

# The Dammed Body: Thinking Historically about Water Security & Public Health

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*This essay traces the historical relationship between the construction of the Nile River and the prevalence of disease in Egypt in the long twentieth century, with an eye to the relevance of this history to other regions on the African continent impacted by the construction of large dams. Beginning in the second decade of the nineteenth century and stretching through the 1970s, the Nile River underwent a dramatic process of transformation. Two large dams – the 1902 Khazan Aswan and the Aswan High Dam – were constructed on the river. Networks of perennial irrigation canals facilitated the practice of year-round agricultural production and the High Dam provided electricity. The remaking of Egypt’s riparian ecologies also had important implications for the health of Egypt’s population as these ecologies were associated with new landscapes of disease and approaches to biomedical treatment.*

**O**n March 30, 1977, the legendary Egyptian singer and actor ‘Abd al-Halim Hafiz died at the age of forty-seven from complications of a chronic and severe parasitic infection. Few stars in Egypt have been as beloved as ‘Abd al-Halim. His musical career was tightly intertwined with the rule of Egyptian President Gamal Abdel Nasser (1954 – 1970) and the politics of that period. Young, charismatic, and inspired, Nasser was fiercely anticolonial and populist. ‘Abd al-Halim helped give voice to these politics. While he sang of love and longing, a subset of his music championed the nation and the struggles of its ordinary citizens. When Egypt’s “nightingale” died, the crowds who thronged the streets of Cairo for his funeral were so distraught that it is rumored at least one woman jumped from her balcony to her death in despair.<sup>1</sup>

While ‘Abd al-Halim Hafiz lived an extraordinary life, he died the most ordinary of deaths. Born in 1929 in the village of al-Halawat in the Nile Delta, the singer was orphaned and grew up poor before moving to Cairo and attending the Academy for Arab Music. When he was a child, ‘Abd al-Halim was infected with the *Schistosoma mansoni* parasite, which causes the disease schistosomiasis, the complications of which led to his death. In 1937, Rockefeller Foundation parasitologist James Allen

Scott estimated that approximately 60 percent of Egypt's population was infected with the parasites that cause schistosomiasis.<sup>2</sup> Despite the fame and fortune that he attained in his lifetime, 'Abd al-Halim became a victim of the same disease that afflicted millions of Egypt's rural poor in the twentieth century. His body, like all of ours, had a past, one that had been shaped by the material environment in which he came of age, the class structures that determined how he interacted with the world around him, and Egypt's position in a global capitalist economy.

Egypt's schistosomiasis epidemic had roots in the agricultural ecologies of the dammed Nile River.<sup>3</sup> The country's history of dam construction is among the earliest and most storied on the African continent. Its first modern dam, Khazan Aswan (anachronistically, the Aswan Low Dam), was completed in 1902. In its time, it was the largest masonry dam in the world. Khazan Aswan was raised twice, once by the British authorities who occupied the country and again by the quasi-independent Egyptian government that was in place between World Wars I and II. In 1960, after the unfolding of a Cold War melodrama, construction began on the hydroelectric Aswan High Dam, which in its time represented a mark of progress for Nasser's regime and those seeking to throw off the yoke of colonialism in other corners of the globe.

That the parasites that cause schistosomiasis thrive in the ecologies of dammed rivers was a lesson learned first in Egypt. Khazan Aswan transformed the landscape and practice of agriculture and in the years that followed its completion, ever larger numbers of patients arrived at hospitals and clinics bearing the marks of severe schistosomiasis infection.<sup>4</sup> During World War I, scientists mapped the life cycle of the parasite, definitively linking it to the practice of perennial irrigation, which had been enabled by the damming of the Nile.<sup>5</sup> Knowledge of this relationship in no way thwarted the erection of other dams on the river; similar constructions were built in Sudan at Sennar (1926) and Jabal Awliya' (1937). As the twentieth century progressed, dams proliferated across the African continent. Predictably, in many places, their construction meant a dramatic increase in the numbers of those suffering from schistosomiasis.<sup>6</sup> Today, approximately 240 million people are infected with this disease. The World Health Organization estimates that at least 90 percent of those requiring treatment for schistosomiasis live in Africa.<sup>7</sup> Schistosomiasis is not the only common trait linking dammed regions of the continent. In the middle decades of the twentieth century, a shared ethos of high modernism that championed the power of science and technology propelled these projects in colonies and independent states alike, displacing millions and leaving river systems marked by degraded water quality, the emission of greenhouse gases from reservoirs, reductions in the diversity of life in riparian ecosystems, and downstream soil erosion.

In this essay, I chart the history of dams and disease in twentieth-century Egypt with an eye to what we might learn from this historical arc in an era of in-

tensifying environmental transformation. As the effects of climate change accumulate, some argue that dams might serve as a form of protection during years of drought and flood and a relatively “clean” way to produce energy.<sup>8</sup> This argument is reflective of a broader approach that believes solutions to climate change will come in the form of big technologies that reshape our environments and protect us from the spiraling effects of ongoing damage. Twentieth-century Egyptian history serves as a potent reminder that environmental interventions are also bodily, one manifestation of which is disease, as Julie Livingston’s contribution to this issue of *Daedalus* describes from a number of different angles.<sup>9</sup> This history also demonstrates that disease never falls equally on a population as its distribution and its effects are inevitably structured by questions of race, class, and geography. This was as true of schistosomiasis in twentieth-century Egypt as it is with respect to the ongoing COVID-19 pandemic.<sup>10</sup>

Neither does the comparison of similar forms of technology across time and space reveal the complexities of their embeddedness and experience. While a shared body of environmental effects has often marked the construction of dams in Africa, a closer look demonstrates that technology is not determinative in its form but rather functions as a material manifestation of specific political economies and technologies of rule, a point highlighted by Allen Isaacman in this volume in his discussion of the decades of controversy that have surrounded the Cahora Bassa Dam.<sup>11</sup> Comparisons can obscure what is necessarily particular, unforeseen, and unfamiliar. In Egypt as elsewhere on the African continent, current threats to water security and the impact of proposed solutions are specific, contextual, and more complex than a simple function of environmental change. The histories of climate change will be those of social hierarchy, global capitalism and its local forms, and approaches to governance. As Egypt’s trajectory demonstrates, change will not (only) be experienced at the scale of the globe or even that of the nation but also through individual bodies that exist in different sets of relations with a physical world.

One history of ‘Abd al-Halim Hafiz’s early death might begin in the southern Egyptian town of Aswan. In 1898, it was there that construction began on the first modern dam built on the Nile River, Khazan Aswan. Thirty-seven meters tall, when it was complete, it formed a reservoir that could store 980,000,000 cubic meters of water and transformed Egypt’s agricultural landscape.<sup>12</sup> For millennia, Egyptian agriculture had depended on the annual Nile flood, which cultivators had channeled into large basins where it soaked and fertilized the soils in which crops were sown. Egypt’s major produce had consisted of crops like wheat, which farmers planted following the evacuation of floodwaters, tended during winter, and harvested in spring.<sup>13</sup> Other crops grew during summer and the season of the flood but as they had to be watered by hand or animal,

the surface area that they covered was more limited. Following the completion of Khazan Aswan, an irrigation frontier divided Egypt. Perennial irrigation and year-round agricultural production predominated in the Nile Delta and the northern portion of the Nile Valley while the southern regions of Egypt's Nile Valley continued to practice basin irrigation.<sup>14</sup> In those regions that were perennially irrigated, irrigation canals and drains replaced basins. These waterways helped to sever with the relationship of agriculture to the temporality of the flood. By 1912, 3.3 of Egypt's 5.3 million cultivable acres were perennially irrigated.<sup>15</sup> Plots of land that had once grown a single crop grew two and sometimes three each year; these crops included cotton, sugarcane, and maize, whose widespread cultivation was impossible with basin irrigation.

Khazan Aswan was built by the British during their occupation of Egypt (1882 – 1923). During this time, Egypt developed a colonial economy characterized by the dominance of cash crop agriculture, cotton in particular, the consolidation of agricultural land in the hands of the elite, and the continued impoverishment of the rural working classes. The roots of this economy can be traced to earlier in the nineteenth century and the policies introduced by the country's Ottoman rulers.<sup>16</sup> When the occupation began, the Ottoman-Egyptian government's deep debt was one pretense cited as a justification for British control of Egypt.<sup>17</sup> The spread of perennial irrigation not only promised to fill state coffers with the land tax revenues; a large proportion of Egypt's cotton production flowed to textile mills in the north of England, further fueling British enthusiasm for the dam.<sup>18</sup> Large landowners were also eager to increase the productivity of their estates, the cultivation of lucrative cash crops in particular.

While the completion of Khazan Aswan was a boon to Egypt's ruling classes and colonial officials alike, it was those who labored in agriculture who experienced its construction and environmental impacts most intimately.<sup>19</sup> During the late nineteenth and early twentieth centuries, the majority of Egypt's population lived in the countryside and farmed the land. Some cultivated their own small plots; many worked for wages or as sharecroppers on large cotton-producing estates owned by the Egyptian elite. The introduction of perennial irrigation and year-round production meant more work for the countryside. It also entailed new forms of environmental contact. Laborers from rural Egypt excavated the canals and drains that carried water to and from crops year-round and cleared canals each winter of the silt that threatened to clog them. No longer performed by the energy of the flood, irrigation became the work of cultivators who waded in canals to channel water into the pulleys and Archimedean screws that helped lift water to the fields.<sup>20</sup>

The water that filled irrigation canals and drains was teeming with life. In addition to human beings, the *Schistosoma haematobium* and *Schistosoma mansoni* parasites that cause schistosomiasis thrived in the slow-moving freshwater. So did

the two species of tiny freshwater snails, *Biomphalaria alexandrina* and *Bulinus truncatus*, that serve as the parasites' intermediate hosts. The eggs of *Schistosoma* parasites exit the human body in urine and feces, hatching in freshwater. When this water also contains their intermediate mollusk host, the parasites undergo a series of organismal transformations that enable them to penetrate unbroken skin and infect a human body. Rural populations writ large were vulnerable to infection as most villages lacked easy access to water and canals became sites at which to wash, fetch water, and play. Men were particularly vulnerable to repeat and severe infections with *Schistosoma* parasites. From their teenage years, the work of irrigation saw them wading in the water that filled canals during the time of the year in which the parasites were most infective.<sup>21</sup> While *Schistosoma haematobium* and *Schistosoma mansoni* are endemic in Egypt, rates of infection in regions practicing basin irrigation were quite low, hovering around 5 percent.<sup>22</sup> The introduction of perennial irrigation caused the prevalence of the disease to skyrocket, averaging 60 percent nationwide and climbing as high as 90 percent in some regions.<sup>23</sup>

Parasites thrived also in the soils of Egypt's new agricultural landscape. Before the construction of the dam and the spread of perennial irrigation, soil had dried and cracked in the dry season that followed the harvest of crops and preceded the arrival of the flood. Perennial irrigation meant the near continuous presence of water on the land, which increased its moisture content. These changed conditions proved conducive to the life cycle of *Ancylostoma duodenale* parasites, which cause one form of hookworm disease.<sup>24</sup> The eggs of these parasites exit the human body in feces and, on soil with the right moisture and nutrition, the parasites hatch and transform, descending a short distance into the soil to await a new human host. As most Egyptians who lived in the countryside went barefoot, they were infected with the organism through their feet. While hookworm is endemic in Egypt, the spread of perennial irrigation altered the regional distribution of the parasite as well as the prevalence of infection among the population.<sup>25</sup> In the early twentieth century, the visible marks of hookworm infection were the most common cause disqualifying recruits for the Egyptian army.<sup>26</sup> By the middle of the 1930s, Scott estimated that five million of Egypt's twelve million inhabitants suffered from the disease.<sup>27</sup>

The spread of perennial irrigation throughout large portions of the countryside also changed the diets of rural populations. Historically, Egyptians had relied for sustenance on grain crops that included barley, millet, and wheat.<sup>28</sup> By the early twentieth century, corn had replaced other traditional grains to become a staple in rural diets, especially in the Nile Delta. It was also one of Egypt's top-ranking exports. The crop's growing season resembled that of cotton, meaning that as perennial irrigation spread, so did the cultivation of corn.<sup>29</sup> It was also durable, and its kernels easily stored. Finally, corn required less labor than other staple grain crops, important traits when considering the extended calendar of labor associat-

ed with perennially irrigated agriculture and the prevalence of sharecropping and agricultural wage labor in the countryside.

The shift to a reliance on corn also had a grave impact on human health. By the early twentieth century, the symptoms of the disease pellagra were widespread in rural communities in the Nile Delta. Pellagra results from a niacin deficiency, which can be caused by an overabundance of corn in the diet. (Corn contains a form of niacin that human beings cannot digest unless the grain is properly prepared.)<sup>30</sup> The appearance of pellagra has historically been common among impoverished communities who lack access to dietary diversity. In Egypt, the disease resulted from changes in patterns of agricultural production that were linked to perennial irrigation as well as the widespread poverty that marked the country's colonial economy. While numbers charting the prevalence of pellagra are more difficult to come by than those measuring schistosomiasis and hookworm, some of its symptoms were visible and the subject of frequent comment by physicians of the period.<sup>31</sup>

In the regions of Egypt whose agricultural ecologies were transformed by the construction of Khazan Aswan and the subsequent spread of perennial irrigation, the prevalence of disease helped to produce new normative habitations of the human body. Those who lived in the countryside of the Nile Delta and northern central Egypt were likely to suffer the symptoms of schistosomiasis, hookworm, or pellagra; many suffered a combination of these maladies. While sparse, historical evidence suggests that rural communities understood the diseases of perennial irrigation not as systemic but rather through their individual symptoms.<sup>32</sup> To inhabit a rural body in the agricultural ecologies supported by the dam – especially a laboring body – included different combinations of a wide variety of physical symptoms. Some were seasonal, a photosensitive rash that appeared in spring for example. Fatigue, fever, aching, and cough were common as were digestive difficulties that included abdominal pain, vomiting, diarrhea, blood in the urine, flatulence, constipation, and weight loss. Children suffered severe anemia, stunted growth, and, in particular, difficulty concentrating. Severe and advanced cases could be marked by cancer of the bladder, high blood pressure through the liver, an enlarged spleen, the build-up of fluid in the abdomen, swollen areas in the esophagus and digestive tract that could rupture and bleed, and disorders of the nervous system that caused memory loss, depression, and eventually dementia. While urban populations and the elite were much less likely to suffer these problems, for the vast majority of the Egyptians who lived in the countryside, the environment produced by the construction of Khazan Aswan and the spread of perennial irrigation had deep and sustained effects on their health.

**T**he year 1928 is another possible point from which one might begin an explanation of 'Abd al-Halim's early death. It was that year that the interwar-period Egyptian regime began a project to heighten Khazan Aswan

and enlarge its reservoir and the surface area of land that it irrigated and, by extension, the proportion of Egypt's population who suffered the diseases that were embedded in this landscape. The regime that made this choice was not controlled by foreign powers but rather comprised of the Egyptian elite. In 1919, a revolt protesting the continued British occupation had erupted. By 1922, Egypt had renegotiated its relationship with the colonial power and while Britain continued to exercise a decisive role in the country, its government was firmly in the hands of Egyptian elites.<sup>33</sup> Under this regime, Egypt's economy continued to rely heavily on export-oriented, cash crop agriculture (cotton in particular), and the social relations of the countryside persisted much as they had during the occupation.

Control of the Nile River was an important tenet of Egyptian nationalism. Before World War I, the British had begun construction on the Gezira scheme in Sudan, an agricultural region that they hoped would be one of the largest cotton-growing areas in the world.<sup>34</sup> In 1919, when the war had ended and the British sought to construct irrigation works in their possessions to the south of Egypt, a heated debate flared concerning the impact these works would have on the quantity of Nile water available to Egypt. In what would prove an enduring problem, Egypt felt its vulnerability as the furthest downstream country. When the British completed the Sennar Dam, which helped to water the Gezira scheme, tension between the countries intensified and, in an attempt to stake its claim to the Nile, Egypt invited an international commission to assess the safety of raising Khazan Aswan.<sup>35</sup>

The commitment to a dammed Nile River set the country on a particular path. Egyptian political officials not only understood the Nile River as an important feature of their landscape, culture, and history, but national development was also associated with a dammed Nile and water-intensive agriculture.<sup>36</sup> While British authorities had made almost no effort to address the epidemic of disease that raged in the countryside, during the interwar period, national development was paired with public health outreach. Hookworm and schistosomiasis were of particular interest. Effective treatment for the former had existed since the late nineteenth century; that for schistosomiasis had been introduced to Egypt around the period of World War I. Beginning in the 1920s, the Egyptian Public Health Department established treatment centers for schistosomiasis and hookworm in Egypt's cities and throughout the towns of the countryside. While the month-long treatment regimen for schistosomiasis caused considerable discomfort, even pain, by the 1940s, approximately 400,000 patients were treated for schistosomiasis each year in these clinics.<sup>37</sup>

Despite treatment, large numbers continued to suffer from schistosomiasis. Even when they were cured of the disease, the vast majority were reinfected with their return to rural life and labor. The lack of infrastructure in Egyptian villages meant that irrigation canals continued to occupy a prominent role in village life, and for cultivators, there was no way to avoid the physicality of irrigation and the

threat of parasitic infection that it posed. While physicians and political officials alike acknowledged that the efficacy of treatment was limited, there was no suggestion that the dam or the patterns of agricultural production that it supported might be undone. A particular archetype of national development had been normalized: like the heightening of the dam, mass treatment demonstrated scientific and bureaucratic sophistication, furthering the cause of national development.

In 1952, a group of junior army officers orchestrated a popularly supported coup that forced the Egyptian monarchy from power. Two years later, one of these young officers, Gamal 'Abd al-Nasser, became Egypt's president. Under his leadership, Egypt became a populist authoritarian state, animated by Nasser's fiercely anticolonial politics. Before the coup, Egyptian politicians had debated the prospect of replacing Khazan Aswan with a hydroelectric dam; the project became a priority in the early days of Nasser's presidency.<sup>38</sup> For funding, Egypt first negotiated with the United States and Great Britain. When Nasser refused to bow to the political conditions attached to the aid – specifically to back down from his conflict with Israel and position Egypt as a quiescent Cold War client state – each country in turn withdrew its support.<sup>39</sup> The Soviet Union stepped in with an offer of financing and soon after, in July of 1956, Nasser nationalized the company that administered the Suez Canal, announcing his intention to use its profits to fund the construction of a new dam on the Nile. In an attempt to corral Nasser's ambition and quash his regional influence, Britain, France, and Israel attacked Egypt, withdrawing their forces from Egyptian territory only after pressure from the United States. While the war was a military defeat for Egypt, Nasser emerged a hero for his willingness to stand strong in the face of neocolonial aggression. In 1958, Egypt and the Soviet Union agreed on the terms of financing and, in 1960, construction on the High Dam began.

The potential of the Aswan High Dam to transform Egypt figured prominently during Nasser's rule (1954 – 1970). The period of its construction witnessed the implementation of reforms that sought to lift Egyptians from poverty and address the dramatically unequal distribution of wealth that had marked the time of the British occupation and that of the interwar period. The era of Nasser's rule saw the implementation of several land reforms, the championing of the rural poor, an endeavor to end the country's dependence on export-oriented agriculture, and the development of Egypt's industrial sector. However, like the regime he had helped topple, Nasser understood the performance of technological mastery and environmental claim-making as central to nationalist development. This time, it was not water for cotton but electricity to power Egyptian industry and light the countryside that fueled enthusiasm for the dam.

When construction was ongoing, Nasser's regime prepared for the possibility that an increase in the prevalence of schistosomiasis would follow the dam's com-



pletion.<sup>40</sup> During the 1950s and 1960s, schistosomiasis treatment was linked to investments in rural public health. Between 1951 and 1963, the state budget devoted to health care nearly quadrupled.<sup>41</sup> The number of rural health care units also increased, from 382 before the coup to 1,525 by 1965.<sup>42</sup> These rural health care units complemented the existent network of clinics devoted to the treatment of parasitic diseases. Schools were also sites of treatment as the rates of infection among children were high and their attendance at school was more predictable than that of adults at clinics.<sup>43</sup>

As many Egyptians were farmers, public health officials wrestled with the seemingly intractable problem that reinfection represented. One approach treated the environment in which schistosomiasis was rooted with chemicals in an endeavor to root out disease. This strategy, one form of what public health officials conceived of as “vector control,” garnered the support of the World Health Organization and governments in the Global North seeking to promote their (national) chemical companies and pharmaceuticals. In Egypt, large field experiments were organized to test the efficacy of different chemical compounds that killed snails in reducing the prevalence of disease. Despite the enthusiasm that surrounded them, in Egypt, chemical agents never became the total solution that many had hoped. When considering the impossibly complex networks of canals and drains that extended from the Nile, their cost was too high as was their toxicity.<sup>44</sup>

In 1961, ‘Abd al-Halim Hafiz began performing the song “Hikayat Sha’ab” (story of a people), which told the story of the Aswan High Dam as a rejection of Egypt’s colonial past and a celebration of the path of national self-sufficiency. That ‘Abd al-Halim sang the song while suffering a disease linked to the ecologies of the dammed Nile might have produced an air of tragedy, even irony, but in the singer’s performance, there is only a sense of pride and steadfastness. Many Egyptians, including those at the highest levels of state, continue to believe that the country had no choice but to build the dam and that the benefits that have flowed to Egypt as a result have been considerable. The conversion of the countryside to perennial irrigation was complete. The cessation of the annual Nile flood in Egypt and the accumulation of its waters in Lake Nasser ended the threat posed by high floods and enabled the successful mitigation of drought. Most important, the dam generates power, which in the 1970s, was used to electrify large swaths of the countryside and fuel Egyptian industry. Neither did the completion of the Aswan High Dam exacerbate the schistosomiasis epidemic. From the 1950s, studies indicated that widespread treatment, the construction of civilian infrastructure, public health outreach, and urbanization had chipped away at the high numbers of those suffering from disease and caused rates of infection to decline.<sup>45</sup>

In the years after the Aswan High Dam was completed, it became evident that the dynamics of schistosomiasis infection in Egypt had changed but not as anti-

pated. When Khazan Aswan was built, *Schistosoma haematobium* had been endemic throughout Egypt while *Schistosoma mansoni* had been confined to particular regions of the northern Nile Delta. By the 1970s, this was no longer the case.<sup>46</sup> *Schistosoma mansoni* had spread into new territories, eventually becoming the more common cause of disease.<sup>47</sup> It is likely that this migration began decades before the High Dam was built. When he conducted his nationwide survey in the 1930s, Scott wondered whether *Schistosoma mansoni* had begun to move beyond its historically endemic territories. Residing in the intestinal system, the species produces a slightly different set of symptoms and sometimes a more severe form of disease than *Schistosoma haematobium*. While the geographies of infection shifted, the profile of who was most vulnerable did not. Among the rural poor, men fell ill in greater numbers than women and rates of infection were highest from childhood through the early years of adulthood.<sup>48</sup>

In the past several decades, the transmission of schistosomiasis has been eliminated or greatly reduced throughout the Middle East and North Africa.<sup>49</sup> Its prevalence is highest in Yemen, which has been destroyed by a Saudi bombing campaign and is wracked by civil conflict. As of 2014, there were approximately 12.7 million individuals infected with schistosomiasis in the Middle East and North Africa, about 10 million of them in Egypt and Yemen. In 2016, estimates placed the nationwide rate of infection in Egypt at 0.2 percent of the population.<sup>50</sup>

This tremendous reduction can, in large part, be attributed to the development of a new and effective oral therapy, Praziquantel, in the 1970s. As patients no longer needed to submit themselves to lengthy courses of injections, treatment could be administered on a large scale and indiscriminately, especially to high-risk populations like children who had not been tested for the presence of the disease. The use of this drug, in conjunction with snail control efforts, health education, and sanitary infrastructure improvements, allowed Egypt's government to gain the upper hand over an epidemic that had haunted the country for almost a century. Other less intentional developments also likely altered the course of the disease. In the 1980s, crayfish were introduced in the Nile Delta for aquaculture and spread rapidly. These creatures happen to prey on the species of snails that serve as the intermediate hosts for *Schistosoma* parasites.<sup>51</sup> In recent years, the end of schistosomiasis in Egypt has finally come into view. In 2016, the Egyptian government announced a plan in cooperation with the World Health Organization to eliminate schistosomiasis by 2020.<sup>52</sup> At the time of writing, the results of this endeavor had not yet been announced.

While the Aswan High Dam did not have the anticipated effect on the landscape of environmental disease in Egypt, the harms that have flowed from the dam's construction have been considerable. Nearly 100,000 members of Egypt's Nubian community – and a larger number in Sudan – were displaced and much of the territory that was historical Nubia was decimated. Many were moved to a settlement

in the town of Kom Ombo, relatively distant from the Nile and the life ways that had once sustained them.<sup>53</sup> The dam's reservoir, Lake Nasser, flooded a number of archaeological sites in Egypt and Sudan. Some, like Abu Simbel, were moved to other locations. Others were gifted to museums abroad and a handful are submerged in the waters of the lake.<sup>54</sup> The effects of the High Dam on the riparian environment have also been substantial.<sup>55</sup> Deprived of adequate sediment, Egypt's northern coastline has eroded; a significant quantity of agricultural land has disappeared; the soil is no longer as productive as it once was; and commentators have long debated the impact of the dam on fish populations in the Mediterranean Sea.

One wonders whether large dams like the Aswan High Dam are one of the great postcolonial traps, destined to pit those who are concerned about their environmental effects and cultural erasures against those who are seeking resources and national development according to the terms that came to predominate in the twentieth century. As the construction of large dams accelerates, many governments find themselves faced with a set of dilemmas resembling those confronted by the Egyptian regime more than sixty years ago. In the short term, agricultural productivity, protection from the variability of floods, and the provision of electricity are attractive prospects. So is the national pride and political favor that attaches to the construction of infrastructure. However, this thirst for resources and development often produces a skewed vision of the cost of dam construction, one that omits the significant price of damage to the environment, public health programs, and the civilian infrastructure necessary to mitigate their effects.

In Egypt, the long history of damming the Nile has also produced consumption habits and expectations that are ill-suited for a world in which resources are ever scarcer. Two of Egypt's most important crops – rice and sugarcane – are both water intensive. Recently, the government has made moves to limit rice cultivation, these policies landing hardest on the farmers who grow the crop. Neither is there a deep history of water conserving irrigation.<sup>56</sup> The current controversy in Egypt that surrounds the construction of the Grand Ethiopian Renaissance Dam (described in Harry Verhoeven's essay in this issue of *Dædalus*) is in part rooted in the government's long-standing concern about the vulnerability produced by its position on the Nile and the tiny amounts of rain that fall in its fields each year.<sup>57</sup> It also stems from the reality that the government will be forced to confront the country's water poverty, which the long history of the dammed Nile has allowed it to avoid.

How Egyptians will experience a future that will be further freighted by the challenges of climate change, among them water security, will, like the country's history of dams, be shaped by questions of political economy and the technologies of power. Khazan Aswan was built under a colonial regime to support a form of agricultural production that served the interests of the British Empire, on the one hand, and Egypt's wealthy landowners, on the other. Its goods flowed to these classes while poverty and parasites molded the bodies of the agricultural working

classes. The Aswan High Dam was imagined as an escape from the geopolitical relationships and material constraints of the past. And yet, like the dam that preceded it, it was a manifestation of environmental authoritarianism. Not only did the government dictate the pathways of water, power, and displacement; it mandated the chemical treatment of human bodies and the environment in order to combat the harms that flowed from the dammed Nile. The strategies that Egypt's current regime deploys to respond to climate change will be similarly shaped by its aggressive authoritarianism, the absence of legitimate channels through which to express dissent, and the interests of the ruling classes, the military primary among them.

If there are lessons to be learned, it is the intractable relationship of human and environment health and the persistent influence of social and economic structures in shaping these terms. History accretes in the body. On global as well as local scales, this accretion is structural as much as it is environmental. A narrow interpretation of Egypt's twentieth-century history would read the historical relationship between dams and disease as a specific warning. But a dam or any piece of environmental infrastructure is not a thing apart but rather a part of a complex human/nonhuman environment and a system of global power structures. 'Abd al-Halim Hafiz inhabited a body that was emblematic of a particular era of Egyptian history. It was a body born into a political economic environment that had been shaped by colonialism; it came of age and met its end during an era in which the damming – of the Nile River and the bodies of many Egyptian citizens – were fundamental tenets of postcolonial national modernity. 'Abd al Halim accepted these inevitabilities, so much so that his voice was the voice of the hope and promise that attached to the High Dam. There exist countless historical examples of the structural-environmental relationships that expose human bodies to harm, and they are at present multiplying. Climate change is being lived differently depending on differentiations of race, class, and geography. As we debate the technological interventions that might mitigate its effects, it is important to remember that technologies themselves are not salient categories of analysis across time and space. Moreover, if our solutions to climate change imagine an environment that is analytically and materially distinct from human bodies, we will continue to be surprised, sometimes horrified, by the costs borne by these bodies, especially the most vulnerable among them.

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## ENDNOTES

- <sup>1</sup> For video footage of the funeral, see “Egypt: Thousands of Mourners Turn Out for Funeral of ‘Halim’ Renowned Egyptian Singer, Abdel-Halim Hafez,” *Reuters*, April 3, 1977, <https://reuters.screenocean.com/record/652571> (accessed February 15, 2021).
- <sup>2</sup> James Allen Scott, “The Incidence and Distribution of the Human Schistosomes in Egypt,” *American Journal of Epidemiology* 25 (3) (1937): 578, 610, cited in Jennifer L. Derr, *The Lived Nile: Environment, Disease, and Material Colonial Economy in Egypt* (Stanford, Calif.: Stanford University Press, 2019), 105.
- <sup>3</sup> There is a robust historiography charting the ecological and social effects of damming the river in Egypt. See, for example, Habib Ayebe and Ray Bush, *Food Insecurity and Revolution in the Middle East and North Africa: Agrarian Questions in Egypt and Tunisia* (New York: Anthem Press, 2019); Jessica Barnes, *Cultivating the Nile: The Everyday Politics of Water in Egypt* (Durham, N.C.: Duke University Press, 2014); Ray Bush, *Counter-Revolution in Egypt’s Countryside: Land and Farmers in the Era of Economic Reform* (London: Zed Books, 2002); and Timothy Mitchell, *Rule of Experts: Egypt, Techno-Politics, Modernity* (Berkeley: University of California Press, 2002).
- <sup>4</sup> Derr, *The Lived Nile*, 118–119.
- <sup>5</sup> Robert Leiper, *Researches on Egyptian Bilharziosis: A Report to the War Office on the Results of the Schistosomiasis Mission in Egypt, 1915* (London: John Bale, Sons and Danielson, 1918), 3.
- <sup>6</sup> See, for example, V. R. Southgate, “Schistosomiasis in the Senegal River Basin: Before and After the Construction of the Dams at Diama, Senegal and Manantali, Mali and Future Prospects,” *Journal of Helminthology* 71 (2) (1997): 125–132; John M. Hunter, “Inherited Burden of Disease: Agricultural Dams and the Persistence of Bloody Urine (Schistosomiasis hematobium) in the Upper East Region of Ghana, 1959–1997,” *Social Science & Medicine* 56 (2) (2003): 219–234; Abiola Fatimah Adenowo, Babatunji Emmanuel Oyinloye, Bolajoko Idiat Ogunyinka, and Abidemi Paul Kappo, “Impact of Human Schistosomiasis in Sub-Saharan Africa,” *Brazilian Journal of Infectious Diseases* 19 (2) (2015): 200–201; and Susanne H. Sokolow, Isabel J. Jones, Merlijn Jocque, et al., “Nearly 400 Million People Are at Higher Risk of Schistosomiasis Because Dams Block the Migration of Snail-Eating River Prawns,” *Philosophical Transactions of the Royal Society B: Biological Sciences* 372 (1722) (2017): 1–12.
- <sup>7</sup> World Health Organization, Regional Office for Africa, “Schistosomiasis (Bilharzia),” <https://www.afro.who.int/health-topics/schistosomiasis-bilharzia> (accessed March 1, 2021).
- <sup>8</sup> The notion that dams are a clean form of energy is much contested. See, for example, Yves T. Prairie, Jukka Alm, Jake Beaulieu, et al., “Greenhouse Gas Emissions from Freshwater Reservoirs: What Does the Atmosphere See?” *Ecosystems* 21 (5) (2018): 1058–1071.
- <sup>9</sup> Julie Livingston, “Water Scarcity & Health in Urban Africa,” *Daedalus* 150 (4) (Fall 2021).

- <sup>10</sup> This argument and the data that support it regarding COVID-19 are widespread. See, for example, Matthew A. Raifman and Julia R. Raifman, “Disparities in the Population at Risk of Severe Illness from COVID-19 by Race/Ethnicity and Income,” *American Journal of Preventive Medicine* 59 (1) (2020): 137–139; L. Ebony Boulware, “Race Disparities in the COVID-19 Pandemic—Solutions Lie in Policy, Not Biology,” *JAMA Network Open* 3 (8) (2020); and Cary P. Gross, Utibe R. Essien, Saamir Pasha, et al., “Racial and Ethnic Disparities in Population-Level Covid-19 Mortality,” *Journal of General Internal Medicine* 35 (10) (2020): 3097–3099.
- <sup>11</sup> Allen Isaacman, “Cahora Bassa Dam & the Delusion of Development,” *Dædalus* 150 (4) (Fall 2021).
- <sup>12</sup> William Willcocks, *The Assuan Reservoir and Lake Moeris: A Lecture Delivered at a Meeting of the Khedivial Geographical Society, Cairo, 16 January 1904* (London: Messrs. E. and F. N. Spon, 1904), 7–8; and Murdoch MacDonald, “Aswan Dam: Protection of Downstream Rock Surface, and Thickening and Heightening,” *Minutes of the Proceedings of the Institution of Civil Engineers* 194 (1913): 261.
- <sup>13</sup> Alan Mikhail, *Nature and Empire in Ottoman Egypt: An Environmental History* (New York: Cambridge University Press, 2011), 11.
- <sup>14</sup> Select regions of southern Egypt had access to perennial irrigation provided by the Egyptian Sugar Company. See Derr, *The Lived Nile*, 75–98. For a discussion as to the notions of value and practices of ownership linked to this frontier, see *ibid.*, 57–59.
- <sup>15</sup> Terje Tvedt, *The River Nile in the Age of the British: Political Economy and the Quest of Economic Power* (New York: I. B. Taurus, 2004), 91.
- <sup>16</sup> For a discussion of the evolution of land tenure regimes and the social relations of the countryside during the nineteenth century, see (in English) Raouf Abbas and Assem El-Dessouky, *The Large Landowning Class and Peasantry in Egypt, 1837–1952*, ed. Peter Gran, trans. Amer Mohsen and Mona Zikri (Cairo: American University in Cairo Press, 2012); Kenneth Cuno, *The Pasha’s Peasants: Land, Society and Economy in Lower Egypt, 1740–1858* (New York: Cambridge University Press, 1992); Roger Owen, *Cotton and the Egyptian Economy, 1820–1914: A Study in Trade and Development* (London: Clarendon Press, 1969); Alan Richards, *Egypt’s Agricultural Development, 1800–1980: Technical and Social Change* (Boulder, Colo.: Westview Press, 1982); and Helen Rivlin, *The Agricultural Policy of Muhammad Ali* (Cambridge, Mass.: Harvard University Press, 1961).
- <sup>17</sup> Robert Tignor, *Modernization and British Colonial Rule in Egypt, 1882–1914* (Princeton, N.J.: Princeton University Press, 1966), 113.
- <sup>18</sup> Derr, *The Lived Nile*, 47–49.
- <sup>19</sup> In addition to the health effects described in this essay, see also Mitchell, *Rule of Experts*, 19–53.
- <sup>20</sup> Derr, *The Lived Nile*, 100–103.
- <sup>21</sup> *Ibid.*, 107.
- <sup>22</sup> Scott, “Incidence and Distribution,” 610.
- <sup>23</sup> *Ibid.*, 578, 610.
- <sup>24</sup> A. Abdallah, “Ancylostomiasis in Egypt,” in *Expert Committee on Helminthiasis (Soil-Transmitted Helminths)* (Geneva: World Health Organization, 1963), 4–5.

- <sup>25</sup> Muhammad Khalil, "The Pail Closet as an Efficient Means of Controlling Human Helminth Infection as Observed in Tura Prison, Egypt, with a Discussion on the Source of Ascaris Infection," *Annals of Tropical Medicine and Parasitology* 25 (1) (1931): 44; and Abdallah, "Ancylostomiasis," 4–5.
- <sup>26</sup> Fleming Mant Sandwith, *Medical Diseases of Egypt* (London: Henry Kimpton, 1905), 245.
- <sup>27</sup> James Allen Scott, "The Prevalence and Distribution of Hookworm in Egypt," *American Journal of Hygiene* 26 (3) (1937): 455–505.
- <sup>28</sup> Mikhail, *Nature and Empire in Ottoman Egypt*, 10–11.
- <sup>29</sup> Richards, *Egypt's Agricultural Development*, 83.
- <sup>30</sup> A New World crop, corn had been subjected to the process of nixtamalization in Central and South America, in which it was soaked in an alkaline solution, washed, and hulled before it was eaten. One effect of nixtamalization was to render the nutrients in corn more biologically available to the human body.
- <sup>31</sup> Fleming Mant Sandwith, "Pellagra When Considered from the Point of View of a Disease of Insufficient Nutrition," *Transactions of the Royal Society of Tropical Medicine and Hygiene* 9 (1) (1915): 10.
- <sup>32</sup> Derr, *The Lived Nile*, 114.
- <sup>33</sup> Egyptian elites had long played important roles in the structures of government. When the British occupied Egypt in 1882, the Ottoman-Egyptian state possessed a developed bureaucracy and ministerial system. This state structure was left in place during the occupation, with British officials appointed to direct and staff the upper echelons of the different ministries.
- <sup>34</sup> For more detail, see Victoria Bernal, "Colonial Moral Economy and the Discipline of Development: The Gezira Scheme and 'Modern' Sudan," *Cultural Anthropology* 12 (4) (1997): 447–479; Tony Barnett, *The Gezira Scheme: An Illusion of Development* (New York: Routledge, 2019); and Maurits W. Ertzen, *Improvising Planned Development on the Gezira Plain, Sudan, 1900–1980* (New York: Springer, 2015).
- <sup>35</sup> Tvedt, *The River Nile in the Age of the British*, 145–146.
- <sup>36</sup> Derr, *The Lived Nile*, 61–73.
- <sup>37</sup> *Ibid.*, 138.
- <sup>38</sup> See Chapter 3, "Shifting Lines of Power: Egyptian Business Groups and the Electrification Schemes of the 1920s and 1930s," in Robert Vitalis, *When Capitalists Collide: Business Conflict and the End of Empire in Egypt* (Berkeley: University of California Press, 1995).
- <sup>39</sup> For the documentary record of the crisis related to the United States Department of State, see U.S. Office of the Historian, "Foreign Relations of the United States, 1955–1957, Suez Crisis, July 26–December 31, 1956, Volume XVI," <https://history.state.gov/historicaldocuments/frus1955-57v16/comp1> (accessed February 15, 2021).
- <sup>40</sup> "Proceedings of the First International Symposium on Bilharziasis in Commemoration of the Centenary of Theodor Bilharz, Organized by the Ministry of Scientific Research U.A.R., 1962," 9.
- <sup>41</sup> Raymond William Baker, *Egypt's Uncertain Revolution Under Nasser and Sadat* (Cambridge, Mass.: Harvard University Press, 1978), 220.
- <sup>42</sup> *Ibid.*, 219–222.

- <sup>43</sup> Egyptian Ministry of Public Health, *Annual Report* (1951): 155; and “Report on the 5th (last but one) Big Blanketing (Spring 1971) of the Irrigation and the Drain System of the Fayoum with Bayluscide,” Bilharzia Control Project, Fayoum Egypt/German Team, Archives of the Parasitology Collection, World Health Organization, schisto1-emro-egypt 1970–1971, 6.
- <sup>44</sup> For reports of toxicity, see José Antonio Jove, “Use of Molluscicides in the Control of Bilharziasis in Venezuela: Equipment and Methods of Application,” *Bulletin of the World Health Organization* 14 (4) (1956): 631; Norman D. Levine, “Integrated Control of Snails,” *American Zoologist* 10 (4) (1970): 580; Ronald Eisler, *Pentachlorophenol Hazards to Fish, Wildlife, and Invertebrates: A Synoptic Review*, vol. 85 (Washington, D.C.: U.S. Department of the Interior, Fish and Wildlife Service, 1989), 1; and D. M. Blair, “Dangers in Using and Handling Sodium Pentachlorophenate as a Molluscicide,” *Bulletin of the World Health Organization* 25 (4–5) (1961): 601.
- <sup>45</sup> Rashida M. R. Barakat, “Epidemiology of Schistosomiasis in Egypt: Travel through Time,” *Journal of Advance Research* 4 (5) (2013): 426–427.
- <sup>46</sup> *Ibid.*, 430.
- <sup>47</sup> Rashida Barakat, Hala El Morshedy, and Azza Farghaly, “Human Schistosomiasis in the Middle East and North Africa Region,” in *Neglected Tropical Diseases: Middle East and North Africa*, ed. Mary Ann McDowell and Sima Rafati (New York: Springer, 2013), 30–31; and Thomas G. Strickland, “Liver Disease in Egypt: Hepatitis C Superseded Schistosomiasis as a Result of Iatrogenic and Biological Factors,” *Hepatology* 43 (5) (2006): 916.
- <sup>48</sup> *Ibid.*, 31.
- <sup>49</sup> *Ibid.*, 23–24.
- <sup>50</sup> World Health Organization, “Egypt Leverages Domestic Funding to Eliminate Schistosomiasis,” November 29, 2016, <https://www.who.int/news/item/29-11-2016-egypt-leverages-domestic-funding-to-eliminate-schistosomiasis> (accessed March 1, 2021).
- <sup>51</sup> W. M. Emam and M. T. Khalil, “Population Dynamics and Stock Assessment of the Newly Introduced Crayfish (*Procambarus clarkii*) in the River Nile Egypt,” *Proceedings of the Zoological Society A. R. Egypt* 26 (1995): 131–143.
- <sup>52</sup> Ahmed Abdelhalim Yameny, “The Evolving Schistosomiasis Agenda 2017–2020 in Egypt: Moving from Control to Elimination,” *Journal of Bioscience and Applied Research* 3 (2) (2017): 52.
- <sup>53</sup> J. D. Maitland, British Embassy, Cairo, to R. S. Scrivner, North and East Africa Department, Foreign Office, May 16, 1964, FO 371–178650, The (British) National Archives.
- <sup>54</sup> Fekri A. Hassan, “The Aswan High Dam and the International Rescue Nubia Campaign,” *African Archaeological Review* 24 (3) (2007): 73–94.
- <sup>55</sup> Gilbert F. White, “The Environmental Effects of the High Dam at Aswan,” *Environment: Science and Policy for Sustainable Development* 30 (7) (1988): 4–40.
- <sup>56</sup> For an in-depth treatment of the politics and environmental practices surrounding irrigation in one region of Egypt, see Barnes, *Cultivating the Nile*.
- <sup>57</sup> Harry Verhoeven, “The Grand Ethiopian Renaissance Dam: Africa’s Water Tower, Environmental Justice & Infrastructural Power,” *Dædalus* 150 (4) (2021).