Water & Technology

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Water - A History

Introduction

The examination of the relationship between mankind and his surroundings is philosophy. Historically, it has explored the interplay between the individual and an infinite universe or ultimate beings. Now, however, the evolution of thought must consider the earth's carrying capacity and degradation. Sustainability and environmental issues are rapidly becoming urgent moral and ethical matters that are facing humanity as a whole. Therefore, to give a historic perspective, we will examine the interplay between the environment and society through twelve, albeit arbitrarily selected, events. Water is used as an example to represent, if for no other reason than it dominates the surface of the Earth and historically has for billions of years. Science, faith and the technological needs of humanity are associated with civilization

Environmental philosophy examines the interactions between man and nature. As humankind is forced to reflect on the livelihood of our descendants, we can also question what organizations can be environmental advocates or caretakers. Such a debate could include evaluating the type of structures one could have in place to address rapidly evolving disasters. More fundamentally, we can ponder if knowledge, or even God, can exist without a context or physical perspective. This brief summary is intended to seed these discussions and make a plea for the confluence of thought and nature.

Water through Twelve Events

1. A sequoia tree can grow to be one hundred metres high. The main reason relates to the capillary action which permits water to be drawn up through the internal tubes (xylem). Interestingly, redwoods, which evidence dates back *two hundred million years* to the Jurassic period, grow higher when in groves. The social element of **trees** can be appreciated by their use as totems. These serve as shore beacons and also to communicate the artist's impression related to the hierarchy of life. A common figure is the raven, which, West Coast oral history tells, brought the earth's first inhabitants, in a shell, to a shore.

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2. Schematic communication, such as art found in **caves**, dates back at least *two hundred and seventy millennia*. Most of these subterranean paintings depict the relationship between the social structure of the time (clans) and animals. Fish began to be harvested about one hundred thousand years ago. One may argue this is the onset of the emotional and social impact of water. This, as everything does, evolved and tools date to thirty-five millennia. At about that time ideograms reveal man on boats casting nets. Interestingly, the primitive technology precedes the discovery of phonetic alphabets. The use of aquaculture would come later as would a shift from collecting water to redirecting it. Innovation was motivated by urgency

3. The pacific archipelagos have been colonized for at least *sixty thousand years*. While islands are visible to each other, most were sufficiently distant to require canoes. Launching into a sometimes hostile ocean and unknown was, indeed, a leap of faith. Some, though not all, of the discoveries may be attributed to ships going off course. Until quite recently the sea people of the orient spent their entire lives afloat.

4. Rivers and lakes are often international boundaries, though this can lead to political tensions. Approximately *800 BCE* the Austronesians built the first sea **port**, which later led to the Silk Road. The establishment of harbours was a key component in the Spanish, Portuguese, Omani and later British empires. Prior to this, conquest was generally carried out on the ground. One example of this was the path the Khans took through Asia and back to Mongolia. The key transport route, be it a river or a land-based artery, is usually the axis for economic development. Therefore, distance from them is often correlated with poverty. Development proceeds along lines, or thoroughfares.

5. The **boat** is the bridge and the bridge is the boat. In 513 BCE Darius would march, with an army of millions, from Persia to Europe. The Hellespont is the narrowest passage between the continents and prevented circumventing the Black sea. A series of ships were anchored in parallel and used to support a walkway. The land invasion was more successful than that of the naval fleet, which was mostly lost in heavy storms. While the link was an innovative platform, it was, however, temporary. Retreat was necessary while the scaffold was still functional. By having a bridge where none could be imagined, the concept of defence was shattered.

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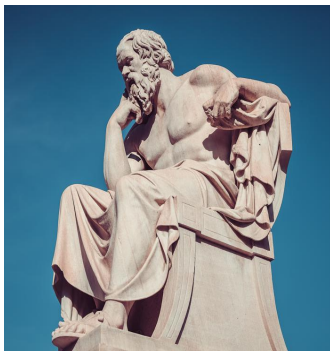
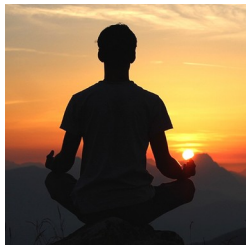


6. The impact of conquering water may well be related to the birth of **philosophy**. When the invincibility of city states was demonstrated, mankind started to question its role in the universe. Philosophy took form at about the time when humans began to look to the sky. God, and the unknown, became a response to questions seemingly without an answer. Socrates, born in *470 BCE*, proposed that the value of life was virtue. The Oracle considered him the wisest in Athens for understanding he knew nothing. Socrates' death often is associated with the outset of Western thought though he, Confucius and Buddha are usually considered contemporaries.



7. Eastern religions focus on the evolution of the individual. Indeed, full enlightenment has, since the fourth century BCE, been associated with harmony and purification. The influence of the mind on one's metabolism is a component. **Meditation** can mediate the quantity of water needed or change the temperature of the skin. One measurement of concentration is to sit and think overnight beside a pile of wet shirts. Once one is dry, a new one is worn. In the morning, one quantifies the extent of the mental mastery by counting the number of dry garments. It is an oversimplified metric though one which relates the mind and body

8. The bank in Petra, which is dated to the second century BCE, is carved into the stone in a hidden gorge. The city of approximately thirty thousand controlled its colonies in part by the system of **aqueducts** carved into the side of the cliffs which approach it. The Aztecs would master waterways. Later, in the Iberian Peninsula, elevated stone trusses were used to deliver potable water and keep it separated from human refuse. Several examples of these engineering feats still remain.

9. Suspension **bridges**, supported by towers, were built in the fifteenth century in what is now Tibet. It was a time when religion and philosophy were essentially evolving in unison, be it Taoism or Christianity. Neither were reachable to the masses as their transmission was either oral or in foreign tongues. One can use the example of Jerome. In the *fifth century* he translated into a common language what had been defined as the Bible. In doing so he created a bridge between mankind and thought. It is not so different from spanning water and providing a new horizon to explore. One can question, then, if all bridges, physical or intellectual, are not really societal links.

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10. The **watermill** was part of the canal age and predates the windmill. The early industrial age, in the *eighteenth century*, certainly relied on running water as a means of generating direct power. An internal combustion engine is fortunate to get twenty percent of its power to the road. Saw mills often achieved efficiencies of ninety percent. The mill served not only for production, but the associated canals provided a way to manage the hygiene of the river and harvest various aquatic species.

11. From fire to **steam**. The relationship between fire and water was materialized in the form of propulsion. Steam-driven engines were used to pump water from mines by *1698*, and Watt would make the first power plant in 1765. These were applied in heating, cleaning and humidification. Steam is also applied in sterilization, both in food and beverage as well as biology and medicine. Water vapour in the atmosphere reflects certain wavelengths of radiation back to the surface, maintaining planet temperature.

12. Ronald Amundsen completed the Northwest passage, across the Northern Arctic by *1906*. it is now an international shipping route, with relatively little **ice**. Five years later, with the aids of dogs and skis, he was the first to the South Pole. The birth of aviation allowed him to reach the North Pole, by flight, in 1925. The icing of Antarctica began over forty million years ago. Some caves, still intact, have been discovered which date over two million years.

Conclusion

Humanity is part of an unfortunately degrading system. Ice fields, much like redwood groves, cannot exist in isolation. The environment is also neither infinite nor absolute. Given their limits, and unidentified thresholds, individuals and society have begun to pose questions. With this examination we attempted to use water as an example of the limitations we may face, and the indicators which could quantify them.

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Updates

Water: Water Defenders

The purest water, in terms of metal concentration, was thought to be trapped in ancient arctic ice. The indigenous communities of “Tay” and “Tiny”, about 100 km north of Toronto, have an aquifer with five times lower lead concentrations. This is thought to result from the water filtering through a combination of silt, gravel and soil for thousands of years. The source is at risk of contamination due to rock mining.

In Honduras, six activists, or “Water Defenders”, arrested for protesting an iron ore pit mine in the Carlos Escaleras National Park have been freed by the country’s highest court.

Technology: Water as a Driver of Democracy

One thousand years ago the Netherlands had 2300 “water boards”. By the 17th century these communal organizations could levy taxes and punish polluters. Some argue that the water structure itself was the basis for Dutch democracy. Twenty one of these institutes remain today though with an extended role. They monitor flooding defences, canals, and are responsible for wastewater treatment. They generate 95% of their needed revenue through their own taxes. The Dutch system is used in Vietnam, Ethiopia and Peru, as examples.

EHS: Is Safe Water Affordable?

Currently 57% of Ethiopia’s population has access to “potable” water, up from 14% three decades ago. However, two-thirds of these wells seem to be contaminated with e-coli, causing diarrhea. In southern Italy approximately 90% of aquifers are contaminated with waste. Many countries permit disposal of untreated sludge into rivers. Resulting in water that cannot be used, even after processing. With 50% of water lost in conduits, and with the cost to construct wastewater treatment facilities at approximately $1000/person, international organizations question if safe water can be affordable.

The US-based National Toxicity Program added eight new substances to their list of carcinogens. This includes antimony trioxide used in plastics and fire retardant production. Six chloro- and bromo-acetic acids. Dichloroacetic acid is a trace product from the chlorination of water. It is also used in topical applications such as the treatment of warts.