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BASRA IS THIRSTY

Iraq's Failure to Manage the Water Crisis



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Iraq's Failure to Manage the Water Crisis

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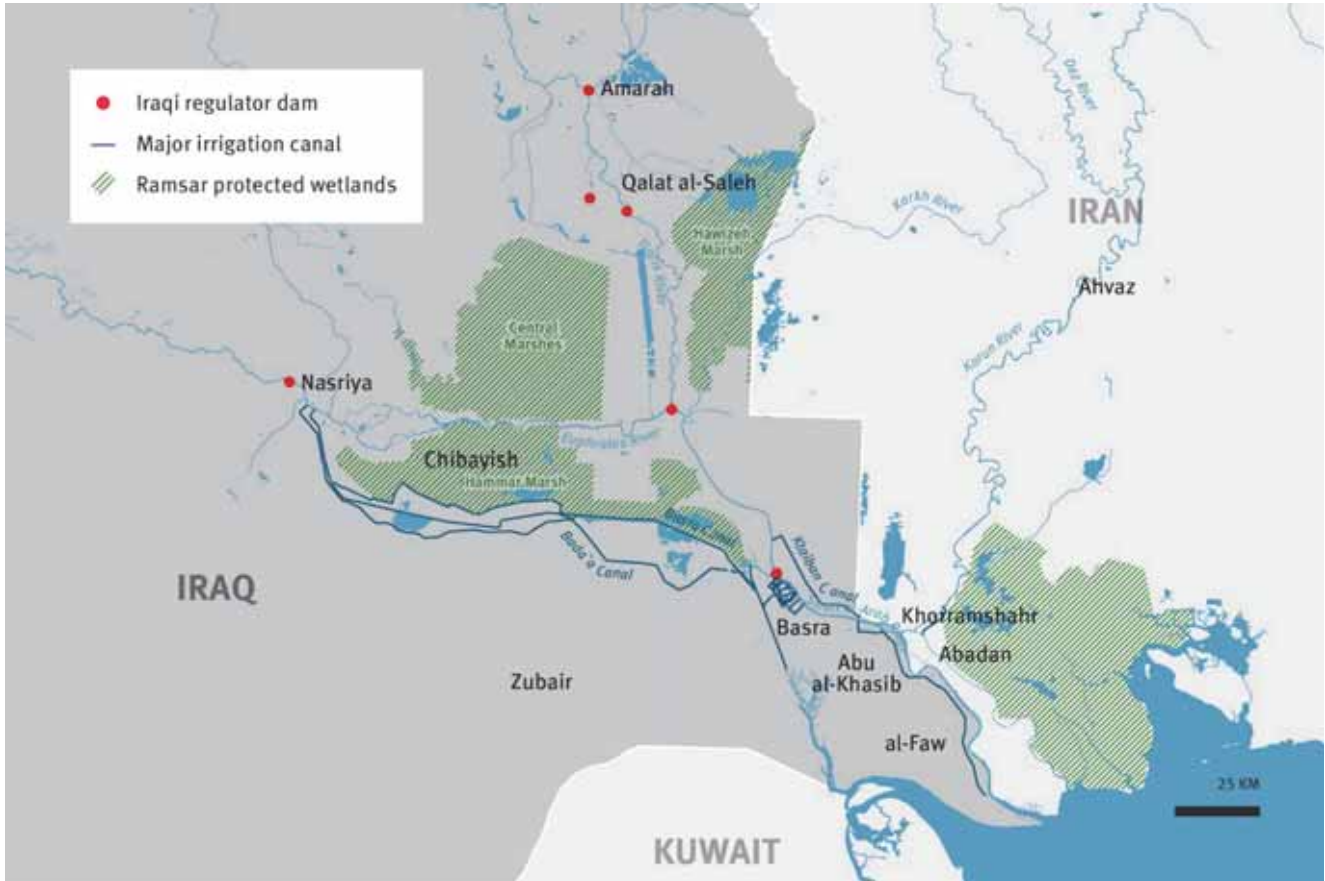
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| | |
|---|------------|
| Map | i |
| Summary | 1 |
| Lack of Information during the 2018 Health Crisis..... | 3 |
| Water Mismanagement..... | 4 |
| Agricultural, Health Impact | 7 |
| The Way Forward | 9 |
| Methodology..... | 11 |
| I. Background..... | 13 |
| II. The Problem: Lack of Safe Water for People and Livelihoods | 19 |
| Salinity..... | 19 |
| Livelihoods: Farming, Raising Livestock, and Fisheries..... | 20 |
| Contamination..... | 25 |
| Schools..... | 34 |
| III. The Reason: Insufficient Water Quality and Quantity | 37 |
| Lack of Enforcement | 38 |
| Mismanagement & Corruption | 71 |
| Unsustainable Agricultural and Domestic Water Usage..... | 86 |
| Lack of Adequate Information, Healthcare, and Remedial Measures | 88 |
| Other Contributing Factors | 93 |
| IV. International Legal Obligations | 103 |
| Right to Water..... | 104 |
| Right to Sanitation..... | 107 |
| Rights to Health and Healthy Environment | 107 |
| Right to Property..... | 108 |
| Right to Information..... | 109 |
| V. The Way Forward | 110 |

| | |
|---|------------|
| Recommendations for Iraqi Authorities | 114 |
| Recommendation for the United Nations' Special Procedures..... | 117 |
| Recommendation for Iranian, Turkish and Syrian Authorities | 117 |
| Recommendations for Donor Governments | 117 |
| Recommendations for JICA..... | 118 |
| Recommendations for Development and Humanitarian Actors..... | 118 |
| Acknowledgements | 120 |
| Appendix I: Letter to Mr. Muhammad Tahir al-Mulhim from Human Rights Watch | 121 |
| Appendix II: Letter to Mr. Shinichi Kitaoka from Human Rights Watch..... | 126 |
| Appendix III: Letter to Human Rights Watch from JICA on May 24, 2019 | 130 |

Map



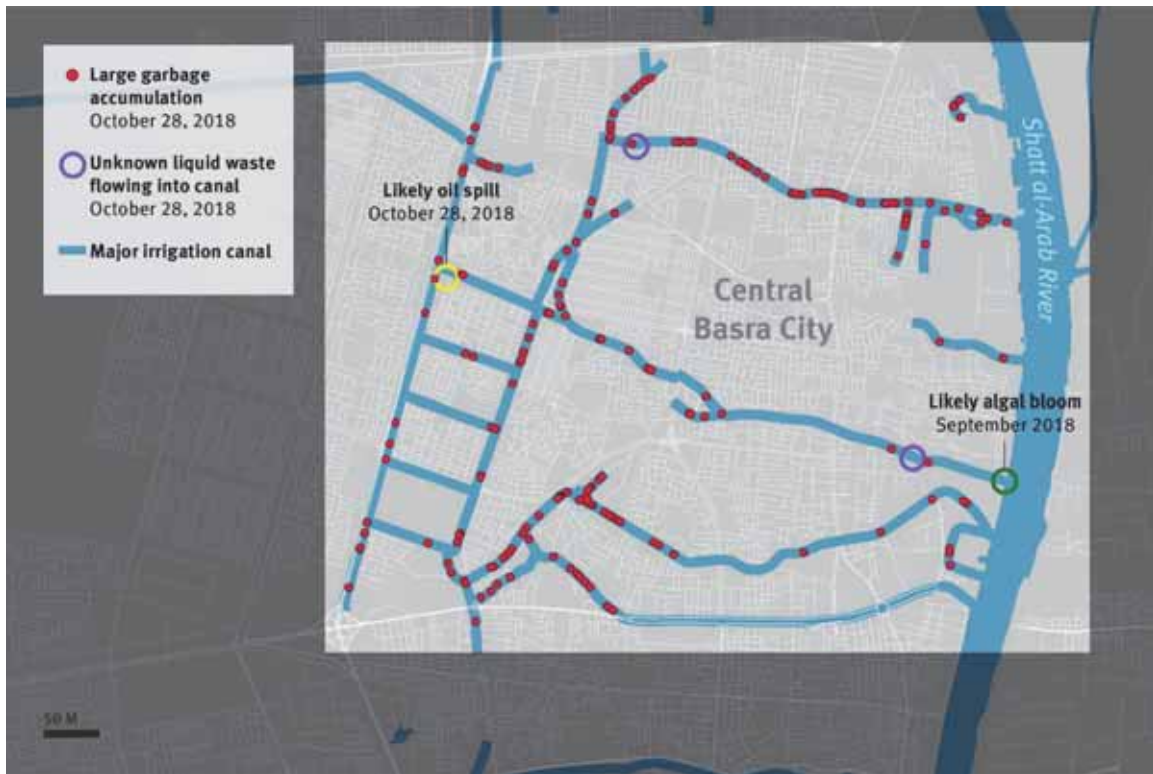
Map of southern Iraq and waterways feeding into the Shatt al-Arab and into the Persian Gulf. Global surface water data: EC JRC/Google. Reference data: OSM, GADM.

Summary

For almost 30 years, including during the period of occupation by the US- and UK-led Coalition Provisional Authority, Iraqi authorities have failed to properly manage and regulate Iraq's water resources, depriving the people in Iraq's southern Basra governorate—a population of roughly 4 million—of their right to safe drinking water. Basra's primary water sources are the Shatt al-Arab river and its freshwater canals. But multiple government failures since the 1980s, including poor management of upstream sources, inadequate regulation of pollution and sewage, and chronic neglect and mismanagement of water infrastructure, have caused the quality of these waterways to deteriorate.

While the degradation of Basra's water sources has been a persistent problem for decades, it became a full-blown crisis in the summer of 2018, when at least 118,000 people were hospitalized due to symptoms doctors identified as related to water quality. In August, hundreds of people began pouring into Basra's hospitals suffering from rashes, abdominal pain, vomiting, and diarrhea, overwhelming their staff and available stocks of medicine. By August 16, the Basra Health Directorate identified water contamination as a likely cause, and its director, Riyad Abd al-Amir, called on people to boil all water before drinking or cooking with it.

The following week, the Iraqi Ministry of Health denied the existence of a serious epidemic of cholera or other diseases due to water contamination in Basra governorate, even as hundreds of people continued to be hospitalized each day. On August 26, hundreds of residents stormed the Basra Health Directorate to protest the poor health services provided to those who had fallen ill. On September 29, the head of the office of the Independent High Commission for Human Rights in Basra, Mehdi Al-Tamimi, stated that the number of cases had reached 100,000, with health authorities registering at least 118,000 cases by November 2018. While experts disagree on the exact cause of the illness, they all agree that it was related to poor water quality.



A range of contaminants in the Shatt al-Arab and connected waterways in central Basra city during the health crisis from September to October 2018 that Human Rights Watch identified in satellite imagery. Analysis. © 2019 Human Rights Watch. Road data: OSM.

Linked to the crisis, according to the United Nations, almost 4,000 individuals had to leave their homes in August 2018, likely because they did not have access to enough potable water, though the causal link has yet to be clearly demonstrated.

That year, the water flowing to the Shatt al-Arab and its canals from rivers upstream decreased, resulting in elevated levels of sewage, agricultural, industrial pollution, and salinity in the water. Some experts believe that the health crisis was sparked by an algal bloom created due to these conditions.

The 2018 crisis was preceded by similar water-related health crises in 2009 and 2015, yet after all these crises local and federal authorities failed to properly address the underlying causes or establish procedures to protect residents before a new crisis arose. For example, during the 2018 crisis authorities did not adequately alert residents regarding the poor water quality and still have not published any official investigations into the cause of the health crisis.

Moreover, authorities continue to allow, or turn a blind eye to, activities that pollute Basra's water resources and lead to a decline in water flows despite the health and financial risks to residents. In February 2019, likely as a result of the 2018 crisis, the Ministry of Health and Environment started posting online weekly reports on the water quality in the Tigris, Euphrates, and Shatt al-Arab. These frequently show the water quality index, which is based on a range of parameters including salinity levels, phosphates, pH levels and other markers, in parts of the rivers, falling below 50 points, well below the acceptable water quality rating.

Compounding the problem, promised government projects to improve water quality have failed to materialize due to mismanagement and corruption. Authorities have also failed to provide residents with adequate information to protect themselves in the event of a future crisis, which experts say is inevitable. These combined failures violate Basra residents' right to water, sanitation, health, information, a healthy environment and property (land and crops) guaranteed under international law as well as national law.

The high cost of water, especially during the crisis, fell hardest on poorer residents and made them particularly vulnerable to unsafe tap water. An estimated 338,400 residents of Basra live in informal housing spread throughout the governorate that is excluded from the formal water and sanitation network, making them among the most water-insecure in the governorate. As a result, some resort to tapping illegally into the water network if there are pipes that run under their homes. This community, and other poorer and marginalized groups in Basra, were particularly acutely affected by the crisis. In order to uphold the right to water states are obliged to work towards achieving universal access to water and sanitation for all, without discrimination, while prioritizing those most in need.

Lack of Information during the 2018 Health Crisis

Authorities failed to promptly or adequately warn residents during the 2018 crisis of the effects of contaminated water and how to avoid harm or to properly investigate incoming cases to try to assess the possible causes of the illness. They also still have not communicated publicly the cause of the water-related illnesses.

Test results from water samples taken by authorities during the 2018 summer crisis along the Shatt al-Arab, and in treatment plants, including in partnership with a Baghdad

university, have not been made public. Nor have reports produced by the university or the World Health Organization in the wake of the crisis. Federal and local authorities all told Human Rights Watch that the results and reports are confidential.

Beyond one inconclusive press release from the Basra governor's office, no official information about the causes of the health crisis has been published. Iraqis have been left in the dark as to what steps authorities have taken to prevent another water-related health crisis or will take to minimize harm if a similar crisis repeats itself.

One significant gap in Iraq's regulatory regime is the total absence of a public health advisory or directive system that would allow authorities to inform residents when a community's drinking water is, or could be, contaminated, what steps should be taken to mitigate harm, and what protocols are in place for government officials to respond to advisories and to lift them. No such system has been implemented since the 2018 crisis.

Water Mismanagement

The 2018 health crisis is a reflection of multiple failures by authorities to protect Basra's water sources or mitigate the impact of their deteriorating quality on residents. Local and federal authorities do not properly implement and enforce Iraq's robust regulatory framework prohibiting public and private entities from dumping untreated waste into any of the country's waterways beyond rates that are allowed by the Ministry of Health. As a result, waterways including the Shatt al-Arab are replete with contaminants from human, animal, industrial, and agricultural waste. The conventional water treatment plants in Basra are not adequately removing the contaminants or testing the water quality, and in some cases are even failing to add enough chlorine during treatment.

Over the decades, as the state has failed to provide residents with adequate safe fresh water, a private water sector has proliferated. But authorities in Basra have failed to provide adequate oversight of this private sector. For example, until very recently they have not been ensuring that private reverse osmosis (RO) desalination and filtering plants and water truckers are licensed and are abiding by local and international standards to ensure proper water treatment.

Authorities have also failed to ensure that all residents are connected to the water and sewage network. This has encouraged families excluded from the network to illegally tap into it. Despite water crises in Basra in 2009 and 2015, until the 2018 crisis, authorities failed to take any serious action to crack down on this illegal water tapping. For years, farmers and businesses were tapping into the freshwater canals, which have no cover enclosing the water. Authorities did not take significant enough measures to repair damage to the piping delivery network to minimize leakage and contamination and to prevent private individuals and businesses from illegally tapping into the network. It was only after the 2018 crisis that the authorities mustered the political will to take measures to stop this practice.

In addition, authorities have severely mismanaged Iraq's water resources so that rivers and freshwater canals are not delivering adequate quantities of water of sufficient quality to the governorate's public treatment plants. Over 300,000 Basra governorate residents are not connected to the water and sewage network, leading these communities to contaminate groundwater with raw sewage and to illegally tap into the piping network to access water, exposing the systems to wastage and revenue loss, decreased water pressure, and potential contamination. Corruption within local businesses and governmental institutions has also prevented engineering solutions from being completed on time.

Dr. Shukri al-Hassan, a marine science lecturer at Basra University, told Human Rights Watch that the water crisis of 2018 was the culmination of years of mismanagement, during which authorities had ignored clear realities and their own responsibilities:

This crisis proved that the government is weak and riddled with mismanagement of public service. This is why the crisis lasted for over three months. Each official was taking decisions merely to exculpate themselves, and [there was] an unwillingness to ask the international community for help and bring in the requisite experts in order to protect the people of Basra. This is why there were so many victims, and of course it is the poorest that suffer. Shame on the government.

Basra's public water plants are not equipped with the technology needed to remove dissolved constituents from seawater intrusion from the Shatt al-Arab. These constituents make chlorine, a chemical commonly used to treat water, less effective at removing harmful substances. Moreover, experts say that water authorities have struggled to obtain adequate quantities of chlorine due to strict controls aimed at preventing the chemical from falling into the hands of groups like the Islamic State (ISIS) that have used it as a weapon. As a result, some public plants have been unable to add enough chlorine to the water supply to make it safe, the experts said.

In addition, by reviewing satellite imagery from July 15, Human Rights discovered a likely oil spill in the Shatt al-Arab that was visible on that date, having started perhaps days earlier near an oil and gas field around 25 kilometers upstream from Basra city. The spill, which appears to span 24 kilometers along the river on July 15, was never reported either by government officials or the media, and none of the water sector workers Human Rights Watch interviewed for the report disclosed it, indicating they may not have known about it.

Satellite imagery analyzed by Human Rights Watch also identified another likely oil spill into a canal in central Basra from October 28 to 29, 2018 next to a gasoline station that drifted approximately 200 meters east towards the Shatt al-Arab. This incident also went unreported at the time. Two unidentified pipelines along canals in central Basra city were also periodically releasing what researchers suspect were large volumes of waste liquid into the canal from July to October 2018. Satellite imagery analyzed by Human Rights Watch also shows that an accumulation of garbage started building up along canals throughout Basra that feed into the Shatt al-Arab in the center of Basra city from March 2018 to February 2019.

The crisis has been worsened by reduced flow rates in the rivers due to upstream damming linked to sugar plantations and other agricultural development, particularly in Iran, and lower rainfall in recent decades, likely a result of climate change, without adequate policies in place to mitigate impact. It has also been exacerbated by unsustainable water use in agriculture and for domestic purposes.



Human Rights Watch has found evidence of a likely large harmful algal bloom along the Shatt al-Arab in the middle of the city of Basra that may have contributed to the health crisis in the summer of 2018. Satellite imagery analyzed by Human Rights also shows that an accumulation of garbage along canals throughout Basra that feed into the Shatt al-Arab in central Basra city, from March 2018 to February 2019. Satellite image date October 28, 2018. © 2019 DigitalGlobe-Maxar Technologies; Source: European Space Imaging.

Agricultural, Health Impact

Agriculture is the main source of income for rural communities in Basra governorate. However, over the last decade farmers have lost use of much of their land due both to irrigation with saline water that damages soil and kills plants and to upstream developments that have stopped winter floods from flushing out salts in the soils into the Persian Gulf. Crop production across the governorate has reduced substantially since the 1980s.

Not long ago, agriculture—dates in the south, wheat, barley and vegetables in the north—was a major source of livelihood for over 70 percent of rural communities and the largest source of rural employment. However, that has changed over the last decade as Basrawis have had access to less fresh water. In the 1970s, Iraq produced over 1 million tons of dates annually; exports from Basra alone reached 130,000 tons per year. About 87 percent

of Basra's agricultural land has since been all or partially lost because of seawater intrusion.

Basra is not the only governorate being affected in this way. According to the UN Environment Program, Iraq is currently losing around 25,000 hectares of arable land annually, mostly in the south, and desertification is also on the rise. Climate change results in temperature increases leading to increased evaporation, declining precipitation, and changing weather patterns that contribute to water shortages. While some farmers received compensation for their losses during previous crises in 2009 and 2015, farmers affected by the 2018 crisis have said they have yet to receive compensation for their losses.

The contaminated water has also affected people's health, most dramatically when at least 118,000 people were hospitalized during the summer of 2018. Human Rights Watch consulted numerous Iraqi and international water quality experts and doctors, sharing with them data from water samples tested during the crisis. Researchers obtained the samples from a range of different sources. While the experts had different theories on what may have sparked the disease outbreak during that period, they all agreed that it was most likely that contaminated water was the cause.

Human Rights Watch has found evidence of a large algal bloom along the Shatt al-Arab in the middle of the city of Basra that may have been related to the disease outbreak. The algal bloom appears to have been present in the river as early as March 2018 until as late as November 2018. It is clearly visible by September 2018, the same month a professor of hydrology and marine sciences at Basra University identified a brown colored mass coming from a side canal into the Shatt al-Arab in central Basra, which he suspected was an algal bloom. Satellite imagery analyzed by Human Rights Watch shows the colored mass in the water. The mass looked characteristic of an algal bloom according to international water quality experts who reviewed the imagery, including one who is a leading expert on harmful algal blooms.

Organic material including human and animal sewage, garbage, runoff of soil contaminated with agricultural fertilizers, and oil residues encourage algal growth. Higher temperatures resulting from climate change also increase the likelihood of harmful algal bloom. Laboratories that tested water samples at the time of the crisis never tested for

harmful algae either because of lack of equipment or because they did not recognize its potential presence. Other possible causes include viruses (such as norovirus), parasites (giardia or cryptosporidium), bacteria (E. coli), and toxic metals from sewage and agricultural and industrial pollution. The high salinity of the water may also have contributed to the outbreak, according to experts involved in water sample testing during the crisis.

The Way Forward

Facing a water crisis that is largely unaddressed, and almost certain to get worse, local and federal authorities should implement Iraq's obligations to respect, protect and fulfil the right to water. The obligation to respect requires states to refrain from interfering directly or indirectly with the enjoyment of the right to water. For example, states should refrain from polluting water resources or arbitrarily and illegally disconnecting water and sanitation services.

The obligation to protect requires states to prevent third parties from interfering with the right to water. States should adopt and enforce legislation to ensure that private actors—such as private water purification or reverse osmosis (RO) plants and water truckers—comply with human rights standards related to the right to water.

The obligation to fulfil requires states to adopt appropriate legislative, administrative, budgetary, judicial, promotional, and other measures to fully realize the right to water. States must, among other things, adopt a national policy on water that: gives priority in water management to essential personal and domestic uses; defines the objectives for the extension of water services, with a focus on disadvantaged and marginalized groups; considers the current and projected impacts of climate change on its planning; identifies the resources available to meet these goals; specifies the most cost-effective way of using them; outlines the responsibilities and timeframe for implementing the measures; monitors results and outcomes, including ensuring adequate remedies for violations.

In line with these obligations, and given the complexity of the issue facing Basra, local and federal authorities should form an inter-jurisdictional independent water and environment task force vested with the authority and obligation to monitor the ongoing situation, coordinate action by different authorities, and consult with impacted populations in order to address Iraq's water crisis in a strategic, long-term, and sustainable manner.

As a first step, the task force should make public the findings of reports authorities commissioned during the 2018 health crisis and make public long-term plans to prevent future water crises and short-term plans to respond to a potential crisis this summer with adequate medical and other mitigation measures. It should ensure compensation for those affected by the impacts of the crisis on their livelihoods, particularly farmers who lost their livelihoods.

The task force should develop a strategy that clearly outlines which authorities are responsible for cracking down on illegal dumping of pollutants into Iraq's waterways, illegal water tapping, and registering, testing, and sanctioning private water plants and water truckers. Baghdad authorities should hold accountable local officials who do not fulfill their responsibilities.

A team of experts, including international experts, should conduct a thorough study of the water problems in southern Iraq, including an assessment of water requirements and of the quality and quantity of water available, before major engineering projects begin. The study should also survey the state of the public treatment plants and of the delivery network in order to develop a strategy to address the crisis. At the same time, the task force should launch a national strategy to educate the public to more responsibly use water in order to reduce consumption. Accountability should be at the core of any strategy, so that there are clear quasi-judicial and judicial mechanisms where both state regulators and individuals may seek enforcement of regulations and the core content of the right to water. For example, clear complaint mechanisms should be developed at the local level for individuals to file complaints, reserving judicial avenues for individuals should local mechanisms be exhausted.

Iraqi local and federal authorities should ensure that all residents have effective access to information about water quality, and that those without access to adequate safe water have an effective remedy against those responsible. Such remedies should include urgent action when access to potable water and sanitation is cut off.

Methodology

For this report, Human Rights Watch interviewed 58 Basra residents, 46 of whom fell ill during 2018 because of the water crisis or had relatives who fell ill, and five who lost their livelihoods because of the water crisis. Interviewees also include one private reverse osmosis (RO) plant owner, one operator of a private desalination plant, three operators of public plants, two private water truckers, four healthcare professionals, and seven individuals who conducted tests of water samples from the Shatt al-Arab, treatment plants, and taps in homes. Human Rights Watch also interviewed representatives from Basra's provincial council, governor's office, the Ministry of Water Resources, Ministry of Municipalities and Public Works' water and sewage departments, Ministry of Health and Environment, and the Ministry of Agriculture.

Researchers reviewed numerous reports written by governmental and nongovernmental organizations on the crisis. Some of these reports included quantitative data and results of sample testing. Researchers also consulted with eight international water quality and engineering experts.

Human Rights Watch researchers spoke to interviewees in person when possible, but in some cases did so over the telephone or via email, in Arabic or English. Researchers informed all interviewees about the purpose and voluntary nature of the interviews, the ways in which they would use the information, and obtained consent from all interviewees, who understood they would receive no compensation for their participation. For reasons of personal security, Human Rights Watch has withheld the names of a few of the interviewees.

Human Rights Watch analyzed over twenty years of scientific and commercial satellite imagery of the region to critically evaluate changes in land and water use practices potentially related to the water crisis. This included a detailed review of local changes in commercial farming and industrial water consumption, as well as the construction of dams, reservoirs, and canals in Iran and Turkey within the catchment basin of the Tigris and Euphrates rivers. Human Rights Watch reviewed environmental and hydrological datasets produced by the European and United States space agencies (ESA and NASA) to assess regional changes in river flow, lake levels, and vegetation cover. Human Rights

Watch also used satellite imagery to identify suspected illegal water diversion schemes, a possible harmful algal bloom, oil spills, to monitor changes in municipal waste levels in the Basra canal network, and to verify the location and approximate date of relevant videos shared on social media.

Researchers submitted written questions to Iraq's independent Integrity Commission in January 2019 but received no substantive response. In addition, on April 18, Human Rights Watch sent the Government of Iraq a list of questions based on its research. Baghdad authorities provided no response. Human Rights Watch maintains a dialogue with the Iraqi federal government and is grateful for the cooperation we received to assess the facts presented in this report and any resulting recommendations.

I. Background

Basra Governorate is located in southern Iraq, bordering Kuwait to the south and Iran to the east and has a population of roughly four million, according to its provincial council.¹ The majority of the population is Shia, with Sunni and small Christian minorities.² Basra holds a significant amount of Iraq's oil reserves, which account for around 95 percent of Iraq's state revenue at current production rates. In December 2018, Iraq was exporting 3.726 million barrels of oil a day, generating US\$6.1 billion in December alone.³

Basra governorate was once the country's biggest producer of dates, wheat, barley, and rice.⁴ Despite being resource-rich, Basra suffers from chronic unemployment and underemployment and poverty, as well as poor public services and decaying infrastructure, which many believe has been fueled by poor governance and corruption.⁵

For decades, including during the period of occupation by the US- and UK-led Coalition Provisional Authority, Basra residents have suffered from the absence of safe tap water. The Shatt al-Arab, a river flowing from where the Tigris and Euphrates meet, is the primary source of surface water for the region. However, a combination of a decrease in the Shatt

¹ Human Rights Watch interview with Alaa Hashim al-Badran, Basra Provincial Council Secretary for the Restoration of the Marshlands, Basra, January 15, 2019; Human Rights Watch interview with Sabah al-Bazooni, head of Basra's provincial council, Basra, January 16, 2019; "By numbers... The latest statistics of the population of Iraq," Alforat News, January 1, 2018, <http://alforatnews.com/modules/news/article.php?storytopic=39&storyid=176111> (accessed March 7, 2019).

² "Basra Fact Finding Mission Report #2," Norwegian Refugee Council, September 22, 2018, https://reliefweb.int/sites/reliefweb.int/files/resources/NRC_2ndBasraMission%20Report_FINAL_9Oct.pdf (accessed March 7, 2019).

³ Ahmed Rasheed, "Iraq's oil exports rise to 3.73 million bpd in December: Oil Ministry," *Reuters*, <https://www.reuters.com/article/us-iraq-oil-exports/iraqs-oil-exports-rise-to-3-73-million-bpd-in-december-oil-ministry-idUSKCN1OWoOU> (accessed April 16, 2019).

⁴ "Basra," Maarifa, <https://www.marefa.org/%D8%A7%D9%84%D8%A8%D8%B5%D8%B1%D8%A9> (accessed March 7, 2019).

⁵ According to the UN Development Programme, 16 percent of the population live below the poverty line of US\$2.50 per day. Youth unemployment stands at around 18 percent, with more than half of the population in the country overall under 24 years old. "The Basra Compact, a Flagship Partnership to Revive the Economy in Southern Iraq," *UN Development Programme*, May 5, 2015, <http://www.iq.undp.org/content/iraq/en/home/presscenter/pressreleases/2015/05/05/the-basra-compact-a-flagship-partnership-to-revive-the-economy-in-southern-iraq/> (accessed May 10, 2019); "Basra Fury Spreads to Baghdad," *The New Arab*, <https://www.alaraby.co.uk/english/indepth/2018/7/19/The-Iraq-Report-Basras-fury-spreads-to-Baghdad> (accessed March 7, 2019); "Basra Fact Finding Mission Report #1," Norwegian Refugee Council, September 9, 2018, https://reliefweb.int/sites/reliefweb.int/files/resources/NRC%20Basra%20Key%20Findings_FINAL_9Oct.pdf (accessed May 10, 2019).

al-Arab's flow, causing a spike in water's salinity, and unchecked pollution, has forced Basra's residents to purchase water for drinking and cooking, threatened farmers' livelihoods, and has led to at least three public health crises.

Policies and practices of Iraqi authorities since the 1980s have been the principle cause of the degradation in the Shatt al-Arab's water quality, but there are also other factors that contribute to a decrease in its flow, including damming upriver, irrigation, and climate change. Damming projects in Iran, Syria, and Turkey have impacted waterflow into the Tigris and Euphrates since the 1980s.⁶ At the same time, local authorities, individuals and businesses have been dumping significantly more industrial, agricultural and human waste into the rivers.⁷

Compounding this, parts of the Iran-Iraq war from 1980-1988 and the Gulf War from 1990-1991 were fought along the Shatt al-Arab, leaving damage behind and toxic waste (including munitions) in the water.⁸ In the 1990s, sanctions imposed on Iraq left the country without the resources to invest in rebuilding Basra's infrastructure.⁹

Also in the 1990s, Saddam Hussein launched a campaign to drain the marshlands located west of Basra city to punish the local community for harboring Shia opposition figures.¹⁰ At

⁶ Human Rights Watch interview with Hassan Janabi, Baghdad, January 15, 2019; Human Rights Watch Interview with Dr. Shukri al-Hassan, marine science lecturer at Basra University, Basra, January 16, 2019; "Shatt al Arab, Karkheh and Karun rivers," UN Economic and Social Commission for Western Asia and Bundesanstalt für Geowissenschaften und Rohstoffe, Inventory of Shared Water Resources in Western Asia, 2013, https://waterinventory.org/sites/waterinventory.org/files/chapters/Chapter-05-Shatt-al-Arab-Karkheh-and-Karun-Rivers-web_o.pdf, p. 148, (accessed February 22, 2019). Several agreements have been concluded between Iran, Iraq, Syria, and Turkey on sharing water resources over the years, which are still active. The most important is "The Protocol on Economic Cooperation" from 1987 which states that 16 billion m³/year is to be released at the Syrian/Turkish border. A 1990 "Syrian-Iraqi Water Accord" allocates the water of the Euphrates coming from Turkey into Syria and Iraq at a rate of 42 percent and 58 percent respectively. "Euphrates river basin," UN Economic and Social Commission for Western Asia and Bundesanstalt für Geowissenschaften und Rohstoffe, Inventory of Shared Water Resources in Western Asia, 2013, <https://waterinventory.org/sites/waterinventory.org/files/chapters/Chapter-01-Euphrates-River-Basin-web.pdf>, p. 71 (accessed February 20, 2019).

⁷ Human Rights Watch interview with Hassan Janabi, Baghdad, January 15, 2019; "Iraq" Polluted Shat al-Arab Threatens Life, Could Spread Diseases," The New Humanitarian, September 25, 2007, <https://reliefweb.int/report/iraq/iraq-polluted-shat-al-arab-threatens-life-could-spread-diseases> (accessed May 8, 2019); Nadhir Al-Ansari, "Hydro-Politics of the Tigris and Euphrates Basins," *Engineering*, 2016, https://file.scirp.org/pdf/ENG_2016032814494183.pdf (accessed May 8, 2019).

⁸ Human Rights Watch interview with Hassan Janabi, former Minister of Water Resources, Baghdad, January 15, 2019.

⁹ Ibid.

¹⁰ Bel Trew, "Iraq's disappearing Eden: water shortages could force four million people to flee their homes," *The Independent*, October 8, 2018, <https://www.independent.co.uk/news/world/middle-east/iraq-water-shortage-unesco-garden-of-eden-bible-four-million-people-homes-latest-a8574781.html>, (accessed February 25, 2019).

the time, the wetlands were Basra's main source of fresh water.¹¹ Over the years, because of this and factors mentioned above, the Shatt al-Arab's water continued to deteriorate in quantity and quality. The government had initially planned to construct a pipeline to pump water from Kut's al-Gharraf river, through Nasriya straight to Basra, but because of the budgetary impacts of the Gulf War, the government decided to save money and instead of a pipeline, constructed the 240-kilometer-long Bada'a open canal, known as the Sweet Water Canal, to bring the Tigris's fresh water to Basra to provide the city with tap water.

Two of Iraq's largest marshes, the Central and Hammar marshes rely mostly on the Euphrates for replenishment.¹² Because of encroachment of sea water up into the Shatt al-Arab, in 2014, the Ministry of Water Resources built a dam along the Euphrates, between the Central and Hammar marshes and before the beginning of the Shatt al-Arab to prevent that sea water from entering the Euphrates.¹³ Over the last decade the quantity of water in the Euphrates has diminished to the point that it is barely able to sustain the marshes at half the size they once were.¹⁴ The dam project on the Euphrates, which has been successful at retaining much of that water in the marshes, has had a considerable effect on reducing the amount of water flowing from the marshes down the Euphrates, into the Shatt al-Arab.

All 58 Basra residents interviewed by Human Rights Watch for this report said that they and other Basra residents have not been able to drink or cook with tap water since the 1980s because of concerns around pollution and water salinity levels, only using the water

¹¹ Human Rights Watch interview with Hassan Janabi, Baghdad, January 15, 2019.

¹² Human Rights Watch interview with Jassim al-Asadi, managing director of the Chibayish office of Nature Iraq, Baghdad, January 13, 2019.

¹³ The Ministry of Water Resources is in charge of all of Iraq's water before it has been treated for use, and in the case of agriculture, until the water arrives at the agricultural site. It is responsible for the full management of water resources in Iraq, and according to its website, "aims to balance Iraqi citizens' competing demands for water and regulate the future use of these resources." Human Rights Watch interview with a senior government official, Baghdad, January 15, 2019; "About the Ministry," Ministry of Water Resources, <http://www.mowr.gov.iq/node/2> (accessed February 6, 2019); Human Rights Watch interview with Dr. Dhurgham al-Ajwady, Deputy Governor of Basra, Basra, January 16, 2019.

¹⁴ Human Rights Watch interview with Jassim al-Asadi, managing director of the Chibaish office of Nature Iraq, Baghdad, January 13, 2019; Human Rights Watch interview with Sameerah Abed Alshabeeb, manager of the Center for Restoration of Iraqi Marshes and Wetlands, Ministry of Water Resources, Baghdad, January 15, 2019.

to wash their dishes, themselves, and fruits and vegetables.¹⁵ To cope, every family, no matter how impoverished, buys either water that has been desalinated and filtered by reverse osmosis (filtered water), delivered by water truck, and stored in personal tanks or containers, or bottled mineral water for cooking and drinking, they all said. As a result, the Norwegian Refugee Council found in 2018 that residents spend a minimum of \$60 per household every month on purchasing filtered water and another \$60 to \$80 per month for water that is clean enough for personal hygiene, laundry, and other non-potable uses.¹⁶ An aid organization conducted a study in 2018 which found that the median total monthly household income at the national level for non-displaced families was IQD 490,000 (\$410).¹⁷ The report also stated that the primary source of water for the majority of households in the south was through purchasing it from a shop, rather than having access to it through a public network.¹⁸

Exacerbating matters, Basra and other parts of southern Iraq began facing extreme water shortage crises starting in 2009, likely exacerbated by the impacts of climate change on temperatures and rainfall patterns.¹⁹

Water shortages became acute again in 2015 and returned in 2017 when the Islamic State's (ISIS) control of areas along the Euphrates river in Syria contributed to less water flowing across the border into Iraq.²⁰ After ISIS gained control of that part of the river, low levels of

¹⁵ Sinan Salaheddin, "Basra's Tap Water is Too Salty and Polluted Even for Washing," *Bloomberg*, August 2, 2018, <https://www.bloomberg.com/news/articles/2018-08-02/water-crisis-salts-the-earth-in-iraq-s-long-neglected-south> (accessed May 6, 2019).

¹⁶ "Basra fact finding mission report #2," Norwegian Refugee Council, September 22, 2018, https://reliefweb.int/sites/reliefweb.int/files/resources/NRC_2ndBasraMission%20Report_FINAL_9Oct.pdf (accessed March 7, 2019).

¹⁷ "Multi-Cluster Needs Assessment Round VI (MCNA VI)," REACH, September 2018, https://reliefweb.int/sites/reliefweb.int/files/resources/reach_irq_report_mcna_vi_sept2018_1.pdf (accessed May 15, 2019) p. 30.

¹⁸ *Ibid.*, p. 34.

¹⁹ Yassin Osman, Mawada Abdellatif, Nadhir Al-Ansari, Sven Knutsson, and Sadeq Jawad, "Climate change and future precipitation in arid environment of the Middle East: case study of Iraq," *Journal of Environmental Hydrology*, 2017, <http://www.hydroweb.com/protect/pubs/jeh/jeh2017/ansari117.pdf> (accessed March 7, 2019); Missy Ryan, "Drought takes toll on Iraq revival efforts," *Reuters*, July 24, 2009, <https://www.reuters.com/article/us-iraq-water/drought-takes-toll-on-iraq-revival-efforts-idUSTRE56No1Q20090724> (accessed February 19, 2019).

²⁰ Human Rights Watch interview with Sameerah Abed Alshabeeb, manager of the Center for Restoration of Iraqi Marshes and Wetlands, Ministry of Water Resources, Baghdad, January 15, 2019; Amir al-Obaidi, "Iraq faces crisis as water supplies dry up," *The New Arab*, April 30, 2015, <https://www.alaraby.co.uk/english/features/2015/4/30/iraq-facing-crisis-as-water-supplies-dry-up> (accessed February 19, 2019); "After the caliphate: has IS been defeated?," *BBC*, February 7, 2019, <https://www.bbc.com/news/world-middle-east-45547595>, (accessed February 20, 2019); Ben Hubbard, "An ancient river in Syria sections off a modern war," *The New York Times*, August 3, 2018, <https://www.nytimes.com/2018/08/03/world/middleeast/syria-euphrates-river-war.html> (accessed February 20, 2019).

rain and snowfall in the winter of 2017-2018 contributed to an extreme water crisis, making thousands of Basra residents sick and destroying agricultural lands in summer 2018.²¹

As a result of worsening access to clean water among other grievances, during the summer of 2018, Basra residents began demonstrating in large numbers against poor service provision and political corruption.²² Authorities responded by shutting down internet and social media in Iraq, using excessive force against protestors, killing at least nine, injuring hundreds, and conducting arbitrary arrests, before ultimately releasing protestors without charge.²³

Because of the lessening water from upstream into the Shatt al-Arab, the river has over time seen significant seawater intrusion, particularly in the summer months. One of the most common recommendations from Basra authorities to address the incursion is the construction of a dam south of Basra on the Shatt al-Arab preventing the intrusion of sea water (often referred to as Abu Fluss Dam proposal), which could include a lock to allow vessels to pass through.²⁴

²¹ Basra needs 75 m³/sec of river flow in order to keep up with current human, industrial and agricultural consumption during the non-summer months (including 19 m³/sec for tap water and 26 m³/sec for the whole governorate) with increased demand during the summer. Human Rights Watch interview with Alaa Hashim al-Badran, Basra, January 15, 2019; Bel Trew, "Iraq's disappearing Eden: Water shortages could force four million to flee their homes," *The Independent*, October 8, 2018, <https://www.independent.co.uk/news/world/middle-east/iraq-water-shortage-unesco-garden-of-eden-bible-four-million-people-homes-latest-a8574781.html> (accessed February 19, 2019); Marta Bellingreri and Alessio Mamo, "In Basra, people avoid doctors. They might find they've cancer," *Al Jazeera*, February 8, 2019, <https://www.aljazeera.com/indepth/inpictures/basra-people-avoid-doctors-find-cancer-190131142629016.html> (accessed March 11, 2019); Josie Ensor, "Iraq suspends rice farming as water crisis deepens," *The Telegraph*, June 19, 2018, <https://www.telegraph.co.uk/news/2018/06/19/iraq-suspends-rice-farming-water-crisis-deepens/> (accessed February 19, 2019); Arwa Ibrahim, "Iraq's farmers hit hard by water shortages," *Al Jazeera*, August 3, 2018, <https://www.aljazeera.com/news/middleeast/2018/08/iraq-farmers-hit-hard-water-shortages-180802193258236.html> (accessed February 19, 2019).

²² "Water shortages fuel ongoing protests in Basra, Iraq," *BBC*, September 25, 2018, <https://www.bbc.com/news/av/world-middle-east-45626170/water-shortages-fuel-ongoing-protests-in-basra-iraq>, (accessed February 19, 2019); Aref Mohammed and Raya Jalabi, "Rockets Fired at Basra Airport as Violent Protests Grip Iraq," *Reuters*, September 8, 2018, <https://www.reuters.com/article/us-iraq-protests/rockets-fired-at-basra-airport-as-violent-protests-grip-iraq-idUSKCN1LOoDV> (accessed May 10, 2019).

²³ "Iraq: Security Forces Fire on Protesters," Human Rights Watch news release, July 24, 2018, <https://www.hrw.org/news/2018/07/24/iraq-security-forces-fire-protesters>; "Iraq: Security forces deliberately attack peaceful protesters while internet is disabled," Amnesty International, July 2018, <https://www.amnesty.org/en/latest/news/2018/07/iraq-security-forces-deliberately-attack-peaceful-protesters-while-internet-is-disabled>; Sara Elizabeth Williams, "Police clash with protesters in Basra as unrest sweeps neglected southern cities of Iraq," *The Telegraph*, July 15, 2018, <https://www.telegraph.co.uk/news/2018/07/15/police-clash-protesters-basra-unrest-sweeps-neglected-southern/>, (accessed February 20, 2019).

²⁴ Human Rights Watch interview with Dr. Mohsen Disher, Basra University, Basra, January 19, 2019.

However international experts Human Rights Watch consulted with have all cautioned against the proposal. One international water expert working in Iraq told Human Rights Watch that damming up an estuary would have major ecological and navigation impacts and should be avoided.²⁵ He warned that the dam might trigger the sea to even more aggressively eat away at the shoreline, speeding up the effects of the current rise in the sea level.

Experts pointed out that because of the lack of controls on the dumping of sewage and industrial and agricultural pollution upstream, the dam would likely end up trapping stagnant and highly contaminated water behind its walls.²⁶ In addition, current tidal waves in the river help to flush the large amounts of solid waste that residents dump into the canals that feed into the Shatt al-Arab.²⁷

The ebb and tide of the water coming into the Shatt al-Arab moves in two directions also complicating matters.²⁸ The experts said they knew of no other example in the world where a dam was built on an estuary with the aim of preventing seawater intrusion.

²⁵ “Grand Opening Ceremony Marks Completion of First Phase of Multi-Million Dollar Modernization Project for Historic Iraqi Port of Al Maqal in the City of Basra,” Business Wire, October 28, 2013, <https://www.businesswire.com/news/home/20131028006194/en/NAWAH-Modernizes-Historic-Port-Basra> (accessed March 7, 2019); Human Rights Watch interview with international engineering expert (name withheld), Baghdad, January 24, 2019.

²⁶ Human Rights Watch interview with local government official (name withheld), Baghdad, January 24, 2019; Human Rights Watch interview with international engineering expert (name and location withheld), February 7, 2019.

²⁷ Human Rights Watch interview with international engineering expert (name and location withheld), February 7, 2019.

²⁸ Human Rights Watch interview with Mufeed Abdulzahra, head of the Basra office, Ministry of Water Resources, Basra, January 20, 2019; Human Rights Watch interview with international engineering expert (name and location withheld), February 7, 2019.

II. The Problem: Lack of Safe Water for People and Livelihoods

For almost 30 years, Iraqi authorities have failed to ensure that Basra receives water of adequate quality and quantity. The reduced quantity in water coming from upstream has led to sea water from the Persian Gulf intruding into the Shatt al-Arab, the river on which Basra sits. At the same time, the water coming from upstream has become more and more polluted including with contaminants that conventional treatment plants are unable to remove. As a result, Basra residents have not been able to drink or cook with tap water for decades because of concerns around pollution and water salinity levels, only using the water to wash their dishes, themselves, and fruits and vegetables. Farmers have had to irrigate their lands with saline river water, damaging their crops.

Iraq's inability to properly manage its water resources and water treatment, enforce anti-pollution regulations and provide residents of Basra governorate with safe drinking water has had an impact on a range of their rights, as became acutely clear during the 2018 crisis. The ongoing decades of water mismanagement have impacted residents' rights to water, sanitation, health, property, and education. The 2018 crisis also may have triggered displacement, though the link between water and displacement in Iraq requires further study.

Salinity

As a result of the lack of adequate water flowing from the Euphrates and Tigris into the Shatt al-Arab waterway, tests show at least a threefold increase in salt concentration in Iraq's main rivers over the past half century, resulting in severely brackish river water.²⁹ This is a result of irrigation of highly intensive agriculture upstream in Iraq as well as evaporation.³⁰ In addition, the lack of sufficient river water has led to the backflow of sea

²⁹ Food and Agriculture Organization of the UN assessment of Iraq's agriculture, 2008, on file with Human Rights Watch.

³⁰ "Data collection survey on water resource management and agriculture irrigation in the Republic of Iraq," Japan International Cooperation Agency (JICA), 2016, http://open_jicareport.jica.go.jp/pdf/12253860.pdf (accessed March 7, 2019).

water into the Shatt al-Arab, further increasing total dissolved solids (TDS) levels.³¹ This is further discussed later in the report. This is having a significant impact on people's abilities to remain and farm in their areas of origin.

Livelihoods: Farming, Raising Livestock, and Fisheries

Declining water quality and water shortages have had a substantial impact on the agricultural sector in the governorate of Basra. Not long ago, agriculture—dates in the south, wheat, barley and vegetables in the north—was a major source of livelihood for over 70 percent of rural communities and the largest source of rural employment.³² However, that has changed over the last decade, as Basrawis have had access to less fresh water. Partly as a result, over the years much of the rural population has resettled in Basra city.³³

Agriculture in Basra depends heavily on irrigation from rivers and wetlands, as Basra generally receives insufficient rainfall. Dr. Mohsen Disher, a professor in Agricultural Sciences at Basra University, said that over the years, because of the salinity in the water being used for irrigation, salt had accumulated in the soil.³⁴ This has led to plant death, low crop yields, and long-term effects on the sustainability of farmlands for future use.³⁵

Disher said that the most significant sign of the seawater intrusion was the death of Basra's date trees. In the 1970s, Iraq produced over 1 million tons of dates annually, and

³¹ Total dissolved solids (TDS) is the term used to describe the inorganic salts and small amounts of organic matter present in solution in water. The presence of dissolved solids in water may affect its taste. The palatability of drinking-water has been rated by panels of tasters in relation to its TDS level as follows: excellent, less than 300 mg/litre; good, between 300 and 600 mg/litre; fair, between 600 and 900 mg/litre; poor, between 900 and 1200 mg/litre; and unacceptable, greater than 1200 mg/litre (1). The most commonly used method of determining TDS in water supplies is the measurement of specific conductivity with a conductivity probe that detects the presence of ions in water. There are no data available on possible health effects associated with the ingestion of TDS in drinking-water. In addition, there is no health-based guideline value for TDS. "Total dissolved solids in drinking-water," World Health Organization, 2003, https://www.who.int/water_sanitation_health/dwq/chemicals/tds.pdf (accessed March 7, 2019).

³² "Livelihoods and market assessment," Norwegian Refugee Council, October 21, 2018, <https://reliefweb.int/sites/reliefweb.int/files/resources/Basra%20Livelihoods%20Technical%20Assessment%20FINAL.pdf> (accessed March 7, 2019).

³³ Ibid.

³⁴ Human Rights Watch interview with Dr. Mohsen Disher, Basra University, Basra, January 19, 2019.

³⁵ "Livelihoods and market assessment," Norwegian Refugee Council, October 21, 2018, (accessed March 12, 2019).

annual exports from Basra alone reached 130,000 tons.³⁶ He estimated that 87 percent of Basra's agricultural land has been all or partially lost due to seawater intrusion.³⁷ Most agricultural activities have now stopped in Basra.³⁸

Jaafar Sabah, a farmer from Abu al-Khasib, a poor town to the southeast of Basra, said that over the last five years the land showed signs each year of the increased salinity.

Each year I was getting 50 percent of the yield of the year before, and then in 2018, almost nothing survived. In 2018, the salinity level in the water was so high that I could grab the salt from the water with my own hands. I am dying of thirst and so are my children. There were four cases of poisoning in my family. I have no money and I cannot take them to the hospital. Where do I get the money from?³⁹

According to the Ministry of Agriculture, farmers in Basra were using 38,607 hectares to grow their crops in the winter of 2008-2009 and 11,393 hectares in the summer of 2008.⁴⁰ A decade later, in the winter of 2017-2018, it had dropped to 16,386 hectares and in the summer of 2018 was at 3,237 hectares.⁴¹

The water quality has also impacted the livelihoods of those raising livestock by leading to the death of most cattle and water buffalo.⁴² In addition, farmers traditionally used wheat

³⁶ "Laboratory-produced date palm trees," Goharbar, January 28, 2016, <http://goharbar.com/en/laboratory-produced-date-palm-trees/> (accessed March 12, 2019); "Dates in Basra," Iraq Business News, October 15, 2010, <http://www.iraq-businessnews.com/2010/10/15/dates-in-basra/> (accessed March 12, 2019).

³⁷ Human Rights Watch interview with Dr. Mohsen Disher, Basra University, Basra, January 19, 2019.

³⁸ Ibid.

³⁹ Human Rights Watch interview with Jaafar Sabah, a farmer from Abu al-Khasib, Basra, January 16, 2019.

⁴⁰ Crop yields for 2008 summer, 2008-2009 winter, 2017-2018 winter, and 2018 summer, Basra Department, Ministry of Agriculture, on file with Human Rights Watch.

⁴¹ A contributing factor to the substantial drop in 2018 was that authorities banned the irrigation of field crops including corn, rice and millet. Human Rights Watch interview with Paul Schlunke, Senior Emergency Response Coordinator for FAO in Iraq, Erbil, January 27, 2019; Crop yields for 2008 summer, 2008-2009 winter, 2017-2018 winter, and 2018 summer, Basra Department, Ministry of Agriculture, on file with Human Rights Watch.

⁴² Ibid.



Remaining date palms in Basra. Farmers in the governorate have lost many of their date palms after years of irrigating their land with sea water which has intruded into the Shatt al-Arab, destroying the soil and killing off their crops. © 2019 Belkis Wille/Human Rights Watch.

residues as animal feed, but saline water disrupted wheat production, making animal feed scarce and more costly.⁴³

When asked about these developments, Ammar Salman Abd al-Hussain, the director of the Basra Agriculture Department, said that the ministry had no program to track animal deaths related to the water crisis.⁴⁴

⁴³ Ibid.

⁴⁴ Human Rights Watch interview with Ammar Salman Abd al-Hussain, director of the Basra Agriculture Department, Basra, January 16, 2019. The water quality has also affected wildlife - the saltwater in the rivers has killed some of Iraq's freshwater fish population and birds that rely on rivers have been dying. Farmers in Salhiya said that over the last year there were at least four species of birds that they had noticed had completely disappeared from the skies; Human Rights Watch interview with Mehdi Abd al-Sayad Hamza, farmer, Salhiya, January 18, 2019; and Human Rights Watch interview with Dr. Shukri al-Hassan, marine science lecturer at Basra University, Basra, January 16, 2019.

Mehdi Abd al-Sayad Hamza, a farmer from an area called Salhiya, said that on his 1.5 hectares of land he used to grow dozens of crops, and before the 2018 water crisis had six cows, 20 chickens, 40 sheep, and a fish farm with 10,000 fish.⁴⁵ He used river water to maintain his land and livestock. At the beginning of the crisis his plants started dying, and within a month he had none left. He said that 14 chickens, 20 sheep and all his fish died, with the fish bleeding out from their eyes. He said his cows survived but were in bad health.

Jassim Muhammad, a farmer from the town of Siba, has 0.24 hectares on which he used to have 40 date-producing palm trees, grapes and several other fruit varieties, and six cows.⁴⁶ He estimates that he suffered about IQD 6 million (\$5,000) in losses in 2018,

All my cows have gotten very sick, and my grapevines and fruit trees all died. My palm trees have been damaged to the point that the dates they produced after the crisis were so inedible that I had to throw them all out.⁴⁷

He said that during the crisis he was buying 1 m³/day of trucked, treated water for his family and cows, because the cows could no longer drink river water. “The only way we survived is by using my army pension, and all that money just went towards basic survival, leaving nothing to reinvest into the land,” he said.⁴⁸

Abd al-Raheem Abd al-Kareem Abd al-Waheed is a farmer from al-Fayhaa, an area 10 kilometers south of Basra city. He has 0.5 hectares on which he used to grow numerous herbs, flowers, and date-producing palm trees. He said,

I used to have 50 palm trees, and over the years they would suffer over the summer but would recover by the winter. During the crisis last year 41 of

⁴⁵ Human Rights Watch interview with Mehdi Abd al-Sayad Hamza, farmer, Salhiya, January 18, 2019.

⁴⁶ Human Rights Watch interview with Jassim Muhammad, farmer, Siba, January 19, 2018.

⁴⁷ Ibid.

⁴⁸ Ibid.

them died, so I am only left with nine. And the dates those nine produced were inedible so I had to throw them all away.⁴⁹

Because of the agricultural impacts in Basra, there is now a high volume of imported agricultural produce from Iran on sale in Basra's markets which traders estimate consist of over 80 percent of the goods on sale.⁵⁰

While the Basra Agriculture Department carried out assessments of farmers losses and said they compensated them accordingly after the 2009 crisis and a Ministry of Agriculture employee in Basra said that farmers in Siba and Abu al-Khasib had been compensated for the 2018 crisis, Muhammad and another Siba farmer said that in November 2018, a committee came to assess their losses but that as of January 2019 they had yet to find out if they would be receiving any compensation.⁵¹

The water crisis's detrimental impact on property has resulted in tensions and violence between residents. According to the Norwegian Refugee Council, Basra residents in September reported localized violence over resources and land-pasture rights for livestock.⁵² In one case, displaced persons reported that their water buffalo were shot at by host community members for grazing in areas farmed by residents. There were also anecdotal reports of armed violence between different communities over the same issues.⁵³

⁴⁹ Human Rights Watch interview with Abd al-Raheem Abd al-Kareem Abd al-Waheed, farmer, Fayhat, January 18, 2019.

⁵⁰ Human Rights Watch interview with Ammar Salman Abd al-Hussain, director of the Basra Agriculture Department, Basra, January 16, 2019; Human Rights Watch interview with Jassim Muhammad, farmer, Siba, January 19, 2018.

⁵¹ Human Rights Watch interview with Ammar Salman Abd al-Hussain, director of the Basra Agriculture Department, Basra, January 16, 2019; Human Rights Watch telephone interview with employee in the Ministry of Agriculture (name withheld), Basra, January 28, 2019; Human Rights Watch interview with Jassim Muhammad, farmer, Siba, January 19, 2018; Human Rights Watch interview with Tahir Khabib Khimana, farmer, Siba, January 19, 2018.

⁵² "Basra fact finding mission report #2," Norwegian Refugee Council, September 22, 2018, https://reliefweb.int/sites/reliefweb.int/files/resources/NRC_2ndBasraMission%20Report_FINAL_9Oct.pdf (accessed March 7, 2019).

⁵³ "Basra fact finding mission report #2," Norwegian Refugee Council, September 22, 2018 (accessed March 7, 2019).

Displacement

The lack of water and livelihoods may have also led to displacement in Basra.⁵⁴ While Basra authorities had no estimates to share, according to the UN, almost 4,000 individuals had to leave their homes in August 2018 because they did not have access to adequate amounts of potable water.⁵⁵ By January 2019, there were still 208 families displaced from Basra likely because of poor or no access to water, living mostly in other southern governorates.⁵⁶

The Danish Refugee Council, which has been supporting families displaced from the south, is concerned that these families are unable to enroll their children into school because they do not have residency cards for their new areas, do not receive government assistance for internally displaced families because they are not registered with the Ministry of Displacement and Migration, and are often living in non-permanent, and often informal, settings without fixed employment.⁵⁷

Contamination

Organic material including human and animal sewage, garbage, runoff of soil contaminated with agricultural fertilizers, oil residues, and other forms of waste are contaminating Basra's waterways. The conventional public water treatment plants are unable to treat for all the contaminants in the water, and in some instances are failing to properly treat contaminants that they could neutralize, because of a lack of adequate chlorine usage. This is further discussed later in the report. This has had an impact on the health of Basra's residents.

⁵⁴ Ibid.

⁵⁵ "Humanitarian Bulletin Iraq," UN Office for the Coordination of Humanitarian Affairs (OCHA), August 31, 2018, <https://reliefweb.int/sites/reliefweb.int/files/resources/OCHA%20Iraq%20Humanitarian%20Bulletin%20-%20August%202018.pdf> (accessed May 10, 2019).

⁵⁶ "Assessing Water Shortage-Induced Displacement in Missan, Muthanna, Thi-Qar and Basra," International Organization for Migration (IOM), 2019, https://reliefweb.int/sites/reliefweb.int/files/resources/IOM_assessing%20water%20shortage%20induced%20displacement%20in%20South%20Iraq.PDF (accessed May 10, 2019), p. 4.

⁵⁷ Human Rights Watch email exchange with aid worker, Danish Refugee Council, January 16, 2019.

Health

The health impact of the water crisis in Basra was seen most acutely in the summer of 2018. A healthcare worker in Basra who was supporting Basra's hospitals said that between August 12, the day the authorities declared an ongoing crisis, and November, the Ministry of Health registered 118,000 individuals as having fallen sick "because of the water," with some hospitals receiving up to 3,000 patients a day during the peak of the crisis.⁵⁸

A health-sector employee from Abu al-Khasib who works at one of the two local hospitals said that during the crisis, his hospital treated over 3,000 patients.⁵⁹ "People came in with diarrhea, vomiting, and abdominal pain. All we could do was treat the symptoms because we didn't know exactly why they were getting sick." A health-sector employee working as a first responder at a hospital in Abu al-Khasib for 16 days during the crisis said:

We had 500 to 700 patients coming in every day at the height of the crisis. We had no time to properly examine or diagnose them. All we could do is give them injections of medication to reduce their stomach pain, put them on saline solution to deal with the dehydration, and give them medication to reduce their nausea.⁶⁰

The healthcare worker in Basra and residents who fell sick, told Human Rights Watch that they were discharged from the hospital within six hours, once cholera had been ruled out and they had received some treatment for the nausea and diarrhea, with full recovery occurring generally within three to four days.⁶¹

⁵⁸ Human Rights Watch interview with healthcare worker who worked at several Basra medical facilities during the crisis (name withheld), Basra, January 15, 2019; Human Rights Watch interview with Hassan Janabi, Baghdad, January 15, 2019; Human Rights Watch interview with Dr. Dhurgham al-Ajwady, Basra, January 16, 2019.

⁵⁹ Human Rights Watch interview healthcare worker who worked at a medical facility in Abu al-Khasib during the crisis (name withheld), Abu al-Khasib, January 18, 2019.

⁶⁰ Human Rights Watch interview healthcare worker who worked at a medical facility in Abu al-Khasib during the crisis (name withheld), Basra, January 15, 2019; Human Rights Watch interview with Hassan Janabi, Baghdad, January 15, 2019.

⁶¹ Human Rights Watch interview with healthcare worker who worked at several Basra medical facilities during the crisis (name withheld), Basra, January 15, 2019; Human Rights Watch interview with Mehdi Abd al-Sayad Hamza, farmer, Salhiya, January 18, 2019; Human Rights Watch interview with Raja Kathim, Abu al-Khasib, January 18, 2019.

Dr. Shukri al-Hassan, a marine science lecturer at Basra University, and the independent healthcare expert said that the actual number of those who became ill is likely much higher, as the official number is the number of those who went to government-run facilities. It does not include those who went to private clinics or those who never made it to the hospital. Furthermore the 118,000 number only includes those whom the ministry registered from August 12 onwards.⁶² The expert said he thought the real number was closer to 130,000 victims. Many interviewees highlighted that people started falling sick well before August 12, and some said they were still falling ill in January 2019.⁶³

The Ministry of Health did not specify the cause of sickness in any of the cases beyond testing patients' stool to rule out cholera, which they were able to do in all instances.⁶⁴ The Basra healthcare worker said that the hospitals' working assumption was that the tap water people were receiving from the Shatt al-Arab was contaminated by a range of pollutants and excessive levels of salinity. While they were not drinking the water, he said patients were telling doctors they used the tap water to wash themselves, their dishes, and their fruits and vegetables.⁶⁵

An independent healthcare expert said that many of the cases were clustered around the public treatment plants that draw most of their water from the Shatt al-Arab rather than from the Bada'a canal, a canal bringing fresh water to Basra from higher up along the Tigris river, via the RZero pumping station. He said that they observed that some neighborhoods receive water from two separate plants, and in those cases, the streets receiving water via a plant relying on the Bada'a canal via RZero showed much lower signs of illness than the streets relying on a plant mostly sending treated water it drew from the Shatt al-Arab. He pointed out that areas like Zubair, Siba, and al-Faw which are towns south of Basra, had

⁶² Human Rights Watch interview with Dr. Shukri al-Hassan, marine science lecturer at Basra University, Basra, January 16, 2019; Human Rights Watch telephone interview with healthcare worker who worked at several Basra medical facilities during the crisis (name withheld), February 17, 2019.

⁶³ Human Rights Watch interview with Mehdi Abd al-Sayad Hamza, farmer, Salhiya, January 18, 2019; Human Rights Watch interview with Raja Kathim, Abu al-Khasib, January 18, 2019.

⁶⁴ Human Rights Watch interview with healthcare worker who worked at several Basra medical facilities during the crisis (name withheld), Basra, January 15, 2019.

⁶⁵ Human Rights Watch telephone interview with healthcare worker who worked at several Basra medical facilities during the crisis (name withheld), February 17, 2019.



Freshwater canals in southern Iraq and other waterways feeding into the Shatt al-Arab and ultimately into the Persian Gulf. Global surface water data: EC JRC/Google. Reference data: OSM, GADM.

much lower rates of illness because they rely on the Bada'a canal and the Ktaiban canal, a freshwater irrigation canal that starts higher up in the Shatt al-Arab.⁶⁶

Data reviewed by Human Rights Watch on the number of patients received by different hospitals between August 12 and October 28 show that the seven hospitals located in neighborhoods receiving water from treatment plants relying more heavily on the Shatt al-Arab saw 10.2 times as many patients coming in as the five hospitals in the neighborhoods receiving treatment plants relying more heavily on the freshwater canal.⁶⁷ The twelve hospitals received a total of over 109,000 patients during that period.

⁶⁶ Human Rights Watch telephone interview with healthcare worker who worked at several Basra medical facilities during the crisis (name withheld), February 17, 2019; a written response received by Human Rights Watch from a Ministry of Health representative via WhatsApp, February 18, 2019.

⁶⁷ Medical authorities shared data of incoming patients with water-related illnesses with Human Rights Watch based on intake forms at twelve hospitals in Basra from August 12 to October 28, 2018.

The Abu al-Khasib health sector employee said that staff at the hospital he was working at took urine and stool samples from patients, but that as far as he knew, the Ministry of Health only tested the samples for signs of cholera.⁶⁸ He was unaware of what other tests the ministry might have done. International water specialist Ed Brown, Professor Emeritus at the University of Northern Iowa, said that given the symptoms, once cholera and other intestinal bacterial and parasitic pathogens were ruled out, hospitals should have been testing for viruses.⁶⁹

In fact, in October 2018, al-Qadisiyah governorate, 300 kilometers northwest of Basra, saw Hepatitis A and E outbreaks due to water contamination, highlighting Iraq's difficulties with ensuring safe water quality.⁷⁰

Theories for Cause of Illness

To ascertain what sparked the illness, Human Rights Watch consulted with numerous Iraqi and international water quality experts and medical doctors. Researchers shared with them data from water samples, taken during the crisis from various locations along the Shatt al-Arab, from public and private water treatment plants, and from people's taps.⁷¹ While the experts had different theories on potential causes of the illness, they all agreed that it was most likely the water that was the cause. They all pointed out that based on the samples and statements from Ruqay Ahmar, head of the central laboratory, about limitations to her testing equipment and regime, it was clear that authorities were not

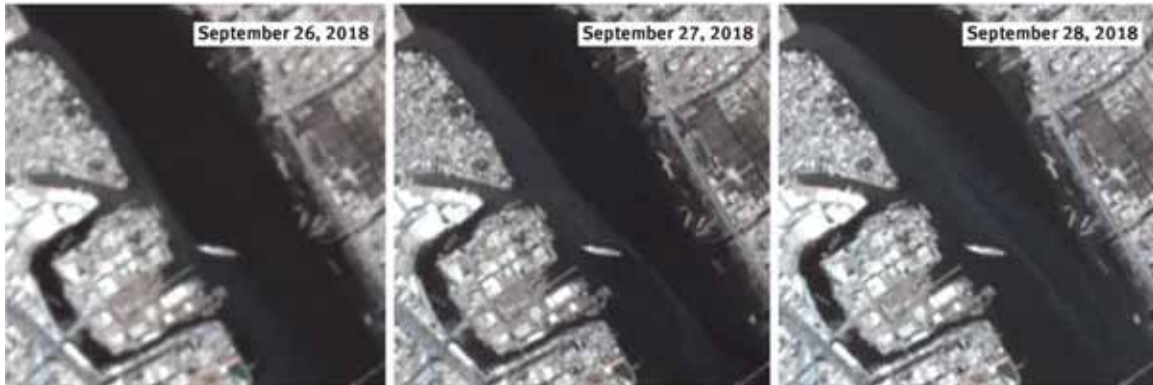
⁶⁸ Human Rights Watch interview healthcare worker who worked at a medical facility in Abu al-Khasib during the crisis (name withheld), Basra, January 15, 2019.

⁶⁹ Human Rights Watch email correspondence with Ed Brown, Professor Emeritus, University of Northern Iowa, April 9, 2019.

⁷⁰ "Diwaniyah Health: We Recorded Viral Hepatitis Due to Pollution, and No Cholera Infections," Al Mirbad, January 10, 2018, <http://www.almirbad.com/news/view.aspx?cdate=01102018&id=c53d26b7-8f86-4d97-8a38-bd8465ecdcof> (accessed May 10, 2019).

⁷¹ Human Rights Watch obtained the data from these water samples from sources which wished to remain anonymous.

Likely Harmful Algal Bloom in Shatt al-Arab River



Human Rights Watch has found evidence of a likely large harmful algal bloom along the Shatt al-Arab in the middle of the city of Basra that may have been related to the health crisis in the summer of 2018. The algal bloom appears to have been present in the river from as early as March 2018 until as late as November 2018. Satellite image date September 26, 27, 28, 2018. © 2019 Planet Labs

testing for many potentially harmful substances that could be present in the water being sent into people's homes.⁷²

A theory put forward by Dr. Abdulzahra Hello, a professor of hydrology and marine sciences at Basra University, is that people were poisoned by algal blooms in water they consumed.⁷³ He shared a video he and colleagues filmed on September 26 of a brown colored mass coming from al-Khandak River, a canal in the middle of Basra city that feeds into the Shatt al-Arab in central Basra city, which he thought was an algal bloom.⁷⁴ Satellite imagery analyzed by Human Rights Watch shows the colored mass in the water, coming from a small canal in the middle of the city of Basra that feeds into the Shatt al-Arab, from March to November 2018.

⁷² Human Rights Watch email correspondence with Ed Brown, Professor Emeritus, University of Northern Iowa, April 17, 2019; Human Rights Watch email correspondence with Tess Russo, hydrologist, Penn State University, April 17, 2019; Human Rights Watch interview healthcare worker who worked at a medical facility in Abu al-Khasib during the crisis (name withheld), Basra, January 15, 2019; Human Rights Watch interview with aid worker (name withheld), Basra, January 20, 2019.

⁷³ An algal bloom is the accumulation or rapid increase in the number of algae in a water body. Some algal blooms produce toxins which can cause skin and eye irritation. If one drinks algae-affected water or eats fish that fed off contaminated water, the toxins can cause gastroenteritis, which can induce vomiting, diarrhea, fevers and headaches, as well as affect the liver or nervous system. "Harmful algal blooms," Better Health, <https://www.betterhealth.vic.gov.au/health/healthyliving/Harmful-algal-blooms> (accessed March 12, 2019).

⁷⁴ Human Rights Watch interview with Dr. Abdulzahra Hello, professor of hydrology and marine sciences, Basra University, Basra, January 19, 2019. Popular Mobilization Forces/Basra Office's Facebook page, https://m.facebook.com/story.php?story_fbid=685302221846925&id=429251827451967 (accessed May 15, 2019).

The mass looked very characteristic of an algal bloom according to two international water quality experts who reviewed the imagery, including one who is a leading expert on harmful algal blooms.⁷⁵ Some of the images showed a turbidity current from runoff, which is what would bring in the nutrients that algae use to grow. In fresh water, harmful algal blooms are almost exclusively caused by blue-green algae. In sea water, harmful algal blooms, often called red tide, are caused by a different type of algae called dinoflagellates.⁷⁶ The imagery did not allow experts to identify the type of algae that the mass might represent, but the water in the Shatt al-Arab was so saline they could not rule out the presence of seawater algae.⁷⁷ Chlorine does not effectively destroy toxins produced by harmful algal blooms.⁷⁸

This would not be the first time a harmful algal bloom was identified in the Shatt al-Arab. In 2015, according to a statement from the Ministry of Water Resources, authorities temporarily shut down several water treatment plants drawing water from the Shatt al-Arab because of the presence of harmful algal blooms in sea water, or red tide, that they said had proliferated because of high rates of pollution and salinity in the water.⁷⁹

Symptoms from drinking water contaminated with algal blooms vary depending on the type of fresh water or sea water, but include abdominal pain, fever, headache, vomiting, and bloody diarrhea.⁸⁰ Excess phosphorus from over-fertilization gets into water and feeds algae as does other organic material including human and animal sewage, and garbage.⁸¹

⁷⁵ Human Rights Watch email correspondence with Ed Brown, Professor Emeritus, University of Northern Iowa, April 17, 2019; Human Rights Watch email correspondence with Tess Russo, hydrologist, Penn State University, April 17, 2019.

⁷⁶ Human Rights Watch email correspondence with Ed Brown, Professor Emeritus, University of Northern Iowa, April 17, 2019; Human Rights Watch email correspondence with Tess Russo, hydrologist, Penn State University, April 17, 2019.

⁷⁷ Ibid.

⁷⁸ “Cyanobacteria and Cyanotoxins: Information for Drinking Water Systems,” United States Environmental Protection Agency, September 2014, https://www.epa.gov/sites/production/files/2014-08/documents/cyanobacteria_factsheet.pdf (accessed May 7, 2019).

⁷⁹ Ibid.

⁸⁰ “Microcystin-LR,” U.S National Library of Medicine, <https://toxnet.nlm.nih.gov/cgi-bin/sis/search2/r?dbs+hsdb:@term+@DOCNO+7751> (accessed May 7, 2019); “Cylindrospermopsin,” U.S National Library of Medicine, <https://toxnet.nlm.nih.gov/cgi-bin/sis/search2/r?dbs+hsdb:@term+@DOCNO+7752> (accessed May 7, 2019); “Anatoxin-a,” U.S National Library of Medicine, <https://toxnet.nlm.nih.gov/cgi-bin/sis/search2/r?dbs+hsdb:@term+@DOCNO+7750> (accessed May 7, 2019) and “Harmful Algal Blooms,” National Capital Poison Center, 2015, <https://www.poisson.org/articles/2015-jun/algal-blooms> (accessed May 7, 2019).

⁸¹ Human Rights Watch email correspondence with Ed Brown, Professor Emeritus, University of Northern Iowa, April 9, 2019.

During the crisis, around 60 percent of the victims were male, and 70 percent were within the 15- to 45-year age range.⁸² In Iraq, Human Rights Watch has observed that men of that age range are more likely to eat out at restaurants than women, children, or the elderly. One Basra healthcare worker, whose brother has worked in numerous restaurants in the city, said that restaurants often use tap water when cooking and washing dishes, instead of using filtered water.⁸³ Water desalination through reverse osmosis likely would have effectively removed the common harmful algal bloom biotoxins.⁸⁴

Ahmar, head of the central laboratory, confirmed that her lab had no equipment to test for harmful algae.⁸⁵ Authorities and UN staff that investigated the causes of illness at the time of the crisis also confirmed to Human Rights Watch that they never tested for algae in the water samples they sent abroad for testing.⁸⁶

Some experts cited other possible causes including the high levels of salinity in the water in concert with the significant levels of untreated sewage as a key likely reason why individuals got sick, with families using this contaminated tap water to wash their fruits and vegetables and their faces.⁸⁷ Others highlighted a lack of sufficient chlorine used during treatment, fecally contaminated groundwater intrusion into the pipes along the water network, and the presence of cryptosporidium and giardia.⁸⁸ However, a bacterial or

⁸² Human Rights Watch telephone interview with aid worker in Basra (name withheld), February 17, 2019.

⁸³ Human Rights Watch interview with healthcare worker who worked at several Basra medical facilities during the crisis (name withheld), Basra, January 15, 2019; Human Rights Watch interview with Hassan Janabi, Baghdad, January 15, 2019.

⁸⁴ S. Boerlage and N. Nada, "Algal Toxin Removal in Seawater Desalination Processes," *Desalination and Water Treatment*, 2014, <https://sci-hub.tw/https://www.tandfonline.com/doi/abs/10.1080/19443994.2014.947785?journalCode=tdwt20> (accessed May 14, 2019); Loreen O. Villacorte, S. Assiyeh Alizadeh Tabatabai, Donald M. Anderson, Gary L. Amy, Jan C. Schippers and Maria D. Kennedy, "Seawater Reverse Osmosis Desalination and (Harmful) Algal Blooms," *Desalination* 360, 2015, <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.842.5006&rep=rep1&type=pdf> (accessed May 14, 2019).

⁸⁵ Human Rights Watch interview with Ruqay Ahmar, head of al-Baradi'yah central laboratory, Basra, January 21, 2019.

⁸⁶ Human Rights Watch interview with Ahmed Hanoon, head of the environmental department, Ministry of Health and Environment, Basra, January 20, 2019 and Human Rights Watch interview with Dr. Adham Rashad Ismail, Acting World Health Organization Representative, Erbil, January 28, 2019.

⁸⁷ Human Rights Watch interview with Dr. Shukri al-Hassan, marine science lecturer at Basra University, Basra, January 16, 2019.

⁸⁸ Human Rights Watch interview with Mufeed Abdulzahra, Basra, January 20, 2019; Human Rights Watch email correspondence with international water expert (name withheld), April 3, 2019.

cryptosporidium or giardia outbreak would normally show victims with symptoms that would last longer, possibly weeks, rather than several hours or only a few days.⁸⁹

Some experts focused on the presence of industrial waste in the water, highlighting that water samples taken over the years showed trace elements of lead, zinc, cadmium, sulfates, boron, and magnesium.⁹⁰ Acute metal poisoning, like cadmium and mercury poisoning for example, can present with nausea, vomiting and diarrhea.⁹¹

⁸⁹ Human Rights Watch interview with a senior UN official, Erbil, January 28, 2019. Human Rights Watch telephone interview, February 17, 2019; “Giardia,” Centers for Disease Control and Prevention, <https://www.cdc.gov/parasites/giardia/general-info.html> (accessed May 7, 2019); and “Cryptosporidium,” Centers for Disease Control and Prevention, <https://www.cdc.gov/parasites/crypto/general-info.html> (accessed May 7, 2019).

⁹⁰ Human Rights Watch interview with Dr. Mohsen Disher, Basra University, Basra, January 19, 2019. Lead is present in tap water to some extent as a result of its dissolution from natural sources, but primarily from household plumbing systems which contain lead. Its effects on the central nervous system can be particularly serious. Signs of acute intoxication include dullness, restlessness, irritability, poor attention span, headaches, muscle tremor, abdominal cramps, kidney damage, hallucinations, and loss of memory. Prolonged exposure results in muscle weakness, gastrointestinal symptoms, lower scores on psychometric tests, disturbances in mood and symptoms of peripheral neuropathy. “Lead in Drinking-water,” World Health Organization, 2011, https://www.who.int/water_sanitation_health/dwq/chemicals/lead.pdf (accessed February 18, 2019). Zinc gives an undesirable taste to water. Water containing zinc at certain concentrations tends to appear opalescent and develops a greasy film when boiled. Acute toxicity arises from the ingestion of excessive amounts of zinc salts. Vomiting usually occurs after the consumption of more than 500 mg of zinc sulfate. “Zinc in drinking-water,” World Health Organization, 2003, https://www.who.int/water_sanitation_health/dwq/chemicals/zinc.pdf (accessed March 7, 2019). Cadmium is found in drinking water due to the corrosion of galvanized pipes and industrial waste contamination, among other factors that increase the acidity of cadmium and in turn increase the solubility of the metal in water. Once it is absorbed, it is transported to other parts of the body through the bloodstream and then filtered in the kidney, resulting in potential kidney, liver, and bone damage. “Cadmium in Drinking-water,” World Health Organization, December 2011, https://www.who.int/water_sanitation_health/dwq/chemicals/cadmium.pdf, (accessed February 7, 2019). Sulfates and sulfuric acid products are used in the production of fertilizers, chemicals, and other materials. Cathartic effects are commonly reported to be experienced by people consuming drinking-water containing sulfate in concentrations exceeding 600 mg/litre. Children and elderly are more sensitive to effects of exposure to high concentrations of sulfate, and that is due to the potentially high risk of dehydration from diarrhea that may be caused by high levels of sulfate. “Sulfate in drinking water,” World Health Organization, 2004, https://www.who.int/water_sanitation_health/water-quality/guidelines/chemicals/sulfate.pdf?ua=1 (accessed March 7, 2019). Boron concentrations in water are largely dependent on the leaching of boron from the surrounding geology and, to a decreasing extent, wastewater discharges, and it is not removed by conventional wastewater and drinking-water treatment methods. Effects of boron exposure include focal seizure disorders, cutaneous lesions, irritability, vomiting, abdominal pain, diarrhea, nausea, lethargy, rash, headache, light-headedness, fever, and muscle cramps. “Boron in drinking-water,” World Health Organization, 2009, https://www.who.int/water_sanitation_health/water-quality/guidelines/chemicals/boron-background.pdf (accessed March 7, 2019). Magnesium is an essential mineral and is beneficial to human health in several respects. However, inadequate intake of the nutrient can result in adverse health consequences. Increased intake of magnesium salts may cause temporary diarrhea. In addition, drinking-water in which both magnesium and sulfate are present at high concentrations can have a laxative effect. “Hardness in drinking-water,” World Health Organization, 2011, https://www.who.int/water_sanitation_health/dwq/chemicals/hardness.pdf (accessed March 5, 2019).

⁹¹ Human Rights Watch telephone interview with Beth Hoagland, hydrogeochemist, February 1, 2019; Human Rights Watch interview with Dr. Jassim Humaidi al-Falhi, Iraq’s deputy minister for the Environment, Baghdad, April 4, 2019; and Ana

One international expert said the symptoms suggested an intestinal virus transmitted from contaminated food and/or water and further spread from person to person.⁹² While the data did not allow him to identify the original source of the contamination, feces from a sick person(s), or animal(s) ending up in drinking water that was not properly disinfected could have spread the virus.

Schools

Even though the water crisis was most acute during the summer vacation, since the beginning of the 2018-2019 school year, students have been hospitalized for symptoms consistent with water-borne diseases such as diarrhea, vomiting, rashes and scabies.⁹³ Abu al-Khasib school principal Abd al-Razzak Sabah said that when schools reopened after the holidays, on September 30, he told the students that they had to bring drinking water with them from home because he was worried about the school's tap water.⁹⁴ Despite his precautions, "in my school at least 15 children got sick, maybe from the water at school, or maybe from home," he said.⁹⁵

According to the Norwegian Refugee Council (NRC), when the school year started, more than 277,000 children in 800 schools were at increased risk of water-borne diseases, because of overcrowding in rundown facilities in extreme heat without sufficient access to safe water.⁹⁶ The deteriorating infrastructure of schools because of a lack of sufficient

Gotter, "Heavy Metal Poisoning," *Healthline*, <https://www.healthline.com/health/heavy-metal-poisoning> (accessed May 7, 2019). "Mercury is a metallic element that occurs naturally in the environment. The ingestion of acute toxic doses of any form of mercury will result in shock, cardiovascular collapse, acute renal failure and severe gastrointestinal damage. Acute oral poisoning results primarily in hemorrhagic gastritis and colitis; the ultimate damage is to the kidney. Clinical symptoms of acute intoxication include pharyngitis, dysphagia, abdominal pain, nausea and vomiting, bloody diarrhea and shock. Later, swelling of the salivary glands, stomatitis, loosening of the teeth, nephritis, anuria and hepatitis." "Mercury in drinking-water," World Health Organization, 2005, https://www.who.int/water_sanitation_health/dwq/chemicals/mercuryfinal.pdf (accessed March 7, 2019).

⁹² Human Rights Watch email correspondence with Ed Brown, Professor Emeritus, University of Northern Iowa, April 9, 2019.

⁹³ "Iraqi children risk being poisoned by unsafe water at their schools," Norwegian Refugee Council, <https://theirworld.org/news/children-risk-disease-unsafe-water-in-schools-basra-iraq> (accessed March 12, 2019); Human Rights Watch interview with Abd al-Razzak Sabah, school principal, Abu al-Khasib, January 18, 2019.

⁹⁴ Human Rights Watch interview with Abd al-Razzak Sabah, school principal, Abu al-Khasib, January 18, 2019.

⁹⁵ Ibid.

⁹⁶ Human Rights Watch email correspondence with Tom Peyre-Costa, Media Coordinator for NRC Iraq, February 17, 2019.

"Iraq: Basra's Children Face Disease Outbreaks in Rundown Schools," Norwegian Refugee Council, October 23, 2018, <https://www.nrc.no/news/2018/october/iraq-basras-children-face-disease-outbreak-in-rundown-schools/> (accessed May 10, 2019).

investment, combined with the high concentration of children in overcrowded classrooms made schools breeding grounds for outbreaks of water-borne diseases.

This situation led to irregular school attendance and potentially school dropouts, according to the NRC, which responded by rehabilitating water infrastructures in 12 of the most affected schools. The NRC is concerned that in the summer of 2019 the same problems will arise.⁹⁷

Cost of Water

The high cost of water, falls especially hard on poorer residents and makes them especially vulnerable to unsafe tap water, this was particularly acute during the 2018 crisis. During the crisis, the price of filtered water from private plants and trucks increased significantly. A water trucker told Human Rights Watch that in his neighborhood of Abu al-Khasib he normally charged IQD 5,000 (\$4) for 1 m³, but that during the crisis he more than doubled his prices.⁹⁸ According to a health sector employee, in another area, truckers were charging IQD 18,000 (\$15) for 1 m³ of salt water for construction, irrigation and other uses, and IQD 25,000 (\$21) for 1 m³ of drinking water.⁹⁹

Many of those who fell sick were from the area of Abu al-Khasib, a poor town to the southeast of Basra.¹⁰⁰ A healthcare worker from Abu al-Khasib said his family stopped using the water for cooking but had to keep using it for washing because they could not afford alternatives, despite him knowing the risks.¹⁰¹

Abd al-Razzak Sabah, a school principal in Abu al-Khasib, said:

We are used to our tap water turning really salty for 2-3 months every summer, but last year it was worse than ever before, and the water started

⁹⁷ Human Rights Watch email correspondence with Tom Peyre-Costa, Media Coordinator for NRC Iraq, February 17, 2019.

⁹⁸ Human Rights Watch interview with water trucker (name withheld), Abu al-Khasib, January 18, 2019.

⁹⁹ Human Rights Watch interview with healthcare worker who worked at several Basra medical facilities during the crisis (name withheld), Basra, January 15, 2019.

¹⁰⁰ Human Rights Watch interview with Hassan Janabi, Baghdad, January 15, 2019.

¹⁰¹ Human Rights Watch interview with healthcare worker who worked at a medical facility in Abu al-Khasib during the crisis (name withheld), Basra, January 15, 2019; Human Rights Watch interview with Hassan Janabi, Baghdad, January 15, 2019.

to change color, becoming brown. As a result, the public plants couldn't do anything to make it less salty and sent us this bad tap water, and the water truckers were selling their water for too much. In our area alone at least 8,000 people ended up sick and in hospital.¹⁰²

The poorer families interviewed by Human Rights Watch described how they had struggled to afford filtered water as well as the registration fees for hospital, and medication from pharmacies.¹⁰³ These families often lived either in informal housing, makeshift self-built structures usually on land not categorized as residential land and built without government permissions, or in neighborhoods far from the center of the city and main roads. As a result, some of the families said the water trucks carrying filtered water only sporadically reached their homes.

¹⁰² Human Rights Watch interview with Abd al-Razzak Sabah, school principal, Abu al-Khasib, January 18, 2019.

¹⁰³ Human Rights Watch interview with Abd al-Atheem Jaseen, labourer, Tanuma, January 18, 2019; Human Rights Watch interview with Mehdi Hamid Silan, laborer, Salhiya, January 18, 2019; Human Rights Watch interview with Kathim Dayigh, water trucker, Abu al-Khasib, January 18, 2019.

III. The Reason: Insufficient Water Quality and Quantity

Since Basra's first serious water crisis in 2009, authorities have embarked on a few initiatives to improve the governorate's water supply, but they have been marred by mismanagement and a lack of long-term budgeting. At the same time, authorities have not enforced stringently enough the existing regulations around public water treatment and delivery; the private water sector, including private reverse osmosis (RO) treatment plants and water trucking; sewage treatment; and the safe disposal of industrial and agricultural waste.¹⁰⁴ As a result, both the quality and quantity of water in Basra have been insufficient and a risk to its residents.

Corruption, according to residents, has also contributed to Basra's worsening water quality and quantity by undermining enforcement of water-related laws and hobbling governmental efforts to build important water-related infrastructure.¹⁰⁵ One common perception is that for almost a decade, individuals working in industry or agriculture paid bribes to local authorities to allow them to illegally tap into freshwater canals to syphon off water, leaving less fresh water for Basra's public treatment plants. Another common view among residents is that corruption has plagued the construction of some of Basra's water installations, including most notably the Great Basra Water Project, leading to years of delays in completing a large new desalination plant.

Iraqis continue to use water unsustainably in both agriculture and domestic use. Upstream damming and climate change have also played a role in diminishing waterflow downstream, which has affected both water quality and quantity. During the 2018 crisis, authorities failed to provide residents with adequate information, free medication, and did

¹⁰⁴ Reverse osmosis or RO is a filtration method that is used to remove ions and molecules from a solution by applying pressure to the solution on one side of a semipermeable or selective membrane. Water can cross the membrane, while large molecules cannot and remain on one side. RO is used in water filtration and to desalinate sea water. Anne Marie Helmenstine, "How reverse osmosis works," *ThoughtCo.*, August 12, 2018, <https://www.thoughtco.com/reverse-osmosis-overview-609400> (accessed March 7, 2019).

¹⁰⁵ Human Rights Watch interview with local government official (name withheld), Baghdad, January 24, 2019; Human Rights Watch interview with healthcare worker who worked at several Basra medical facilities during the crisis (name withheld), Basra, January 15, 2019; Human Rights Watch telephone interview with aid worker in Basra (name withheld), February 17, 2019.

not carry out a thorough enough investigation into the potential sources of the health crisis.

Authorities' failures to provide Basra residents with enough safe water can be broken down into failures around its obligations to respect, protect, and fulfill their rights to water.

Lack of Enforcement

Local and federal authorities do not properly implement and enforce Iraq's robust regulatory framework prohibiting public and private entities from dumping untreated waste into any of the country's waterways beyond rates allowed by the Ministry of Health. As a result, waterways including the Shatt al-Arab are replete with contaminants from human, animal, industrial and agricultural waste. The conventional treatment plants treating Basra's tap water are not adequately treating the water to remove the contaminants, and in some cases are even failing to add the requisite chlorine during treatment.

Over the decades, as the state has failed to provide residents with adequate safe fresh water, a private water sector has proliferated. Until very recently, authorities in Basra failed to provide adequate oversight of operations of private reverse osmosis (RO) desalination plants for filtered water and water truckers, to ensure that they are licensed operators and are abiding by local and international standards to ensure proper water treatment.

Authorities have failed to ensure that all residents are connected to the water and sewage network, which has encouraged families excluded from the network to illegally tap into it. At the same time private agricultural and other businesses have been illegally tapping into the water network to access free fresh water, without authorities taken any measures to crack down on the illegal activities until the 2018 crisis.

Failure to Implement Regulations

Iraq has over a dozen laws in place that relate to water usage, management, and pollution, but authorities are failing to implement key regulations aimed at ensuring adequate water quality.¹⁰⁶ This includes regulations on chlorination of water during treatment, water

¹⁰⁶ Dr. Yadgar Kamal Ahmmad, "Legislations on water resources protection in Iraq: an overview of the basic legal features," *Max Planck Institute for Comparative Public Law and International Law*, August 2012, http://www.mpfpr.de/fileadmin/media/Water_Law/Nationales_Recht/Treaties_Iraq/Overview_-_Water_Law_in_Iraq__English.pdf (accessed April 8, 2019).

sample testing regimes for the public and private water sector, and the prohibition of dumping untreated human, animal, industrial, and agricultural waste into the environment beyond rates set by the Ministry of Health. These regulations, if implemented, would meet the state's obligation to both protect citizens in the context of the private water sector, and fulfill their rights to water in the public water sector.

The most important piece of legislation protecting Iraq's environment is the Environmental Protection and Improvement Law No. 27 of 2009. Article 14 of the law stipulates that it is prohibited to dispose of any "home liquid or industrial or serviceable or agricultural waste" into the ground or into any of Iraq's water resources.¹⁰⁷ Articles 32 to 35 lay out a regime for authorities to issue a warning to polluters within 10 days of them breaking the law and a temporary closure of the facility for 30 days renewable if it does not end the offense, as well as incremental fines and in some cases prison time.¹⁰⁸ The articles require the polluter to properly dispose of their waste in order to remedy the situation.

Iraq's Penal Code No. 111 of 1969 criminalizes willful acts that spread dangerous diseases, including disposing animal carcasses, dirty materials, or items harming the public health into any waterway.¹⁰⁹

The Law of Conserving Water Resources No. 2 of 2001 regulates the nondomestic use of water. It stipulates rules regarding the management, utilization, and preservation of Iraq's water resources. Article 3 prohibits businesses discharging any form of waste into public waterways, unless the body obtains approval to discharge the waste as per the criteria and specifications set out by the Environment Protection and Improvement Directorate (EPID), which now sits within the Ministry of Health and Environment.¹¹⁰ It also details how to dispose of or recycle wastewater, authorizing the EPID to issue environmental restrictions pertaining to the quality of public water as well as the quality of water discharged into public water, sewage systems, or rainwater.

¹⁰⁷ Environmental Protection and Improvement Law No. 27 of 2009, art. 14, <http://extwprlegs1.fao.org/docs/pdf/irq100188E.pdf> (accessed May 15, 2019).

¹⁰⁸ *Ibid.*, arts. 32–35.

¹⁰⁹ Penal Code No. 111 of 1969 and its Amendments articles 368, 496.

¹¹⁰ Law of Conserving Water Resources No. 2 of 2001, art. 3, <http://wiki.dorar-aliraq.net/iraqilaws/law/1402.html> (accessed April 8, 2019). The Ministry of Health and Environment is responsible for monitoring the quality of water from the private plants by carrying out regular sample testing. It is also responsible for monitoring the operation of water trucks through granting licenses. Human Rights Watch interview with Dr. Dhurgham al-Ajwady, Basra, January 16, 2019.

Article 9 prohibits disposing certain materials near water treatment plants, such as pollutants causing metal erosion, materials of high viscosity, and other non-disintegrated materials.¹¹¹ The article also prohibits disposing carcasses, human and animal waste, decayed material, or other wastes of any kind into public waterways or riverbanks. The law authorizes provincial councils to protect and improve the environment through coordination with local councils, requiring them to identify the sources of pollution in public water and indicate the proposed treatment method as well as making plans for each governorate to protect public water from pollution and improve its quality over time.

According to Dr. Jassim Humaidi al-Falhi, Iraq's deputy minister for the Environment, Iraq's regulatory framework around preventing municipal authorities and private citizens from polluting Iraq's waterways and networks is robust but there is a lack of implementation and effective monitoring.¹¹² This includes a failure to properly monitor public and private plants' proper water treatment, as well as private water trucking standards, he said. It also includes failures to enforce restrictions around dumping untreated human and animal waste and industrial and agricultural waste into Iraq's waterways.

One significant gap in Iraq's regulatory regime is the total absence of a public health advisory or directive system that would allow authorities to inform residents when a community's drinking water is, or could be, contaminated, what steps should be taken to mitigate harm and what protocols are in place for government officials to respond to advisories and to lift them.

Public Water Treatment

Experts told Human Rights Watch they are concerned by several gaps in the treatment and management of public drinking water in Basra. They said that treatment plants do not add enough chlorine to make the water safe and do not conduct sufficiently frequent or comprehensive water tests. They also said that the Shatt al-Arab was being used as the main source of water despite high levels of contamination.

¹¹¹ Law of Conserving Water Resources No. 2 of 2001 article 9.

¹¹² Human Rights Watch interview with Dr. Jassim Humaidi al-Falhi, Baghdad April 4, 2019.

The Ministry of Health stipulates the required chlorination levels to prevent cholera during any given season.¹¹³ An employee at al-Baradi'yah treatment plant, one of the main public water treatment plants in Basra, said that plants add 2.5-3 ppm of chlorine in the winter, and 4-5 ppm in the summer.¹¹⁴

The staff at all the public water plants interviewed said that they added chlorine in line with the general standards for chlorine for tap water, at around 4 ppm, an amount in line with international standards.¹¹⁵ However, six experts interviewed said that they had direct knowledge of public water treatment plants that were not adding the requisite amount of chlorine or in some cases no chlorine at all.¹¹⁶ International water specialist Ed Brown, Professor Emeritus at the University of Northern Iowa, reviewed data from a range of water samples tested during the crisis but found no test results that would allow him to conclude whether or not sufficient chlorine had been used during treatment.¹¹⁷

Dr. Beth Hoagland, a hydrogeochemist, explained that high concentrations of total suspended solids (TSS), sulfides, nitrites, and certain organic compounds, as well as high levels of turbidity can make chlorination less effective as a method of killing off bacteria.¹¹⁸ She said that when there is high turbidity in the water, it contains more particles to which

¹¹³ Human Rights Watch interview with an employee at al-Baradi'yah public water treatment plant, Basra, January 21, 2019; Human Rights Watch interview with Dr. Mohsen Disher, Basra University, Basra, January 19, 2019; Human Rights Watch interview with Ahmed Hanoon, Basra, January 20, 2019. Cholera is an illness caused by an infection of the small intestine. The infection is usually mild but can be deadly if it is found to be severe and not medically treated, the severity mainly characterized by excessive diarrhea and sometimes vomiting and muscle cramps. A person can get cholera by contracting the cholera bacterium from food or water that has been contaminated by the feces of a person with the illness, usually in places with unsafe drinking water and poor hygiene measures. "Cholera – *Vibrio Cholerae* Infection," Centers for Disease Control and Prevention, May 11, 2018, <https://www.cdc.gov/cholera/general/index.html>, (accessed February 7, 2019).

¹¹⁴ Human Rights Watch interview with an employee at al-Baradi'yah public water treatment plant, Basra, January 21, 2019.

¹¹⁵ Human Rights Watch interview with Hassan Yusif, manager at Sihan public water treatment plant, Sihan, January 19, 2019; Human Rights Watch interview with Zuhair Jawad Hashim, head of the Basra Water Department, Ministry of Municipalities and Public Works, Basra, January 20, 2019.

¹¹⁶ Human Rights Watch interview with water engineer (name withheld), Basra, January 15, 2019; Human Rights Watch interview with an employee at al-Baradi'yah public water treatment plant, Basra, January 21, 2019; Human Rights Watch interview with Dr. Mohsen Disher, Basra University, Basra, January 19, 2019; Human Rights Watch interview with Ahmed Hanoon, Basra, January 20, 2019; Human Rights Watch interview with aid worker (name withheld), Basra, January 20, 2019; Human Rights Watch email correspondence with healthcare worker who worked at several Basra medical facilities during the crisis (name withheld), February 17, 2019.

¹¹⁷ Human Rights Watch email correspondence with Ed Brown, Professor Emeritus, University of Northern Iowa, April 9, 2019.

¹¹⁸ Human Rights Watch telephone interview with Beth Hoagland, hydrogeochemist, February 1, 2019; Human Rights Watch interview with Ruqay Ahmar, Basra, January 21, 2019; Drinking Water and Health, Volume 2, Safe Drinking Water Committee, 1980, <https://www.ncbi.nlm.nih.gov/books/NBK234590/> (accessed April 15, 2019).

contaminants, including bacteria, can adhere. The World Health Organization recommends that water turbidity should be less than 5 Nephelometric Turbidity Unit (NTU) for chlorination to most effectively treat water. Water sample data from the crisis period showed that turbidity at the water treatment plants was as high as 28.2 NTU.¹¹⁹ In order to address this, plants might need to increase their chlorine use.

Interviewees pointed to several reasons why the plants were using insufficient levels of chlorine. Dr. Disher said that on visits to three public treatment plants during the 2018 crisis, he saw that the chlorine pumps were not functioning, and staff there said they did not have the money to procure the chlorine they needed.¹²⁰ Zuhair Jawad Hashim, the head of the Basra Water Department, explained that chlorine is strictly regulated because of concerns around groups like ISIS trying to steal the gas for military purposes. It requires a military escort during transport and is therefore hard to acquire.¹²¹ As a result, over the last several years, the Ministry of Municipalities and Public Works in Baghdad, which is in charge of procuring chlorine gas for the governorates, has been delayed in doing so.¹²² Because of the delays, he said that at least once, Basra's water department had run out of chlorine gas and had to approach neighboring governorates, asking for their stores.

Two government experts testing water samples leaving public treatment plants and at homes further down the network also said that they often find that as the water leaves the plant, there is sufficient chlorine in it, but that further down the network, no chlorine is left in the water.¹²³ Chlorine is consumed as it interacts with any organic material— disinfecting

¹¹⁹ "Turbidity describes the cloudiness of water caused by suspended particles such as clay and silts and it is typically expressed in Nephelometric Turbidity Unit (NTU). Turbidity can indicate the presence of hazardous chemical and microbial contaminants and have significant implications for water quality. Incidents of elevated turbidity have been associated with several outbreaks of disease." "Water quality and health-review of turbidity: information for regulators and water suppliers," World Health Organization, 2017, https://www.who.int/water_sanitation_health/publications/turbidity-information-200217.pdf (accessed March 7, 2019).

¹²⁰ Human Rights Watch interview with Dr. Mohsen Disher, Basra University, Basra, January 19, 2019.

¹²¹ Human Rights Watch interview with Zuhair Jawad Hashim, Basra, January 20, 2019.

¹²² Ibid.

¹²³ If there is residual chlorine in people's tap water, one can assume that the water contains no living organic matter and is biologically safe. If there is no residual chlorine at the point of consumption, it might not be pathogen free. Human Rights Watch was unable to obtain any water samples taken from people's homes measuring residual chlorine. Human Rights Watch interview with Zuhair Jawad Hashim, Basra, January 20, 2019; Human Rights Watch interview with Ruqay Ahmar, Basra, January 21, 2019.

by killing live bacteria and other living pathogenic organisms.¹²⁴ If organic matter is present, free chlorine is consumed and thus no longer available to kill living pathogens.¹²⁵

Public Health Law No. 89 of 1981 article 64 sets out the procedures to be implemented by the authorities in charge of supplying drinking water to the citizens, including to ensure that all water supply projects are tested and licensed.¹²⁶ Article 67 requires that every treatment plant have an “integrated laboratory to conduct micro-chemical, chemical and physical tests to determine the efficiency of the filtration stages,” as well as a laboratory at the centralized level conducting secondary testing, to conduct regular testing. Only one of the 339 public treatment plants in Basra has a laboratory for testing water samples, the Basra water department’s central laboratory in the same compound as al-Baradi'ya treatment plant, which is used to test samples from all public plants.¹²⁷

Ruqay Ahmar, head of the Basra water department’s central laboratory, confirmed that her laboratory takes regular samples from plants all over Basra and tests them on behalf of the Ministries of Health and Municipalities and Public Works to ensure enough chlorine is being used.¹²⁸ She said that before the crisis, the Ministry of Health had been conducting its own tests, but now their lab processes all the samples, testing for TDS, (including the cations and anions that make up TDS like Al, K, Na, SO₄, Cl, Mg), turbidity, TSS, which is similar to turbidity, hardness, temperature, and alkalinity.

Neither Zuhair Jawad Hashim, head of the Basra Water Department, nor the workers at the four plants Human Rights Watch visited knew of any advisory system for situations in which a test result from a water sample came back showing the water had not been adequately treated.¹²⁹ They all presumed that if authorities found any problems in the

¹²⁴ Jon J. Calomiris and Keith A. Christman, “How does chlorine added to drinking water kill bacteria and other harmful organisms? Why doesn’t it harm us?” *Scientific American*, <https://www.scientificamerican.com/article/how-does-chlorine-added-t/> (accessed April 11, 2019).

¹²⁵ “What is chlorination?” Safe Drinking Water Foundation, <https://www.safewater.org/fact-sheets-1/2017/1/23/what-is-chlorination> (accessed on April 11, 2019).

¹²⁶ Public Health Law No. 89 of 1981, on file with Human Rights Watch.

¹²⁷ Human Rights Watch interview with Hassan Yusif, Sihan, January 19, 2019.

¹²⁸ Human Rights Watch interview with Ruqay Ahmar, Basra, January 21, 2019.

¹²⁹ Human Rights Watch interview with Zuhair Jawad Hashim, Basra, January 20, 2019.

samples they tested, they would notify the plant to replace some equipment and rectify.¹³⁰ The employee from al-Baradi'yah said, “Why would we bother with an advisory? No one drinks their tap water anyway.”

A key challenge facing Basra’s public treatment plants is the reliance on the Shatt al-Arab as a water source because of the high TDS levels in the water, given that they are conventional, not desalination, plants. The public al-Baradi'yah treatment plant, built in 1957 and expanded in 1964, is one of the main water treatment plants in central Basra, servicing the cities two largest hospitals, main hotels, and the center of the city, treating 3800m³/hour. The deputy head of the plant said that during the crisis, the plant was able to get only 30 percent of its water from the Bada’a canal, relying on the Shatt al-Arab for the other 70 percent, which at that point had reached TDS levels of 22,000 ppm in central Basra.¹³¹

As of October 2018, she said they are rationing the fresh water from the RZero pumping station, which in turn is sourced by the fresh water from the Bada’a canal. Under the new rationing system each neighborhood gets supplied with RZero water for one day roughly every three days, while the other neighborhoods are supplied with water from the Shatt al-Arab. Dr. Mohsen Disher, a professor in Agricultural Sciences at Basra University, said that this rationing meant that some neighborhoods received salty water in their taps for 4 days in a row and then receive fresh water for one day.¹³²

The problem extended to other plants. In 2001, the Central Organization for Standardization and Quality Control set the maximum salinity level for drinking water at TDS 1,000 ppm.¹³³ Dr. Shukri al-Hassan said that during the crisis he carried out tests on water in the Shatt al-Arab and then from his tap and found that both reached TDS levels of 22,000 ppm, something confirmed by al-Baradi'yah central laboratory, which also tested

¹³⁰ Human Rights Watch interview with an employee at al-Baradi'yah public water treatment plant, Basra, January 21, 2019; Human Rights Watch interview with RO plant owner (name withheld), Abu al-Khasib, January 18, 2019; Human Rights Watch interview with Hassan Yusif, Sihan, January 19, 2019.

¹³¹ Human Rights Watch interview with an employee at al-Baradi'yah public water treatment plant, Basra, January 21, 2019.

¹³² Human Rights Watch interview with Dr. Mohsen Disher, Basra University, Basra, January 19, 2019.

¹³³ Khayyum A. Rahi and Todd Halihan, “Changes in the Salinity of the Euphrates River System in Iraq,” *Regional Environmental Change*, volume 10, <https://www.iraqicivilsociety.org/wp-content/uploads/2013/02/Salinity-of-Euphrates.pdf> (accessed May 6, 2019).

water at different treatment plants in central Basra.¹³⁴ A health sector worker showed Human Rights Watch a chart he said he obtained from the Ministry of Water Resources showing the TDS values pre-treatment at nine public treatment plants in Basra governorate on August 1, 2018. The values in al-Qurnah, a town 65 kilometers north of Basra where the Tigris and the Euphrates join to become the Shatt al-Arab, were 1,763 ppm and, as the sites moved down stream along the Shatt al-Arab, the values went up to 14,164 in central Basra city, and to 28,000 ppm in Sihan, south of Basra.¹³⁵ Dr. Dhurgham al-Ajwady, Deputy Governor of Basra, said that samples he had seen reached 41,000 ppm in Abu al-Khasib during the crisis.¹³⁶

Human and Animal Waste

The dumping of raw sewage into the Tigris, the Euphrates, and the Shatt al-Arab, both within Basra and upstream, both by residents and municipal authorities (strictly prohibited under Iraqi law), is also affecting water quality in the governorate, as well as elsewhere in Iraq.¹³⁷ In a press conference in February 2019, the prime minister stated that about 5 million m³/day of raw sewage water was being pumped directly into Tigris.¹³⁸ Raw sewage has also seeped into Basra's groundwater, however the full extent of the problem is not being articulated because authorities in Basra are not properly testing the water for harmful contaminants from raw sewage, based on water sample testing data shared with Human Rights Watch.¹³⁹

The problem of illegal dumping of sewage occurs in part because some residents of Basra are living in informal housing which is not connected legally to the water, electrical or

¹³⁴ Human Rights Watch interview with Dr. Shukri al-Hassan, marine science lecturer at Basra University, Basra, January 16, 2019; Human Rights Watch interview with Ruqay Ahmar, Basra, January 21, 2019.

¹³⁵ Chart showing TDS values pre-treatment at nine treatment plants in Basra governorate, August 1, 2018, on file with Human Rights Watch.

¹³⁶ Human Rights Watch interview with Dr. Dhurgham al-Ajwady, Basra, January 16, 2019.

¹³⁷ Environmental Protection and Improvement Law No. 27 of 2009, art. 14; Law of Conserving Water Resources No. 2 of 2001 article 9; Human Rights Watch interview with Hassan Janabi, Baghdad, January 15, 2019; Human Rights Watch interview with Sabah al-Bazooni, head of Basra's provincial council, Basra, January 16, 2019.

¹³⁸ "The Weekly Press Conference of the Prime Minister Mr. Adel Abdul Mahdi," Media Office of the Iraqi Prime Minister's Facebook page, <https://www.facebook.com/watch/?v=2369776499728875> (accessed May 10, 2019).

¹³⁹ Human Rights Watch obtained the data from these water samples from sources which wished to remain anonymous.

sewage networks. A parliamentary study in 2014 estimated 338,400 Basra residents were living in 47,869 informal houses.¹⁴⁰

Some businesses, including restaurants also dump their sewage directly into Basra's waterways, something researchers observed while in Basra in January 2019. Ruqay Ahmar, head of the central laboratory, pointed out an open sewage canal right next to the public al-Baradi'yah treatment plant, saying that during the crisis authorities closed it up but then they had to reopen it because sewage started running out onto the street. Despite requests, Human Rights Watch has been unable to ascertain whether any individuals or businesses have been penalized for illegal dumping of raw sewage.¹⁴¹

Currently, according to authorities, only around 60 percent of Basra's sewage is being treated at best, with the rest being dumped directly into the Shatt al-Arab.¹⁴² An international water expert who visited Basra in early 2019 conducted ground inspections and discovered raw sewage discharges above water treatment intake points and took water samples from various sites which tested positive for cryptosporidium and giardia spores.¹⁴³ Cryptosporidium and giardia come from diseased human and animal fecal waste, and cause respiratory and gastrointestinal illness.¹⁴⁴ Ruqay Ahmar, head of the central laboratory, confirmed that they do not test for cryptosporidium or giardia spores in water samples, and do not have the appropriate equipment to conduct such tests.¹⁴⁵

In its Intended Nationally Determined Contributions (INDC), a draft national climate change action plan that Iraq submitted ahead of the adoption of the Paris Agreement on Climate Change in 2015, the government committed in 2015 to increasing sewage treatment

¹⁴⁰ "Slums in Iraq, risks and solutions," Iraqi Parliament, 2017, <http://parliament.iq/wp-content/uploads/2018/11/%D8%A7%D9%84%D8%B9%D8%B4%D9%88%D8%A7%D8%A6%D9%8A%D8%A7%D8%AA-%D9%81%D9%8A-%D8%A7%D9%84%D8%B9%D8%B1%D8%A7%D9%82.pdf> (accessed March 7, 2019).

¹⁴¹ Human Rights Watch interview with Ahmed Hanoon, Basra, January 20, 2019.

¹⁴² Human Rights Watch interview with Khalid Najm Abdullah, Basra, January 20, 2019; Human Rights Watch interview with Alaa Hashim al-Badran, Basra, January 15, 2019.

¹⁴³ Human Rights Watch email correspondence with international water expert (name withheld), April 3, 2019.

¹⁴⁴ "Parasites – Cryptosporidium (also known as 'Crypto')," Centers for Disease Control and Prevention, <https://www.cdc.gov/parasites/crypto/general-info.html> (accessed June 10, 2019) and "Parasites – Giardia," Centers for Disease Control and Prevention, <https://www.cdc.gov/parasites/giardia/general-info.html> (accessed June 10, 2019).

¹⁴⁵ Human Rights Watch interview with Ruqay Ahmar, Basra, January 21, 2019.

capacity to 2.078 billion m³/year by 2035.¹⁴⁶ In a positive step towards transparency, in February 2019, as a result of the crisis, the Ministry of Health and Environment started posting weekly reports on the water quality in the Tigris, Euphrates, and Shatt al-Arab.¹⁴⁷ Since then the reports frequently show the water quality index falling below the ministry's threshold for acceptable water quality at different parts of the rivers, based on a range of parameters including salinity levels, phosphates, pH levels, and other markers.¹⁴⁸

¹⁴⁶ “Document for the Nationally Determined Contributions to the New Agreement on Climate Change,” November 10, 2015, <https://www4.unfccc.int/sites/submissions/INDC/Published%2oDocuments/Iraq/1/INDC-Iraq.pdf> (accessed May 8, 2019), p. 11.

¹⁴⁸ If the water quality index falls below 50, that is below the acceptable level according to Dr. Jassim Humaidi al-Falhi, Iraq's deputy minister for the Environment. Human Rights Watch interview with Dr. Jassim Humaidi al-Falhi, Baghdad April 4, 2019; Weekly Water Bulletin, Ministry of Health and Environment, <http://www.moen.gov.iq/المركز-الاعلامي/مطبوعات-بيئية> (accessed April 16, 2019).

¹⁵⁰ Ibid; Raheek I. Ibrahim, "Upgrading of Al-Rustamiyah Sewage Treatment Plant through Experimental and Theoretical Analysis of Membrane Fouling," *Iraqi Journal of Chemical and Petroleum Engineering*, June 2017, https://www.researchgate.net/publication/321035692_Upgrading_of_Al-Rustamiyah_Sewage_Treatment_Plant_Through_Experimental_and_Theoretical_Analysis_of_Membrane_Fouling (accessed April 16, 2019).

¹⁵² Third Water Quality Report for Tigris, Euphrates and Shatt al-Arab Rivers for the duration between February 15 to 21, 2019, Ministry of Health and Environment, <http://www.moen.gov.iq/Portals/o/%D8%A7%D9%84%D9%86%D8%B4%D8%B1%D8%A9%20%D8%A7%D9%84%D8%A7%D8%B3%D8%A8%D9%88%D8%B9%D9%8A%D8%A9/%D8%A7%D9%84%D9%86>



Raw sewage running through a street in central Basra city, next to the public al-Baradi'yah water treatment plant, and into the Shatt al-Arab. © 2019 Belkis Wille/Human Rights Watch.

%D8%B4%D8%B1%D8%A9%20%D8%A7%D9%84%D8%A7%D8%B3%D8%A8%D9%88%D8%B9%D9%8A%D8%A9%20%D9%84%D9%86%D9%88%D8%B9%D9%8A%D8%A9%20%D8%A7%D9%84%D9%85%D9%8A%D8%A7%D9%87%20%D8%B4%D9%87%D8%B1%20%D8%B4%D8%A8%D8%A7%D8%B7%20%D8%A7%D9%84%D8%A7%D8%B3%D8%A8%D9%88%D8%B9%20%D8%A7%D9%84%D8%AB%D8%A7%D9%84%D8%AB.pdf (accessed April 16, 2019); Fourth Water Quality Report for Tigris, Euphrates and Shatt al-Arab Rivers for the duration between February 22 to 28, 2019, Ministry of Health and Environment, <http://www.moen.gov.iq/Portals/o/%D8%A7%D9%84%D9%86%D8%B4%D8%B1%D8%A9%20%D8%A7%D9%84%D8%A7%D8%B3%D8%A8%D9%88%D8%B9%D9%8A%D8%A9/%D8%A7%D9%84%D9%86%D8%B4%D8%B1%D8%A9%20%D8%A7%D9%84%D8%A7%D8%B3%D8%A8%D9%88%D8%B9%D9%8A%D8%A9%20%D9%84%D9%86%D9%88%D8%B9%D9%8A%D8%A9%20%D8%A7%D9%84%D9%85%D9%8A%D8%A7%D9%87%20%D8%B4%D9%87%D8%B1%20%D8%B4%D8%A8%D8%A7%D8%B7%20%D8%A7%D9%84%D8%A7%D8%B3%D8%A8%D9%88%D8%B9%20%D8%A7%D9%84%D8%B1%D8%A7%D8%A8%D8%B9.pdf> (accessed April 16, 2019); Fifth Water Quality Report for Tigris, Euphrates and Shatt al-Arab Rivers for the duration between March 1 to 7, 2019, Ministry of Health and Environment, <http://www.moen.gov.iq/Portals/o/%D8%A7%D9%84%D9%86%D8%B4%D8%B1%D8%A9%20%D8%A7%D9%84%D8%A7%D8%B3%D8%A8%D9%88%D8%B9%D9%8A%D8%A9/%D8%A7%D9%84%D9%86%D8%B4%D8%B1%D8%A9%20%D8%A7%D9%84%D8%A7%D8%B3%D8%A8%D9%88%D8%B9%D9%8A%D8%A9%20%D9%84%D9%86%D9%88%D8%B9%D9%8A%D8%A9%20%D8%A7%D9%84%D9%85%D9%8A%D8%A7%D9%87%20%D8%B4%D9%87%D8%B1%20%D8%A7%D8%B0%D8%A7%D8%B1%20%D8%A7%D9%84%D8%A7%D8%B3%D8%A8%D9%88%D8%B9%20%D8%A7%D9%84%D8%A7%D9%88%D9%84.pdf> (accessed April 16, 2019).

Dr. Shukri al-Hassan, a marine science lecturer at Basra University, said when he raised his growing concern around excessive amounts of raw sewage and other forms of pollution being dumped into the Shatt al-Arab over the last decade with staff from the Ministry of Environment's pollution department, they told him they were reporting on this to officials in Baghdad but received no responses to their reports.¹⁵³

Water specialist Ed Brown, Professor Emeritus at the University of Northern Iowa, reviewed data from a range of water samples tested during the crisis and noted that labs were not, as they should have been, testing for fecal streptococci and nitrates which are routine tests in other countries.¹⁵⁴ The data was inconclusive on whether authorities were routinely testing for E. coli and/or fecal coliforms.

Beyond sewage, other solid waste is being dumped into Basra's waterways. Satellite imagery analyzed by Human Rights shows that an accumulation of garbage started building along canals throughout Basra, including in an area with a high concentration of food production companies, that feed into the Shatt al-Arab in the center of Basra city, from March 2018 to February 2019.

According to Dr. Dhurgham al-Ajwady, Deputy Governor of Basra, the governor's office ended its contract with a Kuwaiti company that has been carrying out garbage collection in Basra for years.¹⁵⁵ The contract was worth IQD 69 billion (\$57.8 million) annually.¹⁵⁶ He said that as of March 1, 2018, the company stopped collecting garbage throughout Basra,

¹⁵³ Human Rights Watch interview with Dr. Shukri al-Hassan, marine science lecturer at Basra University, Basra, January 16, 2019.

¹⁵⁴ Human Rights Watch email correspondence with Ed Brown, Professor Emeritus, University of Northern Iowa, April 9, 2019. "Nitrate is used mainly in inorganic fertilizers... Nitrate can reach both surface water and groundwater as a consequence of agricultural activity, wastewater treatment, and from oxidation of nitrogenous waste products in human and animal excreta, including septic tanks. The toxicity of nitrate to humans is mainly attributable to its reduction to nitrite which oxidizes normal haemoglobin causing it to be unable to transport oxygen to the tissues." "Nitrate and nitrite in drinking-water," World Health Organization, 2011, https://www.who.int/water_sanitation_health/dwq/chemicals/nitratenitrite2ndadd.pdf (accessed March 7, 2019).

¹⁵⁵ Human Rights Watch interview with Dr. Dhurgham al-Ajwady, January 16, 2019.

¹⁵⁶ "A Sudden Return of the Cleaning Company to Work in Basra and the Government Accuses it of Extortion," Al Sumaria, March 3, 2018, <https://www.alsumaria.tv/news/231670/%D8%B9%D9%88%D8%AF%D8%A9-%D9%85%D9%81%D8%A7%D8%AC%D8%A6%D8%A9-%D9%84%D8%B4%D8%B1%D9%83%D8%A9-%D8%A7%D9%84%D8%AA%D9%86%D8%B8%D9%8A%D9%81-%D8%A7%D9%84%D9%89-%D8%A7%D9%84%D8%B9%D9%85%D9%84-%D9%81%D9%8A-%D8%A7%D9%84%D8%A8%D8%B5%D8%B1%D8%A9-%D9%88%D8%A7%D9%84%D8%AD/ar#> (accessed May 10, 2019).

without clearly explaining the reasons why beyond alluding to politicking between different parties. As a result, residents and companies started dumping large amounts of waste into the Shatt al-Arab, he said. Since then, he said that the Ministry of Municipalities and Public Works and the governor's office have jointly hired workers to manage garbage collection on their own.

Organic material including food waste, animal feces, dead plants, and oil residues in trash and runoff encourage algal growth in rivers and consume chlorine used to treat drinking water as it runs through the distribution system.¹⁵⁷

¹⁵⁷ Human Rights Watch email correspondence with Ed Brown, Professor Emeritus, University of Northern Iowa, April 18, 2019.



Satellite imagery showing an accumulation of garbage along canals feeding into the Shatt al-Arab in central Basra city. Satellite Image Date October 28, 2018 © DigitalGlobe-Maxar Technologies 2019; Source: European Space Imaging. Insert: Drone footage taken by the Norwegian Refugee Council that matches the satellite imagery October 2018 © Norwegian Refugee Council.

Industrial and Agricultural Waste

Iraq's laws prohibit businesses from dumping any oil remains into shallow waters.¹⁵⁸ They also prohibit them from discharging wastewater into public water beyond rates set by the Ministry of Health.¹⁵⁹ However, these laws appear to be poorly enforced. Despite concerns that the Shatt al-Arab is contaminated by industrial and agricultural waste, authorities are not adequately testing water samples to ascertain the potentially harmful contaminants in the water.

Satellite imagery analyzed by Human Rights Watch showed oil from a likely oil spill into the Shatt al-Arab near the Nahr Bin Umar oil and gas field, a site run by the Basra Oil Company (BOC), a governmental oil company, about 25 kilometers upstream from Basra city, from July 15 to July 25.¹⁶⁰ Human Rights Watch was unable to determine precisely when the oil spill started, but on July 15 it appeared to span 24 kilometers along the river. The spill was never reported by public officials or by the media, and none of the water sector workers Human Rights Watch interviewed for the report had known about it.

In addition to evidence of an oil spill in 2018, media reports published in 2016 and 2017 cite two oil spills respectively in the Shatt al-Arab: in 2016, the Basra Water Department announced that it had suspended the operation of certain public water treatment plants and the piping of water to certain neighborhoods for three days, after an oil spill at al-



Satellite imagery shows what appears to be a likely oil spill into the Shatt al-Arab near the Nahr Bin Umar oil and gas field, a site run by the Basra Oil Company (BOC), a governmental oil company, about 25 kilometers upstream from Basra city. The spill apparently lasted for at least 10 days. Satellite image date July 15, 2018.

© Planet Labs 2019.

¹⁵⁸ Environmental Protection and Improvement Law No. 27 of 2009, <http://extwprlegs1.fao.org/docs/pdf/irq100188E.pdf> Article 14(v).

¹⁵⁹ Protection of Rivers and Public Water from Pollution Law No. 25 of 1967.

¹⁶⁰ "Oil and Gas Fields: Nahr Bin Umar," Iraq-business news, <http://www.iraq-businessnews.com/list-of-oil-and-gas-fields-in-iraq/oil-and-gas-fields-nahr-bin-umar/> (accessed June 7, 2019).

Najibiya electrical power plant.¹⁶¹ In 2017, authorities announced they had stemmed the leakage of oil residue into the Shatt al-Arab again from al-Najibiya electrical power plant, which had already been fined after the 2016 spill.¹⁶²

Oil spills present serious health risks. Ingested hydrocarbons and metals found in crude oil will cause liver damage in the short term and many other serious health consequences including various cancers in the long term.¹⁶³

Satellite imagery analyzed by Human Rights Watch also identified another likely oil spill into a canal in central Basra from October 28 to 29, 2018 next to a gasoline station that drifted approximately 200 meters east towards the Shatt al-Arab. This incident also went unreported at the time. In addition, two unidentified pipelines along canals in central Basra city were periodically releasing what researchers suspect were large volumes of waste liquid into the canal from July to October 2018.

Two interviewees said that their tap water sometimes smells of gasoline.¹⁶⁴ At one pump located on the Shatt al-Arab that supplies water to a public treatment plant, researchers

¹⁶¹ “Emergence of an Oil Spill in Shatt al-Arab which Causes Water Cuts in Residential Neighborhoods,” Al Mirbad, January 24, 2016, <https://www.almirbad.com/Details/52589> (accessed May 9, 2019).

162 “Environment and Ports Announce Control of the Leakage of Oil Residues from a Power Plant in Basra,” Al Sumariya, March 23, 2017, <https://www.alsumaria.tv/news/199194/البيئة-والموانئ-تعلنان-على-السيطرة-تسرب-نفط-مخلفات>/ar (accessed May 9, 2019).

¹⁶³ Human Rights Watch email correspondence with Ed Brown, Professor Emeritus, University of Northern Iowa, April 16, 2019; Gina Solomon and Sarah Janssen, “Health Effects of the Gulf Oil Spill,” *The Journal of the American Medical Association*, August 16, 2010, https://www.researchgate.net/publication/45659858_Health_Effects_of_the_Gulf_Oil_Spill (accessed May 7, 2019); Bernard D. Goldstein, Howard J. Osofsky and Maureen Y. Lichtveld, “The Gulf Oil Spill,” *The New England Journal of Medicine*, April 7, 2011, http://ssu.ac.ir/cms/fileadmin/user_upload/Moavenatha/MBehdashti/TebKar/PDFs/The_Gulf_Oil_Spill.pdf (accessed May 7, 2019).

¹⁶⁴ Human Rights Watch interview with Mehdi Hamid Silan, laborer, Salhiya, January 18, 2019 and Human Rights Watch interview with Hassan Yusif, Sihan, January 19, 2019.



Satellite imagery showing a likely oil spill next to a gasoline station into a canal in central Basra city. The spill drifted approximately 200 meters east towards the Shatt al-Arab. Satellite Image Date October 28, 2018.

© 2019 DigitalGlobe-Maxar Technologies; Source: European Space Imaging.

could smell gasoline and observed a shiny film across the surface of the water. Directly across the river in Abadan, Iran, there is major industrial infrastructure including a water purification plant, an oil refinery, and a petrochemical company.¹⁶⁵ In September 2018, Basra residents posted on YouTube several videos of themselves lighting their tap water on fire.¹⁶⁶ This could result from methane in the water, which can come from industrial processes, oil in the water after an oil spill, or oil that seeped into cracked piping within the network from groundwater.¹⁶⁷ Some algae synthesize oil and if the algae then produce

¹⁶⁵ Water purification plant, Abadan, Iran, Google Maps, <https://www.google.com/maps/place/%D8%AA%D8%B5%D9%81%DB%8C%D9%87+%D8%A2%D8%A8+%D8%A7%D8%B3%DA%A9%D9%87+%D8%B5%DB%8C%D8%A7%D8%AF%DB%8C%E2%80%AD/@30.3252721,48.2377788,12.97z/data=!4m8!1m2!2m1!1swater+purification+abadan!3m4!1soxo:ox7c1102ba055cd503!8m2!3d30.3261566!4d48.2858133>; Oil Refinery, Abadan, Iran, Google Maps, <https://www.google.com/maps/place/Abadan+Refinery+Main+Gate/@30.3403624,48.2672776,15.03z/data=!4m5!3m4!1sox3fc44e52e23272a1:ox830a25947480d9a1!8m2!3d30.3386948!4d48.2715654>; and Petrochemical Company, Abadan, Iran, Abadan Petrochemical Company, Abadan, Iran, Google Maps, <https://www.google.com/maps/place/%D9%BE%D8%AA%D8%B1%D9%88%D8%B4%DB%8C%D9%85%DB%8C+%D8%A2%D8%A8%D8%A7%D8%AF%D8%A7%D9%86+Abadan+petrochemical+company%E2%80%AD/@30.3532432,48.2614616,13.85z/data=!4m5!3m4!1sox3fc44f95e345467f:ox87efeo87681bb3e1!8m2!3d30.3634333!4d48.2712989>.

¹⁶⁶ “Basra’s water is burning,” YouTube, September 3, 2018, <https://www.youtube.com/watch?v=Ug7rDfNVLbo&+https%3A%2F%2Fwww.youtube.com%2Fwatch%3Fv=3EgQloPQ7qY> (accessed March 7, 2019).

¹⁶⁷ Abraham Lustgarten, “Scientific study links flammable drinking water to fracking,” *ProPublica*, May 9, 2011, <https://www.propublica.org/article/scientific-study-links-flammable-drinking-water-to-fracking>.

thick mats, methane from the bottom sediment may become trapped and accumulate under the algae. Under the right conditions, the trapped methane can ignite and burn.¹⁶⁸

Human Rights Watch identified 13 agricultural sites north of Basra, on the Iranian side of the Shatt al-Arab, where sugar cane is growing and where refined sugar, molasses, paper, and animal feed are produced.¹⁶⁹ Sugar cane farming can pose environmental threats which include negative effects on biodiversity, runoff of nutrients, the leaching of pesticides and chemicals into the soil, excessive quantities of nutrients in waterways from fertilizer, and discharges of organic pollutants from sugar mills and ethanol distilleries.¹⁷⁰ Water sample results obtained by Human Rights Watch from the time of the crisis show that at that time authorities testing water from the treatment plants were not testing for nitrates, phosphates, or organic pollutants.¹⁷¹

The Ministry of Health and Environment 2019 weekly reports on the water quality indicated high levels of phosphates in the Tigris in Basra, Maysan, and Wasit in February 2019.¹⁷² The same reports also indicated high levels of nitrates in the Euphrates in Muthanna, as well as high levels of phosphates in the Shatt al-Arab.¹⁷³ Two subsequent reports continued to show high levels of phosphates and nitrates in the Tigris, Euphrates, and Shatt al-Arab.¹⁷⁴

¹⁶⁸ Human Rights Watch email correspondence with Ed Brown, Professor Emeritus, University of Northern Iowa, February 21, 2019.

¹⁶⁹ "Sugar and the environment," World Wide Fund, http://d2ouvy59podg6k.cloudfront.net/downloads/sugarandtheenvironment_fidq.pdf (accessed April 8, 2019).

¹⁷⁰ Carina Borralho, "Sugar cane poses some environmental threats," *Engineering News*, March 28, 2014, <http://www.engineeringnews.co.za/article/sugar-cane-poses-some-environmental-threats-2014-03-28> (accessed March 12, 2019).

¹⁷¹ Human Rights Watch email correspondence with Ed Brown, Professor Emeritus, University of Northern Iowa, April 9, 2019.

¹⁷² Second Water Quality Report for Tigris, Euphrates and Shatt al-Arab Rivers for the duration between February 8 to 14, 2019, Ministry of Health and Environment, <http://www.moen.gov.iq/Portals/o/%D8%A7%D9%84%D9%86%D8%B4%D8%B1%D8%A9%20%D8%A7%D9%84%D8%A7%D8%B3%D8%A8%D9%88%D8%B9%D9%8A%D8%A9/%D8%A7%D9%84%D9%86%D8%B4%D8%B1%D8%A9%20%D8%A7%D9%84%D8%A7%D8%B3%D8%A8%D9%88%D8%B9%D9%8A%D8%A9%20%D8%A7%D9%84%D9%85%D9%8A%D8%A7%D9%87%20%D8%B4%D9%87%D8%B1%20%D8%B4%D8%A8%D8%A7%D8%B7%20%D8%A7%D9%84%D8%A7%D8%B3%D8%A8%D9%88%D8%B9%20%D8%A7%D9%84%D8%AB%D8%A7%D9%86%D9%8A%20.pdf> (accessed April 16, 2019).

¹⁷³ Ibid.

¹⁷⁴ Third Water Quality Report for Tigris, Euphrates and Shatt al-Arab Rivers for the duration between February 15 to 21, 2019, Ministry of Health and Environment, <http://www.moen.gov.iq/Portals/o/%D8%A7%D9%84%D9%86%D8%B4%D8%B1%D8%A9%20%D8%A7%D9%84%D8%A7%D8%B3%D8%A8%D9%88%D8%B9%D9%8A%D8%A9/%D8%A7%D9%84%D9%86%D8%B4%D8%B1%D8%A9%20%D8%A7%D9%84%D8%A7%D8%B3%D8%A8%D9%88%D8%B9%D9%8A%D8%A9%20%D8%A7%D9%84%D9%85%D9%8A%D8%A7%D9%87%20%D8%B4%D9%87%D8%B1%20%D8%B4%D8%A8%D8%A7%D8%B7%20%D8%A7%D9%84%D8%A7%D8%B3%D8%A8%D9%88%D8%B9%20%D8%A7%D9%84%D8%AB%D8%A7%D9%84%D8%AB.pdf> (accessed April 16, 2019); Fourth Water Quality

Dr. Dhurgham al-Ajwady, Deputy Governor of Basra, said that during the crisis in September, the governor invited a team of scientists from Nahrain University's DNA & Forensics Science Center in Baghdad to Basra to carry out testing of surface and deep water, and mud at 54 locations along the Shatt al-Arab.¹⁷⁵ He said that the scientists found Cadmium levels of 165 parts per billion, which is 53 times the maximum allowed amounts in the water.

He said they had also found high levels of mercury, and lead at ten times the maximum limit. They also found sulfates and nitrates at nine times the maximum limit, and Boron. He said that they found in their research that increased salt and acid in water increased the leaching of cadmium from other components in the water.

As is consistent with standards globally and stipulated by the Environmental Protection and Improvement Law No. 27 of 2009, each industry should be providing regulatory authorities with measurements of effluent constituents including heavy metals if relevant to the industry.

The Private Water Sector

Private Water Treatment

For decades, Basrawis have been purchasing drinking water from private reverse osmosis (RO) desalination plants. Dr. Dhurgham al-Ajwady, Deputy Governor of Basra, said that in Basra there are over 100 private “RO plants,” as they are known locally—possibly more than 300 according to an aid worker in the water sector.¹⁷⁶ These plants are required to undergo water sample testing on a monthly basis, but some plants still seem to be using too little chlorine during the treatment and distribution process. Some are failing their

Report for Tigris, Euphrates and Shatt al-Arab Rivers for the duration between February 22 to 28, 2019, Ministry of Health and Environment, <http://www.moen.gov.iq/Portals/o/%D8%A7%D9%84%D9%86%D8%B4%D8%B1%D8%A9%20%D8%A7%D9%84%D8%A7%D8%B3%D8%A8%D9%88%D8%B9%D9%8A%D8%A9/%D8%A7%D9%84%D9%86%D8%B4%D8%B1%D8%A9%20%D8%A7%D9%84%D8%A7%D8%B3%D8%A8%D9%88%D8%B9%D9%8A%D8%A9%20%D9%84%D9%86%D9%88%D8%B9%D9%8A%D8%A9%20%D8%A7%D9%84%D9%85%D9%8A%D8%A7%D9%87%20%D8%B4%D9%87%D8%B1%20%D8%B4%D8%A8%D8%A7%D8%B7%20%D8%A7%D9%84%D8%A7%D8%B3%D8%A8%D9%88%D8%B9%20%D8%A7%D9%84%D8%B1%D8%A7%D8%A8%D8%B9.pdf> (accessed April 16, 2019).

¹⁷⁵ Human Rights Watch interview with Dr. Dhurgham al-Ajwady, Basra, January 16, 2019.

¹⁷⁶ Human Rights Watch interview with Dr. Dhurgham al-Ajwady, Basra, January 16, 2019 and Human Rights Watch interview with aid worker (name withheld), Basra, January 20, 2019.

tests because of the presence of fecal bacteria but have not been shut down by authorities and some are even failing to register with authorities completely.

The owner of a private RO plant in Abu al-Khasib, described the typical filtration process for these plants: he said that his plant takes tap water, lets the sediment settle, and then pumps it through cotton filters and then a semipermeable membrane to remove the salt at a high pressure, through the process of reverse osmosis.¹⁷⁷ He said it then pumps the water into storage containers where staff add chlorine, before selling the water to private and independent water truckers.

Because of the membranes they use, the RO plants in Basra are only meant to desalinate water of up to 4,500 TDS.¹⁷⁸ If water has higher TDS values, they need to filter the water multiple times, meaning they need to replace the costly membranes much more frequently and charge more money for the treated water or try to recoup savings elsewhere.¹⁷⁹ One major cost of operations is the procurement of chlorine. Five experts interviewed said they had direct knowledge that private water treatment plants were not adding enough chlorine or in some cases not adding any chlorine at all in order to save on costs.¹⁸⁰ In addition, as one aid worker in the water sector explained, many RO plants use UV or ozone technology to purify water instead of chlorine because it is cheaper, even though these processes cannot guard against harmful substances that enter the water later, for example, in a water tank.¹⁸¹

¹⁷⁷ Human Rights Watch interview with RO plant owner (name withheld), Abu al-Khasib, January 18, 2019.

¹⁷⁸ Human Rights Watch interview with RO plant owner (name withheld), Abu al-Khasib, January 18, 2019.

¹⁷⁹ Ibid.

¹⁸⁰ Human Rights Watch interview with healthcare worker who worked at several Basra medical facilities during the crisis (name withheld), Basra, January 15, 2019; Human Rights Watch interview with an employee at al-Baradi'yah public water treatment plant, Basra, January 21, 2019; Human Rights Watch interview with Dr. Mohsen Disher, Basra University, Basra, January 19, 2019; Human Rights Watch interview with Ahmed Hanoon, Basra, January 20, 2019; Human Rights Watch interview with local government official (name withheld), Basra, January 20, 2019.

¹⁸¹ Human Rights Watch interview with aid worker in water sector (name withheld), Basra, January 20, 2019.



A private reverse osmosis (RO) desalination and filtering plant that sells drinking water to Basra residents.
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There is no definitive proof that anyone fell ill from filtered water from the private water sector during the 2018 crisis, but several interviewees told Human Rights Watch they believed they or their relatives have gotten sick from RO water, and others emphasized that water could only be purchased from specific plants, because not all plants could be trusted.¹⁸² A health sector employee from Abu al-Khasib said that seven of his family members got sick during the 2018 crisis even though they were only using RO water including for washing fruits and vegetables and dishes, leading him to suspect that the RO plant might not be treating the water sufficiently or that the trucks in which it was transported were contaminated.¹⁸³

¹⁸² Human Rights Watch interview with Abd al-Atheem Jaseen, labourer, Tanuma, January 18, 2019.

¹⁸³ Human Rights Watch interview with healthcare worker who worked at a medical facility in Abu al-Khasib during the crisis (name withheld), Abu al-Khasib, January 18, 2019.

Mehdi Hamid Silan, a laborer from an area called Salhiya, said that he and other families buy filtered water for drinking and cooking, but that he regularly gets stomach pains from that water as well and does not think it is properly treated. During the crisis several people in his family fell ill.¹⁸⁴

The Ministry of Health and Environment is responsible for monitoring the quality of water from the private plants by carrying out regular sample testing.¹⁸⁵ Ahmed Hanoon, head of the environmental department, said that if a private RO plant fails a test, then the Ministry of Health and Environment gives the plant a 10-day warning during which time it should stop operating and fix the problem before the department returns to test the water again.¹⁸⁶ If it fails again, then the department takes legal action to either fine the plant or force it to shut down.¹⁸⁷

However, it appears the ministry does not always follow these procedures. Human Rights Watch obtained a document dated October 21, 2018 that showed laboratory test results for water samples taken from three different private RO treatment plants, done by the Iraqi Food Safety Laboratory.¹⁸⁸ The document showed that all three samples failed to meet standards due to the presence of fecal bacteria and low levels of pH. After the failing results, the person who provided the document on condition of anonymity said the three plants were required to change their filters, separators, and refiners, before they were retested.¹⁸⁹ He personally knew someone who worked at one of the plants and confirmed that it continued to fail tests from then through January 2019 but was still operating. He said that after each failed test, the plant again was told to change certain equipment but then restarted treating water seemingly without doing so. Human Rights Watch was unable to independently verify the instances.

¹⁸⁴ Human Rights Watch interview with Mehdi Hamid Silan, laborer, Salhiya, January 18, 2019.

¹⁸⁵ Human Rights Watch interview with Dr. Dhurgham al-Ajwady, Basra, January 16, 2019.

¹⁸⁶ Human Rights Watch interview with Ahmed Hanoon, Basra, January 20, 2019.

¹⁸⁷ Written response received by Human Rights Watch from a Ministry of Health representative via WhatsApp, February 18, 2019.

¹⁸⁸ Iraqi Food Safety Laboratory results for three water samples, October 21, 2018, on file with Human Rights Watch.

¹⁸⁹ Human Rights Watch interview with healthcare worker who worked at several Basra medical facilities during the crisis (name withheld), Basra, January 15, 2019.

Even more concerning, Dr. Shukri al-Hassan said he knew of many private RO plants that were not registered with the Ministry of Health at the time of the crisis so were operating outside the law and therefore were not part of the testing regime, something confirmed by Zuhair Jawad Hashim, head of the Basra Water Department.¹⁹⁰

Water Trucking

Basra residents rely on buying filtered water from private RO treatment plants, which private water truckers who also function as private operators deliver to them. In 1993, the Ministry of Environment issued a set of instructions governing the private water trucking sectoring in Iraq.¹⁹¹ It stipulates that truckers need to obtain a license to sell water, which they need to renew every three months subsequent to an annual medical test and tank inspections every three months. It also stipulates that they are only allowed to deliver a specific type of water and cannot switch between types—for construction, irrigation, or drinking for example. They should also always buy the water they transport and sell from the same plant. Breaking the instructions can lead to heavy penalties or prison time according to the instructions.

The World Health Organization’s Guidelines for Drinking-water Quality stipulates that water truckers clean their tanks when changing between different fluids to avoid contamination and add chlorine to the water at the point of delivery to users.¹⁹²

However, in Basra some of the drivers are transporting different types of water without properly sanitizing their tanks between journeys in line with best practices and Iraqi regulations and without being properly vetted by RO water treatment plant owners to ensure they are licensed, while others reportedly are paying bribes to avoid having their tanks regularly tested (see section below on corruption). They are not adding chlorine at the point of delivery as far as Human Rights Watch could determine, nor are they monitoring residual chlorine levels when they transfer the water to storage containers.

¹⁹⁰ Human Rights Watch interview with Dr. Shukri al-Hassan, marine science lecturer at Basra University, Basra, January 16, 2019; Human Rights Watch interview with Zuhair Jawad Hashim, Basra, January 20, 2019.

¹⁹¹ “Instructions No. 5 of 1993, Transporting and Equipping Drinking Water,” Ministry of Environment, on file with Human Rights Watch.

¹⁹² “Guidelines for Drinking-water Quality,” World Health Organization, 2008, https://www.who.int/water_sanitation_health/dwq/fulltext.pdf (accessed May 14, 2019).

There is no direct evidence that water trucks, which are generally transporting between 8 and 20 m³ of filtered water to people's homes, might have led to illness during the 2018 crisis. However, three experts with direct knowledge of water trucking said that they knew of specific instances where water truckers would transport Shatt al-Arab water for irrigation one day, and then filtered water for people to drink the next, without properly cleaning out their tanks.¹⁹³ Truckers in Basra generally transport three different types of water: for construction directly from the river, from open canals for irrigation and animals (through illegal tapping), and filtered water for drinking.¹⁹⁴ Some use the same trucks for all three.

Abd al-Atheem Jaseen, a laborer, said that while working on a construction site he had seen a water trucker bring river water to the site, and the next day saw that same trucker delivering filtered water to his neighborhood.¹⁹⁵ Abd al-Razzak, a water trucker since 12 years, admitted that he personally knew truckers who transport different types of water on a regular basis, but said he assumes they rinse out their tanks between changing water sources.¹⁹⁶

The ministries of health and municipalities and public works monitor the operation of water trucks. Kathim Dayigh, a water trucker, said that to obtain a license from the Ministry of Health to operate a water truck, he had to undergo a blood test and the ministry tested his truck for cracks, rust, and any signs of peeling paint, and took a water sample from the truck.¹⁹⁷ He and another trucker said they went back for the water in their trucks to be tested about once every three to four months.¹⁹⁸ Private RO plants however are not demanding truckers' licenses before supplying them.¹⁹⁹ The private plant owner said that at his plant, "I don't ask for a license from water truckers who come. I fill up any tank that

¹⁹³ Human Rights Watch interview with Hassan Janabi, Baghdad, January 15, 2019; Human Rights Watch interview with water engineer (name withheld), Basra, January 15, 2019; Human Rights Watch interview with local government official (name withheld), Basra, January 16, 2019.

¹⁹⁴ Human Rights Watch interview with Kathim Dayigh, water trucker, Abu al-Khasib, January 18, 2019.

¹⁹⁵ Human Rights Watch interview with Abd al-Atheem Jaseen, labourer, Tanuma, January 18, 2019.

¹⁹⁶ Human Rights Watch interview with Abd al-Razzak, water trucker, Abu al-Khasib, January 18, 2019.

¹⁹⁷ Human Rights Watch interview with Kathim Dayigh, water trucker, Abu al-Khasib, January 18, 2019.

¹⁹⁸ Human Rights Watch interview with Abd al-Razzak, water trucker, Abu al-Khasib, January 18, 2019.

¹⁹⁹ Human Rights Watch interview with Ahmed Hanoon, Basra, January 20, 2019.



Basra residents rely on buying filtered water from private RO treatment plants delivered by water truckers.
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looks clean.”²⁰⁰ Abd al-Razzak said that he knew many water truckers who did not have a license from the Ministry of Health, but had no difficulty finding plants that would fill up their tanks.²⁰¹

Dr. Shukri al-Hassan said many water truckers without licenses still found water to purchase for resale because demand was so high.²⁰² At the same time, truckers without licenses do not appear to be targeted by the local police. Ahmed Hanoon, head of the environmental department within the Ministry of Health and Environment, said that during the crisis his department made several appeals to the local traffic police, calling on them

²⁰⁰ Human Rights Watch interview with RO plant owner (name withheld), Abu al-Khasib, January 18, 2019.

²⁰¹ Human Rights Watch interview with Abd al-Razzak, water trucker, Abu al-Khasib, January 18, 2019.

²⁰² Human Rights Watch interview with Dr. Shukri al-Hassan, marine science lecturer at Basra University, Basra, January 16, 2019.

to pull over and check the license of water truckers.²⁰³ He did not share any details regarding whether the traffic police acted on this, and what they found but according to Dayigh there was no increased testing of truckers from the neighborhood during the crisis.²⁰⁴

In a positive development, on July 2, 2019 Dr. Dhurgham al-Ajwady, Deputy Governor of Basra, stated in a Facebook post that local authorities had set a deadline of July 15, by which time all water truckers had to obtain the correct licenses in order to operate. The decision called on security forces, traffic police and other authorities to take measures to crack down on water truckers operating illegally.²⁰⁵

Informal Housing and Clandestine Taps

Over 338,400 residents of Basra living in informal housing and are the most water-insecure in the governorate.²⁰⁶ As a result of being excluded from the formal water network, some resort to tapping illegally into the water network if there are pipes that run under their homes.

An employee at al-Baradi'yah treatment plant, said that until the crisis, they were only receiving 30 percent of the water being sent to them from the RZero pumping station due to illegal tapping.²⁰⁷ He and Zuhair Jawad Hashim, head of the Basra Water Department, said that number was now up to around 60 percent, but that the remaining 40 continues to be lost because of illegal tapping. He and other experts explained that families living in informal housing have tapped into the network, as well as car wash shops, private reverse osmosis (RO) plants, and private reverse osmosis (RO) ice plants.²⁰⁸

²⁰³ Human Rights Watch interview with Ahmed Hanoon, Basra, January 20, 2019.

²⁰⁴ Human Rights Watch interview with Kathim Dayigh, water trucker, Abu al-Khasib, January 18, 2019.

²⁰⁵ Dr. Dhurgham al-Ajwady's Facebook page, <https://www.facebook.com/dr.ajwady/posts/1126140927574083> (accessed July 3, 2019).

²⁰⁶ "Slums in Iraq, risks and solutions," Iraqi Parliament, 2017, <http://parliament.iq/wp-content/uploads/2018/11/%D8%A7%D9%84%D8%B9%D8%B4%D9%88%D8%A7%D8%A6%D9%8A%D8%A7%D8%AA-%D9%81%D9%8A-%D8%A7%D9%84%D8%B9%D8%B1%D8%A7%D9%82.pdf> (accessed March 7, 2019).

²⁰⁷ Human Rights Watch interview with an employee at al-Baradi'yah public water treatment plant, Basra, January 21, 2019.

²⁰⁸ Human Rights Watch interview with Zuhair Jawad Hashi, Basra, January 20, 2019; Human Rights Watch interview with human rights activist (name withheld), Basra, January 20, 2019.



Informal housing in central Basra city. The informal housing for over 300,000 Basra governorate residents is not connected to the water and sewage network, leading these communities to contaminate groundwater with raw sewage, and to illegally tap into the piping network to access water.

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According to General Authority for Water and Sewage Law No. 27 of 1999, all private properties located in an area with a water and sewage network must be connected to it.²⁰⁹ However with people building their own informal housing including on land not categorized as residential, this law is not being applied to those properties.

Illegal Tapping of Canals

For many years business have been taking water straight from the open canals and pumping it to their factories and farms.²¹⁰ After years of inaction, during the 2018 water

²⁰⁹ General Authority for Water and Sewage Law No. 27 of 1999, <http://wiki.dorar-aliraq.net/iraqilaws/law/8999.html>, art. 11(1) (accessed April 8, 2019).

²¹⁰ Bel Trew, "Boiling Basra: Residents afraid of their taps as Iraq's water crisis threatens to destabilize the region," *The Independent*, October 1, 2018, <https://www.independent.co.uk/news/world/middle-east/basra-iraq-water-shortages-crisis->

crisis, authorities seem to have swiftly taken steps to limit the practice, apparently showing that political will was the main barrier towards addressing the problem. Despite this, however, no steps have been taken to penalize those stealing the water.

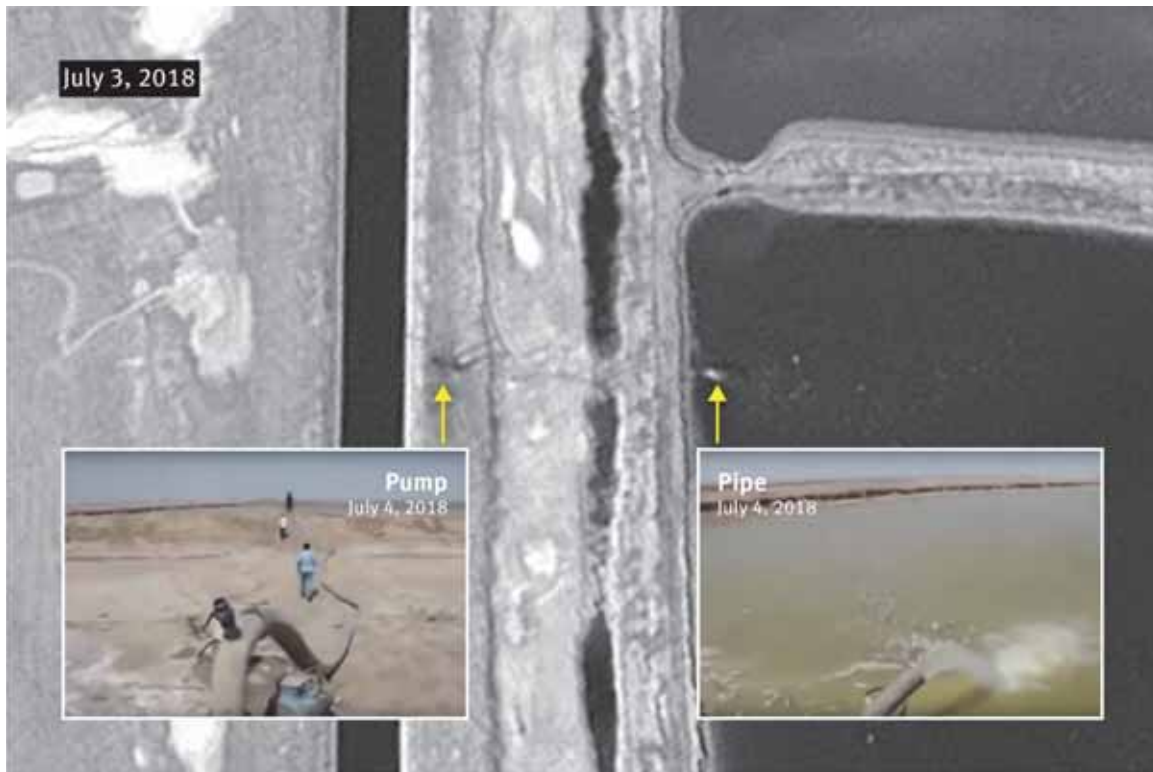
In an anecdotal study using satellite images, Human Rights Watch documented illegal tapping of canals occurring in at least five sites along the Ktaiban canal between 2017 and 2018 and identified three more sites where illegal tapping may have also occurred along the canal in 2016, 2017, and 2018. All the locations identified are located between Abu al-Khasib and Siba and the imagery appears to show pumps and piping being used to syphon water from the canal into different agricultural and other business sites. The Basra Operations Command, which sits jointly under the Iraqi Prime Minister and Minister of Defense, admitted there were many such sites along the canal.²¹¹ Human Rights Watch also identified three sites where illegal water tapping occurred along the Bada'a canal, directly south of Basra city, and in Abu al-Khasib, in one case as early as 2008 through 2017. At each of these sites, imagery shows that canals were constructed that syphoned water directly from the Bada'a canal into man-made reservoirs.

Researchers visited the site of one former tapping operation along the Ktaiban canal that was featured in a clip on YouTube from July 4, 2018, showing Muhammad al-Tamimi, the first deputy governor of Basra, inspecting a pipe that appears to take water directly from the canal south of Basra and pump it a few dozen meters away to a large pond for fish farming.²¹² Satellite images capture the fish pond, which was created and then expanded between 2008 and 2014, syphoning off water from the canal from May 26 to July 3, 2018.

riot-unrest-oil-a8561546.html (accessed April 4, 2019) and "Iraq: unsafe water making children unhealthy," *REliefWeb*, May 10, 2003, <https://reliefweb.int/report/iraq/iraq-unsafe-water-making-children-unhealthy> (accessed April 4, 2019).

²¹¹ "Basra Operations Begin to Lift Misconducts on Irrigation Channels in the South," *The Baghdad Post*, July 6, 2018, <https://www.thebaghdadpost.com/ar/Story/110942/%D8%B9%D9%85%D9%84%D9%8A%D8%A7%D8%AA-%D8%A7%D9%84%D8%A8%D8%B5%D8%B1%D8%A9-%D8%AA%D8%A8%D8%AF%D8%A3-%D8%B1%D9%81%D8%B9-%D8%A7%D9%84%D8%AA%D8%AC%D8%A7%D9%88%D8%B2%D8%A7%D8%AA-%D8%B9%D9%84%D9%89-%D9%82%D9%86%D9%88%D8%A7%D8%AA-%D8%A7%D9%84%D8%B1%D9%89-%D8%A8%D9%85%D9%86%D8%A7%D8%B7%D9%82-%D8%A7%D9%84%D8%AC%D9%86%D9%88%D8%A8> (accessed May 15, 2019).

²¹² "Look at illegal water tapping in Basra," July 4, 2018, video clip, YouTube, <https://www.youtube.com/watch?v=IXMatQMama4&feature=youtu.be> (accessed May 15, 2019).



Video evidence further substantiated by satellite imagery shows that for many years business have been syphoning water illegally from freshwater canals. Satellite Image Date July 3, 2018 © DigitalGlobe-Maxar Technologies 2019; Source: European Space Imaging. YouTube video posted on July 4, 2018 entitled “Look at illegal water tapping in Basra.” © 2018 Private.

Imagery shows that after July 2018, once authorities cracked down on the tapping at some point between July 4 and 11, the site dried up and has remained unused since. 1.36 kilometers south of the first site, researchers saw an abandoned water pump and two pipes that had been severed, that had been used to transfer water out of the canal to an undetermined site. Satellite imagery shows the presence of the pipe as of May or June of 2017.

This site is close to a main road and bridge and was very visible to local authorities.²¹³

²¹³ Human Rights Watch interview with Zaki Aziz Gharban, Siba, January 19, 2019 and Human Rights Watch interview with Hassan Yusif, Sihan, January 19, 2019.



An abandoned pump along the Ktaiban canal that was being used to syphon water illegally from freshwater canals. © 2019 Belkis Wille/Human Rights Watch. Satellite Image Date July 3, 2018. © 2019 DigitalGlobe-Maxar Technologies; Source: European Space Imaging.

As a result of illegal tapping from the Bada'a canal, an employee at the public al-Baradi'yah treatment plant said that before 2003, the plant had been able to get all its water from the Bada'a canal, but that since then illegal water tapping had spiraled out of control and the canal was not able to provide enough water to the plant, leading them to pump water from the Shatt al-Arab.²¹⁴

Irrigation Law No. 6 of 1962 and its Amendments stipulates that the Ministry of Water Resources bears the responsibility of monitoring, operating and protecting lakes and rivers as well as monitoring and improving the natural and man-made waterways.²¹⁵ Almost all interviewees said that as a result, the Ministry of Water Resources was responsible for

²¹⁴ Human Rights Watch interview with an employee at al-Baradi'yah public water treatment plant, Basra, January 21, 2019.

²¹⁵ Irrigation Law No. 6 of 1962, art. 2, <http://wiki.dorar-aliraq.net/iraqilaws/law/698.html> (accessed April 15, 2019).



Photo and video evidence further substantiated by satellite imagery shows that for many years businesses have been syphoning water illegally from freshwater canals. Satellite Image Date July 3, 2018. © 2019 DigitalGlobe-Maxar Technologies; Source: European Space Imaging.

preventing tapping from the Bada'a and Ktaiban canals and that it should have called on security forces to take action much earlier.²¹⁶

However, former Minister of Water Resources Hassan Janabi said that it was the job of local authorities to notify and trigger action from the local police and other security forces.²¹⁷ Zuhair Jawad Hashim, the head of the Basra Water Department, said that responsibility was shared: in his view it was the responsibility of his office, the governor, and security forces to jointly monitor and prevent illegal tapping of any water source within the governorate.²¹⁸ Dr. Dhurgham al-Ajwady, Deputy Governor of Basra, also blamed the

²¹⁶ Human Rights Watch interview with local human rights activist (name withheld), Basra, January 16, 2019.

²¹⁷ Human Rights Watch interview with Hassan Janabi, former Minister of Water Resources, Baghdad, January 15, 2019.

²¹⁸ Human Rights Watch interview with Zuhair Jawad Hashim, Basra, January 20, 2019.

security forces, saying that the illegal tapping was the result of a failure by the Basra Operations Command to crack down.²¹⁹

With regards to the tapping of water directly from the network as opposed to waterways, for example tapping of pipes leaving RZero and the Basra treatment plants, interviewees all agreed that the Ministry of Municipalities and Public Works was responsible for identifying those illegally tapping the water and asking the security forces to act.²²⁰ Dr. Dhurgham al-Ajwady, Deputy Governor of Basra, said that he knew that individuals tapping the pipes, including for large agricultural projects, paid employees in the water department bribes in order to avoid being reported.²²¹ However, another interviewee blamed the governor's office, saying that the governor and local authorities are preoccupied with maintaining their votes and are therefore unwilling to crack down as that would risk angering key members of their constituency.²²²

For the past several years, even in cases in which tapping was reported and action was taken to end it by local Basra authorities, no steps were taken to penalize those stealing the water, and in some cases they resumed their illegal activities later. Hassan Yusif, the manager of Sihan water treatment plant that sits along the Ktaiban canal, said that by 2012 farmers were tapping into the canal, and that he had reported this many times, but despite some measures to stop the tapping, the farmers were continuing the illegal practice because they were not being penalized: "We wrote many letters to the governor's office reporting on this. Sometimes the governor's office sent a committee to remove the pipe, but would not force the agricultural site to close, so right afterwards the farmers would set up a new pipe."²²³

Authorities' inaction in the face of rampant and blatant illegal tapping has raised suspicions that people may indeed have paid bribes to officials to look the other way.²²⁴

²¹⁹ Human Rights Watch interview with Dr. Dhurgham al-Ajwady, Basra, January 16, 2019.

²²⁰ Ibid.

²²¹ Ibid.

²²² Human Rights Watch interview with local government official (name withheld), Basra, January 15, 2019.

²²³ Human Rights Watch interview with Hassan Yusif, Sihan, January 19, 2019.

²²⁴ Human Rights Watch interview with federal government official (name withheld), Baghdad, January 15, 2019; Human Rights Watch interview with local government official (name withheld), Basra, January 16, 2019; Human Rights Watch telephone interview with employee in the Ministry of Agriculture (name withheld), Basra, January 28, 2019.

Yet the head of the Integrity Commission in the Basra governor's office said that his team had never opened any investigation into corruption in the water sector. In addition, the director of the Basra Agriculture Department, denied all knowledge of illegal water tapping for the purposes of farming.²²⁵

Dr. Dhurgham al-Ajwady, Deputy Governor of Basra, said that permanently ending the illegal tapping of water resources was essential to guarantee better water quality in the taps of Basra's residents.²²⁶

Following the 2018 water crisis, Basra authorities seem to have taken further steps to end this practice. Once the crisis began, former Minister Hassan Janabi said that his ministry coordinated with the Basra Operations Command to try to prevent illegal water tapping of both Bada'a and Ktaiban canals and authorities cut off electricity at sites running illegal water pumps along the canals.²²⁷ According to Mufeed Abdulzahra, head of the Basra office of the Ministry of Water Resources, since the crackdown, the Basra Operations Command also continues to fly helicopters over the canals to monitor illegal tapping.²²⁸ Four experts interviewed said that armed forces had been able to make a significant dent into the tapping operations, but that tappers had not been penalized and the experts were unsure if results would last in the long term as a result.²²⁹ Satellite imagery analyzed by Human Rights Watch showed that, as of April 2019, illegal tapping had not returned to the identified locations.

²²⁵ Human Rights Watch interview with the director of the Basra Agriculture Department, Basra, January 16, 2019; Human Rights Watch interview with Muhammad Mehdi Salih, head of the Integrity Commission, Basra Governor's Office, Basra, January 21, 2019.

²²⁶ Human Rights Watch interview with Dr. Dhurgham al-Ajwady, Basra, January 16, 2019.

²²⁷ Human Rights Watch interview with Hassan Janabi, Baghdad, January 15, 2019; "Basra Operations Begin to Lift Misconducts on Irrigation Channels in the South," *The Baghdad Post*, July 6, 2018, <https://www.thebaghdadpost.com/ar/Story/110942/%D8%B9%D9%85%D9%84%D9%8A%D8%A7%D8%AA-%D8%A7%D9%84%D8%A8%D8%B5%D8%B1%D8%A9-%D8%AA%D8%A8%D8%AF%D8%A3-%D8%B1%D9%81%D8%B9-%D8%A7%D9%84%D8%AA%D8%AC%D8%A7%D9%88%D8%B2%D8%A7%D8%AA-%D8%B9%D9%84%D9%89-%D9%82%D9%86%D9%88%D8%A7%D8%AA-%D8%A7%D9%84%D8%B1%D9%89-%D8%A8%D9%85%D9%86%D8%A7%D8%B7%D9%82-%D8%A7%D9%84%D8%AC%D9%86%D9%88%D8%A8> (accessed May 15, 2019).

²²⁸ Human Rights Watch interview with Mufeed Abdulzahra, Basra, January 20, 2019.

²²⁹ Human Rights Watch interview with Zaki Aziz Gharban, Siba, January 19, 2019; Human Rights Watch interview with Hassan Janabi, Baghdad, January 15, 2019; Human Rights Watch interview with Dr. Dhurgham al-Ajwady, Basra, January 16, 2019.

Mismanagement & Corruption

Authorities have severely mismanaged Iraq's water resources so that rivers and freshwater canals are not delivering adequate quantities of good quality water to the governorate's public treatment plants. Authorities have also mismanaged the design, budgeting, and implementation of engineering projects to address the water crisis and provide engineering solutions to improve water quality and quantity. Corruption within local businesses and governmental institutions has also prevented engineering solutions from being completed on time and the proper monitoring of the private water sector.

Mismanagement of Upstream Water Resources

Fresh water flowing into the Shatt al-Arab from the Tigris and Euphrates guards against the intrusion of sea water. The sustained decrease in these flows has increased the Shatt al-Arab's salinity, making reliance on the river as Basra's primary water source increasingly untenable.

According to data provided by the Ministry of Water Resources tracking the quantity of water flowing into the Shatt al-Arab from upstream throughout 2018, in January 2018, the flow of water to the Shatt al-Arab was at its lowest for the year. That month, the Qalat al-Saleh regulator dam, which sits along the Tigris river 120 kilometers north of Basra city, sent an average of 37 cubic meters of water per second (m³/sec) downstream, but Basra city received only 32 m³/sec of that water, a rate that would allow for the encroachment of sea water into the Shatt al-Arab.²³⁰ Every expert interviewed in Basra and Baghdad agreed that in order to prevent seawater intrusion, the Shatt al-Arab needed to receive 50 m³/sec of water from upstream.²³¹ The Ministry of Water Resources' data showed higher water flows during the summer months, with the ministry sending between 53 and 98 m³/sec of

²³⁰ Records of 2018 water flows from Qalat al-Saleh to Basra, Ministry of Water Resources, on file with Human Rights Watch.

²³¹ Human Rights Watch interview with Hassan Janabi, Baghdad, January 15, 2019; Human Rights Watch interview with Sameerah Abed Alshabeeb, manager of the Center for Restoration of Iraqi Marshes and Wetlands, Ministry of Water Resources, Baghdad, January 15, 2019; Human Rights Watch interview with Dr. Dhurgham al-Ajwady, Basra, January 16, 2019; Human Rights Watch interview with Dr. Shukri al-Hassan, marine science lecturer at Basra University, Basra, January 16, 2019; Human Rights Watch interview with Alaa Hashim al-Badran, Basra, January 15, 2019; Human Rights Watch interview with Zuhair Jawad Hashim, Basra, January 20, 2019; Human Rights Watch interview with an employee at al-Baradi'yah public water treatment plant, Basra, January 21, 2019; Human Rights Watch interview with Dr. Mohsen Disher, Basra University, Basra, January 19, 2019.

water to Basra from the Qalat al-Saleh regulator dam and Basra receiving between 46 and 88 m³/sec of water.²³²

Dr. Abdulzahra Hello, a professor of hydrology and marine sciences at Basra University, pointed out that even if the amounts of water the ministry was reportedly sending down the Tigris were accurate and ignoring a certain loss rate before Basra city, they were still not high enough to prevent seawater intrusion.²³³ He said that from Maysan governorate to Basra, 35 m³/sec of water was needed to service Basra's main oil refineries, the Great Basra Water Project's construction site in Hartha, 20 kilometers north of Basra, and agriculture along the banks north of the city. He said that the Ministry of Water Resources was taking another 5 m³/sec out of the river to furnish the Ktaiban irrigation canal. All this left little water for residents of the city of Basra.

The decrease in flows may be even worse than what is officially reported. Five interviewees who had been monitoring the water flow from the Tigris during the 2018 crisis told Human Rights Watch that they believe authorities inaccurately inflate the amount of water they are sending down the river to Basra.²³⁴ When it comes to water supply from the Tigris river, they alleged that the Ministry of Water Resources was not accurately reporting the amount of water it was sending down the river—the levels of water being provided were actually lower, resulting in more seawater intrusion and higher salinity levels. One said that in April 2017 he visited the Qalat al-Saleh dam, where officials told him they were sending 50 m³/sec of water but that by the time he had returned to Basra, the Basra water department reported to him that they had cut the flow.²³⁵ These allegations match the extremely high TDS levels in the water in the Shatt al-Arab during the crisis.²³⁶ None of the five interviewees had ties to either local or federal authorities.

²³² Regulator dams distribute water to branch canals.

²³³ Human Rights Watch interview with Dr. Abdulzahra Hello, professor of hydrology and marine sciences, Basra University, Basra, January 19, 2019.

²³⁴ Human Rights Watch interviews with independent experts (names withheld), Basra, January 15, 16, and 18, 2019.

²³⁵ Ibid.

²³⁶ Chart showing TDS values pre-treatment at nine treatment plants in Basra governorate, August 1, 2018, on file with Human Rights Watch.

During the 2018 water crisis, according to data provided by the Ministry of Water Resources, between May and November of 2018, the ministry was sending between 53 and 98 m³/sec to Basra from the Qalat al-Saleh regulator. Basra was receiving between 46 and 88 m³/sec, reflecting between 4 and 10 m³/sec being used before the water reaches Basra city along the 41 kilometers of river.²³⁷ These numbers contrast with what was observed by four of the interviewees monitoring the water flow, who stated that at the onset of the crisis the flow from Kut dam slowed from a typical 90 m³/sec to 25-30 m³/sec.²³⁸ Alaa Hashim al-Badran, Basra Provincial Council Secretary for the Restoration of the Marshlands, said that during the summer, Basra was receiving only 20-30 m³/sec from the Tigris—in other words, nowhere near enough to stave off seawater intrusion.²³⁹ As a result, during the crisis, the intruding sea water almost reached the area of al-Qurnah, 165 kilometers upstream from the Persian Gulf, the highest ever recorded.²⁴⁰

In order to address the years old problem of seawater intrusion into the Shatt al-Arab, historically Basra has relied on two canals, the Ktaiban and Bada'a canals, that are intended to transport fresh water to residents for domestic use and irrigation but these canals have not provided enough water to Basra and there are also concerns regarding the quality of the water in the canals.

Ktaiban

Ktaiban canal is an irrigation canal that branches off from the Shatt al-Arab and carries water at a rate of 30 m³/sec south of Basra city.²⁴¹ Dr. Dhurgham al-Ajwady, Deputy Governor of Basra, said that in an attempt to provide an alternative source of higher quality fresh water for irrigation, in 2008 the federal government spent IQD 400 billion (\$333 million) to construct the canal, which branches off from the Shatt al-Arab in Ktaiban, 40

²³⁷ Records of 2018 water flows from Qalat al-Saleh to Basra, Ministry of Water Resources, on file with Human Rights Watch.

²³⁸ Human Rights Watch interview with independent expert (name withheld), Basra, January 15, 2019; Human Rights Watch interview with Dr. Shukri al-Hassan, marine science lecturer at Basra University, Basra, January 16, 2019; Human Rights Watch interview with independent expert (names withheld), Basra, January 16, 2019; Human Rights Watch interview with Zaki Aziz Gharban Siba, January 19, 2019.

²³⁹ Human Rights Watch interview with Alaa Hashim al-Badran, Basra, January 15, 2019.

²⁴⁰ Human Rights Watch interview with Hassan Janabi, Baghdad, January 15, 2019; Human Rights Watch interview with Ammar Salman Abd al-Hussain, director of the Basra Agriculture Department, Basra, January 16, 2019; Human Rights Watch interview with Abd al-Razzak, teacher in Abu al-Khasib, Basra, January 18, 2019.

²⁴¹ Human Rights Watch interview with Zaki Aziz Gharban, Siba, January 19, 2019.



Garbage gathering along the Ktaiban irrigation canal which branches off from the Shatt al-Arab and carries water at a rate of 30 m³/sec south of Basra city. © 2019 Belkis Wille/Human Rights Watch.

kilometers north of Basra, and runs for a length of 128 kilometers alongside the Shatt al-Arab.²⁴² The water in the Shatt al-Arab where Ktaiban begins is already seeing elevated TDS levels because of seawater intrusion, thus contaminating the irrigation canal.²⁴³

Hassan Yusif is the manager of one of Basra's public water treatment plants, the Sihan public water treatment plant near Siba, a town that sits on the Ktaiban irrigation canal and the Shatt al-Arab, 50 kilometers south of Basra. The Sihan plant partly relies on the canal for its water. Yusif said that because it is a conventional plant, not a desalination plant, they are unable to do anything beyond filtering and chlorinating the water they receive from the canal and the Shatt al-Arab before sending it into people's homes.²⁴⁴ The maximum salinity level for drinking water is set at TDS 1,000 parts per million (ppm) in Iraq

²⁴² Human Rights Watch interview with Dr. Dhurgham al-Ajwady, Basra, January 16, 2019.

²⁴³ Ibid.; Human Rights Watch interview with Zaki Aziz Gharban, Siba, January 19, 2019; Human Rights Watch interview with Alaa Hashim al-Badran, Basra, January 15, 2019.

²⁴⁴ Human Rights Watch interview with Hassan Yusif, Sihan, January 19, 2019.

but during the 2018 crisis, TDS levels in the canal reached 16,000 ppm, and at the same time closer to 50,000 ppm in the Shatt al-Arab.²⁴⁵ He said:

We had to keep switching between the two sources [the Shatt al-Arab and the Ktaiban canal] because there were lots of electrical cuts, which caused the pump in the canal to stop working and we were not getting enough water from the canal. Later in the crisis, Ataba [the private religious organization linked to Grand Ayatollah Ali al-Sistani] intervened and improved electricity to the pump in the canal and to the treatment plant which made a big difference. But even then, we do not get enough water in the summer months from the canal to solely rely on that, so we have to draw some water from the Shatt al-Arab.²⁴⁶

He said that when the electrical cuts affected the water pumps the canal started to smell “rotten.”²⁴⁷ As of January 2019, the plant was only getting half of the water it took in for treatment from the canal, and the other half from the Shatt al-Arab, he said.

The Bada’a Irrigation Canal and RZero Pumping Station

Approximately half the population of Basra—two million people—rely on water that flows from the Bada’a irrigation canal into the RZero pumping station, according to Alaa Hashim al-Badran, Basra Provincial Council Secretary for the Restoration of the Marshlands.²⁴⁸ The Ministry of Water Resources constructed both the canal and the storage plant in 1997. The Bada’a canal begins in the town of Kut, 280 kilometers northeast of Basra, and runs south to Nasriya and the Central and Hammar marshes to the RZero pumping station. Water from RZero is then pumped to between 6 and 12 major treatment plants in Basra, all of which sit along the Shatt al-Arab.²⁴⁹ The canal, which has no cover enclosing the water, has the

²⁴⁵ Ibid. and Khayyum A. Rahi and Todd Halihan, “Changes in the Salinity of the Euphrates River System in Iraq,” *Regional Environmental Change*, Volume 10, <https://www.iraqicivilsociety.org/wp-content/uploads/2013/02/Salinity-of-Euphrates.pdf> (accessed May 6, 2019).

²⁴⁶ Human Rights Watch interview with Hassan Yusif, Sihan, January 19, 2019.

²⁴⁷ Ibid.

²⁴⁸ Human Rights Watch interview with Alaa Hashim al-Badran, Basra, January 15, 2019.

²⁴⁹ Human Rights Watch interview with Hassan Janabi, Baghdad, January 15, 2019.

capability to deliver an average of 7 m³/sec of water to RZero.²⁵⁰ However, according to al-Badran, the Ministry of Water Resources was only sending 7 m³/sec down the Bada'a canal in September and October, but was sending far less during the other months of the crisis and throughout the year.²⁵¹

Former Water Resources Minister, Hassan Janabi, said this open canal system was only meant to be a short-term measure and did not represent a long-term solution.²⁵² It is incredibly expensive to maintain and loses water from evaporation, leakage, and illegal water tapping directly from the canal.²⁵³ The water is also contaminated by pollutants that enter the water along the canal.²⁵⁴

Dr. Dhurgham al-Ajwady, Deputy Governor of Basra, said that one reason for the leakage is that over the last years, the Ministry of Water Resources had not spent enough money on the upkeep of Bada'a canal, nor has the Basra water department spent enough on RZero.²⁵⁵ He said that RZero had been working over capacity for the last five years and during the crisis operated nonstop, thus damaging parts of the installation. He said because of the damage the installation was now only functioning at 50 percent.

Mismanagement of Attempted Engineering Solutions

Despite the acute and lengthy water crisis, authorities have failed to budget and implement successful projects to provide engineering solutions to improve water quality and quantity. The story of the construction of eight desalination plants in al-Faw and Sihan is emblematic of authorities' mismanagement of funds towards engineering projects in the water sector.

²⁵⁰ Ibid.; Human Rights Watch interview with Dr. Dhurgham al-Ajwady, Basra, January 16, 2019.

²⁵¹ Human Rights Watch interview with Alaa Hashim al-Badran, Basra, January 15, 2019.

²⁵² Human Rights Watch interview with Hassan Janabi, Baghdad, January 15, 2019.

²⁵³ Human Rights Watch interview with Hassan Janabi, Baghdad, January 15, 2019; Human Rights Watch interview with Dr. Mohsen Disher, Basra University, Basra, January 19, 2019.

²⁵⁴ Human Rights Watch interview with senior UN official (name withheld), Erbil, January 28, 2019.

²⁵⁵ Human Rights Watch interview with Dr. Dhurgham al-Ajwady, Basra, January 16, 2019.

Al-Faw and Sihan Desalination Plants

Zaki Aziz Gharban, the deputy head of the Siba provincial council and the staff at the Sihan water treatment plant next to Siba, told Human Rights Watch that in 2009 following Basra's first water crisis, Baghdad decided to build four desalination plants in Sihan and another four in al-Faw, near the Persian Gulf estuary, paid for by the Prime Minister's office.²⁵⁶ The four plants in Sihan were meant to be able to desalinate a total of 400 m³/hour of water.²⁵⁷ Four individuals with direct knowledge of the project said that as far as they were aware, before the Ministry of Municipalities and Public Works in Baghdad signed the contracts to build the plants, the federal government and the companies involved in the project did not conduct any ground engineering assessment.²⁵⁸ As a result, the plants that were built were not fit for desalinating water in these areas, because the water has lots of mud in it.

As constructed, the plants did not have facilities to let the mud settle and add aluminum sulfate as a way of removing the mud from the water.²⁵⁹ As a result, once built, the plants were not functional. They sat unused for almost a decade, until the 2018 crisis, when Ataba, the private religious organization linked to Grand Ayatollah Ali al-Sistani, brokered a deal with authorities to rehabilitate and run the plants.²⁶⁰ When Human Rights Watch researchers visited Basra in January 2019, only two out of the four plants in Sihan were functioning, desalinating water from the Ktaiban irrigation canal as opposed to the Shatt al-Arab, because of the absence of mud in the canal water.²⁶¹

²⁵⁶ Human Rights Watch interview with Zaki Aziz Gharban, deputy head of the Siba provincial council, Siba, January 19, 2019.

²⁵⁷ Ibid.

²⁵⁸ Ibid.; Human Rights Watch interview with Zuhair Jawad Hashim, Basra, January 20, 2019; Human Rights Watch interview with Hassan Yusif, Sihan, January 19, 2019; Human Rights Watch interview with an employee at the Ataba-run Sihan desalination plant (name withheld), Sihan, January 19, 2019.

²⁵⁹ Human Rights Watch interview with Zaki Aziz Gharban, Siba, January 19, 2019; Human Rights Watch interview with Hassan Yusif, Sihan, January 19, 2019; Human Rights Watch interview with an employee at the Ataba-run Sihan desalination plant (name withheld), Sihan, January 19, 2019; "The Iraqi al-Faw is threatened by an environmental disaster, Al Jazeera, June 21, 2010, <https://www.aljazeera.net/news/reportsandinterviews/2010/6/21/%D8%A7%D9%84%D9%81%D8%A7%D9%88-%D8%A7%D9%84%D8%B9%D8%B1%D8%A7%D9%82%D9%8A%D8%A9-%D9%85%D9%87%D8%AF%D8%AF%D8%A9-%D8%A8%D9%83%D8%A7%D8%B1%D8%AB%D8%A9-%D8%A8%D9%8A%D8%A6%D9%8A%D8%A9> (accessed February 25, 2019)

²⁶⁰ Ibid.

²⁶¹ Human Rights Watch interview with Hassan Yusif, Sihan, January 19, 2019.

Inadequate Budget Allocations, Investments, Training

For decades the state has seemingly failed to ensure enough budgetary spending to build new water and wastewater infrastructure as well as maintain current ones, including the treatment plants, freshwater canals, and the piping network. This situation has persisted even after Basra's 2009 water crisis.

In addition, authorities have failed to properly train and employ enough individuals to operate and maintain the infrastructure and service these sites, and to properly equip Basra's central laboratory to test water samples from all its public treatment plants for the full range of possible harmful biological and chemical substances and to monitor compliance with regulations.

Damaged Water Network

Basra's water network has had minimal investment in upkeep over the past few decades despite the rising total dissolved solids (TDS) levels in the water which are causing damage.²⁶² As a result, the iron, plastic, PVC, and concrete piping network delivering water from treatment plants to people's homes has fallen into disrepair. An international water expert who visited Basra in early 2019 and conducted inspections concluded there was 50 percent leakage in the piping network.²⁶³

Exacerbating matters, former Minister of Water Resources, Hassan Janabi, explained that because of cuts in electricity, which plague Basra, like the rest of Iraq, the water flow in the piping network gets frequently interrupted. At moments when the waterflow stops, the change of pressure in the piping causes the surrounding groundwater to get sucked into the piping network, bringing with it mud, sewage, and other waste that comes straight into people's taps.²⁶⁴ Videos posted on YouTube by Basra residents between August and September of 2018, when there were frequent electricity cuts, show that the water coming

²⁶² Human Rights Watch interview with Hassan Janabi, Baghdad, January 15, 2019; Human Rights Watch interview with Zuhair Jawad Hashim, Basra, January 20, 2019.

²⁶³ Human Rights Watch interview with Alaa Hashim al-Badran, Basra, January 15, 2019; Human Rights Watch interview with Hassan Janabi, Baghdad, January 15, 2019; Human Rights Watch email correspondence, April 3, 2019.

²⁶⁴ Human Rights Watch interview with Hassan Janabi, Baghdad, January 15, 2019; Human Rights Watch interview with Sabah al-Bazooni, head of Basra's provincial council, Basra, January 16, 2019; Human Rights Watch interview with Zuhair Jawad Hashim, Basra, January 20, 2019; Human Rights Watch interview with water engineer (name withheld), Basra, January 20, 2019.

out of the taps was muddy.²⁶⁵ Ed Brown, Professor Emeritus at the University of Northern Iowa, said that once fecally contaminated groundwater enters into the piping network even if residents chlorinate their tap water this would likely not effectively treat the new contaminants entering the system.²⁶⁶

Sabah al-Bazooni, head of Basra's provincial council, said that one of the biggest obstacles to repairing the network is the informal housing that has been constructed on land over the piping network. Fixing the pipes would require destroying some of the housing in order to get access.²⁶⁷ Zuhair Jawad Hashim, the head of the Basra Water Department, added that the tunnels that give access to the piping are too dangerous to enter because they have not been maintained.²⁶⁸ Alaa Hashim al-Badran, Basra Provincial Council Secretary for the Restoration of the Marshlands, said he had seen estimates that it would cost close to \$11 billion to redo Basra's piping network.²⁶⁹

In its Intended Nationally Determined Contributions (INDC) linked to the Paris Agreement on Climate Change in 2015, the government committed to rehabilitating and expanding the water piping network that transports tap water to people's homes by 2035 to ensure better delivery and minimize losses from leakage.²⁷⁰ Zuhair Jawad Hashim said that the operational budget he was allocated during the crisis was spent within three months because of the amount of equipment he needed to replace.²⁷¹ He said that in the five years preceding the crisis, he had not had the budget to do any maintenance of the water

²⁶⁵ "Drinking-water in Basra is mud," August 24, 2018, video clip, YouTube https://www.youtube.com/watch?v=Ed_VG4-F4Y (accessed May 15, 2019); "Basra's water has become mud," September 4, 2018, video clip, YouTube, <https://www.youtube.com/watch?v=yoE3CzpDsTo> (accessed May 15, 2019).

²⁶⁶ Human Rights Watch email correspondence with Ed Brown, April 9, 2019; M. W. LeChevallier, T. M. Evans and R. J. Seidler, "Effect of Turbidity on Chlorination Efficiency and Bacterial Persistence in Drinking Water," *Applied and Environmental Microbiology*, July 1981, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC243978/> (accessed May 15, 2019); Hussein Mohamed, Joe Brown, Robert M. Njee, Thomas Clasen, Hamisi M. Malebo and Steven Mbuligwe, "Point-of-Use Chlorination of Turbid Water: Results from a Field Study in Tanzania," *Journal of Water and Health*, 2015, <https://iwaponline.com/jwh/article/13/2/544/28357/Point-of-use-chlorination-of-turbid-water-results> (accessed May 15, 2019).

²⁶⁷ Human Rights Watch interview with Sabah al-Bazooni, Basra, January 16, 2019.

²⁶⁸ Human Rights Watch interview with Zuhair Jawad Hashim, Basra, January 20, 2019.

²⁶⁹ Human Rights Watch interview with Alaa Hashim al-Badran, Basra, January 15, 2019.

²⁷⁰ "Document for the Nationally Determined Contributions to the New Agreement on Climate Change," November 10, 2015, <https://www4.unfccc.int/sites/submissions/INDC/Published%20Documents/Iraq/1/INDC-Iraq.pdf> (accessed May 8, 2019), p. 11.

²⁷¹ Human Rights Watch interview with Zuhair Jawad Hashim, Basra, January 20, 2019.

network.²⁷² Most water systems have two budget lines, one for routine operation and maintenance and one for capital investments. If the operation and maintenance budget is too low, it will mostly be spent on basic operations such as, for example, paying staff, buying disinfectant supplies, or paying energy costs. If systems cannot invest in routine maintenance of the system to repair leaks and maintain pumps, then the system will eventually need extensive capital investments for repair.

Basra's 339 public water treatment plants are all conventional plants and cannot treat the high salinity rates found in the Persian Gulf's sea water.²⁷³ The seawater intrusion into the Shatt al-Arab has had terrible effects on these plants and they have fallen into disrepair. According to the staff at the four plants Human Rights Watch visited, the high TDS count in the water has been eating away at plastic and metal with which it comes into contact. Because of the high corrosiveness of the water, the plants need to replace parts at a high rate.²⁷⁴

Water Sample Testing

The Basra water department's central laboratory is the only laboratory for testing water samples from all the treatment plants in Basra.²⁷⁵ Two plant managers explained that staff from the Ministries of Health and of Municipalities and Public Works come to the plants every 1-2 weeks to take samples from the water to test at the central laboratory.²⁷⁶

Ruqay Ahmar, head of the central laboratory, said her lab was woefully under-resourced, with no proper equipment to test samples for many of the possible harmful substances

²⁷² Ibid.

²⁷³ Ibid.; Conventional water treatment consists of five processes: rapid mixing, flocculation, sedimentation, filtration, and disinfection. Its purpose is to ensure the safety of drinking-water, and that it does not contain any water-borne, water-related, or water-based diseases. "Wastewater recycle, reuse and reclamation," UN Educational, Scientific and Cultural Organization, Encyclopedia of Life Support Systems, 2009, <https://books.google.com.lb/books?id=uCYyCwAAQBAJ&printsec=frontcover#v=onepage&q&f=false>, p. 37 (accessed March 5, 2019).

²⁷⁴ Human Rights Watch interview with Hassan Yusif, Sihan, January 19, 2019; Human Rights Watch interview with RO plant owner (name withheld), Abu al-Khasib, January 18, 2019; Human Rights Watch interview with an employee at al-Baradi'yah public water treatment plant, Basra, January 21, 2019.

²⁷⁵ Human Rights Watch interview with Hassan Yusif, Sihan, January 19, 2019.

²⁷⁶ Human Rights Watch interview with Hassan Yusif, Sihan, January 19, 2019; Human Rights Watch interview with RO plant owner (name withheld), Abu al-Khasib, January 18, 2019.

that might have led to the ongoing health crisis, including dangerous heavy metals, algal blooms, or cryptosporidium.²⁷⁷ Chlorine and organic pollution can cause a reaction that produces a cancerous byproduct but Ahmar said that they have no equipment to test for that.²⁷⁸ She said the lab has UV equipment but does not have the ability to confirm its results.²⁷⁹

Training and Staffing of Plant Operators

The manager at Sihan, a public water treatment plant, said that staffing represents a challenge, with the ministry not sending him staff with adequate training in treatment with chlorine and aluminum sulfate.²⁸⁰ “As a result the small number of staff who are trained need to work incredibly long hours, sometimes 24 hour shifts, just to maintain the treatment plant’s outputs,” he said. An employee at al-Baradi'yah treatment plant said that in a welcome change following the 2018 crisis, the ministry had increased its trainings for staff on chlorine usage.²⁸¹

In one acute example of staffing shortages, in 2011, the UN Development Programme paid for the construction of a purification plant in Khor al-Zubair that had the capacity to purify 25 m³/hour.²⁸² An expert who was assessing the functionality of plants during the 2018 crisis said that he visited the plant in August 2018 only to find that it had never started working.²⁸³ He said the director of the plant explained that it was because the Basra water department had never given him any employees to work at the plant.

Even the staff on hand may not be adequately trained. In a sign of the lack of appropriate awareness of water quality on the side of staff at public treatment plants, or at the very

²⁷⁷ Human Rights Watch interview with Ruqay Ahmar, Basra, January 21, 2019. Cryptosporidium is a microscopic parasite that causes the diarrheal disease cryptosporidiosis. Both the parasite and the disease are known as “crypto”. “Parasites - Cryptosporidium (also known as Crypto),” Centers for Disease Control and Prevention, <https://www.cdc.gov/parasites/crypto/index.html> (accessed May 10, 2019).

²⁷⁸ Human Rights Watch interview with Ruqay Ahmar Basra, January 21, 2019; Brijesh Kumar Mishra, Sunil Kumar Gupta and Alok Sinha, “Human Health Risk Analysis from Disinfection By-Products (DBPs) in Drinking and Bathing Water in some Indian Cities,” *Journal of Environmental Health Science and Engineering*, April 23, 2014, <https://jehse.biomedcentral.com/articles/10.1186/2052-336X-12-73> (accessed May 10, 2019).

²⁷⁹ Human Rights Watch interview with Ruqay Ahmar, Basra, January 21, 2019.

²⁸⁰ Human Rights Watch interview with Hassan Yusif, Sihan, January 19, 2019.

²⁸¹ Human Rights Watch interview with an employee at al-Baradi'yah public water treatment plant, Basra, January 21, 2019.

²⁸² Human Rights Watch interview with water engineer (name withheld), Basra, January 15, 2019.

²⁸³ Ibid.

least a lack of adequate communication, one manager said, “I have no idea what they are testing for and what they do if a test comes out negative. I assume if there was an issue with the testing, then they would inform the ministries and municipal authorities.”²⁸⁴

One international water expert who visited Basra after the 2018 crisis pointed out that most public plant staff and operators have no written Standard Operating Procedures (SOPs). “SOPs need to be ingrained and thousands of plant staff need to be trained in them as soon as possible, otherwise even the best plants will fall quickly into disrepair and be unproductive,” he said.²⁸⁵

Corruption

Annual reports by the Iraqi Commission of Integrity, Iraq’s governmental corruption watchdog, indicate that corruption remains a pervasive problem in the country. In 2017, the commission said it investigated and issued arrest warrants for hundreds of suspected crimes related to corruption and convicted 37 individuals.²⁸⁶ In its 2018 annual report, the commission investigated 221 delayed and incomplete public works projects valued at \$1.5 billion and opened criminal investigations into 41 of them, which were valued at \$1 billion.²⁸⁷ The reports do not provide sufficient information to determine whether these cases implicated the water sector, but a Basra official told Human Rights Watch that the Minister of Municipalities and Public Works referred the former head of the Great Basra Water Project, described below, to the Commission.

Water Trucking

Several interviewees believed that some truck drivers who deliver drinking water pay officials bribes to avoid required inspections and tests. Since water provided through the public networks is not good enough quality for drinking or cooking, all Basra residents rely on private treatment plants that filter the water through a process of reverse osmosis. This

²⁸⁴ Human Rights Watch interview with Hassan Yusif, Sihan, January 19, 2019.

²⁸⁵ Human Rights Watch email correspondence with international water expert (name withheld), July 1, 2019.

²⁸⁶ Summary of 2017 Annual Report, Commission of Integrity, Iraq, July 2017, p. 9, http://nazaha.iq/pdf_up/1876/SARE2017.pdf (accessed April 9, 2019); Detailed Annual Report of 2017, Commission of Integrity, Iraq, 2017, p. 108-120, http://nazaha.iq/pdf_up/4507/p07.pdf (accessed April 9, 2019); and Detailed Annual Report of 2017, Commission of Integrity, Iraq, 2017, p. 110, http://nazaha.iq/pdf_up/4507/p07.pdf (accessed April 9, 2019).

²⁸⁷ Col Activities for the First Quarter of 2018, Commission of Integrity, Iraq, 2018, p. 5, http://nazaha.iq/pdf_up/1927/RQ2018.pdf (accessed April 9, 2019).

water is then delivered to them by private water trucks. While the law requires that the water trucks undergo inspections and drivers have medical exams, including to test for HIV, and receive licenses, one expert said he personally knew drivers who said they were able to bribe officials at the Pollution department in the Ministry of Environment in order to obtain a license but avoid having their tanks tested.²⁸⁸ Another Basra resident said he was personally familiar with this practice and said that as part of the licensing regime, truckers had to pay a one-off fee of IQD 22,000 (\$ 18), then another IQD 25,000 (\$ 21) for their annual medical examination and finally IQD 72,000 (\$ 60) for tank inspections every three months which they told him were prohibitive costs that they preferred to avoid.²⁸⁹

Great Basra Water Project

In 2008, the Japan International Cooperation Agency (JICA) approved a project aimed at improving the quality and quantity of water in Basra. On June 11, 2008, the Japan Bank for International Cooperation (JBIC) signed a loan agreement with the government of Iraq for JPY 42,969 million (\$395 million) for the first tranche of a project set to cost JPY 72,944 million (\$672 million) in total.²⁹⁰ The Ministry of Municipalities and Public Works was supposed to complete the project, which included the rehabilitation and construction of water treatment plants in Hartha, 20 kilometers north of Basra, by November 2014.²⁹¹ The project promised to increase Basra's water supply by 195,800 m³/day within two years of the project's completion, bring TDS levels down to 900 ppm and turbidity down to 10 Nephelometric Turbidity Unit (NTU) or less, and limit water leakage in the system to 30 percent.²⁹²

²⁸⁸ Human Rights Watch interview with local government official (name withheld), Basra, January 16, 2019.

²⁸⁹ Human Rights Watch telephone interview with local government official (name withheld), Basra, April 23, 2019; Human Rights Watch telephone interview with Ahmed Hanoon, Basra, May 2, 2019.

²⁹⁰ Ex-Ante Evaluation of Japanese Loan agreement, June 11, 2008, on file with Human Rights Watch, https://www.jica.go.jp/english/our_work/evaluation/oda_loan/economic_cooperation/c8hovmooooo1rdjt-att/iraq09.pdf (accessed May 21, 2019); Human Rights Watch interview with Dr. Shukri al-Hassan, marine science lecturer at Basra University, Basra, January 16, 2019; Human Rights Watch interview with Dr. Dhurgham al-Ajwady, January 16, 2019.

²⁹¹ Ibid.

²⁹² Ex-Ante Evaluation of Japanese Loan agreement, June 11, 2008, on file with Human Rights Watch, https://www.jica.go.jp/english/our_work/evaluation/oda_loan/economic_cooperation/c8hovmooooo1rdjt-att/iraq09.pdf (accessed May 21, 2019); Human Rights Watch interview with Dr. Shukri al-Hassan, marine science lecturer at Basra University, Basra, January 16, 2019; Human Rights Watch interview with Dr. Dhurgham al-Ajwady, January 16, 2019.

However, it is unclear when construction on the project began and it has yet to open. According to the Deputy Governor of Basra, Dr. Dhurgham al-Ajwady, construction work only began in 2012 and when he visited the site in 2015, he barely saw any signs of progress.²⁹³ Satellite imagery of the site analyzed by Human Rights Watch confirmed minimal construction at the site by December 2015.

Dr. al-Ajwady said he was so concerned that the construction delays were due to misuse of the loaned money that he pushed for a committee to investigate. However, the governor's office formed such a committee, which found that there had been no significant delays or corruption and that the plant would be open in 2016, he said.²⁹⁴ Human Rights Watch was unable to obtain a copy of the report that the committee drafted.

Despite the committee's prediction, the plant has still not opened. The Iraqi government and JICA's lack of transparency regarding obstacles to project progress makes it difficult to identify the specific reasons for this. In a written exchange with Human Rights Watch on May 24, 2018, JICA cited various reasons for the delays: "deterioration of [the] security situation, scope change and rebidding," without providing any further detail.²⁹⁵ However, five people with close knowledge of the project alleged that corruption caused or exacerbated delays. Two government officials in Basra and Baghdad and an international water expert recounted to Human Rights Watch that Iraqi individuals in charge of the project told them that some officials had purposefully created delays in order to increase the length of lucrative contracts with local contractors.²⁹⁶ Two international diplomats who studied the Japanese project alleged that customs authorities refused to let the necessary construction parts through because the Japanese refused to pay them bribes.²⁹⁷ One of the

²⁹³ Human Rights Watch interview with Dr. Dhurgham al-Ajwady, Basra, January 16, 2019.

²⁹⁴ Human Rights Watch interview with Dr. Dhurgham al-Ajwady, Basra, January 16, 2019.

²⁹⁵ Human Rights Watch email correspondence with Shotaro Ono, Middle East Division Deputy Director, Japan International Cooperation Agency, May 24, 2019.

²⁹⁶ Human Rights Watch email correspondence with international water expert (name withheld), April 3, 2019; Human Rights Watch interview with federal government official (name withheld), Baghdad, January 15, 2019; Human Rights Watch interview with local government official (name withheld), Basra, January 16, 2019.

²⁹⁷ Human Rights Watch interview with engineering expert (name and location withheld), February 7, 2019; Human Rights Watch interview with diplomat, Baghdad, January 15, 2019.

experts said he also had direct knowledge of instances where Japanese experts' visas to Iraq were delayed or not processed because they refused to pay bribes.²⁹⁸

One Basra official said officials wanted delays in order to increase the length of salaries for workers.²⁹⁹ Another said that on November 21, 2018, the Minister of Municipalities and Public Works referred a senior official connected with the project to the Iraqi Commission of Integrity on corruption allegations.³⁰⁰

JICA stated that it “has not received any information regarding alleged fraud and corruption” linked to the project and that JICA has requested that the parties involved in the project since its inception adhere to JICA’s compliance requirements.³⁰¹

A May 2018 JICA public statement stated that the first tranche of the loan agreement equivalent to nearly \$400 million had already been disbursed to the Iraqi government.³⁰² JICA documents show that the second tranche of the loan agreement, totaling \$173 million, began in August 2018, and that the total project cost had been increased to JPY 97.670 billion (\$872 million).³⁰³ JICA did not provide any public explanation for what appeared to be a gap of four years of progress from 2014 to 2018. In its written exchange with Human Rights Watch on May 24, 2018, JICA did not explain the reason for the increase in costs but said that the costs might further change due to “some procurement procedures.”³⁰⁴

The construction work has yet to be completed and, despite several requests, Human Rights Watch was unable to determine from Japanese or Iraqi officials when it would be completed, or how much of the allocated money had already been spent. JICA told Human Rights Watch it expected the project to start providing water “as soon as possible.”³⁰⁵ An

²⁹⁸ Human Rights Watch interview with engineering expert (name and location withheld), February 7, 2019.

²⁹⁹ Human Rights Watch interview with local government official (name withheld), January 16, 2019.

³⁰⁰ Human Rights Watch interview with Dr. Dhurgham al-Ajwady, Basra, January 16, 2019.

³⁰¹ Human Rights Watch email correspondence with Shotaro Ono, May 24, 2019.

³⁰² “Signing of Japanese ODA Loan Agreements with Iraq: Contributing to Reconstruction through the Provision and Repair of Water and Irrigation Facilities,” Japan International Cooperation Agency, May 7, 2018, https://www.jica.go.jp/english/news/press/2018/180507_01.html (accessed May 15, 2019).

³⁰³ Ex-Ante Evaluation of Japanese Loan agreement, 2018, https://www.jica.go.jp/english/our_work/evaluation/oda_loan/economic_cooperation/c8hovmoo0001rdjt-att/iraq_180502_01.pdf (accessed May 21, 2019).

³⁰⁴ Human Rights Watch email correspondence with Shotaro Ono, May 24, 2019.

³⁰⁵ Ibid.

international expert linked to the project said it was unlikely the plant could be completed soon. He said that as far as he knew, as of January 2019 there were at least 12 more months of construction needed and then a commissioning period of two years before it would become operational.³⁰⁶

Unsustainable Agricultural and Domestic Water Usage

Despite Iraq's limited water resources, authorities have not taken enough action to educate farmers on water-efficient agricultural practices, nor educate families on responsible domestic use of water.

Agricultural Practices

Seventy to eighty percent of Iraq's water usage is agricultural.³⁰⁷ Because of the shortage of water and its quality deterioration, traditional flood irrigation use in agricultural practices is no longer an option for Iraq. In its 2015 Intended Nationally Determined Contributions (INDC) linked to the Paris Agreement on Climate Change, the government stated that it would introduce machine-led drip and sprinkler irrigation systems throughout the country at an estimated cost of \$45.5 billion over the coming 20 years.³⁰⁸ As far as Human Rights Watch is aware, this initiative has yet to begin. The INDC stated that if these agricultural changes were not implemented, Iraq risked a decrease in agricultural production of up to 20 percent between 2015 and 2035.³⁰⁹

According to Paul Schlunke, Senior Emergency Response Coordinator for FAO in Iraq, the entire agriculture system in southern Iraq must shift from traditional agriculture to protected green or plastic houses and the use of water-efficient irrigation methods with dripper, sprinkler, and hydroponic agriculture techniques in light of water shortage concerns.³¹⁰ Schlunke said that the federal government would need to invest a

³⁰⁶ Human Rights Watch telephone interview with expert linked to the project (name withheld), January 23, 2019.

³⁰⁷ Human Rights Watch interview with Paul Schlunke, Senior Emergency Response Coordinator for FAO in Iraq, Erbil, January 27, 2019.

³⁰⁸ "Document for the Nationally Determined Contributions to the New Agreement on Climate Change," November 10, 2015, <https://www4.unfccc.int/sites/submissions/INDC/Published%20Documents/Iraq/1/INDC-Iraq.pdf> (accessed May 8, 2019), p. 11.

³⁰⁹ *Ibid.*, p. 12.

³¹⁰ Human Rights Watch interview with Paul Schlunke, Erbil, January 27, 2019.

considerable amount, in the hundreds of millions he estimated, in order to help farmers switch their irrigation methods to those more suited to Iraq's water shortages.

Following the 2018 crisis, the Ministry of Agriculture agreed that going forward while it continues to designate the proportion of land in each governorate that is dedicated to agriculture, the Ministry of Water Resources will play that role when it comes to wheat production.³¹¹ Because of the 2018 crisis, Paul Schlunke, Senior Emergency Response Coordinator for FAO in Iraq, said they had banned growing corn, rice, and millet in the south for the rest of the year. He said they did not keep the ban in place for 2019, even though rice, for example, is water intensive and thus more expensive to grow locally than to buy from abroad.³¹²

To conserve water, Iraq should limit the growing of wheat in the south to sprinkler irrigation. Growing wheat is water intensive using traditional flood irrigation methods. It would be more economic to buy wheat from abroad at a significantly lower cost, Schlunke said.³¹³ However, he cited the complications with this, given that wheat is a heavily subsidized crop, which the government purchases from farmers to support the Public Distribution System (PDS) which includes the distribution of flour in the PDS basket. He said that Iraq needed to move away from traditional crops to crops that are less water intensive and salt-tolerant varieties.³¹⁴

Domestic Water Use

The representative of an international team of engineers who spent weeks in Basra in 2018 assessing the water situation said that, by their assessment, current water consumption rates in Basra are at about 0.3 m³/day or 300 liters per person per day, far higher than consumption rates in Europe.³¹⁵ Part of the reason for the high consumption rates is that in

³¹¹ Human Rights Watch interview with Ammar Salman Abd al-Hussain, director of the Basra Agriculture Department, Basra, January 16, 2019.

³¹² Human Rights Watch interview with Paul Schlunke, Erbil, January 27, 2019.

³¹³ Ibid.

³¹⁴ Ibid.

³¹⁵ Human Rights Watch interview with engineering expert (name and location withheld), February 7, 2019; See also: Asit Biswas, Julian Kirchherr, "Water price in Europe need to rise substantially to encourage more sustainable water

Iraq tariffs for water consumption are extremely low, close to \$ 0.01 per m³.³¹⁶ Most local and federal authorities have taken no steps to educate the population about responsible water usage and try to change their water usage habits.³¹⁷ However, in Sulaymaniyah in the Kurdistan Region of Iraq, for example, in June 2018 authorities mandated that all residents install water meters to record consumption in an aim to reduce over-consumption, introducing fines for residents who did not install the meters.³¹⁸

Residents are already suffering the consequences of the dangers of over usage on a regular basis. Mehdi Hamid Silan, a laborer from an area called Salhiya, said that his neighborhood of about 60 households rarely gets tap water.³¹⁹ “Since 2003, every summer our area totally stops getting tap water—we are at the end of the water network and the water just runs out by the time it gets to us,” he said. “So, we get all our water for washing and irrigation straight from a small river here, which gets its water from the Shatt al-Arab.”

Zaki Aziz Gharban, the deputy head of the Siba provincial council, a town with around 17,000 residents, told Human Rights Watch that there is a pipeline from RZero to the area via Abu al-Khasib.³²⁰ He said that during the crisis, all the water was being used up in Abu al-Khasib so none made it to Siba.

Lack of Adequate Information, Healthcare, and Remedial Measures

Local and national authorities failed to adequately respond to the 2018 water crisis in Basra. They did too little to stock hospitals with needed medication, and at the same time did not waive the registration fees for incoming patients. They failed to launch an adequate information campaign warning people about the quality of their tap water or where to seek

consumption,” October 31, 2012, <https://blogs.lse.ac.uk/euoppblog/2012/10/31/europe-water-prices/> (accessed March 4, 2019).

³¹⁶ Human Rights Watch email exchange with international expert (name withheld), February 15, 2019.

³¹⁷ Human Rights Watch interview with Dr. Shukri al-Hassan, marine science lecturer at Basra University, Basra, January 16, 2019; Hannah Lynch, “KRG has sufficient water but outdated system leaves many high and dry,” Rudaw, August 2, 2017, <http://www.rudaw.net/english/kurdistan/02082017> (accessed April 8, 2019).

³¹⁸ “Sulaimani introduces meters, fines to address water concerns,” Rudaw, June 27, 2018, <http://www.rudaw.net/english/kurdistan/270620183> (accessed April 8, 2019).

³¹⁹ Human Rights Watch interview with Mehdi Hamid Silan, laborer, Salhiya, January 18, 2019; Human Rights Watch interview with Mehdi Abd al-Sayad Hamza, farmer, Salhiya, January 18, 2019.

³²⁰ Human Rights Watch interview with Zaki Aziz Gharban, Siba, January 19, 2019.

advice on safe water sources or medical treatment. Authorities also failed to properly investigate the causes of the illness, and since the end of the crisis in November 2018, have failed to make public any information that can explain to the population why at least 118,000 people got sick and what steps the authorities have taken since then to avoid another crisis in the coming years.

In an attempt to stop sending contaminated water into people's homes, on September 4, the provincial council issued an order prohibiting the water department from taking water from the Shatt al-Arab.³²¹ However, Zuhair Jawad Hashim, the head of the Basra Water Department, said that had simply not been possible, "There was absolutely no alternative for so many people in Basra. How on earth could we have implemented that?"³²²

On March 19, 2019, the Prime Minister appointed Hadi al-Ameri, one of the most senior commanders of the Popular Mobilization Forces who headed a political bloc which came in second in 2018 parliamentary elections, to supervise the completion of water and electricity projects in Basra before the summer of 2019.³²³ Human Rights Watch has been unable to gain information about his strategy to fulfill this task.

Access to Healthcare

Despite a statement from the Ministry of Health to the contrary, private and public hospitals charged individuals a registration fee when they came in for treatment during the crisis.³²⁴ The fee depends on the facility but Basrawis told Human Rights Watch they had had to pay between IQD 2,000 and 7,000 (\$1.6 and \$6) per family member that fell ill.³²⁵

³²¹ "Basra council prohibits the use of Shatt al-Arab's water," *The Baghdad Post*, September 4, 2018, <https://www.thebaghdadpost.com/ar/Story/120416/%D9%85%D8%AC%D9%84%D8%B3-%D8%A7%D9%84%D8%A8%D8%B5%D8%B1%D8%A9-%D9%8A%D9%82%D8%B1%D8%B1-%D9%85%D9%86%D8%B9-%D8%A7%D8%B3%D8%AA%D8%AE%D8%AF%D8%A7%D9%85-%D9%85%D9%8A%D8%A7%D9%87-%D8%B4%D8%B7-%D8%A7%D9%84%D8%B9%D8%B1%D8%A8-%D9%84%D8%AA%D8%AC%D9%86%D8%A8-%D8%A3%D8%B2%D9%85%D8%A9-%D8%B5%D8%AD%D9%8A%D8%A9> (accessed July 9, 2019).

³²² Human Rights Watch interview with Zuhair Jawad Hashim, Basra, January 20, 2019.

³²³ "Prime Minister Al-Amiri is Officially Responsible for Overseeing Basra's File of Services," *Al Eshraq*, March 19, 2019, <https://www.aleshraq.tv/all-detat.aspx?jimare=43979> (accessed May 10, 2019).

³²⁴ Written response received by Human Rights Watch from a Ministry of Health representative via WhatsApp, February 18, 2019.

³²⁵ Human Rights Watch interview with Dr. Shukri al-Hassan, marine science lecturer at Basra University, Basra, January 16, 2019.

A Basra healthcare worker said that a week into the outbreak of the crisis, the ministry increased the stock of saline solution bags at Basra's main hospitals.³²⁶ Beyond the saline solution, while public hospitals should have dispensed free medication, many told Human Rights Watch that by the time they went to the hospital, it had run out of the medication they were prescribed and they had to buy it at local pharmacies, spending up to IQD 19,000 (USD\$16) each time someone in the family fell sick.³²⁷ Mehdi Abd al-Sayad Hamza, a farmer from Salhiya, said that in addition to the registration fees and cost of medication, his family had to pay about IQD 25,000 (\$20) each time someone fell ill simply for a taxi to bring them to the hospital and back because they live in a remote area.³²⁸

Failure to Provide Information

In the only official Ministry of Health statement of its kind at any time during the crisis, on August 25, then health minister Adila Hamoud held a press conference in Basra, where she downplayed the health crisis.³²⁹ She said that there was no outbreak of cholera, that all the cases were mild, and that the necessary treatments were being provided, without providing any concrete information on what families could do to avoid illness.³³⁰

A health sector employee said that the Ministry of Health launched an information campaign to warn the public, with the support of organizations including the Iraqi Red Crescent, the Norwegian Refugee Council, and the UN International Children's Emergency Fund that did not reach all residents, only those already sick or caring for the sick. The campaign included posters and flyers that were put up in hospitals warning residents of the risks of contaminated water and instructions on basic cholera prevention techniques.³³¹

³²⁶ Human Rights Watch interview with healthcare worker who worked at several Basra medical facilities during the crisis (name withheld), Basra, January 15, 2019.

³²⁷ Human Rights Watch interview with Dr. Shukri al-Hassan, marine science lecturer at Basra University, Basra, January 16, 2019.

³²⁸ Human Rights Watch interview with Mehdi Abd al-Sayad Hamza, Salhiya, January 18, 2019.

³²⁹ "Health Minister: There is no serious outbreak in the province of Basra," Radio Nawa, August 25, 2018, <https://www.radionawa.com/all-detail.aspx?Jimare=6033> (accessed March 7, 2019).

³³⁰ "Health Minister: There is no serious outbreak in the province of Basra," Radio Nawa, August 25, 2018, <https://www.radionawa.com/all-detail.aspx?Jimare=6033> (accessed March 7, 2019).

³³¹ Human Rights Watch interview with aid worker (name withheld), Basra, January 15, 2019.

One aid worker said that in their effort to provide guidance to the public on steps to prevent cholera, they were instructing people to wash their hands, knowing full well that washing one's hands might represent a further source of contamination.³³²

He and one other Basra resident said the Ministry of Health did engage in a public campaign and they both received text messages from the ministry calling on people to only use water from trusted sources.³³³ The messages did not include any emergency contact, hotline number, social media page, or website link for people to obtain more information on the risks or mitigating measures.

Raja Kathim from Abu al-Khasib whose daughter fell ill said she did eventually get a text message from the Ministry of Health.³³⁴ “The message said something like ‘Be careful of polluted water.’ It did not include any details on how to obtain safe water, a link to a website for more information, or a hotline number we could call if we had questions or if someone we knew fell sick,” she recalled. Most of the other individuals interviewed for the report do not remember receiving any text messages or seeing any other information from local or federal authorities.

Local experts were critical of this response, and in one case, Dr. Shukri al-Hassan, a marine science lecturer at Basra University, argued that once doctors saw there was a clustering of cases, the ministry should have been warning families not to use the tap water at all in areas linked to treatment plants getting much of their water from the Shatt al-Arab.³³⁵

Since last summer, authorities have yet to communicate anything conclusive about the causes of the crisis, and what steps they have taken to avoid further crises in the future. Different government agencies took water samples for testing but all said their findings

³³² Human Rights Watch interview with aid worker (name withheld), Basra, January 20, 2019.

³³³ Human Rights Watch interview with aid worker (name withheld), Basra, January 15, 2019 and Human Rights Watch interview with Raja Kathim, Abu al-Khasib, January 18, 2019.

³³⁴ Human Rights Watch interview with Raja Kathim, Abu al-Khasib, January 18, 2019.

³³⁵ Human Rights Watch interview with Dr. Shukri al-Hassan, marine science lecturer at Basra University, Basra, January 16, 2019.

were confidential.³³⁶ Ahmed Hanoon, head of the Environment Department in Basra, said based on the results of the water samples his department took, he concluded that the high rates of sewage coupled with ineffective water treatment at plants led to people getting sick.³³⁷ However, he said he was not allowed to share any of the data from water samples tested with Human Rights Watch, which had not been made public.

Outside of Iraq, the World Health Organization carried out testing of samples its team collected at multiple sites in Basra and authored a report based on their findings.³³⁸ However, government and UN employees informed Human Rights Watch that the report was the property of the Ministry of Health and as such the agency did not have the right to share it.³³⁹ The government has kept the report confidential.

Dr. Dhurgham al-Ajwady, Deputy Governor of Basra, said that the report that Nahrain University produced based on its analysis of water samples taken during the crisis had also been classified as confidential and was not allowed to be made public.³⁴⁰ He shared with Human Rights Watch a press release issued by his office on December 9, the only public statement of its kind, summarizing the university's findings but without providing much detail into the water sample data.³⁴¹

Failure to Properly Investigate

The government was quick to investigate and rule out cholera as the root of illness, after testing stool samples from patients.³⁴² Dr. Adham Rashad Ismail, Acting World Health

³³⁶ Human Rights Watch interview with Dr. Jassim Humaidi al-Falhi, Baghdad April 4, 2019; Human Rights Watch interview with Hassan Janabi, Baghdad, January 15, 2019; Human Rights Watch interview with Dr. Dhurgham al-Ajwady, Basra, January 16, 2019; Human Rights Watch interview with Dr. Adham Rashad Ismail, Erbil, January 28, 2019; and Human Rights Watch interview with Ahmed Hanoon, Basra, January 20, 2019.

³³⁷ Human Rights Watch interview with Ahmed Hanoon, Basra, January 20, 2019.

³³⁸ Human Rights Watch interview with Dr. Adham Rashad Ismail, Erbil, January 28, 2019.

³³⁹ Human Rights Watch interview with local government official, Basra, January 20, 2019; Human Rights Watch interview with Dr. Adham Rashad Ismail, Erbil, January 28, 2019.

³⁴⁰ Human Rights Watch interview with Dr. Dhurgham al-Ajwady, Basra, January 16, 2019.

³⁴¹ "Basra: Many reasons behind poisoning citizens, most notably (cadmium), which polluted Shatt al-Arab," Almirbad, December 9, 2018, <http://www.almirbad.com/news/view.aspx?cdate=09122018&id=7670641f-1a25-4121-8357-a57308f5cfe6> (accessed March 7, 2019).

³⁴² Human Rights Watch interview healthcare worker who worked at several Basra medical facilities during the crisis (name withheld), Basra, January 15, 2019.

Organization Representative, said that the hospitals were able to rule out cholera. They found some cases of *E. coli* in the samples but that the number of cases was not above normal rates.³⁴³

However, Basra water sector authorities did not at any point conduct a mapping of the illness hotspots and then subsequently isolate the water in pipes in that area from other neighborhoods to prevent further spread of illness.³⁴⁴ As far as Human Rights Watch is aware, officials did nothing to try to identify locations, food consumed, water sources, or any other common characteristics between the patients, which is standard in disease outbreak investigations and what they should have done.³⁴⁵

The government's response to the Basra water crisis was in stark contrast to another event in late 2018, when millions of farmed carp in al-*Musayab* district in *Babil* governorate were found dead. In the latter case Iraqi Prime Minister Adil Abdul-Mahdi deemed it a national security issue and immediately assembled a crisis team to investigate and take appropriate remedial measures.³⁴⁶ The team concluded that the death was caused by a lethal disease, Koi Herpes Virus, not pollution, and issued a public and detailed statement outlining their findings.³⁴⁷

Other Contributing Factors

Other factors contributing to Basra's water crisis included reduced flow rates in the rivers due to upstream damming within Iraq, agricultural developments and damming in Iran and

³⁴³ Human Rights Watch interview with Dr. Adham Rashad Ismail, Erbil, January 28, 2019; Human Rights Watch interview with Dr. Jassim Humaidi al-Falhi, Baghdad, April 4, 2019. *Escherichia coli* (*E. coli*) is a bacterium that lives in the intestines of healthy people and animals unless it is capable of causing disease, in which case the strain produces a Shiga toxin that causes infections in the body. A person can get infected by ingesting food or water that has been contaminated with the toxin-producing strain, usually by eating food from cattle or drinking water that was not disinfected. Symptoms of *E. coli* infections include bloody diarrhea, stomach cramps, and vomiting. There is no treatment for *E. coli* infections other than hydration. "E. coli (*Escherichia coli*)," Centers for Disease Control and Prevention, December 1, 2014, <https://www.cdc.gov/ecoli/general/index.html> (accessed February 7, 2019).

³⁴⁴ Human Rights Watch interview with aid worker (name withheld), Basra, January 15, 2019; Human Rights Watch interview with Hassan Janabi, Baghdad, January 15, 2019; Human Rights Watch interview with Dr. Shukri al-Hassan, marine science lecturer at Basra University, Basra, January 16, 2019.

³⁴⁵ Ibid.

³⁴⁶ "Uncovering a fish epidemic that stunned Iraq," UN Iraq, March 6, 2019, http://www.uniraq.org/index.php?option=com_k2&view=item&id=10507:uncovering-a-fish-epidemic-that-stunned-iraq&Itemid=605&lang=en (accessed March 12, 2019).

³⁴⁷ Ibid.

potentially damming in Turkey and lower rainfall in recent decades, likely a result of climate change, without policies in place to mitigate impact.

A team of engineers estimated that the quantity of water in Iraq's rivers that flowed into Iraq from neighboring countries was historically between 92 and 98 percent, but as of 2018 was about 82 percent.³⁴⁸

Damming in Turkey

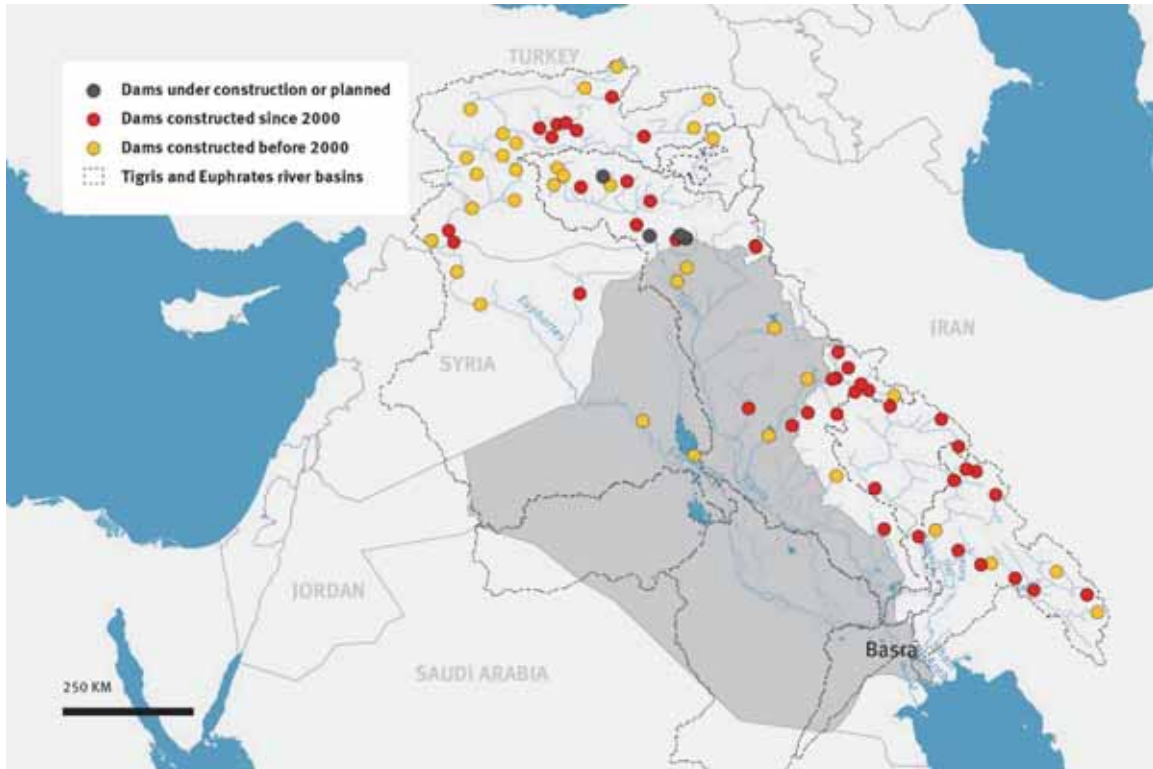
The effects of Turkish damming on the lessening of waterflow into Iraq and ultimately affecting Basra is difficult to determine for various reasons including because the Euphrates runs first through Syria and then through several upstream dams once inside Iraq. Similarly, the Tigris river is dammed inside Iraq upstream from Basra.

The Southeastern Anatolia Project, or Güneydoğu Anadolu Projesi (GAP), is one of the largest river basin development projects in the world. Historical satellite imagery analysis conducted by Human Rights Watch demonstrates that the GAP resulted in the construction of over 20 dams in the Euphrates catchment basin since the late 1980s, including the Ataturk dam (1992) and the Alpaslan-1 Baraji dam (2009). Construction continued through 2015. Imagery demonstrates that this massive system of hydroelectric dams has had a substantial impact on downstream water flow into Syria and Iraq, however because of the lack of Syrian river gauge data, and specifically at the al-Tabqa dam, it is very difficult to assess what the historic impact on downstream water flow into Basra has been.

The Ilisu dam, the largest planned within GAP, is located on the Tigris river in southeast Turkey and might also impact annual inflows to the Tigris in Iraq.³⁴⁹ Since 2016, Turkish and Iraqi officials have been negotiating Turkey's plans to fill the Ilisu dam, with experts

³⁴⁸ Assessment of Basra's water deficiencies by a team of international engineers, November 2018, on file with Human Rights Watch; Food and Agriculture Organization of the UN assessment of Iraq's agriculture, 2008, on file with Human Rights Watch.

³⁴⁹ Arda Bilgen, "Turkey's Southeastern Anatolia Project (GAP): a qualitative review of the literature," *British Journal of Middle Eastern Studies*, 2018, https://www.researchgate.net/publication/328769209_Turkey's_Southeastern_Anatolia_Project_GAP_A_qualitative_review_of_the_literature (accessed March 7, 2019).



Current and planned damming throughout Iran, Iraq, Syria and Turkey including along the Tigris and Euphrates. Dam analysis © Human Rights Watch. Hydrology data: EC JRC/Google, WWF, USGS, CIAT, TNC. (Lehner, B., Verdin, K., Jarvis, A. (2008) New global hydrography derived from spaceborne elevation data. *Eos, Transactions, AGU*, 89(10) 93-94.) Reference data: OSM, GADM.

predicting greater declines in annual inflows to the Tigris once the Ilisu dam is filled.³⁵⁰ The Ilisu dam remained empty through March 2019 but by April 2019, because of high snow melt and rainfall, the dam began to fill up, with President Recep Tayyip Erdoğan announcing that it would be filled in June 2019.³⁵¹ In order for it to function as a hydroelectric dam though, it has to allow for water to flow downstream in a regulated manner.

Within the water catchment basin of the Tigris River in Turkey, GAP-related dam construction beyond the Ilisu dam is currently ongoing. A total of nine dams have already been constructed for GAP since 1997, six of which, including the Ilisu, were constructed

³⁵⁰ "Impacts of the Ilisu dam in Iraq: a lecture at the Marine Science Center Basra University," Iraqi Civil Society Solidarity Initiative, November 28, 2012, <https://www.iraqicivilsociety.org/archives/948> (accessed April 4, 2019).

³⁵¹ Ece Toksabay, "Erdogan says Turkey will start filling Ilisu dam in June," *Reuters*, <https://www.reuters.com/article/us-turkey-dam-erdogan/erdogan-says-turkey-will-start-filling-ilisu-dam-in-june-idUSKCN1Q01V5> (accessed June 7, 2019).

since 2011, satellite imagery shows. In addition, satellite imagery analysis conducted by Human Rights Watch demonstrates there are at least six new dams currently under construction and likely to be operational by 2020, and a seventh new dam in Cizre is planned.

Satellite imagery shows that there are also two new dams on the Zab river in Turkey that became operational in November 2018, which will likely impact downstream flow into the Tigris south of Mosul.

In January 2019, Turkey appointed former Forestry and Water Affairs Minister Prof. Veysel Eroğlu as a special representative responsible for addressing Iraqi water issues.³⁵²

Agricultural Developments in Iran

Iranian hydroelectric damming activity linked to agricultural developments in three major river basins since the late 1990s has likely had a significant negative impact on the water flow into the Tigris River upstream from Basra and downstream into the Shatt al-Arab. Historical satellite imagery analysis conducted by Human Rights Watch demonstrates that until 1997, within the catchment basin of the Sirwan river, which flows south into the Iraqi Hamrin Dam, there were only two functioning dams. Since 1997 however, twelve new dams have been constructed, nine of which have been constructed since 2011 with one becoming operational in 2019, satellite imagery demonstrates.

Imagery shows that in the catchment basin of the Karkh River, no dams existed until 2001, when the first and largest dam was constructed. Then, between 2011 and 2017, five additional dams were constructed further upstream. In the Karun river basin, imagery shows that as of 2001 there were four dams in operation. Between 2002 and 2013, a further eight dams were constructed, most notably the Upper Gotvand dam in 2012. Dr. Dhurgham al-Ajwady, the Deputy Governor of Basra, said that until the dams along the Karun river were built, 75 percent of Basra's water consumption came from water originating from the Karun and flowing into the Shatt al-Arab.³⁵³

³⁵² Fehim Tastekin, "Turkey names "water czar" to ease disputes with Iraq," *Al-Monitor*, January 23, 2019, <https://www.al-monitor.com/pulse/originals/2019/01/turkey-iraq-names-water-czar-to-ease-disputes.html> (accessed April 8, 2019).

³⁵³ Human Rights Watch interview with Dr. Dhurgham al-Ajwady, Basra, January 16, 2019.

Iraqi officials highlighted the negative impact of the hydroelectric dams in Iran on waterflow into the Shatt al-Arab, however it is likely that the impact of the Iranian agricultural developments is as important, if not more so, to lessening waterflow than the dams themselves.³⁵⁴ In addition to the rapid construction of the hydroelectric dams, historic satellite imagery analyzed reveals a substantial expansion in the area of land allocated for water-intensive sugar plantations and fish farming over a 25-year period.³⁵⁵ Imagery shows that the water consumption by the Iranian sugar industry in this area has had a substantial impact on falling water flow into the Shatt al-Arab. Starting in the mid-1990s, sugar plantations started to expand in the Shush region, where the Karkh and Karun approach each other, and this rapidly accelerated through the early 2000s, with new plantations developed further south along the rivers.

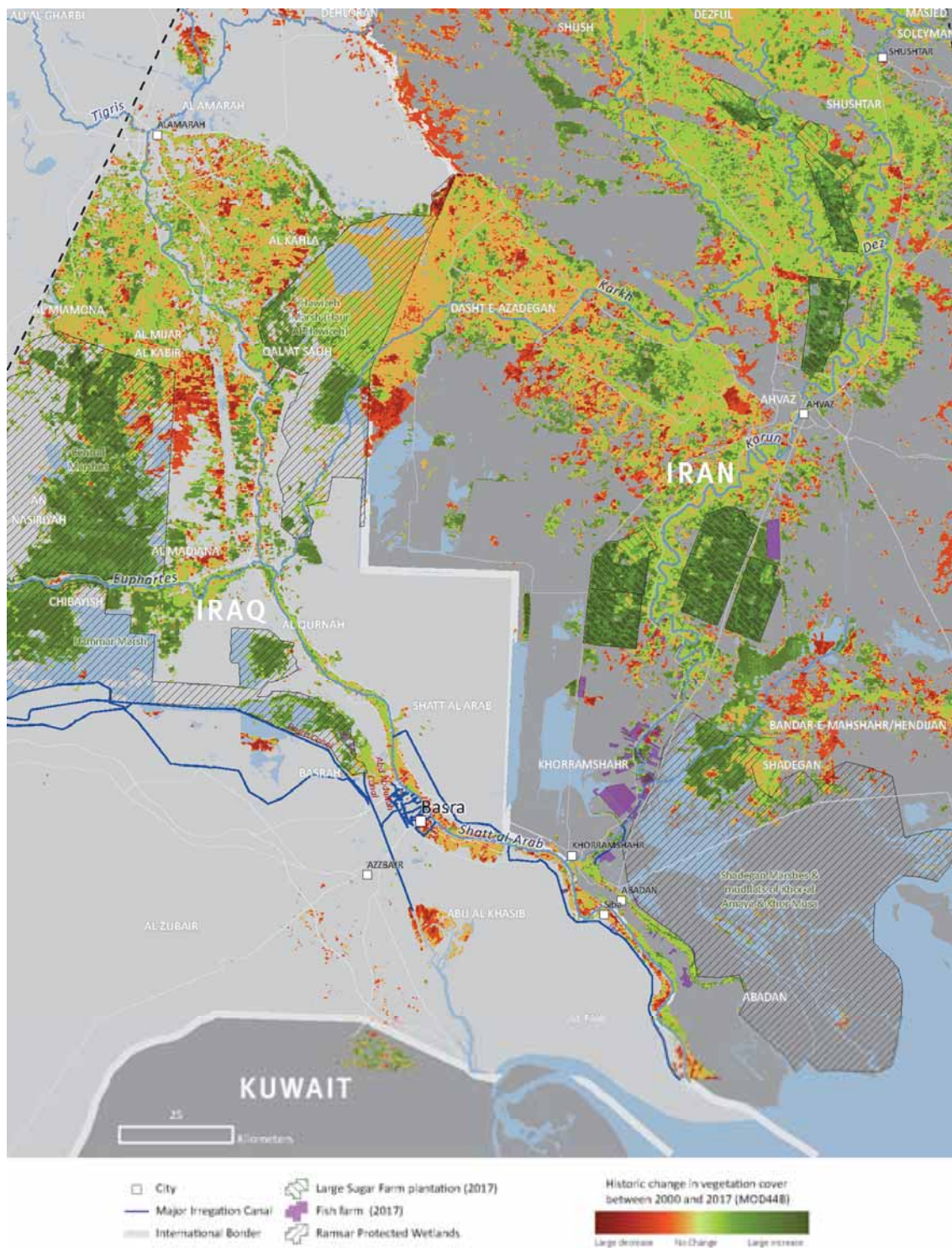
Imagery shows that between 2000 and 2009 three large sugar plantations and a fish farm were developed south of the town of Ahvaz, measuring over 100,000 hectares in total area.³⁵⁶

Feeding these plantations is an elaborate network of several thousand kilometers of surface canals and dozens of pumping stations that actively draw water from of the Karkh and Karun, according to the imagery analyzed. While Human Rights Watch is not able to quantify the water consumption, it is clear from the scale and intensity of water diversion for commercial sugar cultivation as visible in satellite imagery that the overall impact on water flow reduction into the Shatt al-Arab has been substantial.

³⁵⁴ Human Rights Watch interview with federal government official (name withheld), Baghdad, January 15, 2019; Human Rights Watch interview with local government official (name withheld), Basra, January 16, 2019; Human Rights Watch telephone interview with employee in the Ministry of Agriculture (name withheld), Basra, January 28, 2019.

³⁵⁵ Moin Qazi, "India's Thirsty Crops are Draining the Country," *The Diplomat*, April 6, 2017, <https://thediplomat.com/2017/04/indias-thirsty-crops-are-draining-the-country-dry/> (accessed May 22, 2019); "Thirsty Crops. Our Food and Clothes: Eating Up Nature and Wearing Out the Environment," World Wide Fund for Nature, October 15, 2003, http://wwf.panda.org/wwf_news/?9181/Thirsty-Crops-Our-food-and-clothes-eating-up-nature-and-wearing-out-the-environment (accessed May 22, 2019) p. 9.

³⁵⁶ In 2001, major increases of sugar cane farms were observed immediately before the junction of Dez and Karun river and 13 km south of the city of Ahvaz. In 2012, there is a clear increase of sugar cane farms immediately before the junction of the Dez and Karun Rivers, 2 kilometers north of the city of Ahvaz, along right bank of Dez River.



Map on previous page: Analysis shows major agricultural developments in the three major river basins because of the intensification of Iranian hydroelectric damming activity since 2000. The analysis shows that increased damming and water consumption in Iran has led to a proliferation of Iranian sugar plantations, fish farming, and other agricultural developments. At the same time, the damming has had a substantial impact on falling water flow into the Shatt al-Arab, increasing the salinity of the river due to sea water intrusion. As a result, the analysis shows that Basra has seen major vegetation losses since 2000 as farmers have had to rely on saline river water to irrigate their land, destroying the soil and killing off their crops. Vegetation change detection analysis (2000 – 2017) © Human Rights Watch. Vegetation data: NASA (MOD44B); Global surface water data: EC JRC/Google. Reference data: OSM, GADM.

In addition, satellite imagery shows a notable vegetation increase since 2001 along both banks of the Dez and Karun river in Iran; downstream from the Dez dam and Upper Gotvand dam respectively. Apart from major sugar cane plantations, imagery shows a proliferation of fish farms and other agricultural plantations along the last approximately 80 km of the Karun river before it flows into the Shatt al-Arab in Iraq. Before arriving at Shatt al-Arab, the Karun river flows into its main estuary, the Bahmanshir river, parallel to Shatt al-Arab and inside Iran. Between 2000 and 2017, imagery shows an increase of cultivated areas along the Iranian Bahmanshir river and in sharp contrast, shows a decrease of cultivated land on the right bank of the Shatt al-Arab river, after its junction with the Karun river, in Iraq.

Additionally, satellite imagery shows a canal constructed from 1991-2000 that is now operational and runs parallel to the Karun river in Iran. This canal is diverting water from the Karun river, feeding it into the Bahmanshir. Since 2000, imagery shows a proliferation of crops and fish farms on both sides of the canal.

Climate Change

Compounding the many challenges facing Basra's waterflow, climate change threatens to deteriorate water quality and decrease quantity.³⁵⁷ Iraq is one of the region's countries that is considered most vulnerable to climate change.³⁵⁸ It is already experiencing the impacts

³⁵⁷ "Iraq Climate-Related Security Risk Assessment," Expert Working Group on Climate-related Security Risks, August 2018, <https://www.eastwest.ngo/sites/default/files/iraq-climate-related-security-risk-assessment.pdf> (accessed May 10, 2019). p. 5.

³⁵⁸ Yassin Osman, Mawada Abdellatif, Nadhir Al-Ansari, Sven Knutsson and Sadeq Jawad, "Climate change and future precipitation in arid environment of the Middle East: case study of Iraq," *Journal of Environmental Hydrology*, 2017, (accessed March 7, 2019).

of climate change, with temperature increases leading to evaporation, declining precipitation, and changing weather patterns contributing to water shortages.³⁵⁹ The catchment areas of the Tigris and Euphrates rivers are also experiencing diminishing rainfall.³⁶⁰ Low rainfall has impacted the water quality of the rivers, making the shallower waters more prone to pollution from wastewater and the petroleum industry.³⁶¹ Research shows that frequent droughts and a decline in precipitation, leading to greater evaporation and water shortages, have intensified salinization in the Shatt al-Arab.³⁶² Higher temperatures also increase the likelihood of harmful algal blooms.³⁶³

According to experts, scarcity of fresh water and the rise in the sea level in Iraq will likely increase over time as a result of climate change.³⁶⁴ Experts predict that most of Iraq is likely to experience a reduction in annual mean precipitation with an increase in intensity of precipitation, higher temperatures, intense heat waves, a decrease in runoff and sea level rise in the Persian Gulf.³⁶⁵ Saline levels are also projected to increase with future sea level rise.³⁶⁶ Water scarcity, pollution, and higher temperatures have been associated with the spread of epidemics, such as cholera.³⁶⁷

³⁵⁹ For a general overview of present and historic changes, see “Iraq Climate Data: Projections,” World Bank Group, <https://climateknowledgeportal.worldbank.org/country/iraq/climate-data-projections> (accessed May 10, 2019); Nasrat Adamo, Nadhir Al-Ansari, Varoujan K. Sissakian, Sven Knutsson and Jan Laue, “Climate Change: Consequences on Iraq’s Environment,” *Journal of Earth Sciences and Geotechnical Engineering*, 2018, https://www.researchgate.net/publication/324681020_Climate_Change_Consequences_on_Iraq%27s_Environment (accessed May 10, 2019); A. A. Azooz and S. K. Talal, “Evidence of Climate Change in Iraq,” *Journal of Environmental Protection and Sustainable Development*, 2015, https://www.researchgate.net/publication/280097953_Evidence_of_Climate_Change_in_Iraq (accessed May 10, 2019).

³⁶⁰ Nasrat Adamo and Nadhir Al-Ansari, “Climate Change Impacts: The Middle East and Iraq in Focus,” ResearchGate, September 2018, https://www.researchgate.net/publication/327690004_Climate_Change_Impacts_The_Middle_East_and_Iraq_in_Focus (accessed May 10, 2019).

³⁶¹ “Climate Change Risk Profile Iraq,” USAID, March 2017, https://www.climatelinks.org/sites/default/files/asset/document/2017Mar3_GEMS_Climate%20Risk%20Profile_Iraq_FINAL.pdf (accessed May 10, 2019).

³⁶² “Iraq Systematic Country Diagnostic,” World Bank Group, February 3, 2017, <http://documents.worldbank.org/curated/en/54281148727729890/pdf/IRAQ-SCD-FINAL-cleared-02132017.pdf> (accessed May 10, 2019) and Bushraa Yassein, Kadum A. Al Asaady, Ali Alwaeli and Miqdam Tariq Chaichtan, “Environmental Impacts of Salt Tide in Shatt Al-Arab Basra/Iraq,” *Journal of Environmental Science, Toxicology and Food Technology*, 2016, https://www.researchgate.net/publication/292152354_Environmental_Impacts_of_Salt_Tide_in_Shatt_Al-Arab-BasraIraq (accessed May 10, 2019).

³⁶³ “Climate Change and Harmful Algal Blooms,” UN Environmental Protection Agency, <https://www.epa.gov/nutrientpollution/climate-change-and-harmful-algal-blooms> (accessed May 10, 2019).

³⁶⁴ “Iraq Systematic Country Diagnostic,” World Bank Group, February 3, 2017, <http://documents.worldbank.org/curated/en/54281148727729890/pdf/IRAQ-SCD-FINAL-cleared-02132017.pdf> (accessed May 10, 2019).

³⁶⁵ “Iraq Climate Data: Projections,” World Bank Group, <https://climateknowledgeportal.worldbank.org/country/iraq/climate-data-projections> (accessed May 10, 2019); Yassin Osman, Mawada Abdellatif, Nadhir Al-Ansari, Sven Knutsson and Sadeq Jawad, “Climate change and future precipitation in arid environment of the Middle East: case study of Iraq,” *Journal of Environmental Hydrology*, 2017, (accessed March 7, 2019).

³⁶⁶ “Climate Change Risk Profile Iraq,” USAID, March 2017, (accessed May 10, 2019).

³⁶⁷ Ibid.

Ahead of the adoption of the Paris Agreement on Climate Change, Iraq submitted its Intended Nationally Determined Contributions (INDC), a national climate change action plan, in November 2015.³⁶⁸ More than two years after the entry into force of the Paris Agreement, Iraq is one of only a dozen countries that have not ratified it.³⁶⁹ As a result, Iraq has not submitted its Nationally Determined Contributions to update its INDC. However, in May 2019, Iraq's Council of Ministers recommended that the Parliament pass a bill ratifying the Paris Agreement.³⁷⁰

In the INDC, the Iraqi government committed to establishing a specialized center for climate change which would draw up strategies to mitigate and adapt to climate change in the country.³⁷¹ It included a goal to reduce greenhouse gas emissions by 14 percent between 2020 and 2035.³⁷² The document lays out a range of commitments to improve water quality and quantity in light of expected changes due to climate change. In line with a desire to better manage its water resources, the INDC detailed a range of measures aimed at mitigating the effects of climate change including to rehabilitate several key dams and construct new ones, to improve flood control systems, and to better monitor water consumption including through meters.³⁷³ It also committed to extracting more water from underground resources.³⁷⁴ To increase the quantity of available drinking water, the government committed to increasing public water treatment capacities to treat 6.4 billion m³/year of water per year by 2035, in line with the population's growing consumption rates.³⁷⁵

³⁶⁸ Through the Paris Agreement, state parties agreed to a long-term goal to increase the ability to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas emissions development, in a manner that does not threaten food production. Additionally, they agreed to work towards making finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development. Nationally determined contributions (NDCs) embody efforts by each country to reduce national emissions and adapt to the impacts of climate change. "Nationally Determined Contributions (NDCs) The Paris Agreement and NDCs," UN Climate Change, <https://unfccc.int/process/the-paris-agreement/nationally-determined-contributions/ndc-registry> (accessed May 15, 2019); "Document for the Nationally Determined Contributions to the New Agreement on Climate Change," November 10, 2015, <https://www4.unfccc.int/sites/submissions/INDC/Published%20Documents/Iraq/1/INDC-Iraq.pdf> (accessed May 8, 2019) p. 1.

³⁶⁹ At time of writing, the government of Iraq had signed but not yet ratified the Paris Agreement, https://treaties.un.org/Pages/ViewDetails.aspx?src=TREATY&mtdsg_no=XXVII-7-d&chapter=27&clang=_en.

³⁷⁰ "Decisions of the 20th Ordinary Session held on May 21, 2019," General Secretariat of the Council of Ministers, May 23, 2019, <http://cabinet.iq/ArticleShow.aspx?id=9097&lang=A> (accessed May 27, 2019).

³⁷¹ "Document for the Nationally Determined Contributions to the New Agreement on Climate Change," November 10, 2015, (accessed May 8, 2019), p. 2 and p. 9.

³⁷² *Ibid.*, p. 2.

³⁷³ *Ibid.*, p. 11 and p. 12.

³⁷⁴ *Ibid.*, p. 12.

³⁷⁵ *Ibid.*, p. 11.

As far as Human Rights Watch is aware, the government has yet to establish a climate change center or to start implement any of the other INDC commitments in a dedicated manner. The INDC did not outline any commitments around better oversight of pollutants in the water or broader environment, of the private water sector, or of illegal water usage like illegal water tapping of pipes and canals. It also fails to discuss the importance of realizing the right to water for marginalized communities, such as people living in informal housing settlements.

IV. International Legal Obligations

Iraq has ratified numerous human rights treaties that contain obligations related to the right to water, sanitation, and health, including the International Covenant on Economic, Social and Cultural Rights (ICESCR), the Convention on the Elimination of All Forms of Discrimination against Women (CEDAW), the Convention on the Rights of the Child (CRC), the Convention on the Rights of Persons with Disabilities (CRPD), and the International Covenant on Civil and Political Rights (ICCPR).³⁷⁶

The Iraqi constitution guarantees every individual “the right to live in safe environmental conditions” and obliges the state to “undertake the protection and preservation of the environment and its biological diversity.”³⁷⁷ It outlines the federal government’s obligation to implement “policies relating to water sources from outside Iraq and guaranteeing the rate of water flow to Iraq and its just distribution inside Iraq in accordance with international laws and conventions.”³⁷⁸ It also obliges federal and local authorities to “formulate environmental policy to ensure the protection of the environment from pollution and to preserve its cleanliness, in cooperation with the regions and governorates that are not organized in a region,” and to “formulate and regulate the internal water resources policy in a way that guarantees their just distribution.”³⁷⁹

The UN Committee on Economic, Social and Cultural Rights (CESCR), which monitors governments’ compliance with the ICESCR, noted in 2015 concerns around Iraq’s respect of the right to water, including for families living in informal housing settlements, and shortages of safe drinking water and sanitation facilities. It recommended that Iraq, “in

³⁷⁶ International Covenant on Economic, Social and Cultural Rights (ICESCR), 19 December 1966, 993 *U.N.T.S.* 3, Can. T.S. 1976 No. 46, 6 I.L.M. 360, entered into force 3 January 1976, ratified by Iraq 1971; Convention on the Elimination of All Forms of Discrimination against Women (CEDAW), adopted December 18, 1979, G.A. res. 34/180, 34 UN GAOR Supp. (No. 46) at 193, U.N. Doc. A/34/46, entered into force September 3, 1981, acceded to by Iraq 1986; Convention on the Rights of the Child (CRC), adopted November 20, 1989, G.A. Res. 44/25, annex, 44 UN GAOR Supp. (No. 49) at 167, UN Doc. A/44/49 (1989), entered into force September 2, 1990, acceded to by Iraq 1994; International Covenant on Civil and Political Rights (ICCPR), adopted December 16, 1966, G.A. Res. 2200A (XXI), 21 UN GAOR Supp. (No. 16) at 52, UN Doc. A/6316 (1966), 99 U.N.T.S., ratified by Iraq 1971; Convention on the Rights of Persons with Disabilities (CRPD), adopted December 13, 2006, G.A. Res. 61/106, Annex I, UN GAOR, 61st Sess., Supp. (No. 49) at 65, UN Doc. A/61/49 (2006), ratified by Iraq 2013.

³⁷⁷ Iraqi Constitution, Art. 33, http://iraqinationality.gov.iq/attach/iraqi_constitution.pdf.

³⁷⁸ *Ibid.*, art. 110(8).

³⁷⁹ *Ibid.*, art. 114.

cooperation with neighbouring countries, intensify efforts to conclude agreements concerning the fair and equitable use of the river courses within its territory. The Committee also recommended that Iraq develop a human-rights-based strategy on drought preparedness, taking into consideration the National Drought Management Policy Guidelines of 2014, and take effective steps, other than compensation for farmers, to assist those most affected by drought. Furthermore, the Committee recommended that Iraq take preventive measures to control and stop the spread of diarrhea and cholera, including by providing vaccinations and information on basic sanitation procedures.³⁸⁰

Right to Water

The right to water entitles everyone, without discrimination, “to have access to sufficient, safe, acceptable, physically accessible and affordable water for personal and domestic use.”³⁸¹ Various resolutions from the UN General Assembly and Human Rights Council affirm that the right to safe drinking water is derived from the right to an adequate standard of living.³⁸² The right to an adequate standard of living is enshrined in human rights instruments ratified by Iraq, such as the ICESCR, CEDAW, CRPD, and the CRC.

The CESCR, in its General Comment 15 on the right to water, noted that an aspect of the core content of the right to water is that water required for personal or domestic use must be safe. This means it must be free from microbes and parasites, chemical substances, and radiological hazards that constitute a threat to a person’s health.³⁸³

³⁸⁰ UN Committee on Economic, Social, and Cultural Rights, “Consideration of Reports Submitted by States Parties under articles 16 and 17 of the Covenant Concluding Observations, Iraq,” E/C.12/IRQ/CO/4, October 27, 2015, para. 52.

³⁸¹ UN General Assembly, “The human rights to safe drinking water and sanitation,” Resolution 70/169, U.N. Doc. A/RES/70/169, December 17, 2015.

³⁸² Ibid.; See also: UN Human Rights Council resolution 15/9 of September 2010, resolution 16/2 of March 2011, resolution 18/1 of September 2011 and resolution 21/2 of September 2012.

³⁸³ The Committee on Economic, Social and Cultural Rights is the UN body responsible for monitoring compliance with the ICESCR. UN Committee on Economic, Social and Cultural Rights, General Comment No. 15, The Right to Water, UN Doc. E/C.12/2002/11, adopted January 20, 2003, para. 12(b).

The committee also stated that a “violation of the obligation to fulfill” the right to water can occur when there is “insufficient expenditure or misallocation of public resources which results in the non-enjoyment of the right to health by individuals or groups.”³⁸⁴ The UN special rapporteur on the rights to water and sanitation has also noted that in situations of emergency, states “have an obligation to provide culturally appropriate services directly.”³⁸⁵ She also noted that violations of the right to water may result from a failure to act, to implement comprehensive plans and strategies to ensure full realization of the rights in the long term, to regulate non-state actors, and as an unintended consequence of policies, programs, and other measures.³⁸⁶

The state also has an obligation to:

prevent third parties from interfering in any way with the enjoyment of the right to water. Third parties include individuals, groups, corporations and other entities as well as agents acting under their authority. The obligation includes, inter alia, adopting the necessary and effective legislative and other measures to restrain, for example, third parties from denying equal access to adequate water; and polluting and inequitably extracting from water resources, including natural sources, wells and other water distribution systems.

Where water services (such as piped water networks, water tankers, access to rivers and wells) are operated or controlled by third parties, States parties must prevent them from compromising equal, affordable, and physical access to sufficient, safe and acceptable water. To prevent such abuses an effective regulatory system must be established, in conformity with the Covenant and this general comment, which includes independent

³⁸⁴ CESCR General Comment No. 15, para. 44(c).

³⁸⁵ UN, report of the independent expert on the issue of human rights obligations related to access to safe drinking water and sanitation, “Common violations of the human rights to water and sanitation,” June 30, 2014, UN Doc. A/HRC/27/55, para. 53.

³⁸⁶ *Ibid.*, para. 85.

monitoring, genuine public participation and imposition of penalties for noncompliance.³⁸⁷

Facing a water crisis that is largely unaddressed, and almost certain to get worse, local and federal authorities should meet Iraq's obligations to respect, protect and fulfil the right to water:

The Obligation to Respect

The obligation to respect requires states to refrain from interfering directly or indirectly with the enjoyment of the right to water. For example, states should refrain from polluting water resources or arbitrarily and illegally disconnecting water and sanitation services.

The Obligation to Protect

The obligation to protect requires states to prevent third parties from interfering with the right to water. States should adopt and enforce legislation to ensure that private actors—such as private water purification or reverse osmosis plants and water truckers—comply with human rights standards related to the right to water.

The Obligation to Fulfil

The obligation to fulfil requires states to adopt appropriate legislative, administrative, budgetary, judicial, promotional, and other measures to fully realize the right to water. States must, among other things, adopt a national policy on water that: gives priority in water management to essential personal and domestic uses; defines the objectives for the extension of water services, with a focus on disadvantaged and marginalized groups; considers the current and projected impacts of climate change on its planning; identifies the resources available to meet these goals; specifies the most cost-effective way of using them; outlines the responsibilities and time frame for implementing the measures; and monitors results and outcomes, including ensuring adequate remedies for violations.³⁸⁸

³⁸⁷ CESCR General Comment No. 15, para. 24.

³⁸⁸ Adapted from: OHCHR, UN Habitat, WHO. "The Right to Water". Fact Sheet 35. No date.

Right to Sanitation

The right to sanitation entitles everyone, without discrimination, to “have physical and affordable access to sanitation, in all spheres of life, that is safe, hygienic, secure, and socially and culturally acceptable and that provides privacy and ensures dignity.”³⁸⁹ As with the right to water, the right to sanitation is derived from the right to an adequate standard of living.³⁹⁰

The UN special rapporteur on the rights to water and sanitation has stated that states should “ensure that the management of human excreta does not negatively impact on human rights.”³⁹¹

Rights to Health and Healthy Environment

The right to the highest attainable standard of health is found in article 25 of the Universal Declaration of Human Rights and in international treaties binding upon Iraq, including the ICESCR and the CRC.³⁹²

The CESCR, in its General Comment 14 on the right to health, has interpreted the ICESCR to include:

[T]he requirement to ensure an adequate supply of safe and potable water and basic sanitation [and] the prevention and reduction of the population’s exposure to harmful substances such as radiation and harmful chemicals

³⁸⁹ UN General Assembly, “The human rights to safe drinking water and sanitation,” Resolution 70/169, U.N. Doc. A/RES/70/169, December 17, 2015.

³⁹⁰ Ibid. See also: UN Human Rights Council resolution 15/9 of September 2010, resolution 16/2 of March 2011, resolution 18/1 of September 2011 and resolution 21/2 of September 2012.

³⁹¹ UN, report of the independent expert on the issue of human rights obligations related to access to safe drinking water and sanitation, July 1, 2009, UN Doc. A/HRC/12/24, para. 64; see also UN Committee on Economic, Social and Cultural Rights, Statement on the Right to Sanitation, UN Doc. E/C.12/2010/1 (2010).

³⁹² Universal Declaration of Human Rights (UDHR), adopted December 10, 1948, G.A. Res. 217A(III), U.N. Doc. A/810 at 71 (1948), art. 25; ICESCR, art. 12; and Convention on the Rights of the Child, art. 24.

or other detrimental environmental conditions that directly or indirectly impact upon human health.³⁹³

The CESCR has stated that a “violation of the obligation to fulfill” the right to health can occur when there is “insufficient expenditure or misallocation of public resources which results in the non-enjoyment of the right to health by individuals or groups.”³⁹⁴

The right to health encompasses the right to healthy natural environments.³⁹⁵ The right to a healthy environment involves the obligation to “prevent threats to health from unsafe and toxic water conditions.”³⁹⁶ The UN Special Rapporteur on human rights and the environment’s Framework Principles on Human Rights and the Environment, which interpret the right to a healthy environment, provide that states “should respect and protect the rights to freedom of expression, association and peaceful assembly in relation to environmental matters.”³⁹⁷ The Principles also emphasize the need for “public access to environmental information by collecting and disseminating information and by providing affordable, effective and timely access to information to any person upon request.”³⁹⁸

Right to Property

The right to own property is found in article 17 of the Universal Declaration of Human Rights.³⁹⁹ The government has an obligation to take measures to protect the rights of farmers to their land and crops, including by mitigating against factors that will prevent farmers from being able to fulfill this right include damage to property through government

³⁹³ UN Committee on Economic, Social and Cultural Rights, General Comment No. 14: The right to the highest attainable standard of health, U.N. Doc. E/C.12/2000/4, adopted August 11, 2000, para. 15.

³⁹⁴ CESCR General Comment No. 14, para. 52.

³⁹⁵ ICESCR, art. 12 and CESCR General Comment No. 14, para. 15.

³⁹⁶ CESCR General Comment No. 15, para. 8. See also: CESCR General Comment No. 14, para. 15.

³⁹⁷ UN Office of the High Commissioner on Human Rights, Framework Principles on Human Rights and the Environment with commentary, 2018, A/HRW/37/59, Principle 5, <https://www.ohchr.org/EN/Issues/Environment/SREnvironment/Pages/FrameworkPrinciplesReport.aspx>.

³⁹⁸ Ibid., Principle 7.

³⁹⁹ Universal Declaration of Human Rights (UDHR), adopted December 10, 1948, G.A. Res. 217A(III), U.N. Doc. A/810 at 71 (1948), art. 17.

policies. Iraq's constitution protects the right to private property and secures "the right to benefit, exploit and dispose of private property within the limits of the law."⁴⁰⁰

Right to Information

The CESCR, in its General Comment 15 on the right to water, has noted that a core obligation of states under the right to water is that individuals have the right to seek, receive, and impart information concerning water issues.⁴⁰¹ The CESCR has also noted that "[i]ndividuals and groups should be given full and equal access to information concerning water, water services and the environment, held by public authorities or third parties."⁴⁰²

The CESCR, in the General Comment 14 on the right to health, has stated that a "core obligation" of states under the right to the highest attainable standard of health is:

To provide education and access to information concerning the main health problems in the community, including methods of preventing and controlling them.⁴⁰³

⁴⁰⁰ Iraqi Constitution 2005, art. 23 (1), https://www.constituteproject.org/constitution/Iraq_2005.pdf?lang=en.

⁴⁰¹ CESCR General Comment No. 15, para. 12(c).

⁴⁰² *Ibid.*, para. 48.

⁴⁰³ CESCR General Comment No. 14, para. 44(d).

V. The Way Forward

According to the local and international experts on water quality in Iraq, because of increasing water scarcity exacerbated by climate change, continued pollution of Iraq's waterways, and the excessive use of water by households, agriculture, and industry in Iraq, Basra will suffer from acute water crises in coming years in the absence of strategic solutions.⁴⁰⁴ Given the governments' obligations to respect, protect and fulfil the rights of Basra residents including their rights to water, health, and a healthy environment, authorities at the local and federal level should engage seriously in approaches to solving the long-term challenges facing Basra's water sector in order to fulfill their obligations to provide residents with access to safe water and sanitation, as well as water for irrigation, and to protect their rights to health, healthy environment, education, and prevent further potential displacement.

Local and federal authorities at all levels should acknowledge the right to water as well as their obligations to ensure sufficient, safe, acceptable, physically accessible and affordable safe drinking water immediately for all and to grant victims of violations access to an effective remedy against those responsible. Such remedies should include urgent action when access to potable water and sanitation is cut off. Individuals, as well as state regulators, should have access to meaningful complaint local mechanisms and judicial enforcement should they exhaust local mechanisms.

Through its research into the violations outlined throughout the report, Human Rights Watch came across a range of options being proposed by international and local engineers to address Basra's water challenges in a more long-term, holistic, and effective way.⁴⁰⁵ While the experts cited advantages and disadvantages to each of the proposals, they all emphasized that before the authorities invest in any of them, they conduct a

⁴⁰⁴ Human Rights Watch interview with water engineer (name withheld), Baghdad, January 24, 2019; Human Rights Watch interview with engineering expert (name and location withheld), February 7, 2019; Human Rights Watch interview with Mufeed Abdulzahra, Basra, January 20, 2019.

⁴⁰⁵ Human Rights Watch interview with water engineer (name withheld), Baghdad, January 24, 2019; Human Rights Watch interview with engineering expert (name and location withheld), February 7, 2019.

comprehensive study to determine which single solution or basket of solutions will serve Basra best in the long-term.⁴⁰⁶

Given the complexity of the issue facing Basra, Human Rights Watch recommends that federal and local authorities form an inter-jurisdictional independent task force that assesses failures that led to the 2018 health crisis in Basra, acute and long-term problems facing water for people and for agriculture in Basra and the surrounding areas, regulatory and monitoring gaps, public and private sector negligence, illegal water diversion, and projected climate change impacts among other topics. The task force should conduct its assessment with opportunity for broad participation.

The task force should have clear terms of reference that include fulfilling the following tasks (and even if such a task force is not created the local and federal authorities should find a way to fulfil these tasks anyway):

- Review the findings of the reports commissioned during the health crisis of 2018 and assess the adequacy of measures taken in response;
- Make public the findings of the reports commissioned during the health crisis of 2018 and share publicly all the measures taken to ensure that in the long-term authorities are working to prevent water crises;
- Review all existing water strategies for the management of water resources, particularly in the Tigris and Shatt al-Arab and determine the adequacy of current implementation;
- Analyze current climate data for the region and their projected impacts on water quantity and quality;
- Consider all legal and regulatory regimes governing water in Basra and assess their level of implementation;
- Investigate potential sources of environmental contamination, including the evidence HRW collected regarding the oil spill near the Nahr Bin Umar oil and gas field from July 15-25, 2018;
- Assess the region's vulnerability to harmful algal blooms;
- Provide clear steps for authorities to implement previously agreed upon multi-decade water strategies or develop a new strategy that focuses on the overarching need for the Shatt al-Arab to improve its flow and health;

⁴⁰⁶ Ibid.

- Ensure that regional negotiation efforts lead to the development of a framework that secures the equitable sharing and distribution of water resources between Iran, Iraq, Turkey, and Syria;
- Ensure that local negotiation efforts lead to the development of a framework that secures the equitable sharing and distribution of water resources within Iraq;
- Lay out more clearly which authorities have the responsibility to crack down on illegal water tapping and regulate the registration, testing, and sanctioning of private water plants and water truckers. Baghdad authorities should hold local officials accountable if they fail in their responsibilities;
- Investigate instances where there are credible allegations that authorities have accepted bribes in exchange for ignoring violations of water-related laws or in the context of water-related infrastructure projects and identify which authority should act to address malfeasance;
- Provide guidance on the content of a campaign national authorities should launch to educate Iraqis about responsible use of water and water-saving techniques in an aim to change local water habits. The campaign should not be limited to affected areas in Basra and span the whole country with suggestions on household-level mechanisms to better monitor usage. The campaign should ensure that it includes measures to avoid disproportionately impacting poorer and marginalized communities;
- Provide clear and actionable recommendations for the establishment of a public health advisory system that provides clear levels of drinking water advisories, including preemptive advisories, delineation of responsibility, protocol for putting an advisory in place and lifting it, and clear communication on steps individuals should take to mitigate risk;
- Ensure that all residents without access to adequate safe water have an effective remedy against those responsible for failure to ensure such access. This should include effective local complaint mechanisms that are administrative or quasi-judicial, as well as judicial mechanisms when these mechanisms are exhausted. Such remedies should include urgent action when access to potable water and sanitation is cut off;
- Ensure that in the advent of a new crisis, authorities understand and are accountable to taking steps to minimize the financial and other burdens of the most impacted and marginalized populations and to ensure their access to water; and

- Before proceeding with recommendations on any further major engineering works, bring in a team of engineering experts to conduct a thorough study of the water problems in southern Iraq, that includes both a study of the quality and quantity of water available and needed, the state of the public treatment plants and delivery network, as well as current and projected impacts of climate change on water quantity and quality. Only after such a study should authorities agree on a strategy that may involve increasing water resources through desalination plants and may involve considerable investment into rehabilitating Basra's public water plants and piping network and sealing the Bada'a and Ktaiban canals. Authorities at all levels should commit to ensuring that they police corruption around such projects with vigilance to avoid such practices from hammering project completion.

Once the authorities develop a strategy, they should ensure proper and responsible financing, management, oversight, and regulation of the strategy, and enforcement of environmental standards.

In the view of the international engineers and water experts consulted, the priority of such a task force should be better management of the flow of water into the Shatt al-Arab to avoid seawater intrusion, minimize pollution, and ensure that the open canals providing water to Basra are converted into closed piping to avoid water loss and pollutants.⁴⁰⁷ A team of international engineers proposed various solutions, including in the short term if a new crisis looms, for Iraq to rent a fleet of modular floating desalination plants that could be constructed abroad and deployed to Iraq within three months, thus avoiding some of the pitfalls that caused almost a decade of delays in the construction of the Great Basra Water Project.⁴⁰⁸ However, they cautioned that adequate study is needed before any engineering works begin. "If they refuse to take the time to get a proper study done, all that will happen is that they will spend lots of money on quick fix construction, but then will face the exact same situation a few years from now," the head of the team concluded.⁴⁰⁹ He said that the study, and then the implementation of an agreed-upon

⁴⁰⁷ Ibid.; Human Rights Watch interview with Mufeed Abdulzahra, Basra, January 20, 2019.

⁴⁰⁸ Human Rights Watch interview with engineering expert (name and location withheld), February 7, 2019.

⁴⁰⁹ Ibid.

strategy would take several years to implement, and that authorities need to start the process now in order to stave off a crisis in several years' time.

Additional recommendations include the following:

Recommendations for Iraqi Authorities

For Parliament

- Ratify the Paris Agreement to ensure that Nationally Determined Contributions are updated to respond to the impacts of the water crisis on marginalized populations in light of the projected impacts of climate change and to realize their right to water in adaptation planning.
- Ratify the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal and the Convention on the Protection and Use of Transboundary Watercourses and International Lakes in line with recommendations made by the Council of Ministers to parliament on May 21, 2019.

For All Authorities Linked to Water Storage, Treatment, and Delivery

- Ensure that the government starts implementing its commitments made in the November 2015 Intended Nationally Determined Contributions (INDC) linked to the Paris Agreement on Climate Change, including regarding increased water and sewage treatment, improved water storage and piping infrastructure, and changes to agricultural practice; and
- Address the challenges in the supply chain and regulation of chlorine supplies to ensure all water authorities have consistent access to necessary supplies.

For the Basra Water Department within the Ministry of Municipalities and Public Works

- Ensure that Basra's central laboratory has the appropriate equipment to test for all harmful biological and chemical substances in the water, including heavy metals and harmful algal blooms in both fresh water and sea water;
- Set up effective sources of public information to allow the laboratory to share publicly and with affected communities the results of its tests, as well as an effective public health advisory system to inform the public about any negative testing results, consistent with the recommendations of the task force; and
- In the event of a future crisis, conduct a mapping throughout Basra to identify whether certain neighborhoods are more affected, and then isolate the water in the

pipes in those neighborhoods from others, so as to prevent the further spread of illness.

For the Ministry of Health

- In advance of the next crisis, set up appropriate websites, social media networks, hotlines, and other avenues to provide people with information in the event of another crisis and to instruct all households to store bleach at home which they can use to disinfect their water and stockpile the necessary medications to ensure that hospitals have sufficient supply;
- Ensure that no one in acute need is turned away from care;
- Implement Basra authorities' decision from July 2, 2019 requiring all water truckers to obtain the correct licenses and obliging relevant authorities to more effectively crack down on water trucks operating illegally. Develop tighter regulations around regular inspections and licensing enforcements of water truckers and strengthen methods to prevent truckers from transporting different types of water (for construction, irrigation, household use, or drinking) within the same period including by conducting more rigorous testing of water loads or requiring certification of load content; and
- Investigate potential sources of environmental contamination including oil spills, harmful algal blooms, raw sewage, and garbage in waterways.

For the Basra Traffic Police

- Pull over and check the licenses of more water truck drivers.

For the Basra Water and Sewage Departments within the Ministry of Municipalities and Public Works

- Ensure that all residents of Basra living in informal settlements are added to the water and sewage network, including by officially registering their settlements as residential, by finding families formal housing alternatives that are connected to water and sewage networks, or by providing septic tanks so as to ensure proper storage and disposal of sewage.

For the Council of Ministers

- Improve the tax policies to encourage importing crops best suited for import because of water usage or irrigation method and encourage the growth of crops that are less water intensive and salt-tolerant varieties.

For the Ministry of Agriculture

- Ensure compensation for farmers with losses from the 2018 crisis, as well as for longer term losses; and
- Finance schemes for farmers to change their irrigation methods and change their crops from conventional to non-conventional ones. Consider incentives to encourage farmers to stop growing water-intensive and economically unsound crops like wheat and rice.

For the Ministries of Water Resources and Agriculture

- Develop a national water management policy that takes into account the country's depletion in water resources, reduction in water flow from neighboring countries, projected climate change impacts and incorporates sustainable agricultural practices.

For the Ministry of the Environment

- Investigate potential sources of environmental contamination including oil spills, harmful algal blooms, raw sewage, and garbage in waterways; and
- Upon ratification of the Paris Agreement, ensure that the updated Nationally Determined Contributions (NDC) respond more specifically to the impacts the water crisis on marginalized populations and the need to realize their right to water in light of the projected impacts of climate change. Also ensure that the NDC contains plans on how to monitor and control pollutants or algal bloom in the water or broader environment, enforcement of environmental laws with the private water sector, and prevention of illegal water usage like illegal water tapping of pipes and canals.

For All Law Enforcement Authorities

- In order to ensure that protesters in Basra do not face unlawful limitations on their right to right to free expression and peaceful assembly, ensure that Iraqi security

forces engaged in law enforcement duties strictly abide by the United Nations Basic Principles on the Use of Force and Firearms by Law Enforcement Officials and credibly, impartially, and transparently investigate the use of force by the security forces in the Basra Governorate. Security force members, including commanders, responsible for the unlawful use of excessive or lethal force should be disciplined or prosecuted as appropriate.

Recommendation for the United Nations' Special Procedures

- In light of Iraq's standing invitation to all thematic special procedures, the Special Rapporteur on the human rights to safe drinking water and sanitation and the Special Rapporteur on human rights and the environment should conduct visits to Iraq, including to Basra.

Recommendation for Iranian, Turkish and Syrian Authorities

- Ensure that local damming and agricultural developments do not interfere with the equitable sharing and distribution of water resources into Iraq and take efforts to mitigate the effects of water losses stemming from both damming and agriculture in neighboring countries.

Recommendations for Donor Governments

- Provide support and facilitate regional dialogues that work towards developing a framework for an equitable sharing and distribution of water resources between countries in the region;
- Support long term efforts by the Iraqi government to improve water infrastructure by providing technical/financial support to the relevant Iraqi ministries;
- Operate transparently, including by publishing detailed reports on the disbursement of project funds related to the Iraqi water sector and publicly identifying reasons for significant project delays;
- Help ensure that Basra's central laboratory has sufficient equipment to test for all harmful biological and chemical substances in the water, including heavy metals and algal blooms;
- Help the Ministry of Health to develop a platform to provide people with information in the event of another crisis; and

- Support UN agencies and NGOs to address immediate humanitarian needs and prevent spread of water-borne diseases.

Recommendations for JICA

- Publish a realistic and detailed timeline for the Basra Great Water Project and associated costs. Hold contractors accountable to these timelines unless there is a compelling justification for delay; and
- Investigate independently and jointly with Iraqi authorities credible allegations of corruption linked to the Great Basra Water Project, including to delays in the completion of the project and the increase in costs.

Recommendations for Development and Humanitarian Actors

- Work in coordination with Iraq's public and private sector to improve the quality and quantity of water supply and expand the water network to all Basra residents;
- Operate transparently, including by publishing detailed reports on the disbursement of project funds and publicly identifying reasons for significant project delays;
- Work with public and private authorities to ensure access to affordable and safe drinking water. This should include working to decrease costs and safe drinking water prices, particularly in marginalized neighborhoods, through cross-subsidies or other methods of guaranteeing affordability;
- Support livelihoods programming in areas where agricultural livelihoods has been affected due to lack of alternative water sources, consistent with what affected individuals identify as key support required;
- Provide farmers with agricultural inputs such as seeds, tools, fertilizers, pesticides and greenhouses with drip irrigation kits for vegetable production, as well as training in the necessary skills to use the inputs provided; and
- Conduct an assessment of current humanitarian needs and design interventions to address, through an integrated program approach:
 - An immediate water, sanitation, and hygiene response to prevent the possible spread of water-borne diseases, potentially using schools as an entry point.

- An immediate and targeted cash transfers program to vulnerable households to ensure affordable clean water and prevent potential spread of illnesses in the short term.
- Partnership with and support local civil society organizations already operational in Basra, including through direct funding partnerships, to identify and better reach households most at risk from unsafe water.

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Appendix I: Letter to Mr. Muhammad Tahir al-Mulhim from Human Rights Watch

April 18, 2019

Mr. Muhammad Tahir al-Mulhim
Prime Minister's Advisory Commission
Baghdad, Iraq

Re: Basra Water Crisis

Dear Mr. al-Mulhim,

Thank you for your and the Prime Minister's continued assistance and support to Human Rights Watch. We very much appreciate your team's willingness to maintain an open line of communication with Human Rights Watch to discuss human rights challenges in Iraq and recommendations for overcoming them as well as your willingness to engage with the findings of our human rights investigations and to provide your input and information.

We write to request information in connection with research that Human Rights Watch has carried out on Basra's decades-long water crisis and its impact on residents there, which we plan to publish in mid-2019. I am writing to seek your response to several questions, set out below. In the interests of thorough and objective reporting, we would appreciate it if you could provide us with a reply by May 16, 2019 so that we can reflect your views and comments in our forthcoming report.

Our research indicates that since Basra's first serious water crisis in 2009, the Iraqi government has embarked on initiatives to improve the governorate's water supply, but that these have been marred by mismanagement, lack of long-term budgeting, and corruption. At the same time, officials and local water and healthcare experts with whom we

spoke allege that the government has failed to adequately implement regulations concerning public water treatment, the private water sector including private plants and water trucking, sewage treatment, and the safe disposal of industrial and agricultural waste.

Numerous interviewees assert that local authorities have allowed individuals working in industry or agriculture to illegally tap into fresh water sources to syphon off water. They also allege that corrupt practices took place at some of Basra's water installations, including the Great Basra Water Project (also known as the Hartha or Japanese project). According to the many local officials, water and healthcare experts that we interviewed, both the quality and quantity of water in Basra has suffered.

The report will examine the impact of the lack of water of sufficient quality and quantity on crop production and use of arable land, access to schooling, and its triggering of displacement. The report will also examine the most acute impacts on the health of Basra residents in the summer of 2018.

Our research finds that authorities failed to adequately warn residents during the crisis of the effects of contaminated water, to stockpile sufficient medicine or otherwise address the massive need for medical care, or to properly investigate the root causes of incoming patients' symptoms to assess the possible causes of the illness.

As far as we have understood, the government was quick to investigate and rule out cholera as the root of illness, after testing stool samples from patients. However, three healthcare experts told us that Basra water sector authorities did not at any point conduct a mapping of the illness hotspots and then subsequently isolate the water in pipes in that area from other neighborhoods to prevent further spread of illness. They also said that healthcare workers did nothing to try to identify locations, food consumed, water sources, or any other common characteristics between the patients, in order to investigate the roots of the illness.

Authorities still have not communicated publicly the root cause of the epidemic, or the steps they are taking to ensure that such a crisis does not reoccur.

Based on those considerations, we would appreciate receiving your responses to the following questions:

- I. Budgeting and allocation in the water and agricultural sector:

1. Can you share with us information on the budget allocations for the ministries that work in the water sector, with regards to funds allocated for new water installations and projects and upkeep of existing infrastructure, for the years 2017, 2018, and 2019? We would appreciate this information for all relevant authorities including the Ministry of Water Resources, Ministry of Municipalities and Public Works' water and sewage departments, Ministry of Health and Environment, and the Ministry of Agriculture. Please include the percentage that the values represent within the total national budget.
2. Can you share with us information on the government's annual domestic and nondomestic water allocations by governorate in southern Iraq for the years 2017, 2018, and 2019?
3. Can you elaborate on how that allocation is decided, and what mechanisms are in place to prevent some areas from taking more than their allocated amount of water?
4. Can you share with us information on the annual allocation of land for agricultural purposes by governorate in southern Iraq for the years 2017, 2018, and 2019, and the process by which authorities allocate certain crop amounts to certain areas and farmers?
5. Can you elaborate on how that allocation is decided?

II. The environmental sector:

1. Can you share with us information regarding any private individuals, companies, government officials, or other entities, who authorities have fined or otherwise sanctioned for the illegal polluting, including with human, animal, agricultural, or industrial waste, of any of the waterways in Basra since 2017? Please include any details you can share on the types of infractions, and the sanctions imposed.

III. The health sector:

1. Can you share the specific regulations in place that cover the oversight of public and private water treatment plants' treatment process, including Reverse Osmosis (RO) plants:
 - a) How much chlorine are public plants required to add to water during treatment? How much chlorine are private plants required to add to water during treatment?
 - b) Are either public or private plants required to add any other chemicals during treatment?

- c) How often do staff at the plants take and test water samples pre and post treatment? What tests are they obliged to run?
 - d) How often do authorities take their own samples for testing? What tests are they obliged to run?
 - e) Are there any differences in requirements between private and public water treatment plants?
 - f) What are the minimum equipment types that all state water testing laboratories must have?
- 2. If government tests of water samples taken from public or private water treatment plants identify contaminants in the water from specific waterways or plants, what steps do authorities take in the immediate and longer term to ensure polluted water is not circulated, that measures are taken to properly treat the water, identify the cause of the contaminant and penalize the polluter, if relevant, and that the public is informed of any risk?
- 3. Can you share the specific regulations in place that cover the oversight of water trucking? Please describe the water testing regime that is in place. How often is testing undertaken, who is responsible for testing, and what type of tests are done?
- 4. If tests of water samples identify contaminants in the water from specific trucks, what steps do authorities take to ensure polluted water is not circulated, that vendors not complying with regulations are penalized, and that the public is informed of any risk?
- 5. During the Basra water crisis in 2018, what steps did authorities take to investigate the root causes of patients' illness beyond stool sampling to rule out cholera? Please include the findings of any such investigations.
- 6. During the Basra water crisis in 2018, did authorities take any steps to conduct a mapping to identify whether certain neighborhoods were more affected, and then isolate the water in the pipes in those neighborhoods from others, so as to prevent the further spread of illness? If so, can you share details with us of the process and steps taken?

IV. The work of the Iraqi Commission of Integrity and other anti-corruption instruments:

- 1. Authorities in Basra informed us that on November 21, 2018, the Minister of Municipalities and Public Works referred the former head of the project, [REDACTED], to the Iraqi Commission of Integrity on corruption allegations. Could you confirm whether this is correct and share any information on what the

- allegations were? If the investigation is ongoing, when is it expected to be concluded? If it has concluded, what was the outcome of the investigation?
2. Have authorities, including the Iraqi Commission of Integrity, opened investigations into any other individuals based on allegations of corruption linked to the Great Basra Water Project?
 3. Have authorities, including the Iraqi Commission of Integrity, opened investigations into any other private individuals, companies, government officials, or other entities for alleged corruption linked to misuse of water management or illegal tapping of water resources in Basra governorate since 2017? If so please share any details that you can regarding the allegations and the investigations.

V. Further queries:

1. Can you share with us an update on the ongoing projects in Basra to address its water quality and quantity challenges, including the timeframe of the completion of each?
2. In particular, can you share with us a timeframe on the completion of the Great Basra Water Project, as well as an explanation of why the project has been delayed for almost a decade?

Please direct your response and any questions to my colleague Senior Iraq Researcher Belkis Wille via email or phone at [REDACTED] or [REDACTED].

Thank you for your attention to our requests.

Sincerely,

Lama Fakhri
Deputy Director
Middle East and North Africa
Human Rights Watch

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Appendix II: Letter to Mr. Shinichi Kitaoka from Human Rights Watch

April 18, 2019

Shinichi Kitaoka

President

Japan International Cooperation Agency

1-6th floor, Nibancho Center Building,

5-25 Niban-cho, Chiyoda-ku,

Tokyo 102-8012, Japan

Re: Great Basra Water Project in Basra, Iraq

Dear Mr. Kitaoka,

We write to request information in connection with research that Human Rights Watch has carried out on the Great Basra Water Project (also known as the Hartha or Japanese project) in Iraq. This research is part of a broader report on the human rights implications of the water crisis in Basra, which we plan to publish in mid-2019.

We are writing to obtain your response to several questions, set out below. In the interests of thorough and objective reporting, we would appreciate it if you could provide us with a reply by May 15, 2019 so that we can reflect your views and comments in our forthcoming report.

Human Rights Watch is an independent nongovernmental organization that monitors and reports on human rights in more than 90 countries around the world.

Our research indicates that since Basra's first serious water crisis in 2009, the Iraqi government has embarked on initiatives to improve the governorate's water supply, but that these have been marred by Iraqi

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government mismanagement, lack of long-term budgeting, and possibly corruption. At the same time, officials, water quality experts and healthcare professionals with whom we spoke allege that the government has failed to implement regulations around public water treatment, the private water sector including private plants and water trucking, sewage treatment and the safe disposal of industrial and agricultural waste. Numerous interviewees claim that local authorities have allowed individuals working in industry or agriculture to illegally tap into fresh water sources to syphon off water and made corruption allegations against local water authorities as well as local businesses regarding some of Basra's water installations, including the Great Basra Water Project. As a result, both the quality and quantity of water in Basra has suffered.

Authorities familiar with the project told us that while the Japan Bank for International Cooperation (JBIC) signed a loan agreement with the government of Iraq for YEN 62,384 million (US\$558 million) on June 11, 2008, construction work only began in 2012. One official said he visited the site in 2015 and saw barely any signs of progress. He said he was so concerned about misuse of the loaned money that he tried to push for a committee to investigate the site and its delays but said that the committee determined that there had not been any significant delays or corruption and that the plant would be open in 2016. It has yet to be completed.

Two government officials and one water expert told Human Rights Watch that the team leading the project had purposefully created delays to try to increase the length of contracts with local contractors. Two international experts said another reason why the project ground to a halt is because Japanese authorities refused to pay bribes to customs authorities to let the necessary construction parts, and for visas for visiting experts. In addition, one Basra official said the project managers wanted delays in order to increase the length of salaries for workers.

Basra authorities informed us that the Minister of Municipalities and Public Works referred the former head of the project, [REDACTED], to the Iraqi Commission of Integrity on corruption allegations on November 21, 2018.

Based on those considerations, we would appreciate receiving your responses to the following questions:

1. Please describe the current stage of the Great Basra Water Project.
2. How much of the total funds for the project has JICA already dispersed?
3. What was the project budget at its inception? What is the current estimate for what the total cost of the project will be?
4. At project inception, what was the anticipated timeframe needed to complete the project? What is the current anticipated completion date?
5. Based on your assessment of the water needs of the Basra population, could you please describe the impact completion delays have had on residents there?
6. What have been the main causes of the delays in completing the project? Please comment on any challenges in getting needed construction parts through customs, obtaining visas for experts, and monitoring compliance of local contracting parties when hiring local labor?
7. To what extent do you believe corruption by the Iraqi teams involved in the project's completion or local officials has contributed to these challenges and the project's costs? Have you faced any other corruption-related concerns during the construction process?
8. At any point since project inception have you shared concerns regarding corruption impacting the project with Iraqi authorities? Have you had any concerns regarding [REDACTED] [the former head of the project's] possible role in corruption? Please summarize these concerns and correspondence if so.
9. What is your role, if any, in the Iraqi Commission of Integrity investigation of [REDACTED] [the former head of the project]?
10. Kindly share with us your anti-corruption policy and any measures you have put in place with regards to this project to ensure transparent and accountable use of funds.

Please direct your response and any questions to my colleague Senior Iraq Researcher Belkis Wille via email or phone at [REDACTED] or [REDACTED].

Thank you for responding to our requests.

Sincerely,

Kanae Doi
Japan Director
Human Rights Watch

Lama Fakh
Deputy Director
Middle East and North Africa
Human Rights Watch

Appendix III: Letter to Human Rights Watch from JICA on May 24, 2019

1. Please describe the current stage of the Great Basra Water Project.
 - JICA understands the construction works are on-going and Iraq's Ministry of Municipalities and Public Works (MMPW) expects to start providing water as soon as possible.
2. How much of the total funds for the project has JICA already dispersed?
 - JICA, as a financier, cannot disclose exact disbursed amount of a loan without the consent of the borrower.
3. What was the project budget at its inception? What is the current estimate for the total cost of the project will be?
 - The initial total project cost was 72,944 mil JPY and the current estimate is 97,670 mil JPY. This figure may change due to the result of some procurement procedures.
4. At project inception, what was the anticipated timeframe needed to complete the project? What is the current anticipated completion date?
 - At the inception, the target of completion was set as November, 2014.
 - JICA understands that various backgrounds such as deterioration of security situation, scope change and rebidding resulted in the delay of the above planned schedule. Currently, MMPW expect to start providing water as soon as possible.
5. Based on your assessment of the water needs of the Basra population, could you please describe the impact completion delays have had on residents there?
 - JICA has been deeply concerned about the water situation in Basra and strongly expects water to be distributed to the residents in an expeditious manner.
6. What have been the main causes of the delays in completing the project? Please comment on any challenges in getting needed construction parts through customs, obtaining visas for experts, and monitoring compliance of local contracting parties when hiring local labor?
 - As far as JICA understands, there are several causes for delay such as deterioration of security situation, scope change and rebidding.
7. To what extent do you believe corruption by the Iraqi teams involved in the project's completion or local officials has contributed to these challenges and the project's costs? Have you faced any other corruption related concerns during the construction process?

- It is JICA's policy to require that concerned parties under Japanese ODA observe the highest standard of ethics during the procurement and execution of works and JICA requests the parties involved in this project to adhere to JICA's compliance requirements. So far, JICA has not acknowledged any information regarding alleged fraud and corruption in this project.
8. At any point since project inception have you shared concerns regarding corruption impacting the project with Iraqi authorities? Have you had any concerns regarding [REDACTED] possible role in corruption? Please summarize these concerns and correspondence if so.
- JICA has requested the parties involved in this project to adhere to JICA's compliance requirements from the inception of this project. So far JICA has not acknowledged any information regarding alleged fraud and corruption for this project.
9. What is your role, if any, in the Iraqi Commission of Integrity investigation of [REDACTED]?
- JICA has no relation to the Iraqi Commission of Integrity investigation
10. Kindly share with us your anti-corruption policy and any measures you have put in place with regards to this project to ensure transparent and accountable use of funds.
- Please visit the following website regarding JICA's compliance and anti-corruption policy and guidelines, which has also applied to this project:
https://www.jica.go.jp/english/our_work/compliance/index.html
 - In addition, JICA requests all the concerned parties including this project to comply with JICA's Guidelines for the Employment of Consultant, Guidelines for Procurement under Japanese ODA Loans and The General Terms and Condition for Japanese ODA Loans for transparent and accountable usage of our funds.
 (Please see the section 1.06 of the Guideline as follows)
https://www.jica.go.jp/english/our_work/types_of_assistance/oda_loans/oda_op_info/guide/handbooks/201204.html
 (Also see the section 4.03 of the General Terms and Condition for Japanese ODA Loan indicated below)
https://www.jica.go.jp/english/our_work/types_of_assistance/oda_loans/oda_op_info/general_terms/index.html



BASRA IS THIRSTY

Iraq's Failure to Manage the Water Crisis

For almost 30 years, including during the period of occupation by the US- and UK-led Coalition Provisional Authority, authorities in Iraq have failed to provide Basra's 4 million residents with safe drinking water. The water crisis came to a head in 2018, when at least 118,000 people were hospitalized with rashes, abdominal pain, vomiting, and diarrhea because of contamination of the water in the Shatt al-Arab, the river Basra sits on. A severe water shortage from upstream has led to seawater incurring into the Shatt al-Arab so that farmers have had to irrigate their land with salt water- losing most of their produce over the last decade. This continuing water crisis is a result of a complex combination of factors including mismanagement of upstream flows leading to too little water coming to Basra; pollution in Basra and further upstream, including raw sewage, garbage, oil spills, and industrial and agricultural waste; damming by neighboring Iran and Turkey; and climate change. Corruption, including by local authorities, has also led to illegal use of precious freshwater resources. Since last summer the government has refused to make public any of its investigations into why the water poisoned people. Nor has it announced any significant measures to improve the quality of water in Basra in coming years. Iraqi authorities have an obligation to secure Basrawis' right to use their land and to safe drinking water and to inform the public when water sources are unsafe. Where authorities have violated these rights, they should ensure that people can access an effective remedy against those responsible.

(above) A view of the Shatt al-Arab river east of Basra showing garbage along its banks, September 21, 2018.

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(front cover) A river in central Basra filled with sewage and trash that feeds into the Shatt al-Arab, the city's main water source, September 12, 2018.

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