentieth centuries, for example, angling was the most popular participative sport in Europe.

Control and ownership of rivers presents its own unique set of historical precedents and patterns. Any use of the river may present an impediment to other users of the water or of the flow. Weirs and dams may improve the utilisation or storage in one place, but may impede the flow, block transport or disrupt fishery life cycles. On the other hand they may offer the benefit of regulation and management – obviating uncertainty either in times of drought or flood, since all rivers are seasonal to a certain extent, some catastrophically so. Most medieval societies had restrictions on the use of rivers, both in terms of use of the flow and in terms of maintaining water quality. Industries such as tanning, textile processing, or metallurgy, which were likely to generate effluent or pollutants, were the subject of controls over siting and intensity of use.

Property claims in relation to water usually revolve around a complex determination of both the nature of rights of use and the impact of these rights. As industrialisation took place, many societies saw a phase-step in the dispute over control of river flow between the industrial and the agricultural user. In the case of the USA, as Paavola's chapter notes, increased industrialisation had a range of downstream impacts, from the introduction of pollutants emanating from, for example, tanneries and paper mills that could de-oxygenate water and destroy fisheries, to sawdust from timber yards settling to the bottom and disrupting flow and navigation. Paavola follows the evolution of the doctrine of 'reasonable use' and its development against the background of a legal tradition of upstream–downstream riparian laws that stretch back to Roman laws. Naeser and Smith underline the complexity and specificity of this issue in analysing the origins and impact of prior appropriation law in the west of the USA in the nineteenth century. Here we see a set of laws that evolved in a specific context, originally in the gold fields of California, where a doctrine of 'first in time, first in right' developed. This set of rights, which principally applied to diverted water – which in turn must be for beneficial use, in other words 'use it or lose it' – turned it into a transferrable commodity, even when transferred between different uses. The complexity returns, however, as the authors note, when groundwater rights are contested during a later period.

The robustness of laws and ownership rights is constantly challenged by a spectrum of factors including new economic configurations, new

demographic formations and the development of new technologies. The interplay of several of these factors is highlighted in the chapter by Dyrnes and Marañón-Pimental, which takes developments in Mexico as its focus. Mexico City has undergone dramatic demographic and economic change in the twentieth century. The city has increasingly relied on water from the Ixtlahuaca valley bringing the need to establish some form of cooperation with local users there. New technology has enabled increased exploitation of the aquifer to meet the needs of the growing city, but to the detriment of local users in the Ixtlahuaca valley. Agreement over water rights that had previously been agreed did not envisage the deep-water technologies which would, in effect plunder the valley's resources from a distance. This city-rural conflict is not new of course. A variant of this conflict emerged most notoriously with the appropriation of the water from the Owens Valley by the growing city of Los Angeles at the start of the twentieth century.<sup>4</sup> In the case of Mexico City the imbalance of political power between competing parties is all too evident.

The balance of forces in terms of changes in environment, patterns of use, changing technologies, etc., forms the basis for the chapter by Jeffrey, Lemon and Jefferson. In calling for a cross fertilisation of ideas between engineering, behavioural, economic and environmental experts to advise policy makers, the authors show how only a total and integrated approach can provide appropriate regimes of rights and property laws. That these laws need to take into account a range of non-instrumental factors is, perhaps, underlined by Regmi, whose study of the Kathmandu Valley, traces the changes that have brought about a dichotomy between the modern, in the form of the piping systems of the Nepal Water Supply Corporation, and the local dhunge dhara, or water spout system. The key here is that the latter reinforced a set of social rights and interactions (and politics even), and stood at the heart of tradition and community in their role as not just a source of water, but as a gathering place, a forum for local communication.

Another set of conflicts around the flow of the river emerged as rivers, *as rivers*, became totally controlled or 'industrialised'. Here we can frequently see a conflict between conservative forces and the engineer – characterised as questing to control nature, offering a reconfigured landscape with an industrial aesthetic which the engineer believes to be an improvement but which has little empathy with traditional values. We can see this process in operation in Sweden from the early middle ages. From the thirteenth century the activities of mills were regulated to emphasise the 'natural flow' of rivers. By the early twentieth century engineers were increasingly keen to utilise the flow of rivers for hydro-electric schemes. A conflict emerged between farming, fishing and logging interests on the one hand and the hydroelectric lobby and mill

owners on the other. The key weapon in the armoury of the engineer in Sweden and elsewhere in the industrialised world was that of the notion of 'progress', as the idea of 'reasonable use' replaced the idea of 'natural flow'.<sup>5</sup> Some 70 per cent of Swedish rivers were harnessed for hydroelectric power to fuel the industrialisation of the country after The First World War. The idea of industrial power or progress, in harnessing rivers, is of course not confined to the Scandinavian experience. Hydroelectric and river management schemes, offering flood control, irrigation water, domestic and industrial water and power became the symbol of modernity in the twentieth century. Perhaps the most graphic example of this process is the Tennessee Valley Authority (TVA) scheme of the 1930s in the USA, deeply redolent of the New Deal ambitions for a changed role for the state in leading the way in modernising and fostering a capitalist economy. For the embodiment of modernist civil engineering in aesthetic terms however, the Hoover dam probably gets precedence.<sup>6</sup>

It must be noted that this process has been reversed in a number of places, and from a number of dynamics. Some rivers have become de-industrialised as the industrial economies on which they were based have become eroded. The River Severn in Britain provides an poignant example of this process. Ironbridge – the so-called 'cradle of the industrial revolution' – is situated on the banks of the Severn. The river formed the main arterial connection between the ironmaking centre of Britain's industrial heartland (the enterprises of the Darbys and the Foleys) and Bristol, the centre of a global trading system. In the eighteenth century the Severn's tributary, the River Teme, boasted the densest concentration of watermills in the world. By the mid-twentieth century, nothing of this remained. The river has virtually no industrial use at all, and is simply used for domestic water supply and leisure industries. The Severn's demise as an industrial river simply reflects shifts in energy technologies, industrial markets and a new international division of labour. The de-industrialisation of other rivers may reflect the strength of alternative ideas – a challenge to modernism or extractive, non-sustainable industrial use. Support for the free flow of rivers in the latter part of the twentieth century went beyond the issue of instrumentalist riparian rights. Freedom of flow movements were composed of a range of groups, which did not always act in concert. Interests encompassed a spectrum stretching from fishing and angling, landscape preservation, industrial archaeology and heritage to concerns about sustaining bio-diversity, or maintaining traditional cultures. Many of these movements have emerged since the 1960s, influenced by pioneers such as Schumacher and Carson, but by no means all of them. There was significant opposition to the construction of many late nineteenth century dams, for example, from local angling lobbies in

Britain, and a major confrontation over the use of the River Tees in the 1950s.<sup>7</sup> The Sierra Club's opposition to the Hetch-Hetchy Dam in the USA was, according to Jackson, the earliest confrontation between big dams and an environmentalist pressure group.<sup>8</sup>

River flow pressure groups may operate on a local, national or international level. Evenden's chapter provides a graphic case study of this process in action at a local industrial and national level in the case of the Fraser river in Canada. He outlines a complex and evolving dispute over access to the river's resources between the fishing industry and the power lobby, overlain with international trans-border issues between Canada and the USA. The Fraser river is one of the most abundant salmon rivers in the world and historically forms the centre of an important commercial fishery. Evenden charts the success of the fishing industry in fighting off successive proposals to dam the river, and thus inhibit or destroy the migratory patterns of the fish. The fishing industry, more recently allied to a newcomer – the environmental lobby – effectively forestalled all industrialising projects on the main river and successfully implemented positive restoration projects such as that at the infamous Hell's Gate gorge. Evenden provides a stark contrast between the preservation of natural flow in the Fraser river, with that of the nearby Columbia river in the USA with 14 mainstream dams along its length.

The difficult path to international agreement on trans-boundary water resources between Canada and the USA features in another study in this volume. Scarpino examines the history of agreement over the use and conservation of the Great Lakes, particularly as a fishery resource. Formal agreements have quite a long history, including the 1909 Boundary Waters Treaty, for example. But the enforcement and observance of these treaties has a chequered history, and agreement over falling fish stock levels and pollution is hard to obtain in a changing economic and ecological environment. Only when a major crisis emerges – in this case the migratory ingress of the species that destroy the balance of fish stocks in the lakes, notably the lamprey and the alewife – does meaningful treaty cooperation emerge. Scarpino points to the inherent difficulties in achieving both a natural and a political balance when it comes to a complex resource such as the Great Lakes.

Where rivers cross international borders the problems of usage and rights can become extremely complex. Much hype has surrounded the notion that the twenty-first century would in fact be characterised by 'water wars' over a resource that is predicted to become increasingly valuable given increased demand and changing or uncertain supply. The Danube today, for example, flows through seven countries on its way to the Black Sea, each with its own concerns and ambitions about level and type of use and each with some responsibility for the user downstream.

The river flows across a variety of legal traditions, economic regimes and political cultures. Several chapters in this book highlight the issues inherent in trans-boundary water resources. One of the key issues here is change – change in legal and political structures and change in demographic, social and economic activity. Sanchez, for example, points to the ways in which treaties between Mexico and the USA came under increasing pressure as the border communities industrialised and modernised and the population profile underwent radical transformation. New concerns also reset the water resource agenda, including a heightened environmental awareness and changing assessments of groundwater quantity and quality.

Several chapters in this collection highlight the complex and evolving trans-boundary issues relating to the River Nile. Dellapenna uses the Nile as a case study in order to reject or tone down the ‘water wars’ thesis. In charting the history of international law in regulating the use of the river, he shows how agreement can be reached and implemented. Just as the Nile flows across boundaries, from its headwaters in central Africa, through the Sudan and through Egypt, so too it flows through history – across many historical–political boundaries, most notably perhaps through the colonial and post-colonial period.<sup>9</sup> Dellapenna tracks British imperial ambitions for control of the river along its entire length, and subsequent agreements following the withdrawal of the British. In doing so he shows how international conflict can be successfully resolved, though he is at pains to point out that changing ambitions in the Sudan, for example, mean long-term stability is not assured. The case of Sudan and post-colonial change is the focus of El Zain’s Nile study, which highlights the complex political and ethnic factors that influence new control regimes, though it stresses that inter-regional political agreement on the use of the river’s resources is possible. Arsano, in tracing the origins of the Nile Basin Initiative, perhaps takes a more pessimistic stance, identifying a basic dichotomy between upstream and downstream interests, which remain unresolved.

## THE MUNICIPAL IDEAL

Roman water engineering for public supply and hydrotherapeutic use set the standard by which urban water systems were to be judged well into the early modern period. Medieval water systems were less grandiose, and did not involve complex technologies to transport water over long distances. Instead, medieval water systems in Europe tended to be local and open, often serving as defensive as well as supply systems in the case of moated towns. As Guillaume notes, the French medieval city ‘knew how to master the hydraulic environment, and it is precisely

on this point that these cities differed fundamentally from the earlier Gallo-Roman or the later industrialised city, both of which dreaded surface water.<sup>10</sup> Monastic orders could be found to be leading the way in water control technology and aquaculture in early medieval Europe, and examples have been found of water supplies being extended from monasteries into the local town, as in the case of Southampton and Exeter in England in the thirteenth century.<sup>11</sup>

Historians are wary of the idea of an industrial revolution as a clearly definable period – a new paradigmatic shift in the scale and technologies of manufacturing. Nevertheless the industrialisation of water in the Western economies, its use as a power source and as a component in a range of industrial processes, does expand significantly from the late eighteenth century onwards. In addition, however, increased urbanisation, which coincides with increased industrialisation to a great extent, further extended the use of water resources to an increasingly large scale. Cities in America and Europe grew at an unprecedented rate from the mid-nineteenth century onwards. With this growth came problems of water supply and management as part of a pressing regime of public health. Private water companies grew as a concomitant to the growth of private enterprise generally – utilising manufacturing advances in technology, some understanding of hydrological science and, importantly, the growing sophistication and availability of capital markets to provide risk capital. In parallel with these developments – the application of scale and scope to the water enterprise – there was increasing concern or realisation that rapid urbanisation imposed a sanitary burden, which in a Malthusian sense could impose a catastrophic effect, the most notable of these being the cholera pandemic of the early 1830s. Though the science of water-borne disease remained at the empirical level, with miasmatic theory and Snow's observed linkages in the case of cholera, the technology of urban water supply and disposal systems improved throughout the century. As Melosi notes, the Chadwickian 'sanitary idea' spread throughout the advancing industrial countries and the provision of clean and universally available water supplies became an increasing priority.<sup>12</sup> During this period, from the mid-nineteenth to the mid-twentieth century, we see the most intense contest between public and private.

As might be expected, the earliest organised water providers in this rapid phase of industrial-urban expansion were private companies. However, as the century wore on, a challenge to these companies emerged from national and local state initiatives in a number of countries. National or state governments provided an arena where enabling or restricting controls could be established. Control here encompasses a spectrum: from the setting of legislation to enable, or compel local authorities to act, to the specific arbitration over proposed works. When

a private company sought to establish or extend waterworks in Britain, for example, it would need the consent and support of an Act of Parliament. Governments in these cases are subject to the full range of interest group pressures, which may shape legislation or ensure the success of individual acts. Under the aegis of these national or local state legislative developments there developed a distinct phase of municipal enterprise. Local authorities began to offer themselves as alternatives to private enterprise.

While some countries – France, for example – continued to place the emphasis on private supply of water, elsewhere in the industrialising west, notably in Britain and the USA, city municipal authorities began to successfully challenge the private sector. In the USA, for example, there were 116 public and 128 private water companies in 1870; by 1924, the figures were 6,900 public and 2,950 private. In a much larger sector, municipal companies had captured 70 per cent of the market.<sup>13</sup> Here we have a central paradox: in the heart of two economies dominated by the ideology of the free market some of the heaviest concentrations of investment began to be made by the public sector. Cities such as Glasgow for example, which had a local economy synonymous with the ideal of free trade, built its Lough Katrin scheme in the teeth of local industrial opposition.<sup>14</sup> It has been calculated that the municipal investment in water schemes in the nineteenth century in Britain, for example, represents the largest single category of investment in the economy at that time.<sup>15</sup>

The answer to this paradox can found at several levels. The most straightforward argument is one of simple economics. As cities grew at a very rapid rate, water systems needed to be built on an increasingly large scale and in a fully integrated and expandable way. Private capital, it was argued, could not raise sufficient investment to build these systems. Also it was feared that too much power would be vested in the monopoly powers of single companies – who would need to be granted security of contract over the long term before embarking on large scale investment. An early example of this can be found in the resistance to Aaron Burr's Manhattan Company proposal to supply water to New York in the first decade of the nineteenth century.<sup>16</sup> The later expansion can be partly attributed to the growing movement against monopoly capital during the progressive period, nevertheless the scale of intervention – replacement of private by public corporations – marks the sector off as a very special case. Of course the political environment in some countries determined absolutely the nature of the public/private enterprise split or development.

Though argued persuasively at the time, these purely economic arguments were probably the weakest arguments in favour of municipal water. Some private companies had succeeded in raising considerable

sums for investment, and proved to be highly profitable and enduring enterprises. Moreover, the example of other large-scale rapid investment cycles in canal and rail companies would seem to gainsay this as a valid objection and besides, governments could offer inducements and guarantees in some cases (as they had done in the case of American railway development, for example), to support the private sector, rather than offering itself as an alternative. The case for a natural monopoly – therefore a possible state monopoly – also fails in the comparison with investment in the transport infrastructure where duality of provision did not prove an obstacle to private enterprise. Nevertheless, as Melosi notes, the move towards municipal control was irresistible, ‘... even well reasoned criticisms were drowned out by the enthusiasm for publicly managed services in most large cities ... Water became a particularly favourite political issue because embedded in it were so many concerns touching the well-being of the citizenry, as well as the role of the government in serving that of the citizenry.’<sup>17</sup>

The set of arguments that emerged centred on ideas of trust, security or universality. Here we begin to see the overlap of economic and what might be termed non-rational or emotional arguments. Water provision, it was held, could not be entrusted to the market. The ‘means of life and death’, as Joseph Chamberlain, the high priest of municipal socialism in Britain, put it, could not be left to the commercial imperative. Chamberlain was by no means the first to profess a suspicion of private companies when it came to a ‘vital’ resource like water. William Cobbett, the architect of his own special form of proto-environmentalism, who had argued for the ‘cottage economy’ of local scale and sustainability, was vociferously against the water company monopolies in London and highly critical of the quality of water they provided. Private companies may go bankrupt and cease provision, they had a record of supplying only those who could afford it, and the balance between purity and price would always swing towards the latter. In an urban landscape where the ‘sanitary idea’ was sweeping forward, though the idea of purity of water supply was based on imprecise and limited science – simple observation of clarity and suspension levels – quality was superseding reliability of supply as the central issue. To hand stewardship of this responsibility to private enterprise was seen by some as increasingly untenable.

If water was held to be a ‘special’ commodity of some sort, a commodity to stand outside the normal rules of political economy, then this was both reinforced and exploited by the political ambitions of those in power. Water systems, built with public money, could be the concrete embodiment of a political construction – a bureaucratic fiefdom – established and extended by local political groups. Moreover, with the increasing scale and ambition of civil engineering works to trap, store, treat and transmit water, often over large distances, a strong element of

monumentalism began to be incorporated into municipal schemes. In many cities the gospel of civic pride was being reinforced by public works and space – parks, libraries and other public buildings embodied the ideal of duty, pride and service. Similarly, many of the water schemes built in the late nineteenth century embodied high ideals, which were often delivered with lofty imagery. Water for industrial cities in Britain, such as Birmingham, Glasgow and Liverpool, was provided by schemes that impounded distant rivers behind monumental dams, which vied for position as the tallest, largest or most advanced in design.<sup>18</sup> In these monumentalist projects, urban politicians allied themselves with equally ambitious civil engineers – some of whom, like Bateman and Mansergh, became figures of national and international renown – in a period when reverence for the great engineer was at its height.<sup>19</sup>

Designs for dams, pumping stations and intake towers and valve towers also began to incorporate a symbolism that embodied monumental pride and echoed an idealised past in its gothic revivalism. Water engineering, more than any other, was seen as emblematic of progress.<sup>20</sup> Great play was made of the contrast between the clean, rural source of water and the urban world it sought to regenerate and cleanse. Many lakes created by these schemes were also to become leisure destinations – extensions of the city park ideal – an arcadia deep in the rural hinterland where the urban citizen could escape to experience the wilderness, albeit manufactured.

As noted above, the municipal ideal, with its admixture of economic, moral and political arguments, did not completely win the day. Private companies did continue to operate successfully in some major urban areas. San Francisco water was provided by the private sector throughout the twentieth century. French private companies, notably *Compagnie Generale des Eaux* and later *Compagnie Lyonnaise* continue to dominate French water supplies.<sup>21</sup> Municipal water supply remained largely a small town initiative in France, however. In other countries, particularly Britain and the USA, the municipal ideal dominated water supply until the readjustments that came with new right economics from the mid-1970s in the USA and the early 1980s in Britain. Deregulation in the USA and privatisation in Britain fuelled by the economic thought of Friedman, Von Hayek and Schumpeter could muster sufficient political and ideological capital such that even water provision was unable to resist. The determination to remove the state from economic activity swept all before it, including the previously untouchable water supply sectors. Public control and ownership of water supplies had held sway, however, in important parts of the industrialised west, for nearly 150 years, defying the dominant logic of free markets for the greater part of that period.

Outside the developed industrial world, the debate over provision of clean water and the unequal distribution of the benefits of this resource

moves to a different historical rhythm, and is often based on divisions of class, wealth, gender and ethnicity. A number of chapters in this volume highlight this pattern. Ramachandraiah, for example, stresses the continuance of the debate over water as a civic service or social good versus water as an economic commodity in his study of Andhra Pradesh. Whatever the view, cities like Hyderabad still experience periodic drought and uncertain quality of supply. Slum areas constitute perhaps 30–35 per cent of the population. The problem is that local, municipal authorities have poor resources, leading to administration and maintenance inefficiencies. Proposed economic liberalisation, it is feared, will simply benefit the well-off disproportionately. Ledo provides another example in highlighting the development of drinking water access in the city of Cochabamba in Bolivia. From the 1980s onwards, immigration to the city placed an increasing strain on drinking water provision. What emerged was a conflict between the old city and the new city, a local water war based in social inequality. One interesting development here is the way in which, as so often is the case, water becomes the catalyst for political organisation and activism. Avila tells a similar story in terms of squatter settlements in Mexico. Hydropolitics at a micro level can act as a springboard for the development of broader political movements. A similar pattern emerges in the account of gender, poverty and water in Pakistan, given by Khan-Tirmizi. She stresses the role of women in the management of water resources, not simply in the domestic environment as usually depicted but in broader agricultural and industrial activity as well. (This point is also stressed in Regmi's chapter on Nepal.) This fact has often been ignored in framing policy and in considerations of modernisation and devolution of irrigation control to a local level. This is partly due to the restrictions of the purdah system. The limits of this restricted outlook are amply demonstrated in the problems with the Left Bank Outfall Drain Project, for example. Khan-Tirmizi demonstrates ways in which this regime can change, and in particular the empowering effects of Women's Action Groups.

## STATE CONTROL – EMPIRES OF WATER

If the municipal ideal in the West had successfully challenged free market economics, and politics and ideology had prevailed over rational economic calculations, the power of water as an ideological or political tool was also exploited in other important ways. In what might be termed imperial expansion, states used their control of water to both appropriate and transform 'new' lands and to impose imperial order and authority. Two very notable cases have been highlighted by historians. British control of India was characterised in part by the construction

and reconstruction of water systems. (Dutch governance of territories in the East Indies followed similar patterns.) Canals and irrigation systems in particular bore the stamp of British control. Indeed, many British civil engineers owed their careers to work instigated in Empire. Imperial authority was reinforced through large-scale water systems that reconfigured the ownership, class and political systems surrounding agriculture and industry in India. The debate about the effectiveness and legacy of this reconstruction is yet to be resolved. Historians have pointed to the destruction of indigenous patterns of work and cultures and the increase in some health problems such as malaria, which were exacerbated by these changes. They have also highlighted the ways in which post-imperial *deconstruction* of these systems has led to more effective local water provision. There is also a considerable revisionist school of history that now seeks to highlight some of the benefits of Empire, rather than concentrate on the guilt. Historians such as Niall Ferguson, for example, are quick to point to the benefits in agricultural output and public health under the Raj, a liberal 'Empire' when compared to the Mughal regime which it replaced.<sup>22</sup>

The other prominent example of water control as a system of imposing imperial authority and appropriating new land is to be found in the westward expansion of the USA in the nineteenth and twentieth centuries. Worster, Reisner and others have pointed to the ways in which control of water, particularly from the large rivers flowing from the Rocky Mountains, has been used to establish and redraw the agricultural, industrial and demographic profile of large areas of western USA. Worster's *Rivers of Empire* notes the ways in which British rule of India was consolidated through water control, and ascribes the same motivation to the large-scale projects that came to be dominated by the Bureau of Reclamation and the US Army Corps of Engineers into the twentieth century. Indeed, Worster and others have asserted that a political-engineering alliance – a 'priesthood of technocrats' – extended their ambitions into the Cold War period seeking to impose the same model of control through development – water development – to satellite regimes within the West's geopolitical sphere of interest.<sup>23</sup> This regime of control through water engineering was challenged through pressure from two areas. Firstly the dismantling of the apparatus of Cold War, and secondly, the simultaneous pressure from the environmentalist paradigm which, from the 1960s onwards, has confronted the preconceptions of large-scale engineering-led projects. Indeed the big dam, along with nuclear power and the motor car, have become the prominent symbols of antipathy for those seeking sustainability and sensibility in economic activity. This is not to say that large-scale water engineering schemes have been curtailed. Though there may be movements strong enough to challenge big dams – even to propose their dismantling,

within the USA – elsewhere Western interests and capital continue to promote, or at least participate in, the development of such schemes, the most visible being the Three Gorges Project currently underway in China.<sup>24</sup> It is in the command economies of the twentieth century where we see the most open use of large-scale engineering as a monumental–bureaucratic system displacing local–scale initiatives and swamping local communities and cultures. It is in these societies that we see a parallel emergence of a powerful central bureaucracy, allied to a reverence for the engineer in society. Large-scale engineering solutions with little possible opposition from local or environmentalist movements have also been pushed through by a developmental imperative – a mind-set that sees industrial and urban growth as the key goal of economic policy.

As we noted earlier, rivers, or water resources generally, flow across historical–political boundaries. The colonial/post-colonial divide is one such historical fracture, which several authors highlight in terms of legacies, burdens and historical change. Forrest's study of water resources in South West Africa raises several crucial points. He demonstrates the way in which the TVA model of river basin planning was imposed on Namibia by a centralised and dominating power when the region was under South African control. This system was inappropriate for, and indeed took little notice of, local indigenous water needs. This disregard reflected embedded ideologies of racial inequality and indeed provides the means to perpetuate these in concrete form: 'political power in much of Southern Africa was literally reinforced through the management of water resources so as to ensure the economic advantage of white farmer settlers and the dis-empowerment of rural Black Africans.' Thabane's chapter contains similar undertones. He examines the historical relationship between Lesotho and South Africa. Water from Lesotho's highlands flows into the river systems of South Africa, many of which are dammed for hydroelectric power and irrigation. Lesotho water, carrying silt into the system, has been described by South Africa as 'a menace'. Thabane charts the origins and effectiveness of the Lesotho Highlands Water Scheme, showing again how a colonial dominance is embedded within the technology and planning of the system; this has echoes in the way the scheme underwent a chequered existence, reflecting the political priorities of South Africa.

Some of the studies here reinforce the idea that post-colonialism and independence are more often than not, neo-colonialism, administered and controlled by more subtle or indirect means but still reflecting continuing dominance and dependency. A good example of the complex historical ties that continue to prove difficult to unravel is provided in the case of Palestine and Israel, where water resource control forms one of the most complex and intractable issues underpinning conflict. Gaarde traces this conflict back to the days of British control of Palestine,

illustrating the plans to develop an infrastructure favouring exports (a favourite British policy) and the ways in which these plans remained unrealised by 1948. Feitelson extends the story into the second period of centralised control – by Israel – highlighting various initiatives, including the priority given to desalination and explores the various initiatives that might result in de-centralisation in the region, though the likelihood of trans-boundary authority remains precarious.

Yet another historical–political boundary crossed by water in recent times is that between the Soviet and post-Soviet regime and its satellites, and similar, though partial developments in China. Developments under the Soviet regime raise interesting issues in terms of ‘traditional’ (perhaps Muslim) ideas on water uses and rights and those inherent in the often grandiose and centrally planned water schemes of the Soviet system, the most graphic failure in this respect being the disaster of the Aral Sea. The legacy of these grand plans now confronts many of the independent states that have emerged. Lange’s chapter explores this legacy in the case of the rivers Amu Darya and Syr Darya and the conflicts that have arisen between Uzbekistan and Kazakhstan, where irrigation projects were constructed, and Tajikistan, where hydroelectric schemes were favoured. The original water system and its engineering was established with its own Soviet national logic, which fitted badly with the independent needs of each successor state. In trying to affect a transition to independence, each is faced with ownership of a different component, and in trying to establish trade and continued independence a number of disputes persist. The massive infrastructure that favoured irrigated cotton growing in one region and industrial concentration in another, for example, has resulted in an extremely complex set of relationships and negotiations in terms of flood control, resource payments and so on. Ilieva’s chapter charts similar problems of transition which have arisen in Bulgaria. The problem in China is clearly different, given that the state itself, though reforming, is still an unfragmented entity, and still seems to favour large-scale ‘solutions’ such as the Three Gorges Dam. Nevertheless economic reform is being undertaken and the introduction of market forces is encroaching. Mao’s chapter explores this transition and outlines the difficulties in ascribing a ‘market’ value to water and introducing some form of water pricing.

## **OWNERSHIP AND NATIONAL IDENTITY**

If we take a more general view of the term ‘ownership’, then water resources might be seen as public in a different sense. Water can be seen as a symbolic national possession. The debate here may not devolve to one of public versus private ownership at the level of the enterprise but

rather possession at a general national political level. Indeed, water can be the focal point for ideas of national identity in certain historical circumstances. As we have seen, the scale and extent of 'water wars' remains the subject of historical debate. It became fashionable among commentators, influenced by climate change predictions, to hypothesise water as the 'oil of the 21st century' – a *strategic* good – and to project that water wars would be a feature of ensuing geo-political struggles in certain regions. Following from these projections, it became popular to ascribe conflicts in the past to water resource motivations, particularly in the Middle East. No doubt many historians went too far in this process and, while water resources may be a *factor* in some conflicts, deeper, more complex causalities – political, economic and cultural – need to be kept in the foreground of the picture. To cite water resources as the primary agent in many conflicts is too simplistic. It is certainly the case, as pointed out in a number of studies in this volume, that many water resources – large lakes and, in particular, large rivers – do overlap national boundaries. International agreements are constantly negotiated and re-negotiated concerning river use. Incidence of conflict over these issues remains a rare occurrence.

Water can be a powerful force for the organisation of national opposition, however. Here we return to the elemental power of water, the symbolic value of a commodity, superseding rational economic values. The ownership and control of water resources in Wales, for example, have often been used as a rallying point for opposition to political and economic control by England. When the major schemes for the impounding and transmission of water from Welsh rivers to the large English cities have been proposed and constructed, opposition, based around the national ownership of water, has been used to promote the interests of nationalist political movements. This was true in the case of the Elan and Vyrnwy schemes to supply water to Birmingham and Liverpool respectively from the 1890s. It was also the case in the 1950s, when the Tryweryn scheme to supply Liverpool was constructed. The construction of the Tryweryn reservoir in particular was used as a catalyst by nationalists to galvanise support for a flagging independence movement.<sup>25</sup> Tryweryn drew resistance both in terms of the drowning of a valley and its culture, but more importantly as the appropriation of a national resource by a 'foreign power'.

Water appropriation as a focal point for resistance can also be seen at a number of levels. The city versus rural communities – Owens valley versus Los Angeles, for example – or local economy and community versus national scale rationalisation – for example, the Three Gorges Dam. In the case of the Three Gorges Dam, opposition is not aimed at a foreign power, but rather the power of the national over the local. For its part national government will often see that local concerns must be

sublimated to the national or at least regional interest: river basin management, large-scale power generation, etc. In the case of the command economies, as we have seen, public was the norm. Elsewhere, the situation could and did change from one regime to the next. Diverse historical and political events shape the context within which ownership is determined and provide the background that may be more or less conducive to private enterprise or state management. Central governments may legitimately step in to control and integrate water resources, where localised political interests are incapable of regulation. Again this may reflect the nature of water resources as a system, a system whose geography does not conform to the political geography of a region. Flood control is perhaps the most obvious example here, though there are many others. An example of this process can be found in the case of the imposition of national controls on river management in Japan during the Tokugawa Shogunate in the eighteenth century, for example.

## CONCLUSIONS

Water might most accurately be termed a 'strange' commodity. The only comparable economic goods might be military ones or possibly medical provision. With the history of water ownership and control, we see a complex overlap and interplay of 'normal' supply and demand considerations plus an added strategic quality, and an emotive, *essential* idea of the nature of water, which has often placed it outside the ambit of 'rational' economic thought. To complicate matters further, some waters – for example flowing rivers, domestic water supplies, and so on – also have a degree of innate recyclability, a good which can be used and used again. Alternatively water can move between different types of good, or become two or more separate goods simultaneously, as in the case of impounded water, for example. The contributors to this volume use a range of methods and hypotheses to probe the complexity inherent in the history of water and its provision. In measuring the extent to which provision went to one sector of the population rather than another, and the ramifications of this, Schmid and Hallström, for example, emphasise the utility of Geographic Information Systems (GIS) methodology, amongst a number of techniques they employ. Their study of Linkopping and Norkopping in Sweden constructs a spatial and temporal analysis which enables light to be shed on issues of unequal provision and its origins, and to track the development of water technologies and systems.

In order to understand how different societies throughout history have managed controlled water resources we need to understand a range of economic systems of thought, but most importantly we need

to understand the ways in which these economic ideals were reshaped when it came to water ownership and control. Economic relationships were subject to the stresses and strains imposed by contemporary science and technology, by cultural and religious imperatives, and by political ambition. Sophal and Acharya's chapter in this volume is particularly poignant perhaps in this respect. Taking a very long-term historical perspective, they outline the development of the irrigation system in Cambodia and show how, despite the grand remnants of civilisations past, the water system was always local, fragmented and at a personal scale 'in harmony with nature in the midst of plenty'. Even the tragic interventions of the Khmer Rouge regime, focussed as it was on the forced construction of large-scale irrigation systems, failed to alter this. It is only now that it is coming under increasing pressure, from the impositions of a globalised economy. The world we inhabit is changing around us in complex ways, the ramifications of which we often only dimly perceive. In attempting to understand the ways in which water has flowed through history, through this volume and its two companion volumes, we can perhaps get a better perspective on where water and history will flow in the times to come.

## NOTES

1. For a general discussion of this process see P. H. Gleik, *The World's Water* (Washington, DC: Island Press, 1998, pp. 24–8).
2. K. Bakker, *An Uncooperative Commodity: Privatising Water in England and Wales* (Oxford: Oxford University Press, 2004).
3. N. Brown, *History and Climate Change: A Eurocentric Perspective* (London: Routledge, 2001, pp. 191, 221).
4. M. Melosi, *The Sanitary City: Urban Infrastructure in America from Colonial Times to the Present* (Baltimore, MD: Johns Hopkins, 2000); Marc Reisner, *Cadillac Desert: The American West and its Disappearing Water* (London: Secker & Warburg, 1990).
5. Eva Jakobsson, *History of Water*, Vol. 1, (London: I. B. Taurus, 2006).
6. Terje Twedt and Donald Worster, 'Hoover Dam: A Study in Domination', in Donald Jackson (ed.), *Dams* (London: Ashgate: 1997).
7. R. Coopey, 'Business and Nature: The Eighteenth Century Midland Ironmasters in their Landscape', paper presented at the Business History Conference, Le Creusot, June 2004; J. Sheail, 'Government and the Perception of Reservoir Development in Britain: An Historical Perspective', *Planning Perspectives*, 1, 1986, pp. 45–60.
8. Donald Jackson, *Building the Ultimate Dam: John Eastwood and the Control of Water in the West* (Lawrence, KS: Kansas University Press, 1995).
9. T. Tvedt, *The River Nile in the Age of the British: Political Ecology and the Quest for Economic Power* (London: I. B. Tauris, 2004).

10. Andre Guillerme, *The Age of Water: The Urban Environment in the North of France, A.D. 300–1800* (Austin, TX: Texas A&M University Press, 1983, p. x).
11. J. Dooge, *Water Science and Technology: History and Future* (Dublin: Centre for Water Resources Research, University College Dublin, 2000).
12. M. Melosi, *The Sanitary City: Urban Infrastructure in America from Colonial Times to the Present* (Baltimore: Johns Hopkins, 2000).
13. Ibid.
14. W. H. Fraser and I. Maver, *Glasgow, Volume II: 1830–1912* (Manchester: Manchester University Press, 1996).
15. J. F. Wilson, S. Sheard and R. Millward, 'Trends in Local Authority Loan Expenditure in England and Wales, 1870–1914', *University of Manchester Working Papers in Economic and Social History*, 22, 1993; J. F. Wilson, 'The Finance of Municipal Capital Expenditure in England and Wales, 1870–1914', *Financial History Review*, 4, 1997.
16. M. Melosi, *The Sanitary City*, pp.36–7.
17. Ibid., p.123.
18. R. Coopey and O. Roberts, 'Public Utility or Private Enterprise? Water and Health in the Nineteenth and Twentieth Centuries', in A. Borsay (ed.), *Public Service or Private Commodity? Medicine in Wales 1800–2000* (Cardiff: University of Wales Press, 2003).
19. G. M. Binnie, *Victorian Water Engineers* (London: Thomas Telford, 1981).
20. J. P. Goubert, *The Conquest of Water* (Princeton, NJ: Princeton University Press, 1986).
21. When the privatisation imperative swept Britain in the 1980s, these companies were quick to expand into British water.
22. N. Ferguson, *Empire: How Britain Made the Modern World* (London: Allen Lane, 2003).
23. Donald Worster, *Rivers of Empire: Water, Aridity and the Growth of the American West* (Oxford: Oxford University Press, 1986); Marc Reisner, *Cadillac Desert*.
24. The Bureau of Reclamation was instrumental in early plans for this scheme, for example, and Western companies such as Siemens are providing generation sets and other technology for the project.
25. Minor acts of terrorism occurred during the campaign against Trewern, including attempts to blow up the pipeline.