

**A History of Water. Vol II**  
**The Political Economy of Water**  
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### **Introduction - Water as a unique commodity**

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 which 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 (World Bank).

However, water has been, and remains the most controversial commodity (perhaps alongside military goods) in terms of the application of economic "laws". There is something emotive - essential - in the nature of water, in the very *idea* of water, often seen as God-given, being at the heart of religious cosmologies and practices, be it in Hinduism, Islam, Buddhism, Shintoism or Christianity, thus militating 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. Water is an essential good it is said, something that humans and societies rely upon for their very existence and development. Bearing this notion of the exceptionality of water in mind this book will examine the ways in which water has been owned and controlled throughout history. It will present examples of different institutional arrangements and management practices as well as of public and private ownership and highlight the rationale behind these forms of control. In doing so the book will show that there are many different waters and historically many different motivations behind the quest for their control.

Water is many things - also political economy exists in many forms, often tied to the inertias of historical development. One way to represent this may be to construct a matrix. Along one axis we might place the spectrum of control ranging from private, through public influence, through regulated private, to private, reflecting the variety of direct and indirect forms which national or local state intervention may occur. Along the other axis we might place the different forms which water takes - power source, irrigation, industrial process, domestic consumption, leisure component etc.

DIAGRAM HERE

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 more besides. It can also exist in all these functions simultaneously. Water can of course 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. Part of the difficulty lies also in the fact that water is always on the move, spatially downwards and in time, as part of the hydrological cycle. This evasive and fluid physical character of the waters present particular challenges and problems related to different forms of control.

### **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, and whether irrigation developed independent of strong central authorities or whether the latter was a precondition for irrigation on a large scale, but it seems clear that the ownership and control of water in some societies was central to 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 some Asian areas which may have been built upon the control of water resources.(Brown) Marx and later Karl Wittfogel identified these "hydraulic societies", as existing around a polity which relied on its monopoly of the control of irrigation for its

general political control. In turn the control of water resources in countries like China and Egypt can be seen to reinforce the tendency towards centralisation - the beginnings of an argument for economies of scale began to emerge, though it is by no means clear that such technical economies existed - rather these systems were based on the overall agglomeration of smaller scale technology grouped into an interconnected system. Also we need to be wary of interpretations of centralised societies and forms of "oriental despotism" in history when those interpretations were written in the context of the Cold War (Brown). These volumes indirectly underline that there is a need for more comparative research on these issues (Sumer, Mohenjodaro-Harappa, Egypt, China, the impressive tank system in the ancient water history of Sri Lanka, for example, as well as the relationship between the emir institution and irrigation systems in smaller communities, as in the Hunza valley in the Himalayas). 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.

Roman water engineering for public supply and hydro-therapeutic 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 Guillerme 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."(Guillerme) 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 13th century (Dooge).

### **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 20th century. Rivers were also very important as highways; they formed the transport networks for thousands of years, vital to communities, trade and cultural diffusion, and as such they played very different roles in England, the Netherlands, China and most of Africa. Rivers provide the basic support for a range of fishing and agriculture, water for domestic or industrial use, and facilities for a range of leisure activities. The latter is by no means inconsiderable. For much of the 19th and 20th 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. Weirs and dams on the other hand 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 that were likely to generate effluent or pollutants, were the subject of controls over siting and intensity of use. Property rights in relation to water usually revolve around rights of use - riparian rights(Cumber). 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 Cumber has noted how the courts were forced to adopt a "reasonable use" strategy which was constantly reinterpreted in the light of changing economic conditions. A variant of this conflict later emerged between the local and the urban - the most notorious example being the appropriation of the water from the Owens Valley to the growing city of Los Angeles at the start of the 20th century (Reisner, Melosi).

Another set of conflicts around the flow of the river emerged 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 13th century the activities of mills were regulated to emphasise the "natural flow" of rivers. By the early 20th 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 hydro-electric 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" (Jakobson). Some 70 percent of Swedish rivers were harnessed for hydro-electric power to fuel the industrialisation of the country after World War One. The idea of industrial power or progress, in harnessing rivers is of course not confined to the Scandinavian experience. Hydro electric and river management schemes, offering flood control, irrigation water, domestic and industrial water and power became the symbol of modernity in the 20th century. Perhaps the most graphic example of

this process being the Tennessee Valley scheme of the 1930s, 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. Though for the embodiment of modernist civil engineering in aesthetic terms the Hoover dam probably gets precedence (Worster).

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 a 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 18th century the Severn's tributary, the River Teme boasted the densest concentration of watermills in the world. By the mid 20th 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 20th century went beyond the issue of instrumentalist riparian rights. Freedom of flow movements were composed of a range of groups - not always acting in concert. Interests might encompass a spectrum stretching from fishing and angling, landscape preservation, industrial archaeology and heritage to concerns about sustaining biodiversity, 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. There was significant opposition to the construction of many late 19th century dams for example, from local angling lobbies in Britain, and a major confrontation over the use of the River Tees in the 1950s (Coopey, Sheail). 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 (Jackson). These pressure groups may in turn operate on a local national or international level.

### **The Municipal Ideal**

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 18th century onwards. In addition, however, increased urbanisation, which to a great extent coincided with increased industrialisation, also brought the extended use of water resources on an increasingly large scale. Cities in America and Europe grew at an unprecedented rate from the mid-19th century onwards. With this growth came problems of water supply and management as part of pressing problems of public health. Private water companies grew as a concomitant to the growth of private enterprise generally - utilising manufacturing advances in technology, better understanding of the 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 the observed linkages of Snow 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", developed in relation to sanitation improvements in London in the 19<sup>th</sup> century, spread throughout the advancing industrial countries and the provision of clean and universally available water supplies became an increasing priority.<sup>1</sup> During this period, from the mid-19th to the mid 20th century, we see the highest 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 the challenge to these companies emerge 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 2950 private. In a much larger sector, municipal companies had captured 70 per cent of the market (Melosi). 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 - a local economy synonymous with the ideal of free trade, for example, built its Lough Katrin scheme in the teeth of local industrial opposition (Maver). Millward has calculated the municipal investment in water schemes in the 19th century in Britain, for example, represent the largest single category of investment in the economy at that time.

The answer to this paradox can be 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 to supply water to New York in the first decade of the 19th century (Melosi). 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.

Though this was 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. 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 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 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>ii</sup>

The set of arguments which 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.(Jenner, Cobbett) 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 of 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 in 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.(Briggs) Similarly, many of the water schemes built in the late 19th century embodied high ideals - often delivered with lofty imagery. Water for industrial cities such in Britain, such as Birmingham, Glasgow and Liverpool, was provided by schemes which impounded distant rivers, behind monumental dams which vied for position as the tallest, largest or most advanced in design.(Coopey, Coopey and Roberts) 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.(Smiles, Binnie, Jackson)

Designs for dams, pumping stations intake and valve towers also began to incorporate a symbolism which embodied monumental pride and echoed an idealised past in its gothic revivalism. Water engineering, more than any other, was seen as emblematic of progress (Goubert). Great play was made of the contrast between the clean, rural source of water and the urban world it sought to regenerate and cleanse (Maver). 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, an albeit manufactured, wilderness.

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 20th century. French private companies, notably Compagnie Generale des Eaux and later Compagnie Lyonnaise continue to dominate French water supplies.<sup>iii</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 which 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.

### **State control - empires of water**

If the municipal ideal 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. A number of 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.(Sahota, Da Souza) Indeed many British civil engineers owed their careers to work instigated in Empire. Imperial authority was reinforced through large scale water systems which reconfigured the ownership, class and politic systems surrounding agriculture and industry in India.(Hardiman) 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 (Sahota). There is also a considerable revisionist school of history which 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, when compared to the Mughal regime which it replaced.

Other prominent examples 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 19th and 20th century. 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 the 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 which came to be dominated by the Bureau of Reclamation and the US Army Corps of Engineers into the 20th century (Worster, Jackson, Reisner). 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 (Worster, Storey). This regime of control through water engineering was eventually dismantled through pressure from two areas. Firstly the dismantling of the apparatus of cold war, and the simultaneous pressure from the environmentalist paradigm which, from the 1960s onwards has challenged 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>iv</sup> It is in the command economies of

the 20th century where we see the most open use of the large scale engineering as a monumental-bureaucratic system displacing local scale initiatives and swamping local communities and cultures (see Tvedt 2003 for a narrative of such grand developments in the Nile valley under British rule). 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 mindset which sees industrial and urban growth as the key goal of economic policy.

### **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. There are a number of examples where the big dams of a country were named after state leaders – as if to underline its role as symbols of power and prestige (Hoover dam, Nasser dam, Atatürk dam, Hussein dam, Assad dam. The World Bank and the United Nations have, moreover, again and again underlined that disagreements over and competition for freshwater resources may become the most important source of conflict in the decades to come. The scale and extent of "water wars" remains the subject of historical debate. It became fashionable among commentators, influenced by a mechanical understanding of climatic change predictions, to hypothesise that water wars would be a feature of ensuing geo-political struggles, and also to ascribe conflicts in the past too easily to disagreements about water - particularly in the Middle East. No doubt

the battle for control over water resources has been an important factor in some cases and a major issue in imperial strategies and state policies in international river basins (Tvedt 2003). But to cite water resources as the primary agent in many conflicts has been too simplistic. It is certainly the case that many water resources - large lakes and in particular, large rivers, do overlap national boundaries. The Nile (running through ten countries), the Danube, the Zambezi, the Jordan, the Mekong and the Indus are among the most famous examples, but there are large numbers of smaller rivers and even streams that cross boundaries. International agreements are constantly negotiated and renegotiated concerning river use. Incidence of conflict over these issues remains a rare occurrence, but on the other hand; to argue, as has become fashionable in the recent years, that waters and rivers have been and will be primarily a source of co-operation and peace, is also too simplistic.

What is beyond doubt, is that water can be and has been a powerful force for the organisation of national opposition. 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>v</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 - e.g. Owens valley versus Los Angeles, for example, or local economy and community versus national scale rationalisation - e.g. 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. 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 physical system whose geography does not conform to the political geography of a region, or a state, or ethnic boundaries. 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 18th century(Sippel).

## **Conclusions**

Water might be most accurately 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 - e.g. 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. In order to understand how different societies throughout history have managed water resources we need to understand these rivers' physical characteristics and their changes over time as well as 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, by the nature of the available water resources and by political ambition.

## Endnotes

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i. M. Melosi, *The Sanitary City: Urban Infrastructure in America From Colonial Times to the Present*, Johns Hopkins, 2000

ii. Ibid. p.123.

iii. When the privatisation imperative swept Britain in the 1980s these companies were quick to expand into British water.

iv. 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.

v. Minor acts of terrorism occurred during the campaign against Treweryn, including attempts to blow up the pipeline.