

ENVIRONMENTAL HISTORY OF WATER RESOURCES

Stephane Frioux

ENS de Lyon, France

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Summary

Water resources, indispensable to life, are relatively limited with respect to the Earth surface and unequally distributed in the humanized spaces. They have been targeted by many different human actions through the centuries. In addition to its use for drinking and cleaning, water has contributed to the development of an increasingly productive agriculture. However, massive irrigation has produced negative results such as the interruption of natural cycles in dammed rivers and the salinization of soils. Seas and oceans remain an important means to transport goods. In the past centuries, rivers and canals have also played a major role in facilitating the traffic of people and merchandise and have structured the economics of many cities. The Industrial Era (ca. 1780-1960 in the West) was a crucial period for the use of water resources because of the competition between different activities needing water: washing, factories needing pure water, factories using rivers as a receptacle for their wastes, professional or leisure fishing, etc. With the decrease of industrial discharges and boat traffic, in the last decades of the twentieth century (and mainly in the Western countries), water has been integrated in many urban development programs as a source of leisure and of aesthetic value. Restoration projects allowed for the return of salmon and other fish species. Water resources remain an object of public policies that nowadays defend a very different goal from the post-WW2 modernist ideologies which led to vast dam and irrigation schemes. Within a perspective of sustainable development, water has to be saved or preserved and its quality must be improved, at a local or regional scale. Nevertheless, great disparities

still exist on a global scale, making “wars for water” a potential threat for the next century.

1. Introduction

No water, no life. Every environmental history work encounters water-related issues, at one stage or another of the research. The statistics indeed aim at being aware that water is almost everywhere on Earth, the “Blue Planet”: 70% of the surface of our planet is covered by water, of which 97% are in oceans and 2% in ice (this last proportion has been decreasing for the last few decades). But when looking at a planisphere, it becomes obvious that people do not have the same relationships with water, if they live in Greenland, in the United States or in Saharan Africa. Throughout history, humankind developed means and technologies to master the water system of the Earth, thanks to processes like storage, treatment or transfer, but even in the beginning of the twenty-first century, the threat of drought continues to be serious for millions of people, while others are periodically targeted by flooding. Even if, during the last century, humankind has altered the hydrosphere as never before, it is quite evident that the great water manipulation efforts pursued by various societies, engineers and political leaders have not produced benefits only, but also significant imbalances in the relationships between local societies and their waterscapes.

Water under its three physical states has many uses for human beings. Firstly, let us consider the solid state: ice can chill beverages and preserve food for several months. In the early twentieth century, the appearance of modern refrigerating devices changed the world meat market, allowing importation from Argentina or New Zealand to Europe. For the scientific community, ice is also an important resource: for instance glaciology uses it as natural archives for climate and earth history. The history of late twentieth-century environmental movements is linked with the preservation of Antarctica and with concerns about the increased melting of ice-floes. Secondly, water can evaporate. Coal and steam were pillars of the Industrial Revolution. But the use of the physical properties of steam date back from the Antiquity. Major progress was made from the time of Denis Papin (seventeenth century) to that of James Watt (one century later, 1769 patent). The nineteenth century was a period of numerous inventions, in terms of engines as well as words (“horsepower”, for instance). Steamboats and steam locomotives revolutionized transportation practices, accelerating the speed of travel and democratizing it by diminishing trips’ costs. The flipside of the coin was the ever increased production of smoke in cities of the “Industrialized World”. Many engineers sought to use steam power; for instance, at the end of the nineteenth century Liverpool took advantage of the steam produced by incinerating garbage to run the municipal tramway. Last but not least, let us consider water under its most common state: liquid. Since the Ancient Times water has been a high necessity for human agglomerations and a relevant geographic condition for their implementation: it was not only indispensable for human life, but also for many industrial processes (textile, tanneries, breweries). Water was also vital for cities to prevent great fires: Rome already had the predecessors of our firemen, the *Vigiles*. The necessity of mastering the provision of water is the reason why the Mycenaean fortresses had deep cisterns, and why many Roman colonies were created near rivers. Rivers, often described through anthropomorphizing discourses, have always been essential to the life of cities - and indeed, most cities are

riverine cities - : they could provide drinkable water if there was no available spring; they offered industrial water, as a source of energy or a component of industrial processes; they were indispensable to boat traffic, to float timber or to ship merchandise to and from the agglomeration.

The uses of water resources throughout history can be classified into five major categories: humankind vital needs and comfort (including personal hygiene and cleanliness of the daily environment); agricultural use for cattle and for irrigation; industrial use as a component of the fabrication process or as a source of energy, means of transportation of goods and people; lastly, the aesthetic or cultural dimension of waterscapes. Besides, we need to take into account the potential hazards carried by water or climate (epidemics, flooding, landslides, and drought). It is only recently (end of nineteenth century) that the idea of resource conservation, and the correlated notion of multi-purpose water development, emerged: many first achievements were realized under Theodore Roosevelt's presidency in the United States, long before the Tennessee Valley Authority of Franklin D. Roosevelt.

Water has always been a topic of interest in environmental history, whether we focus on the disappearance of fish in rivers (Rachel Carson, *Silent Spring*), on the history of resources conservation (Samuel Hays, *Conservation and the Gospel of Efficiency*) or on the pollution by urban wastewater and industrial effluents (Joel Tarr's works). Water is now recognized as a major research subject, as illustrated by the founding of an International Water History Association (2001), and very recently by a new scientific and interdisciplinary journal, *Water History* (July 2009). Let us also note that rivers have also provided a metaphor for history!

The concept of "Water resources" implies focusing on the relationships between water and the human societies and questioning the various uses of the different type of resources (sea, streams, ponds, groundwater, ice). Throughout several millennia, the representations of water drastically changed, evolving from a vision in which water was like a treasure, or a tool, given by divinities to men, to an increasingly anxious point of view, conscious of the non-renewable character of many sources of water and of the multiple risks associated with water pollution.

The present article has no claim to be exhaustive, since it is quite impossible to completely address such a broad topic, around which many fields of study meet. Rather than trying to cover all aspects of water environmental history, it will provide some highlights carefully chosen to exemplify a number of issues, to show original situations and a number of new elements taken from still unpublished personal research results. It will explore the various facets of the humanity/water resources relationships, by studying on a very long term the main usages of water, even if the attention will of course be drawn upon the twentieth century, in which a hugely increasing demand and use of water transformed the daily life and the environment of millions of people. Examples will be taken on specific case-studies.

2. Drinkable and Domestic Water

Cities had always been dependent on vital needs of their dwellers, and the problem of

food and water supply is one of the most crucial for urban authorities. Getting enough water for a growing population was a major challenge, inspiring sometimes ingenious solutions. Of course, water was indispensable to Hellenistic cities but it is during the Roman period that cities acquired most public facilities related to water control and management: the aqueduct/fountain couple became a standard pattern of the Roman city-planning. Water towers (*castella*), networks of pipes (*fistulae*), public taps (*salientes*) represented expensive equipment that was firstly financed by public funds, then by rich people like Agrippa, the son-in-law of Augustus. The Augustan period marks the generalization of a water management policy: beyond technical progress and the diffusion of hydraulic monuments, new administrative structures were set up, and the distribution of water carried by aqueducts to domestic buildings broadened from aristocratic houses to “middle-class” *domus*.

The Roman civilization was also famous for the cultural importance given to the public baths (*thermae*): water was an object for evergetism and tourists can still visit Caracalla's *thermae* in Rome, as well as dozens of public baths in the former “Roman world”. Use of water for cleaning bodies – and souls – remained a core value in other civilizations, like in the Muslim world; while popular baths in Christian Middle Ages cities were progressively denounced by clerks as places of immorality.

For centuries, water was generally not delivered to urban houses (or provided to a very small percentage of buildings), while the locations of rural settlements were often chosen because of the existence of a spring, a pond, or the digging of a well, indispensable to satisfy the vital needs of the human beings as well as domestic animals and plants. A few cities had aqueducts, the best example being Republican and Imperial Rome; in other cases, urban dwellers relied upon hundreds of thousands of private wells or sometimes cisterns gathering rainwater, or a combination of those systems, like in Jerusalem. The richest citizens could afford the service of water haulers. It is only very recently, compared to the long-standing nature of the urban phenomenon, that people have been able to turn on a tap to get the precious liquid. Often, it has been possible through a change in the supply system, involving the use of surface water from lakes or rivers, or groundwater related to the river. In a country like France, after the Second World War, an inquiry stated that in 38 014 “*communes*” (the smallest administrative division), approximately one third had functioning water supply systems. In many rural districts, villages and scattered farms were linked to a public water system only in the late 1960s. Before that time, each farm relied on harnessed springs or on its own well. Today, approximately two billion people still do not have any domestic access to public water (and much more cannot drink bacteriological safe water).

To quench thirst, water has always been in competition with other – tasty – beverages, since the Ancient times: beer, wine, various types of alcohol, and nowadays sodas. Was it only a question of taste, or a question of accessibility and/or conservation of safe water? Waterborne diseases, like cholera or typhoid fever, struck Western cities until the first half of the twentieth century (for instance, the population of Hamburg was decimated by a cholera epidemic in 1892; Russian and Italian cities suffered from the same disease as late as in 1910-1911). Nowadays, waterborne illnesses are still considered as the second highest cause of mortality. Thus, the World Health Organization continues to foster the fight against the consumption of polluted water. Of

course, the issue of pure water has also been an economic one: at the turn of the twentieth century, the implementation of technical devices to purify tap water was often neglected by local authorities who did not understand the importance of spending much money on it. Today, some countries or coastal cities lacking sufficient water supply systems have invested in desalinization plants to use sea water for domestic purposes: technological tools are more and more available to create more drinkable water resources, but they are expensive, discriminating among societies and countries affluent people who can get water even at a high price, and much poorer communities deprived of money necessary to finance such equipments.

Moreover, for a long time, consumers had been accustomed to get water for free, and the idea of paying for water has been very slow to diffuse into societies. During the nineteenth century and early twentieth century in Western cities, and much longer in other countries, people got their water from public fountains set up in squares or at each street corner. Engineers had to struggle to make politicians and citizens understand that the improvement of water both in quality and in quantity was correlated to a pay-for-what-you-get system, through the installation of water meters.

Water resources are not only useful for the consumption of food and beverages; at the other end of the domestic cycle, they serve to carry away all wastes produced by human bodies and by cooking and housekeeping. Environmental urban history is concerned with what Joel Tarr has called the “search for the ultimate sink”. At least since the Roman world, urban authorities had to think about a water-carriage system to deal with sewage problems.

But for centuries, the problem has been difficult to solve in many cities: either the canalizations were too small, or water was insufficient to flush the sewers. Sometimes, there were even no underground pipes, but only small gutters or narrow drains between buildings; wastes stagnated until a rainfall flushed them, and in summer time, the accumulation of organic wastes produced foul smells to which some urban dwellers attributed diseases. Rivers were seen as a convenient public good to dump wastes at will; even if some regulations were established, like the forbidding of throwing wastes during the daytime, nightly discharges did not suppress water pollution.

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Biographical Sketch

Stéphane Frioux recently completed a PhD in urban environmental history (2009) at the University of Lyon II, France: *The Networks of Modernity. Environmental improvements and the diffusion of innovations in urban France from the late 19th century to the 1950s*. He currently teaches at the Ecole Normale Supérieure de Lyon. In 2003 he was awarded the first ESEH (European Society for Environmental History) Publication Prize for his article "Assainissement urbain et vie politique à Limoges, 1849-1914", which was published in the French academic review *Cahiers d'histoire* in 2002. Since 2007 he has served as French Regional Representative for the European Society for Environmental History, and has presented communications at several international environmental history meetings. He is currently pursuing research on municipal environmental sanitation policies implemented by French provincial cities in the 20th century, especially as regards water and air pollution. He is guest editor of an issue of the French review *Géocarrefour* on the topic "Plague, resource, outlet: visions and uses of urban rivers (18th-20th centuries)" (<http://geocarrefour.revues.org/>, forthcoming, 2010).