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## Tehran's Water Crisis: Bad Luck or Poor Management?

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Iran is facing one of the most significant water crises in the world, specifically in its capital city of Tehran. Experts estimate that if water consumption does not change soon, Tehran's supply will be unable to meet the city's needs by 2026.<sup>1</sup> Until recently, Tehran succeeded in meeting its population's water needs despite low levels of rainfall and frequent droughts. In fact, Iran was once considered "the pioneer of sustainable water management for thousands of years" and was home to one of the most sophisticated water management systems in the world. Now it ranks among the most water-stressed countries in the world.<sup>2</sup> The government routinely blames this deterioration on climate change and other periodic factors instead of water policy changes. However, resilient water management systems are expected to withstand such external challenges. How have changes in water usage and management led to and worsened Tehran's water insecurity? I argue that the most significant factor is a systematic state-led reorientation of the water management system away from sustainability and towards rapid development to support the state's desire to modernize and establish itself as a competitive actor in the global economy.<sup>3</sup>

### Literature Review: *Enclosure* by Gary Fields

Throughout this paper, I will be drawing on a framework of analysis established by Gary Fields in his book, *Enclosure*. Fields uses historical examples of land enclosure in England and colonial America to examine the dispossession of Palestinians from their land to assert that the "establishment of a Jewish landscape in Palestine is part of this same lineage of creating exclusionary spaces."<sup>4</sup> Land enclosure is a process of consolidating communal land into individually owned farms which became the norm in 17<sup>th</sup> century England.<sup>5</sup> The aim was to improve agricultural production and increase the value of the land. Fields argues these "virtues of improving land" were rooted in an "imagined vision of the landscape in which land lying empty could be improved and thus redeemed by those willing to work it."<sup>6</sup> Fields discusses John Locke's belief that "land 'poorly cultivated' was akin to land laying in waste."<sup>7</sup> Fields argues

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<sup>1</sup> Kayla Ritter, "Tehran Faces Crisis as Iran's Water Supply Runs Low," Michigan State University, 19 December 2018, [www.circleofblue.org/2018/middle-east/tehran-faces-crisis-as-irans-water-supply-runs-low/](http://www.circleofblue.org/2018/middle-east/tehran-faces-crisis-as-irans-water-supply-runs-low/).

<sup>2</sup> Jason Rezaian, "Iran's Water Crisis the Product of Decades of Bad Planning," *The Washington Post*, 2 July 2014, [https://www.washingtonpost.com/world/middle\\_east/irans-water-crisis-the-product-of-decades-of-bad-planning/2014/07/01/c050d2d9-aeeb-4ea1-90cc-54cef6d8dd10\\_story.html](https://www.washingtonpost.com/world/middle_east/irans-water-crisis-the-product-of-decades-of-bad-planning/2014/07/01/c050d2d9-aeeb-4ea1-90cc-54cef6d8dd10_story.html).

<sup>3</sup> Adam Hanieh, *Money, Markets, and Monarchies*. Cambridge University Press, 2018; *Street Politics: Poor People's Movements in Iran*, by Asef Bayat (American University in Cairo Press, 1998).

<sup>4</sup> Gary Fields, *Enclosure: Palestinian Landscapes in a Historical Mirror* (University of California Press, 2017), xiii.

<sup>5</sup> "Enclosing the Land," *UK Parliament*.

<sup>6</sup> Fields, *Enclosure*, 11.

<sup>7</sup> *Ibid.*, 12.

this imagined vision of improved land led to a shift in power between the cultivators and the land owners. This power dynamic leads to the core draining the periphery of its resources. This same lens can be applied to the water crisis that Iran's capital faces today. The Iranian government sought to urbanize quickly, so it privatized farmland in the periphery of Tehran to increase agricultural productivity. This forced newly disempowered farmers to migrate *en masse* to Tehran. The increased water demand in Tehran coupled with industrial water extraction for agricultural production has led to the water crisis we see in Tehran today.

## A Historical Overview of Water Management in Iran

Water availability has always been a significant concern in Iran because of frequent droughts. However, historically they have not presented a significant issue. This is largely due to what is sometimes considered “one of the greatest hydrologic achievements of the ancient world:” *qanats*.<sup>8</sup> Ancient Persians developed Qanats as a “water transfer system . . . wherein groundwater from mountainous areas, aquifers and sometimes rivers [were] brought to points of re-emergence” for collection and use.<sup>9</sup> Qanats were used extensively in the periphery of Tehran. The city sits at the base of the Alborz mountains where water was mined and utilized. In place for more than 2000 years, the innovative system maintained Tehran's water supply at a relatively stable level for agricultural and domestic use, even during the frequent droughts the region experienced.<sup>10</sup> However, as the state began to prioritize Iran's transformation from an agrarian society to a more industrial one, the government slowly but systematically phased out the use of qanats.

Today, Iran has only half the number of qanats it had 50 years ago.<sup>11</sup> This is likely due to changing perceptions of modernity and the desire to establish self-sufficiency in an increasingly globalized world.<sup>12</sup> In the 1960's, the Shah of Iran began mass efforts to modernize Iran's agriculture. He implemented widespread land reforms to improve the production of Iranian sugarcane, wheat, rice and tea – all water-intensive crops. Policymakers hoped these reforms would modernize Iran's economy and orient the use of land towards international markets while establishing the peasantry's loyalty to the state rather than the landowners.<sup>13</sup> The Shah's reforms resulted in widespread enclosure of land. While intended to increase production, enclosure led to

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<sup>8</sup> Homayoun Motiee et al., “Assessment of the Contributions of Traditional Qanats in Sustainable Water Resources Management.” *International Journal of Water Resources Development*, vol. 22, no. 4, 2006, p. 575., doi:10.1080/07900620600551304.

<sup>9</sup> Ibid.

<sup>10</sup> Najmeh Bozorgmehr “Iran: Dried Out,” *Financial Times*, August 21, 2014, [www.ft.com/content/5a5579c6-0205-11e4-ab5b-00144feab7de](http://www.ft.com/content/5a5579c6-0205-11e4-ab5b-00144feab7de).

<sup>11</sup> Ibid.

<sup>12</sup> Begum Adalet, *Hotels and Highways: The Construction of Modernization Theory in Cold War Turkey* (Stanford University Press, 2018), 121–57.

<sup>13</sup> Nikki R. Keddie, “The Iranian Village Before and After Land Reform,” *Journal of Contemporary History*, 3, no. 3 (196): 88., doi:10.1177/002200946800300305; Adalet, *Hotels and Highways*, 121–157.

“absolute property rights in land and differences in crop patterns that disrupted proper cultivation of land.”<sup>14</sup> Privatization of land also rendered much of the lower class unable to own land.

### **The Impact of the Shah’s Land Reforms: Rapid Development and Mass Rural Exodus**

The Shah’s land reforms had two major impacts on water management in Tehran. First, the reforms inadvertently forced many people to migrate to urban centers of Iran, namely Tehran. With national lands privatized, many farmers did not receive enough land to cultivate crops or received no land at all. Without a way to generate income, they migrated to cities like Tehran in search of living wages. Mass rural-to-urban migration led to much higher demand for residential water in the city of Tehran. It also meant the industrial sector could grow at a faster pace, also increasing the demand for water in the city. Like many stories of modernization, the population who suffered most from these reforms were those they claimed to help, the lower class. Known to have negative repercussions for the lower classes, enclosure policies are often still pursued because of their association with successful development and modernization. Economic and political institutions that arise from enclosure strategies generally positively impact policymakers and those already in positions of power.<sup>15</sup>

Second, once land was privatized, the Shah was determined to increase production of key agricultural exports. High capacity diesel water pumps were installed across farmlands. These pumps allowed faster water extraction, with the intention of stimulating growth in the agricultural sector. Deep well pumps replaced some qanats because of their potential to increase productivity. However, these pumps have led to a steep “decline of water tables, which has resulted in a large number of the Iranian qanats having been abandoned over the last 50 years.”<sup>16</sup> The degradation of many qanats is not only a cultural and historical tragedy, but it left entire villages deserted because their inhabitants relied upon qanat irrigation and maintenance-based jobs for their livelihood. Without the qanat they were forced, like the farmers, to migrate to cities like Tehran. With the intention of enabling rural farmers to cultivate more efficiently, this attempt at modernization resulted in mass migration to cities.<sup>17</sup> In turn, this increased Tehran’s water demand, led to further underground extraction, and lowered the water tables. Tehran drained the water tables so aggressively the city now sinks at a rate of 25cm per year.<sup>18</sup>

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<sup>14</sup> Keddie, “Iranian Village Land Reform,” 70

<sup>15</sup> Timothy Mitchell, *Rule of Experts: Egypt, Techno-Politics, Modernity* (Berkeley: University of California Press, 2002), 54–79.

<sup>16</sup> Motiee et al., “Assessment of the Contributions of Traditional Qanats,” 583.

<sup>17</sup> Keddie, “Iranian Village Land Reform,” 88; Adalet, *Hotels and Highways*, 74.

<sup>18</sup> Mahmud Haghshenas Haghighi and Mahdi Motagh, “Ground Surface Response to Continuous Compaction of Aquifer System in Tehran, Iran: Results from a Long-Term Multi-Sensor InSAR Analysis.” *Remote Sensing of Environment* 221 (2019): 534.

## Water Management Under the New Islamic Republic

Tehran's water problems did not go away with the deposition of the Shah. After the 1979 Islamic Revolution, the new government reorganized the system of water governance and created a hierarchy of experts with the expectation they would advise officials on proper water management procedures. However, because of the nature of this hierarchical system, these experts were at odds with each other. They competed to maximize water extraction instead of putting forward sustainable practices.<sup>19</sup> This meant these experts were highly motivated to take bribes, so corruption within this committee ran rampant. Former President Ahmadinejad exacerbated these problems with his reforms of the water management system. To capitalize on natural surface-water runoff, watershed boundaries previously determined water management boundaries. President Ahmadinejad removed and replaced these boundaries with political or provincial boundaries, "accentuating interprovincial competition and the tendency of water to 'flow toward power,'" with no regard for long term environmental consequences.<sup>20</sup>

In attempts to spark growth, the government heavily subsidized water and energy used for agriculture. This removed any motivation farmers had to increase their water efficiency, as seen in Iran's average irrigation efficiency of less than 35%.<sup>21</sup> The government exacerbates the problem with its unwillingness to change traditional crop choices and practices to match available water conditions. In order to continue producing the crops the government wishes to sell on the international market at the rate it wishes to produce, it cannot rely on rainfall or surface-level water collection alone. Because of this, even more deep well pumps have been installed across Iran, specifically on industrial farmlands. The Iranian agricultural sector is "responsible for more than 90% of the groundwater consumption (compared to the 8% domestic groundwater consumption and 2% of industrial groundwater use)."<sup>22</sup> Especially concerning for Tehran, the surrounding water systems are now being tapped into to support these water-intensive crops.

Over time, the Iranian government has recognized these inefficiencies, and gradually increased the price of energy and decreased its water subsidies to minimize excessive economic and water losses. However, these policies have negatively affected the remaining farmers and lower-class workers. Public discontent with these policies is thought to be one of the significant factors that led to the massive protests that occurred in the periphery of Tehran and across Iran in the summer of 2018.<sup>23</sup> The Iranian government prioritizes immediate economic relief in order to quell discontent among the lower and middle class, but these policies are rarely effective.

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<sup>19</sup> David Michel, "Iran's Impending Water Crisis," *Water, Security and US Foreign Policy*, ed. David Reed (Routledge, Taylor & Francis Group, 2017), 176.

<sup>20</sup> Ibid.

<sup>21</sup> Kaveh Madani, "Water Crisis in Iran: A Desperate Call for Action," *Tehran Times*, December 14, 2016, [www.tehrantimes.com/news/301198/Water-crisis-in-Iran-A-desperate-call-for-action](http://www.tehrantimes.com/news/301198/Water-crisis-in-Iran-A-desperate-call-for-action).

<sup>22</sup> Motiee et al., "Assessment of the Contributions of Traditional Qanats."

<sup>23</sup> Thomas Erdbrink, "Protests Pop Up Across Iran, Fueled by Daily Dissatisfaction," *The New York Times*, The New York Times, August 4, 2018, [www.nytimes.com/2018/08/04/world/middleeast/iran-protests.html](http://www.nytimes.com/2018/08/04/world/middleeast/iran-protests.html).

## Government Accountability and Long-Term Environmental Impact

The Iranian government has yet to claim responsibility for its role in creating the acute water crisis in Tehran and around the country. The government escapes responsibility for remedying the crisis by advancing the narrative that it simply results from worsening climate conditions. It allows the government to minimize all social, political and economic implications of the problem, externalize fault, and avoid accountability.<sup>24</sup> Without government accountability, nothing will compel the Iranian government to change course in time to avoid environmental catastrophe.

Of course, droughts will be detrimental to any water management system. It is necessary to adapt water management systems to effectively deal with a drought. A study on average annual rainfall in Iran found “a consistent decreasing trend in annual rainfall” across the country between 1951 and 2000.<sup>25</sup> However, Iran increased its water extraction and built seven dams between 1990 and 2000.<sup>26</sup> This extreme water extraction increase led to the high levels of subsidence in the periphery of Tehran due to the draining of water tables by industrial deep well pumps.<sup>27</sup> Iranian authorities reported last year that parts of the Tehran plain are sinking at a rate of 22cm per year, which many experts believe will result in catastrophic damage to some of Tehran’s crucial infrastructure, including its international airport and oil refinery.<sup>28</sup> In 2017, Issa Kalantari, head of the Iranian Environment Department, criticized Iran’s Sixth Development Plan, saying, “Such plans are forced on the government without taking soil and water capacities into account . . . We are using our resources in excess without thinking about how to sustain them.”<sup>29</sup> Kalantari raises the visibility of this issue, but this water crisis likely requires a government-wide effort to change course.

## Conclusion

Changes in water usage and management led to and worsened Tehran’s water crisis. This sheds light on the scale of corrective action needed to address the crisis. To achieve an imagined vision of improvement and modernization, Iranian leadership embarked on a state-led, systematic reorientation of the water management system. To support the state’s desire to modernize and establish itself as a competitive actor in the global economy, water management moved away from sustainability and towards rapid development. The Shah implemented various

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<sup>24</sup> Jan Selby, Omar S. Dahi, Christiane Fröhlich, and Mike Hulme, “Climate Change and the Syrian Civil War Revisited,” *Political Geography* 60 (September 1, 2017): 232–44.

<sup>25</sup> R. Modarres and A. Sarhadi, “Rainfall trends analysis of Iran in the last half of the twentieth century,” *Journal of Geophysical Research* 114, no. D3: 238.

<sup>26</sup> Amin Alizadeh and Abbas Keshavarz, “Status of Agricultural Water Use in Iran,” *Water Conservation, Reuse, and Recycling: Proceedings of an Iranian-American Workshop* (Washington, DC: The National Academies Press, 2005), 97.

<sup>27</sup> Mehdi Fattahi. “Drought-Stricken, Parched Iran Is Sinking – Literally,” *The Times of Israel*, January 24, 2019, [www.timesofisrael.com/drought-stricken-parched-iran-is-sinking-literally](http://www.timesofisrael.com/drought-stricken-parched-iran-is-sinking-literally).

<sup>28</sup> Ibid.

<sup>29</sup> “Iran’s Water Crisis Passes Tipping Point,” *Radio Farda*, Iran News by Radio Farda, December 13, 2017, [en.radiofarda.com/a/iran-water-crisis-serious-soil-erosion/28914002.html](http://en.radiofarda.com/a/iran-water-crisis-serious-soil-erosion/28914002.html).

land reforms to modernize Iran's agricultural sector and orient it towards a global market. To increase production of key agricultural exports, high capacity diesel water pumps were installed across newly privatized farmland, displacing thousands of former farmers. This sparked a mass rural exodus to Iran's city centers, namely Tehran.

After the Islamic Revolution, the pursuit of rapid development continued as the government heavily subsidized water and encouraged competition among farming provinces to maximize gains and production. However, this discouraged water efficiency, leading to even more reliance on heavy groundwater extraction. Rapid agriculture development coupled with rising population in Tehran's periphery led to an increase in water demand. However, current levels of water extraction threaten the long-term stability of Iran's agriculture and Tehran's water supply. Iran prioritized development over sustainability, and with water so heavily extracted, subsidence now threatens the very development projects Iran sought to advance. To prevent environmental catastrophe in the future and move forward, the Iranian government must not place modernization at odds with sustainable resource use. Maximizing agricultural gains by orienting this sector of the economy towards an international market may benefit Iran in the short term. However, those benefits are unsustainable if water consumption for agriculture does not change and continues to threaten the integrity of Tehran's infrastructure and the water security of its people.