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Steven Soloman, *Water: The Epic Struggle for Wealth, Power, and Civilization*

Steven Solomon, *Water: The Epic Struggle for Wealth, Power, and Civilization*, Harper Perennial Publishing, New York, NY (2011); 596 pp; \$17.99; ISBN 978-0-06-054831-5; paperback.

Steven Solomon is a journalist and historian, and his prior works can be found in *The New York Times*, *Business-Week*, *The Economist*, *Forbes*, and *Esquire*. *Water* looks back through the annals of history ending in the present day and draws correlations between the successful development of water resources and what it means to be a successful civilization.

The *Prologue* paints a comprehensive portrait of civilization's use of water from the time of Abraham through the present day. Repeatedly, history has shown that successful civilizations are those , which harness the potential of water for industry, security, expanding economic capacity, domestic consumption, and do so sustainably. Throughout history, innovative societies have created key water breakthroughs that propelled the world's civilizations forward until the next heralded breakthrough. So the cycle continues; however, with no water breakthrough on the foreseeable horizon, the 21st century will be a century of reckoning. Those societies that are flexible and innovative will make it, while leaving those societies that remain entrenched in the conventional wisdom of yesteryear behind.

Part I, *Water in Ancient History*, explores the various methods some of the world's earliest civilizations used to exploit water resources.

Chapter One, *The Indispensable Resource*, highlights that of all the resources we depend upon water is the only renewable one. Yet, what we have access to as recoverable freshwater is less than one percent.

Chapter Two, *Water and the Start of Civilization*, theorizes that throughout history the most successful civilizations were those that best utilized their water resources. Historically there are five ways civilizations have used water: (1) domestically for drinking, cooking, and sanitation; (2) economic production for agriculture, industry, and mining; (3) power generation; (4) transportation; and (5) environmental mitigation. As technological innovation and expertise progressed—and access to irrigation water made easier—agricultural production increased translating to an upsurge in human population.

It is a correlation that is not unique in history. The reliance on irrigation to produce food for an ever-growing population continues today. It is no small significance that in water scarce civilizations strong-centralized leadership structures were commonplace.

Chapter Three, *Rivers, Irrigation, and the Earliest Empires*, discusses four of the cradles of civilization of ancient history: Egypt, Mesopotamia, Indus, and China. The common denominator shared by each of these civilizations is that they grew grain irrigated from large, flooding, and navigable rivers: the Nile, Euphrates and Tigris, Indus, and Yellow rivers respectively. In these early civilizations, if a leader controlled the water, they controlled the people. While water was at times plentiful, its erratic

regime and physical properties posed significant challenges for exploitation. Direction from a strong central authority and the use of a massive labor force defined water projects during that era.

Chapter Four, *Seafaring, Trade, and The Making of the Mediterranean World*, theorizes that trading among the various city states dotting the Mediterranean coast developed because of limited water resources. Trading encouraged the early Mediterranean states to develop early forms of market-based economies with a vested citizenry. For many of these city-states, survival was dependent on the development of a worthy navy. Rome's rise to superpower status occurred only after wresting control of the sea-lanes of the western Mediterranean. Often, Rome's most successful periods were those during aqueduct construction and an expanding water supply. There is little doubt that this ability to exploit water resources—unrivaled until modern times—led to Rome's unparalleled rise to power.

Chapter Five, *The Grand Canal and the Flourishing of Chinese Civilization*, highlights China's superior exploits in mastering its water resources. The Grand Canal was its water breakthrough, bridging the gap between the drier northern reaches with fertile soils and the moisture-rich but nutrient-poor southern reaches. The development of the Grand Canal gave China access to 30,000 miles of inland water travel for distribution of supplies. It provided the catalyst for revolutions in transport, agriculture, and industry.

Chapter Six, *Islam, Deserts, and the Destiny of History's Most Water-Fragile Civilization*, discusses the pivotal role early Islamic civilization had as the liaison between East and West. Acting as the nexus between East and West, the Islamic civilization had a broad and effectual power base from Spain to North Africa to the western borders of the Silk Roads in Asia. No other civilization was more bound to the hydrological regime than the Islamic civilization, where water scarcity meant complete reliance on trade for food.

Part II, *Water and the Ascendancy of the West*, discusses the key role water had in the Industrial Revolution and the rise of Europe.

Chapter Seven, *Waterwheel, Plow, Cargo Ship, and the Awakening of Europe*, highlights two transformative water breakthroughs for the West: (1) trans-oceanic sailing with long distance cannonry, and (2) the use of water power for industry. Northern Europe's temperate climate provided adequate moisture for agricultural production and plentiful streams for industrial use of water. On top of that, the coastline provided many natural harbors for shipping. The invention of the moldboard plow triggered an agricultural revolution that required more effectual water management schemes. Mirroring the expansion in agricultural productivity, Europe's population doubled in the 400-years between A.D. 700 and 1200. Advances in the cog—a ship that by 1200 was able to transport over 300-tons—opened up Europe for trade and supported thriving markets along Europe's coast.

Why was Europe the birthplace of modern day capitalism? The late anthropologist Marvin Harris theorized, "Unlike hydraulic despots, Eu-

rope's medieval kings could not furnish or withhold water from the fields." Lacking that control, Europe's citizenry were free to develop cultural and economic identities.

Improved navigation, ship design, and advances in long-distance cannonry also contributed to Europe's rise. Trade increased exponentially because of these advances within the Mediterranean region, eventually leading to Europe's trans-oceanic seafaring. Chapter Eight, *The Voyages of Discovery and the Launch of the Oceanic Era*, highlights the significance of this event. Essentially, because of these voyages of discovery, the next 500 years belonged to European powers as they ventured forth to secure raw goods, slave labor, and precious metals.

Chapter Nine, *Steam Power, Industry, and the Age of the British Empire*, discusses the rise of Great Britain and its technological prowess in the nineteenth century. Driven by a shortage of local wood fuel, England was keen to develop methods for heating and textile production without the use of wood charcoal. The Industrial Revolution came about in two phases. The first centered on textiles and the use of the water-wheel—and later steam—in a centrally organized production model *i.e.*, a factory. The impacts these developments had on British culture were profound, economic growth accelerated from one percent to over four percent annually.

Part III, *Water and the Making of the Modern Industrial Society*, explores the challenges and triumphs of managing water resources as civilizations transitioned into the modern age.

Chapter Ten, *The Sanitary Revolution*, highlights the consequences of poor water quality. Industrialization encouraged concentrated urban centers, which compounded the effects of pollutants. Since Rome's heyday, the link between health and proper sanitation remained illusory in Europe. Scotland initiated a Rome-styled water impoundment program and incorporated water filtration. London soon followed. Becoming evermore dependent on the Thames for freshwater due to increased population and industrial use, London was vulnerable to large and severe Cholera outbreaks. In response, London invested in state-of-the-art sewage and freshwater delivery systems that were independent from one another. By 1940, the United States had virtually eliminated waterborne diseases by installing wastewater treatment facilities while acquiring and protecting new freshwater resources. These developments proved essential to the sustainability of the city and played no small part in the West's rise to dominance.

Chapter Eleven, *Water Frontiers and the Emergence of the United States*, discusses the transfer of power from Europe to the United States and America's ability to capture its diverse water wealth. Employing "Yankee ingenuity", along with European technologies, the United States experienced exponential growth with the opening of the frontier west of the Appalachian range. Many large navigable rivers, engineered canal-works, and able steam-powered riverboats, coupled with a trans-continental railroad network, fueled America's industrial engine. Utilizing water resources in its eastern half, the United States made proficient

use of the water turbine in factories while the nation as a whole exploited hydropower to provide cheap and accessible electricity. The United States demonstrates again that those civilizations that best harness their water resources and continually innovate their water infrastructure find themselves at the top of the heap.

Chapter Twelve, *The Canal to America's Century*, describes the herculean effort brought by the United States to construct and operate a canal across the Isthmus of Panama. The United States went to great lengths to build the canal; it fostered Panamanian independence in order to wrest control of the isthmus from Columbia. Facing the challenge of widespread yellow fever and malarial outbreaks, the United States created vaccines and devised strategies to significantly reduce infection rates, which in turn increased worker's productivity on the canal. Moreover, it employed steam-power in innovative ways to get through the most daunting stretch of the canal—the Culebra Cut.

The benefits of the completed canal were almost immediate. Today billions of dollars worth of various goods and commodities pass through the canal every year. Construction of the canal further propelled the United States rise to superpower status. By incorporating the Pacific and Atlantic fleets at short notice, the United States could respond to challenges all over the world.

Chapter Thirteen, *Giant Dams, Water Abundance, and the Rise of the Global Society*, brings to the forefront the many advances in water resource exploitation in the twentieth century and what it may mean for communities in the twenty-first century and beyond. The development of massive multi-purpose dams, such as the Hoover on the Colorado River and Bonneville on the Columbia, provide inexpensive electricity and subsidized irrigation water to rural communities and growing cities such as Los Angeles, Phoenix, Las Vegas, and San Diego. While not immune to the consequences of drought, the advent of the multipurpose dam created large reservoirs with the capability to trap multiple years' worth of a river's flow. Civilizations around the world soon initiated similar projects: Egypt's Aswan Dam, China's recently completed Three Gorges' Dam, Turkey's Ataturk Dam, and Pakistan's Tarbela Dam to name a few. In sum, over 45,000 large dams exist around the world, reservoir capacity has quadrupled, agricultural production expanded by two and a half times, the availability of hydropower doubled, and overall world GDP multiplied by six.

Part Four, *The Age of Scarcity*, brings it all together by connecting the lessons of the past to the uncertainties of the future.

Chapter Fourteen, *Water: The New Oil*, brings to the forefront the new realities of the twenty-first century's Water-Haves and Have-Nots. As oil was to the twentieth century, water is to the twenty-first. However, there is one key distinction that makes this comparison inadequate, oil can be replaced—albeit painfully—by other fuel sources, while water cannot. A paradigm shift is taking place. Most of the world's accessible water resources are built-out and tapped out. Absent a new water breakthrough, which is not likely in the near future, civilizations around the

world are about to go through a tumultuous period like none before. The disparity between the Water-Haves and the Water Have-Nots will increase.

Chapter Fifteen, *Thicker Than Blood: The Water-Famished Middle East*, makes mention of the fact that currently, in the Middle East, water use exceeds 120 percent of renewable supplies. Egypt, for example, is dependent on forces outside of its border for access to the historic flows of the Nile. Innovative watershed-wide agreements will need to be legitimate and enforceable for success in the region.

Equitable apportionment of the Jordan River is crucial to any Palestinian-Israeli peace agreement. While water reuse and desalinization can offset some losses and provide some wiggle room, the Jordan River will continue to play an integral role moving forward. Much as Ethiopia holds the key to the Nile, Turkey holds the key to Euphrates and nearly half the Tigris River's waters. Iraq and Syria are both dependent on Turkey's willingness to distribute impounded waters equitably. From the Arabian Peninsula to Northern Africa the few remaining exploitable water resources that exist are going to be up for grabs. Success in the region will depend on how well the various interests can work together.

Chapter Sixteen, *From Have to Have-Not: Mounting Water Distress in Asia's Rising Giants*, discusses the constraints on water resource development in Asia and the deleterious effects of environmental degradation on its economy. Along with the United States, China and India produce half of the world's grain; any shortage of water in this region will undoubtedly have a global impact. India's infrastructure is dependent on seasonal monsoonal patterns leaving India vulnerable to the slightest change in climate. Coupled with unregulated and pervasive groundwater extraction India is ripe for disaster. While China continues to pursue large-scale water projects with massive multi-purpose dams, although realizing a clear economic benefit from the distribution of irrigation water and inexpensive hydropower, the environmental effects of unchecked growth may retard its economic growth.

Chapter Seventeen, *Opportunity from Scarcity: The New Politics of Water in the Industrial Democracies*, imports the idea that while the threat of conflict in a water scarce world is very real, it is by no means inevitable. Small-scale, ecosystem-oriented solutions are beginning to take root in many industrialized societies. Market forces are beginning to show themselves as scarcity becomes more noticeable. We are seeing efficient water reuse with existing technologies; municipalities are creating sustainable systems that safely and economically create reused treated wastewater for domestic supply. Irrigation practices are becoming more efficient, coupled with the planting of crops that are better adapted to the environment. Communities are using desalinization to augment drinking water supplies. Landscape practices around homes and businesses include the use native plants and decorative rock in place of water hungry lawns.

As promising as these innovations are, they are still facing plenty of headwinds. There is the constant threat of rolling back environmental

safeguards. Moving water still requires tremendous amounts of energy, which in and of itself is becoming more costly. These challenges can be overcome by bold leadership, unconventional foreign policy directives, and taking advantage of strategic alliances. It may take a full-fledged crisis to bring these new forces to bear, but without a new water breakthrough, the only viable way out of the impending crisis is to employ these factors to achieve a sustainable and efficient use of water resources.

The *Epilogue* highlights four traditional categories of water use: (1) domestic use; (2) economic production; (3) power generation; and (4) transport or military. The author advocates for a fifth category: innovation of governing bodies and technologies to better tap into available resources sustainably and in a way to equitably distribute freshwater to a thirsty planet. This can be done by maximizing efficiency in existing technologies, employing market oriented incentives that assign a realistic value to water, continued investment in effective infrastructure, and adaptability to each nation's water requirements. Finally, we should never forget the lessons of history.

Water provides a comprehensive overview of civilization's successes and its failures exploiting water resources. Offering more of a historical overview than contemporary analysis, the book sheds light on the inherent value placed on water, a value taken for granted in a majority of developed societies. While *Water* does a good job of integrating the lessons of history into a contemporary analysis, the book's best asset is the in-depth descriptions of water's impact on humankind throughout the ages and how we, as a society, can use those lessons when facing the water challenges of the future.

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