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Let There Be Water: Israel's Solution for a Water-Starved World

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BOOK NOTE

Seth M. Siegel, Let There Be Water: Israel's Solution for a Water-Starved World, A Thomas Dunne Book for St. Martin's Griffin (2017 reprint); 368 pp.; ISBN 978-1250115560.

Seth Siegel is a lawyer, activist, writer, and successful serial entrepreneur. His essays on water and other policy issues have appeared in *The New York Times, The Wall Street Journal, The Los Angeles Times,* as well as leading publications in Europe and Asia. He speaks regularly on a range of topics, including water policy, Middle East politics, and national security. In one of his latest books, he examines Israel as an increasingly viable model for how to deal with impending water shortages worldwide.

Part I, "The Creation of a Water-Focused Nation," covers three chapters. Chapter 1, "A Water-Respecting Culture," discusses some of the principles Israeli schoolchildren are taught. Essentially, Israel teaches the youth of the nation how to minimize the use of water, embracing the idea that saving water is everyone's job. Israelis use the educational process to teach water conservation. Turning back the clock, Siegel takes the reader to the young State of Israel's beginning, and the Zionist pioneers' decision to make water the common property of all. Siegel explains that the nation codified its water in a series of laws that confirmed the centralized water philosophy of Israel. The first, passed in 1955, prohibited any drilling for water anywhere in the country, even by an owner on his private land, without first obtaining a license to do so; the private property rights yielded to government control. The second of the water laws, also passed in 1955, prohibited any distribution of water that does not pass through a meter. This requires that all utilities install separate meters to measure the amount of water provided to each home or business. A third law, passed in 1957, addressed surface water. This placed the water found in rivers and streams under government control and took charge of rainwater. The law took ownership of the sewage flowing out of Israelis' homes. The law prohibited diversion of any of these forms of water without first receiving a government permit. It compelled farmers to obtain a license before herding their own grazing animals on their own property if the animals would cross a waterway in the process. This centralization ultimately culminated in 1959 when the legislation vested in the government "widespread power to control and restrict the activities of individual water users in order to further and protect the public interest." Ultimately Siegel points out that Israel's water system may be the most successful example of socialism in practice anywhere in the world today.

Chapter 2, "The National Water Carrier," explores a pivotal point in the Israel solution to a diminishing water supply. Jewish water engineer Simcha Blass, pushed by the British White Paper of May 1939, asked to create a "fantasy water plan" that could be presented to the British in the hope that it might modify their thinking about expanding the number of Jewish immigrants.

Blass's idea was to develop a massive infrastructure project that would take water from the water-rich north and bring it to the water-limited center and water-impoverished south. Blass proposed a three-phrase approach to national self-sufficiency in water. First, Blass believed that large amounts of water lay below the surface of the Negev desert, accessible by deep drilling. Second, Blass proposed pumping water out of the Yarkon River, north and east of Tel Aviv, and transporting it to the Negev, primarily for agricultural use. Then, water would be brought from north to south via mostly underground infrastructure that would bisect the nation in what would become the National Water Carrier. Using the diversion of the Colorado River as a model, an engineering feat that brought freshwater to Los Angeles, Blass created plans to transport these sources of water south as needed, until the system would terminate at farms dotted throughout the then-sparsely populated Negev. The National Water Carrier enabled the Negev desert to fulfill Ben Gurion's pledge that Israel would make the desert bloom. The country's new system not only improved water reliability, access, and quality overnight—it also served as a great inspiration for the young nation.

Chapter 3, "Managing a National Water System," discusses how Israel began to distinguish its system from the rest of the world. Siegel points out that initially the Finance Ministry set water prices, except for the price paid by farmers, the price of which the Agriculture Ministry set. However, in 2006, The Water Commission was renamed the Israel Water Authority, and it was given real authority when power was transferred from the political level to a technocratic one. This became essential to the success of Israel. In 2008, the Water Authority announced that everyone would have to pay the real price for the water they were using. The reason for the price increase was not exclusively related to conservation, Siegel explains. The water regulators wanted to maximize spending on water infrastructure, both existing and new. The water fees were to be spent exclusively on the nation's water needs, with nothing diverted to help balance other parts of municipal or national budgets. Thus, water prices increased by forty percent in all households. At about the same time the price hikes went into effect, the Water Authority took away management of all water and sewage from every municipality and created a new, apolitical system of municipal water corporations.

Part II, "The Transformation," covers four chapters. Chapter 4, "Revolution(s) on the Farm," begins by focusing on Jewish water engineer Simcha Blass. Blass visited a farm in the 1930s when he noticed a row of planted trees. One of the trees was much larger than the others. Blass noticed a small leak in an irrigation pipe near the base of the taller tree. This image stayed with Blass, and would ultimately help create drip irrigation, which completely revolutionized agricultural water use in Israel and worldwide. After several years Blass made two discoveries. First, regardless of the location of his experiment in Israel and regardless of the type of tree or plant, drip irrigation used far less water than flood or sprinkler irrigation on adjacent test areas. On average, drip irrigation saved fifty to sixty percent of the water customarily used. Second, the yield from crops watered with drip irrigation was higher than with other known irrigation techniques. Blass did run into hardships though. One major challenge, Siegel points out, was when Blass buried the drip line next to the seed. The experiment quickly ended when the roots migrated into the drippers, blocking the

flow of water and killing all of the trees. Luckily, Blass adjusted and, following the suggestion of Yehuda Zohar, the drippers were placed at the base of the trees rather than in the soil. This proved to be extremely successful. As technology has advanced, drip irrigation has become more efficient. Not only are there now drip systems that produce higher yields with less water, but the driplines also save on the energy cost of pumping water to the field. Drip lines have also been used to increase efficiency when applying fertilizer to the seeds, resulting in a decrease of polluting runoff from excess fertilizer.

Chapter 5, "Turning Waste into Water," reveals yet another way Israeli scientists found to conserve water. Siegel begins the chapter by enlightening readers, explaining that over eighty-five percent of the nation's sewage is reused. Sewage includes everything that goes down the sink, shower, bathtub or toilet, and the rain that falls into the storm drains. The country began using Sand Aquifer Treatment ("SAT") to obtain tertiary-quality reclaimed water. This process essentially uses fine sand as a filter for cleaning sewage. Using SAT systems, sewage in Israel can supply a third of the water needed for agriculture. Israel began the treatment of its sewage to reduce pollution and to improve the quality of its citizens' lives. In the same breath, Israel developed a parallel water supply that can be used safely in agriculture.

Chapter 6, "Desalination: Science, Engineering, and Alchemy," discusses the old idea of how to make salty seawater potable. The large-scale desalination of the Mediterranean seawater appeared to be an ideal solution to persistent water shortages. Alexander Zarchin made the first attempt in 1954, where he proposed spraying water into a vacuum, then freezing it to push the salt out. This method proved to be too expensive and impractical for large-scale implementation. Nathan Berkman took over Zarchin's group. By combining certain mechanical elements of Zarchin's technique, including various concepts for heating water to create vapor, Berkman's team created two new energy-efficient approaches to desalination. The first, Mechanical Vapor Compression ("MVC"), works in settings where the cost of an unscheduled shutdown would be economically unacceptable. The negative aspect of MVC is that the assurance of consistency comes with a price in higher operating costs. The second, Multi-Effect Distillation, uses a series of linked aluminum tubes to replace the chambers traditionally employed to heat the water to produce vapor. Since these aluminum tubes held and transferred heat more efficiently than any previous method or material, the temperature could be kept consistently high, thereby reducing the need for a new energy source to heat water added during the process. In 1966, Sidney Loeb, a Jewish-American, developed a technique called reverse osmosis while working in Israel. Initially designed for brackish water, reverse osmosis pushes water through a membrane that causes pure water to move one way while salt molecules move in the opposite direction. Through the use of reverse osmosis, the water yield was not just the highest quality water in Israel in terms of cleanliness, low salinity, and high clarity; it also turned out to be about fifty percent cheaper than any of the cost estimates the Israeli Cabinet had received when deciding to pursue desalinated water. Siegel points out that with desalination, water has become a purely economic issue. Water is no longer a question of how, but how much.

Chapter 7, "Renewing the Water of Israel," discusses the change the technology has had on the landscape of Israel. By reusing water, using less water,

and decreasing pollutants in water sent back to water ways, Israel's natural rivers are returning to healthy states. This in turn has led to an increase in parks around the nation.

Part III, "The World Beyond Israel's Borders," covers four chapters beginning with Chapter 8, "Turning Water into a Global Business." Naturally, given the success of the technology Israel developed in the realm of water, many Israeli entrepreneurs have explored global opportunities for water conservation. Siegel points out that the result of this has been the transformation of Israel's water expertise into a lucrative export industry.

Chapter 9, "Israel, Jordan, and the Palestinians: Finding a Regional Water Solution," discusses how Israel shares its water expertise with neighboring nations. The more stressed these nations become for water, the more willing they are to see across political stances to work towards a common solution. Israel helps by offering not just water, but also providing training and technology to the Palestinian National Authority. Israel and the Palestinian National Authority have also teamed with Jordan to develop a project to desalinate the Red Sea among the three nations.

Chapter 10, "Hydro-Diplomacy: Israel's Use of Water for Global Engagement," and Chapter 11, "No One is Immune: California and the Burden of Affluence," tell the story of how Israel broke out of the diplomatic isolation of the region. The sharing of Israel's expertise of water has helped Israel form bonds with nations all around the world. Siegel points to China as one example of a country that has struggled with water issues. In the 1980's, the Chinese government reached out to Israeli water engineers in hopes of getting assistance with an irrigation plan for Wuwei. After the success of this project, a bond began to form between the two nations. Siegel also points out that the United States has worked and continues to work with Israel to try and solve water issues. Hundreds of African communities also use Israel training programs to aid in their management and irrigation.

In the final chapter, "Guiding Philosophy," Siegel reiterates the three key tenets of Israeli water philosophy. The first being public ownership of water. Siegel quotes Haim Gvirstam who argued that by allowing government control over the entire resource, Israel can prioritize water based upon its highest and best use which gives certainty to Israeli water users, especially when compared to the "chaotic" free-market approach. The next is real-cost pricing. Siegel states that the most important reason for setting water and sewage fees at their real price is to let market forces work. Real pricing encourages consumers to use all of the water they need, but no more. Lastly, Israel heavily supports innovation in water technology. Government policy encourages privately driven innovation and public-private partnerships.

In conclusion, *Let There Be Water* portrays a possible model for solving water problems around the world. With technological innovation, political foresight, and powerful public mindfulness, Israel has "made the desert bloom." Today, Israel shares what the nation has learned with developing countries around the world.

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