



# The Water Crisis in Iran: Heightening Instability

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Iran suffers from a serious water shortage, and with ongoing population growth and damage to water resources infrastructure, the condition worsens each year. In many of the remaining freshwater resources there are significant levels of salinity and pollution.

The water crisis has exacerbated Iran's domestic problems. It greatly concerns citizens, raises frustrations, leads to protests in the streets, and figures frequently in academic forums, on social media, and in traditional media. The crisis has amplified class disparities, the lack of confidence in the authorities, and the unemployment and migration of the rural population to cities, known in Iran as "water refugees." Moreover, the agricultural sector, which consumes the most water in Iran, has been less productive than expected—encouragement from the regime notwithstanding—and many farmers have stopped engaging in agriculture and moved to urban areas. However, many have not succeeded in integrating in the cities as they expected, and this in turn intensifies social tensions, crime, and unemployment. The nuclear reactors, which need large amounts of fresh water for the uranium mining industry and for cooling the reactors, and whose wastewater pollutes the soil and water sources, are also influenced by Iran's water crisis, as is the volume of electricity production in Iran. Numerous power outages occur each year, including in the main cities, affecting hospitals, infrastructure, and the operation of heavy industry and the petrochemical industries.

Despite the severity of the water crisis, the solutions Iran has pursued are inadequate. This stems partly from improper water management and from the fact that in-depth solutions require extensive policy changes and considerable capital. To emerge from the crisis, Iran must advance large-scale technological water solutions, such as desalination and wastewater treatment. This requires cooperation with countries that specialize in water solutions and a decision to prioritize the funding of these solutions, yet this is a problematic road for Iran as long as it suffers from an economic crisis, international isolation, and sanctions.

*Keywords:* Iran, water, climate crisis, regime stability, agriculture, economy, urbanization, electricity, protests, policy management

## Introduction

In 2018 the Israeli Ministry of Foreign Affairs launched a website in Persian intended for Iran, presenting Israel's innovative technological solutions regarding the water crisis. In addition, Prime Minister Benjamin Netanyahu posted a video of himself sitting in his office and drinking water. He tells the Iranian people (in English, with subtitles in Persian) about the technological solutions that Israel can provide in order to resolve the serious water crisis confronting Iran, and emphasizes: "Israel has the knowledge to prevent an environmental catastrophe in Iran, but unfortunately the regime in Tehran does not allow us to do so" (Eichner, 2018).

Senior officials in Iran, such as Isa Kalantari, who at the time was head of the Iranian Department of Environment, and Bahram Kasemi, then-spokesman of the Ministry of Foreign Affairs, hastened to hold press conferences. They criticized Israel vehemently for intervening in Iran's internal affairs, and insisted that Iran has sufficient tools to address the water crisis practically and professionally and does not need external help, especially not from Israel (RFI, 2018).

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The water problem did not begin in 2018, and it has been on the public agenda in Iran for more than two decades. During the campaign prior to the February 2016 elections, hundreds of members of parliament signed an agreement calling for a national environmental plan. But despite the calls from elected officials and large demonstrations throughout Iran that were violently suppressed by the regime, the water crisis has worsened from year to year.

In addition to the accompanying domestic instability and public frustration, the water crisis has led to a worsening of natural disasters and human problems in Iran, including sinkholes, the subsidence of the land by a few centimeters each year, salinization of the soil and groundwater, damage to biological diversity, harm to agriculture and heavy industry, and tension at the borders. In a paper on the water situation at Iran's borders, Ali Shahidi and Fariba Niroomand Fard from the Department of Water Engineering at the University of Birjand claim: "[The water situation] can determine the state of peace or war in the current era" (Niroomand Fard & Shahidi, 2018).

This article surveys Iran's water management policy and the impact of the water crisis on Iran's social fabric, national security, foreign and economic relations, and regime stability, and examines how the regime addresses these challenges. On some of these topics there is extensive academic literature in English and Persian, but on others the literature is insufficient or not up to date. Given the difficulties of attaining verified data due to the lack of transparency in the information supplied by the regime and the limitations of physical distance, this article is based inter alia on data compiled and compared from Iranian news sites, blogs, and governmental and private research institutes in Iran.

## Background

In both ancient and modern times alike, water has played a critical role in maintaining human societies, and socioeconomic development is dependent to a large extent on proper access to water resources (Shalamzari & Zhang, 2018). Access to water was among the main reasons for the fall of ancient empires. Archeological climate research in Iran shows that the changing amount of precipitation had a major impact on the strengthening and weakening of various civilizations that existed within the current territory of Iran over the last 6,000 years (Fallah et al., 2017). Numerous studies attribute the civil

unrest that led to riots, such as during the so-called Arab Spring, to the water crisis and the resulting food shortage (Kelley et al., 2015; Perez & Climatewire, 2013), which were not managed properly by the authorities and increased the flight to urban areas by people seeking to earn a livelihood. Yet despite this internal migration, unemployment worsened and class disparities deepened, with the shortage of food and water exacerbating despair and frustration among Iranians. Similar explanations help in understanding the outbreak of the crisis in Yemen and the Yemen-Saudi Arabia war. It is estimated that almost a third of Yemen's residents lack access to sufficient food and water (Mohamed, 2017).

Iran is located between the continental climate zone of western Asia and the Mediterranean climate zone. It covers an area of 1.648 million square kilometers—the nineteenth largest country in the world in terms of area (Sodoudi et al., 2010). About 42.5 percent of Iran's territory is covered by deserts that are difficult if not impossible to settle and cultivate (Khosroshahi et al., 2009). The climate in central and northern Iran is defined as about 65 percent arid, about 20 percent semi-arid, about 15 percent subtropical climate, and hot-summer Mediterranean climate (CSa) on the coast of the Caspian Sea (Madani et al., 2016). The region of western Iran is part of the Fertile Crescent, which has experienced a serious water crisis in recent years, including droughts and the depletion of surface and groundwater sources (Kelley et al., 2015), alongside a sharp decline in regional vegetation cover, increased dust storms, damage to the quality and quantity of crops, migration from villages to cities, and political unrest. Many researchers predict the collapse of the Fertile Crescent in the coming century (Notaro & Kalashnikova, 2015).

In the average year, temperatures in Iran range from -20 to +50 degrees Celsius. The average amount of precipitation is almost 250 mm per year, but in most of the territory the average precipitation is 100 mm per year. This is

about a third of the global average precipitation (Gohari et al., 2017). It is estimated that in the coming decades, average temperatures in Iran will increase by 2.6 degrees Celsius and precipitation will decline by 35 percent. According to the European Commission (EC), Iran is the leading producer of greenhouse gas emissions in the Middle East and ranks seventh in the world. Iran's greenhouse gas emissions, due to the increased production of oil, gas, metals, and chemicals, increased by about 6.1 percent between 2019 and 2021, in contrast with emissions by India and Russia, which increased by 3.3 and 3.2 percent, respectively (JRC, 2022). Another reason for the serious air pollution is rapid urbanization—75.9 percent of the population now lives in cities ("Iran," 2019).

There are many reasons for the water crisis in Iran, among them:

- a. Climate change, drought, and reduced precipitation.
- b. Since 1980, the population has doubled to 89 million (Sattari, 2018).
- c. A regime-led policy of doubling the area of cultivated land in order to attain agricultural independence and food security. For example, during a 20-year period that included serious droughts, the cultivated land area grew from 7,000 sq km in 1991 to 8,800 sq km in 2011. Agriculture is deemed the sector that consumes the most water in Iran, more than the consumption of households, industry, and the defense forces combined. Despite the water shortage and soil salinization, traditional methods that are not adapted to the climate are still used (Moridi, 2017).
- d. Iran, considered one of the biggest water wasters per capita, subsidizes its citizens' consumption of water as part of its subsidy policy ("Water Companies," 2022). The average daily consumption per capita is 250 liters—twice the global average. The average daily consumption in Tehran is 400 liters per person (Madani, et al., 2016).

- e. Inefficient and corrupt management of the water sector, including a dam construction policy that has dried out streams, lakes, rivers, and swamps, and non-enforcement regarding water use.

### **Dam Construction and Harm to Water Resources**

Iran constructed dams to resolve the water crisis. Today about 647 dams are in use, and 683 dams are under construction (DW Global Media Forum, 2018). These dams, intended for the immediate provision of water to cities and suburbs that have grown at a tremendous pace and to other government projects, succeeded in reaching their goal only partially (DW Global Media Forum, 2021) and led to serious environmental crises.

Today the dams are almost empty. Hadi Beiginejad, a member of the parliamentary energy committee, warned in 2022 that the amount of water in the dams was less than 37 percent of the originally desired capacity. The Iran Water Resources Management Company reported that of the most important dams for supplying drinking water in Iran, the 11 largest dams fill to less than 20 percent of capacity, and about 63 percent of the dam reservoirs in the country are empty (“Water Crisis,” 2023).

The dams have led to numerous environmental hazards. For example, Lake Urmia, a salt lake that was the sixth largest in the world, shrank to 10 percent of its original size in 2017 after its tributaries were blocked by dams and after massive pumping from deep water wells (Rahimi & Breuste, 2021). The drying of Lake Urmia, which intensified in the last decade, has led to ecological damage, an increase in health risks, a decline in the volume of agricultural production, and the migration of residents (Feizizadeh et al., 2022). Another example is Lake Bakhtegan, which in the past was considered the lake with the richest biological diversity in Iran and provided water to the residents of Fars Province. Lake Bakhtegan dried out due to the Sivand Dam and

the Doroodzan Dam that the state built on the lake’s tributaries. As with Lake Urmia, the drying out of Lake Bakhtegan affected the supply of water for households and for agriculture, caused some wells to dry out and others to become saline, and harmed biological diversity. The salinity of agricultural land increased, the lake bottom became saline, and this saline soil is lifted up by gusts of wind and causes damage to agriculture and to the health of the local population (Tasnim, 2013). Another case is the Gotvand Dam, which was very expensive to construct. Despite the warnings of geologists and engineers, it was built on saline land next to large salt deposits. When water began to collect, the salt dissolved, increased the salinity of the Karun River that brought water into it, and caused damage to agriculture and to the domestic water sector in the region (DW Global Media Forum, 2016).

Some blame the regime for advancing the construction of the dams as a means to provide work to Revolutionary Guards engineering and contracting companies, which were established during the Iran-Iraq War. Thus the construction of the dams became more of an economic project than an ecological and humanitarian endeavor. Indeed, the issue of the dams raises many arguments throughout Iran. Isa Kalantari, the Minister of Agriculture in the Rafsanjani government and in the first government of Mohammad Khatami, and Hamid Chitchian, Minister of Energy in the government of Hassan Rouhani, presented the construction of the dams as the second reason for the water crisis in Iran after reduced precipitation (DW Global Media Forum, 2018).

### **Land Subsidence and Flooding**

The unchecked pumping of water accelerated declining groundwater levels and the depletion of the Iranian aquifer. This pumping and the salinization of the land led to subsidence and sinkholes throughout Iran, including in Tehran, and these collapse every few weeks (Hamshahri, 2021). About 70 percent of the land in Iran is

prone to collapse, including airports, railroads, roads, cities, and factories (Madani et al., 2016). The rate of land subsidence in Iran—on average about 13 cm per year—is five to seven times the global average, and this causes serious damage to infrastructure and buildings (Stone, 2023).

The problem of flooding has worsened worldwide, and Iran too suffers from flooding on a large scale. Recent years have seen more and more cases of heavy rains falling in very short amounts of time. The large-scale logging of forests and deficient urban planning, including construction methods that cover the ground and pave roads, thus preventing water from soaking into the ground, and changing the land surface likewise limit the ground's ability to absorb water fast enough, leading to flooding. Already a decade ago it was estimated that in recent years flooding affected about 11 million people in Iran (Madani, 2014), and about 130 people were killed each year (Madani et al., 2016).

The 2019 floods in Iran affected 31 provinces, with southwestern Iran hit most seriously. According to Red Cross reports, 3,800 cities and villages were damaged by the floods, 65,000 homes were destroyed, and 114,000 homes were partly damaged. Damage was also suffered by 70 hospitals and health centers, 1,200 schools, and 159 roads; 700 bridges collapsed; and there was much damage to property (Shokri et al., 2020). In the summer of 2023, floods in the Sistan and Baluchestan province, which suffers from a water shortage, caused severe damage to agriculture. The government ordered people not to visit the area of the floods, in part due to the risk of infection from the standing water (Independent in Persian, 2023a).

After the rounds of flooding, the provincial and national governments issued tenders for subsidized construction to help residents restore and rebuild their homes (Mehr, 2023d). But despite the regime's promises of compensation, it is difficult to estimate what occurs in practice. For example, after the 2018 floods, the regime announced a plan with the participation of residents to build homes, but the contractors

who received the civilians' money and the state subsidies stopped construction in the first stage and disappeared, and the state did not take action on the issue (Young Journalists Club, 2023). A similar situation emerges from the types of plans for preparing the land to cope with floods, whereas they do not move forward or are not implemented in the first place. Local officials disclaim responsibility, and the recommendations are not applied (Mehr, 2023b; Shakeri & Fadayi, 2014). Plans for preparing civilian infrastructure for future floods have not been implemented properly, to the point where the provincial attorney generals have started to intervene and to demand the advancement of solutions in a specified time period; otherwise, local officials will have to take legal responsibility for the fiasco (Mehr, 2023c).

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The head of the government crisis management organization, Mohammad-Hassan Nami, stated that the government approved a reconstruction budget that would be transferred to the population in the coming weeks. He also explained that there would be a need for "jihadist" forces (civilians and non-civilians) to help with the work in order to lower the high costs, as, he stated, "implementation of conventional methods has imposed many costs on the state." The prevention plan that was submitted to the parliament, which requires a budget of 2 billion tomans, was not approved in 2022 (IRNA, 2022).

In addition, unseasonal and excessively heavy rains break stalks of wheat, which is a central crop in Iran, wash away blossoms, and thus damage potential fruit, break trees, and flood plots beyond their capacity, causing the decay of vegetables before they become ripe, and exposing their roots and uprooting



them. When soil erodes due to the intensity of the water and dilutes the composition of the remaining soil, its quality also declines. All these phenomena, along with the damage to buildings and infrastructure in villages, hurt the livelihood of locals and farmers and constitute another catalyst encouraging internal migration and unemployment (Mossavar-Rahmani, 2019).

## Electricity and Water

Since 2021, advertisements throughout Iran have encouraged reduced consumption of electricity and threatened rolling blackouts to major consumers; electricity on roads and highways has been reduced or turned off entirely; and above all, there have been repeated power outages. There were power outages before 2021 too, but they have become more severe from year to year (“Electricity Shortage,” 2023). In many provinces there are power outages that last for days, and they also occur in major cities such as Tehran.

Iranian electricity is produced in various ways: nuclear power plants, power plants operated using natural gas, gasoline, and oil (Kohli, 2023; Fallahi, 2021). The nuclear power plants that produce electricity consume more water than those using other methods to produce electricity. Some use fresh water while some, such as the power plant in Bushehr, use water from the Persian Gulf that is desalinated for the plant (BBC, 2014). Since the reforms in 2010, most of the energy is planned to come from hydroelectric power generation. Hydroelectric power plants are located in the Caspian Sea basin, near the Persian Gulf, and at lakes and dams built inside Iran (“Iran’s,” 2020). Each summer, Iran, which relies in part on hydroelectric power generation at the dams that it built, watches them as they empty, due to the inability to meet the national electricity supply. Thus in practice, despite the plans of the electricity reform, in 2018, 94 percent of Iranian electricity was produced from natural gas and oil, 3.5 percent from hydroelectric power plants, and 2.3 percent from nuclear energy (BP, 2019).

In the summer of 2021 there were prolonged power outages throughout Iran. In Khuzestan province, where the water shortage is the most severe and numerous demonstrations have taken place regarding water and electricity, Iranian Supreme Leader Khamenei issued a statement: “The water shortage is not a small problem, considering the hot weather in Khuzestan. The demonstrators cannot be blamed, and their problems must be addressed.” However, there was no specific reference to the electricity shortage (Iran Primer, 2021). In the summer of 2021, the power supply situation got so bad that Iran stopped providing power to Iraq and imported power from Armenia, Azerbaijan, and Turkmenistan (Kullab, 2021). Nonetheless, prolonged power outages continued during those weeks.

The problem in Iran regarding electricity supply also stems from old and dilapidated infrastructure, which leads to power loss on the way to consumers. According to a report by the civilian association of the Chamber of Commerce, Industries, Mines and Agriculture of Iran (2023), as long as the country does not undertake fundamental reform, increase the use of natural gas at existing power plants as a substitute for gasoline, and develop renewable energy industries, the electricity situation will worsen from year to year, along with the harm to households and industry.

The power outages hurt hospitals, government ministries and other government buildings, industry, and the economy, including steel production—a leading industry in Iran—and the resulting losses are estimated at \$7-8 billion per year. In addition, production at petrochemical industries (“Report,” 2023), which have a significant impact on Iran’s economy, has also been affected. A study published in the CCSE showed that there is a positive correlation between Iranian economic growth and the petrochemical industries that are critical to its economy (Maitah & Bassam, 2015).

## Water and Internal Stability in Iran

The water crisis has intensified the crisis of civilian confidence in the regime. Aside from the waves of civil protest directed toward the government, the water crisis generates difficulties in the Iranian social fabric. Frustration at the ongoing shortages of water and electricity and at the inadequate government supervision have led to water conflicts among farmers and villagers trying to survive.

In early 2018, Ismail Najjar, then-head of Iran's National Disaster Management Organization and deputy Minister of Interior, warned that if the drinking water problem is not resolved, he predicts that "problems such as water wars and similar conflicts will arise." In order to address this problem, he convened committees of various experts (DW Global Media Forum, 2018). But this problem, which was not dealt with until 2018, has also not been addressed by the committees that he planned to establish.

Iran confronts civil conflicts over access to and use of water resources. These water conflicts have intensified in the last two decades, especially in places where well water has become saline. They are expressed mainly in mutual damage to water transport and blockages of waterways and water pipelines, and they sometimes become violent. In addition, there are water conflicts that are directed at the regime, such as the 2012 riots surrounding the laying of the water pipeline to Yazd, east of Isfahan, and the violent riots at Boldaji in 2016 surrounding the transfer of water for use by a steel factory (Bijani & Hayati, 2011). As described in an article by the Iranian Climate Center: "Water protests have become a permanent feature on Iran's political landscape"; this permanent feature has been evident since the great famine of 1999 ("Water Stress," n.d.).

A study conducted at the Zarrineh River basin in Kurdistan Province showed that despite the water shortage, residents lack motivation for water conservation, and there

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is strong competition over water and its extensive use among the affluent, even when unnecessary (Veisi et al., 2020). Such civilian behavior interferes with proper, effective water management. Presumably there is a positive correlation between the undisciplined hoarding by the population in these provinces and the deep lack of confidence in state institutions regarding the supply of their basic needs. The water crisis, along with water conflicts and difficulties with agriculture and livelihood, have led many villagers to migrate to the cities: despite the lack of a precise breakdown of the reasons for migration to the cities, we can learn from the nature of the migration, the reasons given by migrants, and government and citizen discussions on the issue that water-related issues are among the main reasons for the high level of urbanization in Iran (Stone, 2023). The phenomenon of mass departure of farmers despite the government policy of encouraging agriculture has become so common that they are dubbed "water refugees" (BBC, 2014). According to a UN Human Development Report, of Iran's entire population, the urban sector increased to 75.94 percent in 2019, and it is expected to increase to 85.82 percent by 2050—among the highest in the world (United Nations, 2019). In the provinces where villages have great growth potential, such as Mazandaran province (44.2 percent) and Gilan province (46.8 percent), both with subtropical climates, the level of urbanization is lower (Asghar Pilehvar, 2021).

Urbanization has exacerbated the water crisis in the major cities, including Tehran ("Reason for the Water Crisis," 2023), and caused numerous social problems in Iran. Class divisions have deepened and urban crime, unemployment, and the stress on infrastructure have increased. Nevertheless, about 21 percent of the rural

population living in the margins of the major cities and metropolises still maintain their rural culture (Asghar Pilehvar, 2021).

At the initiative of non-governmental organizations and with the support of the Center for Strategic Studies in the President's Office, periodic conferences have begun in Tehran under the title Water, Culture, and Society. Ghorbanali Saadat, the governor of West Azerbaijan province, estimated at a conference in 2014 that if the condition of Lake Urmia deteriorates further, 5-6 million people will need to emigrate from his province. Former President Hassan Rouhani also confirmed this concern and said: "If we cannot save Lake Urmia, we need to know that millions of people in Iran will need to leave their homes and their lives. And not only in West Azerbaijan [province]." Another expert said at the conference: "In the future it will not be America, Saudi Arabia, and extreme religious sects that endanger us, but rather it is water that will cause the greatest impact on the system's stability" (DW Global Media Forum, 2015).

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Numerous demonstrations have taken place throughout Iran as a result of the water crisis. In August 2023 many from Sistan province took to the streets after being cut off from water for a prolonged period, caused partly by the Taliban's damage to the flow of the Helmand River, which flows from Afghanistan and provides Sistan province's water. The water crisis has caused serious harm to the local population, and many of the demonstrations were led by the province's mullahs and elders (LiveIranNews, 2023). These

demonstrations included cries against Raisi for not taking an interest in the provinces' needs, a demand that he and his representatives come in person to speak with them, and a demand for tax returns on the agricultural sectors that have been destroyed. The demonstrators also protested the government's lack of initiative in solving the water crisis vis-à-vis the Taliban and the salinity of groundwater and wells in the provinces. Meanwhile, large scale protests with similar demands took place in Kurdistan and other provinces due to the water crisis. These demonstrations, even the quietest among them, were violently suppressed by the regime (independentpersian, 2023).

On social media the water shortage has become another issue for criticizing the regime, and seen as proof of the regime's corruption and dysfunction. Allegations have been made that Iran provides water to its neighbors to advance narrow interests instead of providing its residents with their basic civilian needs, and that it focuses on funding militias instead of developing water solutions (Karamizand, 2023). A highly popular tweet stated, "Everyone thinks that something special will happen in the country on the anniversary of Mahsa Amini's death and the regime will fall...if this system is going to fall, it will fall because of other reasons and factors such as poverty, the water crisis, financial corruption and so on, not because of a minimal demand such as freedom regarding the hijab" (Radmand, 2023). People's Mujahedin of Iran leader Maryam Rajavi added the following on Twitter: "Cities and villages in Iran are burning hot without water. This disaster has also reached Tabriz and Mashhad. This is a disaster that is the result of anti-nationalist actions by mullahs, looting people's property, and wasting money in nuclear projects and in supplying the regime's proxies in the region. Nuclear projects have exacerbated the crisis through large-scale water consumption" (Rajavi, 2023). This claim, which connects the water crisis with the nuclear program, appears in numerous places in the public discourse.



The nuclear program is a water-devouring consumer. Enormous amounts of fresh water are needed for uranium mining, for which Iran has built dams, drilled wells, and diverted rivers. In addition, the liquid waste from uranium mining, poured into lakes, streams, and open areas, has a very high level of radioactive material and contaminates the groundwater and surface water. Moreover, most of the reactors are located in areas defined as arid or semi-arid, where citizens already suffer from a shortage of fresh water. Since 1971, the groundwater level has decreased 12 meters in the areas between Yazd and Ardakan. This is exactly in Iran where many facilities of the uranium mining and refining industries are located. In addition, the reactor cooling process requires water and heavy water, for which large amounts of fresh water are needed (BBC, 2014).

On the other hand, the regime has declared that it will solve the water shortage by means of nuclear reactors, whose cooling unit is to include a desalination unit (like at Bushehr). As Mohammad Eslami, Head of the Atomic Energy Organization of Iran (AEOI) said: "Wherever we establish a nuclear power plant, we will have a desalination plant beside it." According to him, the AEOI is also assigning the treatment of industrial wastewater to factories connected to the nuclear reactors (Mehr, 2023a). Nuclear power plants could advance the water desalination program, which would produce water while cooling the reactors themselves, but the whole process of producing uranium and fuels for the reactors requires very large amounts of fresh water and causes contamination. This will not stop, especially given Iran's nuclear program. Presumably even if the reactors can serve as somewhat of a solution for Iran's water crisis, they still constitute a significant problem.

### **Regime Efforts to Address the Water Crisis**

For climate-related and ecological changes, civilian conduct must shift; otherwise it is difficult to implement deep-seated changes

(Ladi et al., 2021). In order to advance solutions to Iran's water crisis, enforcement authorities must begin to monitor the consumption of water and combat the illegal pumping of water. Along with enforcement, cooperation among the different government ministries is necessary to promote effective water solutions. However, to implement enforcement and water solutions, government ministries must be in contact with local leadership of communities in the provinces, those that are not appointed by the central government, and earn the public's confidence, so that local leaderships will cooperate with plans and implement them among the civilian population. Citizens' increasing frustration at the lack of proper handling of the water crisis has expanded the crisis of confidence in the regime, which could make it difficult for the regime to undertake in-depth changes.

Some of the problems that exacerbated the water crisis stem from problems of infrastructure maintenance and enforcement. According to government estimates, about 15,000 villages are not connected to the water network (Tasnim, 2022). Villagers channel water to the villages using traditional open canals with high levels of evaporation and contamination and in trucks. In addition, because of old and unmaintained water infrastructure, the percentage of water that is lost due to leaks in the infrastructure on the way to its destination in urban regions is between 15 and 50 percent. In villages the situation is even worse (Madani et al., 2016). Furthermore, rural and urban sewage that is dumped without regulation and industrial and agricultural waste damage the soil and contaminate the water, such that in many places the existing water is subject to various levels of contamination and endangers people's health (Ladi et al., 2021). These lapses are not addressed and proper enforcement is lacking, because issues of monitoring, pumping, and wastewater are determined mainly based on political pressure (Moridi, 2017).

Alongside the problems of maintenance and enforcement, Iran has not advanced

an ordered water policy since the Islamic Revolution in 1979. In 1966 a law was passed on monitoring the pumping and drilling of wells, regulating water, and preserving groundwater. In 1983, the law was changed to the Law on the Fair Distribution of Water; supervision was transferred to the Ministry of Energy and the Ministry of Agriculture, with the Ministry of Health responsible in practice for the distribution of water to households. The law approved the drilling of private wells in places where the groundwater is in danger only after receiving permission from the Ministry of Energy. Another article in the law permits drilling wells freely in the rest of the country. The law has six articles that focus on punishing citizens who damage waterways and pipelines for their personal or commercial benefit (Law on the Fair Distribution of Water, 1983). In practice there was insufficient enforcement regarding the drilling of wells and the diversion of water. Consequently, the drilling of wells increased even in places where approval is needed, and water conflicts increased in rural areas. In 2010 a law was passed to regulate wells. Aiming to control and regulate illegal pumping and drilling of wells, the law in fact legalized thousands of illegal wells and gave them a pumping license. Another barrier to the law's success was that the budget that was invested in installing water meters at pumping centers was discontinued, and thus monitoring of pumping quantities is not possible (Banihabib et al., 2020). In 2023, a law on the management of environmental crises was passed. The first action carried out since it was passed was to establish steering committees in each province to discuss the prevention of floods (Payamema, 2023b).

In general Iran suffers from deficient public management, which harms its ability to advance proper policy. Part of the functional problem stems from the political appointments of high-ranking and low-ranking officials. When an official, no matter how senior, does not toe the line with the regime's policy or expresses too much criticism, he is replaced by another

official. An example is Kaveh Madani, a professor and expert on the environment and water, who was Deputy Head of Iran's Department of Environment. After he expressed harsh criticism, he was accused of espionage and forced to leave Iran ("Kaveh Madani," 2016).

Because of the appointment system, many decisions are made according to political rather than professional considerations. Elected officials operate and promote solutions whose results can be seen immediately (during the elected official's term of office), rather than effective long-term solutions. This is also the case when warnings are issued by experts (Payamema, 2023a). Furthermore, when making and implementing decisions, public servants and elected officials are warned not to hurt those who are politically connected, such as certain pistachio traders, select industrialists, and more (Sattari, 2018). Even when deciding on a long-term plan, it is difficult to know if ultimately it will be implemented properly. If a contract is signed and the contractor receives payment, this does not necessarily mean that he will actually perform the work. The conduct of authorities and ministries has led to a situation where authorities' legitimacy and the level of public confidence in them is low, so it is difficult for a local authority to recruit its residents for a shared goal (Pazhuhan, 2023). As a rule, there is no inter-ministerial cooperation in government institutions, and this affects the limited power of the Department of Environment (IDOE) and the Ministry of Energy (MOE) in collaborating with governmental and non-governmental organizations. Today both civilian and governmental water management companies operate in Iran. The civilian companies complain that the state does not carry out its payment commitments, which undermines their ability to promote proper management and performance ("Water Companies," 2022). The main solutions that the regime has pursued so far are the many dams and the deep wells it has dug, intended to provide water immediately to citizens and to industry. In recent years the regime has pursued

additional limited solutions to the water crisis, and those who lead the implementation, similar to the construction of the dams, are Revolutionary Guard personnel. A project of connecting villages in Bushehr province to the water network began in 2021. The first stage saw the connection of 39 villages, followed by the connection of 3,000 villages in other provinces. The project included laying water pipelines that did not previously exist in those villages and outside of them (“Revolutionary Guards,” 2022). If water flow through the pipelines is steady and free without advancing plans to resolve the water crisis and provide education on water conservation, connecting the villages to the water network could exacerbate the water crisis in the short term, in specific provinces and in Iran in general.

There are provinces in which, in order to cope with the local water crisis, governors have called for “agricultural jihad,” meaning reducing the irrigation of fields and watering of animals, without providing sustainable solutions for farmers (IRNA, 2023). If this call is implemented as planned, it will help maintain the groundwater but will seriously hurt the various agricultural sectors, due to a lack of advanced agricultural infrastructure for water-efficient irrigation, thus harming locals’ livelihood. In recent years the governmental fund for the environment has invested in providing incentives for companies advancing sustainable technological solutions for adapted, water-efficient agriculture, but this year the fund for the environment was nationalized by the Majles for other purposes, so these incentives were discontinued (SNN, 2023).

Aside from changes to water management, the most suitable solution for Iran’s water crisis, given Iran’s two large saltwater sources—the Caspian Sea and the Persian Gulf—is desalination. The small desalination plants in Iran today are used mainly for the nuclear reactors. Despite the government’s declaration that beside each nuclear power plant a desalination plant would be built that would also serve the civilian population, the plan is far

from implemented and it is not clear whether the plants will provide water, and how much. The main difficulty in developing desalination facilities stems from their being expensive to develop and to operate. The other difficulty is that for these facilities, Iran needs technological collaboration with external technology companies and partnerships with countries that have this technology (Ghasemzadeh & Sharifi, 2020). Both make it difficult for Iran to attain desalination while it is at the height of an economic crisis and under sanctions and has severed diplomatic relations with countries that have desalination solutions. If Iran chooses to work toward this solution, it will need to forfeit or to suspend other plans and goals that it is currently pursuing and in which it invests considerable resources, so that it has sufficient economic or diplomatic resources for pursuing the expensive solution of desalination.

### **Water in Neighboring Countries: Water Diplomacy**

The shortage of water is a global problem that is not unique to Iran. The countries bordering Iran and those surrounding the Persian Gulf also suffer to varying extents from a water crisis. Some rivers in these countries border on Iran’s territory, and thus they affect the water supply in Iran itself (Figure 1). Moreover, due to the water shortage there are fluctuations in governmental stability in these countries, and this affects security, employment, and mutual migration. There are also countries that have successful technological water solutions, and can share them with Iran if they choose to do so (Atef et al., 2019).

An example of a water conflict on the borders is the Harirod River that originates in Afghanistan, continues to Iran, and from there to Turkmenistan. The Kajaki Dam on the Harirod River in Afghanistan was a source of conflict between Iran and Afghanistan even before the Islamic Revolution. In 1973 an agreement was signed whereby Afghanistan must provide Iran with water at a flow of 97.2 cubic meters per



**Figure 1.** Water sources shared between Iran and its neighbors, based on map of Iran's cities and main towns

Source: Wikipedia

second. However, during droughts, when the river is low, Afghanistan has difficulty providing this amount of water, and there are increased problems with the supply that it committed to Iran in the agreement. In 2000, when there was a drought, Iran turned to the UN Security Council, claiming that the Taliban was not meeting the agreement and was impairing the water flow. In such a case, according to the agreement, a joint committee is to be appointed to discuss the situation. The problem is getting worse because the river provides water to the city of Mashhad and to wetlands in Iran that are an important source for agriculture, and any change in the supply of water risks drying out the wetlands (Thomas et al., 2016). In May 2023, the Taliban stopped the agreed water flow, and the situation escalated to the point of exchanges

of fire between Iran and Afghanistan (Dages, 2023). A similar case is the Helmand River, which also originates in Afghanistan and flows into Iran. An agreement was signed in 1973, and confrontations take place when its tributaries are blocked by Afghanistan during dry periods (Teillet & Ali Shariati, 2023).

Iran also blocks waterways to neighboring countries. It violates the 1975 agreement with Iraq, which regulates the flow of tributaries that originate in Iran to the Tigris in Iraq (Voldani, 2018). In 2005, after blockages, Iran and Turkmenistan built the Doosti Dam to regulate the transfer of water between them (Thomas et al., 2016).

Aside from water conflicts with countries bordering Iran, there are countries close to Iran that have advanced solutions for desalinating



water. The percentage of water that comes from desalination plants in the Gulf countries ranges from 70 to 90 percent. Saudi Arabia is currently trying to become a desalination empire, and on September 4, 2023, Crown Prince and de facto ruler Mohammed bin Salman declared the establishment of the national water organization in Riyadh, which aims to be the center of technological knowledge and collaborations in the field of freshwater solutions (Independent in Persian, 2023b). Technological knowledge on desalination has become a diplomatic and strategic asset: diplomatic due to the ability to advance partnerships with countries that do not have abundant water, and strategic in that they are independent when it comes to water and are not dependent on a river that originates in a neighboring country. But at the same time, this asset has also become their Achilles' heel (Chibani, 2023), given assessments that in the case of an escalation, Iran would strike the desalination systems of another Gulf country, thus paralyzing it. These concerns exist even though in 2023 Iran renewed its diplomatic contacts with the Gulf countries, in particular with Saudi Arabia (Cafiero, 2023). To the extent that these diplomatic contacts deepen, and Iran succeeds in recruiting sufficient economic resources, it will be able to progress toward technological partnerships with these countries regarding water solutions.

### Impact on the Iranian Market

The climate crisis also directly affects the economy and food security. Iran, which faces international isolation, sanctions, and high inflation, faces problems with its gross national product, which has declined since 2013 (Iran GNP, n.d.). The impact of the climate crisis on Iran is of great importance in increasing Iran's dependence on external actors.

In early 2022, the head of Iran's association of flour producers announced that in that year the country must import about 20 million tons of grain, and stated that it had never been so dependent on imports (Iran International,

2022). Relative to its population size and compared to other countries, Iran imports an average amount of wheat. However, Iran invests considerable resources in having an independent wheat supply, without being dependent on imports—71 percent of the cultivated land is dedicated to growing grains based on rainfall. Recently Iran has suffered from drought and flooding, and has not met its production requirements with respect to population growth, thereby increasing its dependence on imports each year. The estimate for 2019 was that the recent droughts had caused 52 trillion rials of damage to the agricultural sector, and 3.6 billion rials of damage to water resources (Mossavar-Rahmani, 2019). Aside from the fact that wheat is an important basic food product in every country, in Iran, which subsidizes bread for its citizens, importing becomes an even greater economic burden for the regime (Iran International, 2023; Reuters, 2022). Since the beginning of the Russia-Ukraine war, the amount of wheat imported from Russia has increased, and on many occasions the wheat has been frozen at ports because of Iran's difficulties providing foreign currency for payment (Grain Brokers Australia, 2023). Presumably difficulty providing foreign currency to Russia in all areas of imports was one of the many catalysts for the joint Russian ruble (RUB) exchange rate.

An important agricultural sector that was affected is pistachios, the Iranian "green gold." The scarcity of water in pistachio-growing regions has lowered production. Hossein Rezaei, secretary general of the Iran Pistachio Association (IPA), announced that pistachio production in Iran had declined by 70,000 tons in 2022, and was only around 150,000 tons. Rezaei added that the sprouts of the current year were also destroyed because of climate change, which directly affects future production ("Iran Exports," 2022). The two main pistachio suppliers today are Iran and the United States. The major pistachio traders in Iran have close connections with the government.



Alongside agriculture and food security, heavy industry and the petrochemical industries also suffer from production problems that stem from the shortage of water and electricity, and each year they record losses as a result (Chamber of Commerce, Industries, Mines and Agriculture of Iran, 2023; “Electricity Shortage,” 2023). The petrochemical industry is Iran’s leading export industry, so any harm to it has significant economic consequences.

## Conclusion and Recommendations

The water crisis in Iran is severe. The reasons for the crisis are the doubling of the population (United Nations, 2019), poor and damaging water management, droughts, and wasteful agriculture (Banihabib et al., 2020). All of these have led to a situation where water resources are quickly being depleted. The water crisis has led to serious damage from which it will take Iran decades and even centuries to recover. Some results, like subsidence, are irreversible. The forecasts for Iran’s water and climate future, if it maintains its policy, are not good, and they indicate harm to all remaining water resources in the country. As a result, Iran could suffer serious humanitarian, political, and social crises that are in many ways similar to those that exist in countries like Syria and Yemen.

Iran is entangled in conflicting objectives that make it difficult for it to pursue a policy that will save it from this bleak future. On the one hand the regime buys quiet from its citizens through subsidies that include subsidizing water for farmers and households. On the other hand, as long as this policy continues, Iranian citizens will continue to consume large amounts of water, and incentives for water conservation will fail.

Iran is trying to attain independence that will end its dependence on external actors, and thus, inter alia, it is working to advance its food security by expanding the agricultural sector. However, because it lacks a policy for promoting advanced, sustainable agriculture, the agricultural sector is draining water reserves

and hurting soil quality, affecting the volume of production in the near future, in turn undermining food security, while harming the remaining water resources to an unprecedented degree.

On the one hand Iran is working toward regional hegemony through “Shiitization,” militias, and influence over leaders of various countries. On the other hand, it is losing its internal stability and citizens’ confidence in the regime and exacerbating civil unrest, whereas due to the worsening crisis, even the subsidization policy no longer properly provides for citizens’ needs.

Although Iran faces an economic crisis and sanctions, it seems that it has no choice but to pursue technological water solutions, such as desalination and use of treated wastewater for agriculture. In order to advance such solutions, it apparently would have to forfeit and suspend other major programs that deplete its cash reserves or cause diplomatic isolation. But even these expensive solutions would not be enough. In order to overcome the serious crisis, Iran will have to create a proper water administration that enforces rules regarding water pumping without political corruption and promotes education toward water conservation, while lowering subsidies and investing in a strict policy of transitioning to sustainable, water-efficient agriculture. As long as Iran does not fundamentally change its policy, its economic, social, and political stability is in danger.

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