REPORT

Water, Peace and Security

Action Needed: Three Priorities for Iraq's Water Sector

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Introduction: New opportunities ahead

With a new parliament elected and new government to be formed, opportunities for addressing some of Iraq's most pressing water issues emerge. Such actions could be linked to and complement efforts that address existing climate-related challenges. The outgoing government became quite engaged in this field over the last years, with the signing and ratification of the Paris agreement, re-establishment of the Ministry of Environment, and the drafting of a green paper on addressing environmental and climate problems. To supplement these efforts, this policy brief suggests three priorities for the new government to improve Iraq's water situation and prevent or mitigate related crises.

The water situation in Iraq is alarming. In 2021, the country experienced its second driest season in 40 years due to record lows in rainfall (ACTED et al., 2021). Over the last 40 years, water flows from the Euphrates and Tigris rivers, which provide up to 98% of Iraq's surface water, have decreased by 30-40% (Alwash et al., 2018, p. 6; von Lossow, 2018, p. 2). Iraq's overall water supply is expected to decrease by up to 60% by 2025 in comparison with 2015 (Al-Ansari, 2013). Pressures on the country's water resources include dam construction by neighbouring countries, intensive water usage in Iraqi agriculture and unsustainable domestic water consumption, the impact of violent conflicts and wars on water infrastructures and the consequences of climate change, among others (Alwash et al., 2018). Despite the rapid decline of Iraq's water resources over the last years, water is still inefficiently used or even wasted. The increasing competition over resources contributes to tensions and conflicts.

In 2021, the Iraqi parliamentary elections brought some political shifts. While established parties and players sustained losses, new and – in some cases – contested movements gained votes. The Sadrist Movement was the clear winner. Led by Muqtada Al Sadr, the Sadrists' reputation for political and social reform has been fluctuating since 2003 and Iraqis are deeply divided over their ability to carry out major reforms. Moreover, the political representation of the Tishreen activists who argue for major political and social reforms won 15 seats in total (Al Jazeera, 2021b).[1] They were supported by the international community and are widely embraced by the Iraqi youth. The Tishreen activists have their roots in the 2018 Basra uprising when citizens protested – among other things – against authorities' failure to address water shortages and pollution.

1 The distribution of seats: 9 Emtidad and 6 Eshraqat Kanoon.

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Both the Sadrist movement as well as the Tishreen activists, but also other parties and blocs, wave the flag of 'reform', which increases the chance that pressing water issues might be addressed under the new government. In support of such efforts, this policy brief looks into transboundary water negotiations, water pollution, and inefficient water use – three key priorities for Iraq's water sector.

Transboundary water negotiations with Turkey and Iran

The extreme dependency on the Euphrates and Tigris determines Iraq's water policies and politics as they provide more than 90% of the country's fresh water supply (Al-Ansari, 2013; Jawad, 2021). The twin rivers and their tributaries originate outside the country in Turkey and Iran, representing the bulk of Iraq's water resources (see Table 1 & Figure 1). While most of the water stems from Turkey, Iran hosts important tributaries to the Tigris and the Shatt al-Arab – to which both rivers confluence in Qurna, namely the Lesser Zab, the Diyala, and the Karkheh (UN-ESCWA & BGR, 2013).

Since the 1980s, the water inflow to Iraq from upstream countries has declined by 30-40% and the overall water supply is expected to decrease by up to 60% by 2025 compared to 2015 (Alwash et al., 2018, p. 6; von Lossow, 2018, p. 2). Some scenarios see the Shatt al-Arab running dry before reaching the Persian Gulf by 2040 (Al-Ansari, 2013). This continuous decrease of Iraq's main freshwater sources has dramatic consequences for the households' freshwater supplies and sanitation needs, irrigation, hydroelectricity production, and sustaining ecosystems. The acute shortages in southern Iraq in 2018 and 2019 illustrated the relevance of the transboundary rivers to Iraq's water security and how collapsing supplies contribute to widespread protests – also against the upstream neighbours. This can add to the already existing tensions between the riparian states – within, but also beyond the water sector.

Contribution to water flow	Euphrates (share)	Tigris (share)
Turkey	90%	40%
Syria	10%	n.a.
Iran	n.a.	9%
Iraq	0%	51%

Table 1. Contribution to Water flow Euphrates & Tigris (Kibaroglu & Scheumann, 2013).

Water challenges and conflicts over the distribution and utilisation of the waters of the Euphrates and Tigris first arose in the 1970s, when Turkey, Syria, Iran, and Iraq began to unilaterally develop large water infrastructure projects (von Lossow, 2018). Turkey's South-Eastern Anatolia Project (Güneydoğu Anadolu Projesi, GAP) has been of particular concern over the last 40 years – with 22 dams, 19 hydropower plants, schemes for irrigating 1.7 million hectares of land, and extensive drainage networks. This makes it one of the largest infrastructure projects in the world.

Particularly in the 1990s and 2000s, Iran built a large number of dams on its Tigris tributaries and continues to do so today. Those dams are mainly aimed at storing and – in a significant number of cases – diverting water from the west of the country to the central parts, which have been suffering from a severe water crisis in the past years. During the summer months, the lack of water inflow from Iran causes problems for Iraqi Kurdistan and southern Iraq (Keynoush, 2021; Sala & von Laffert, 2021).

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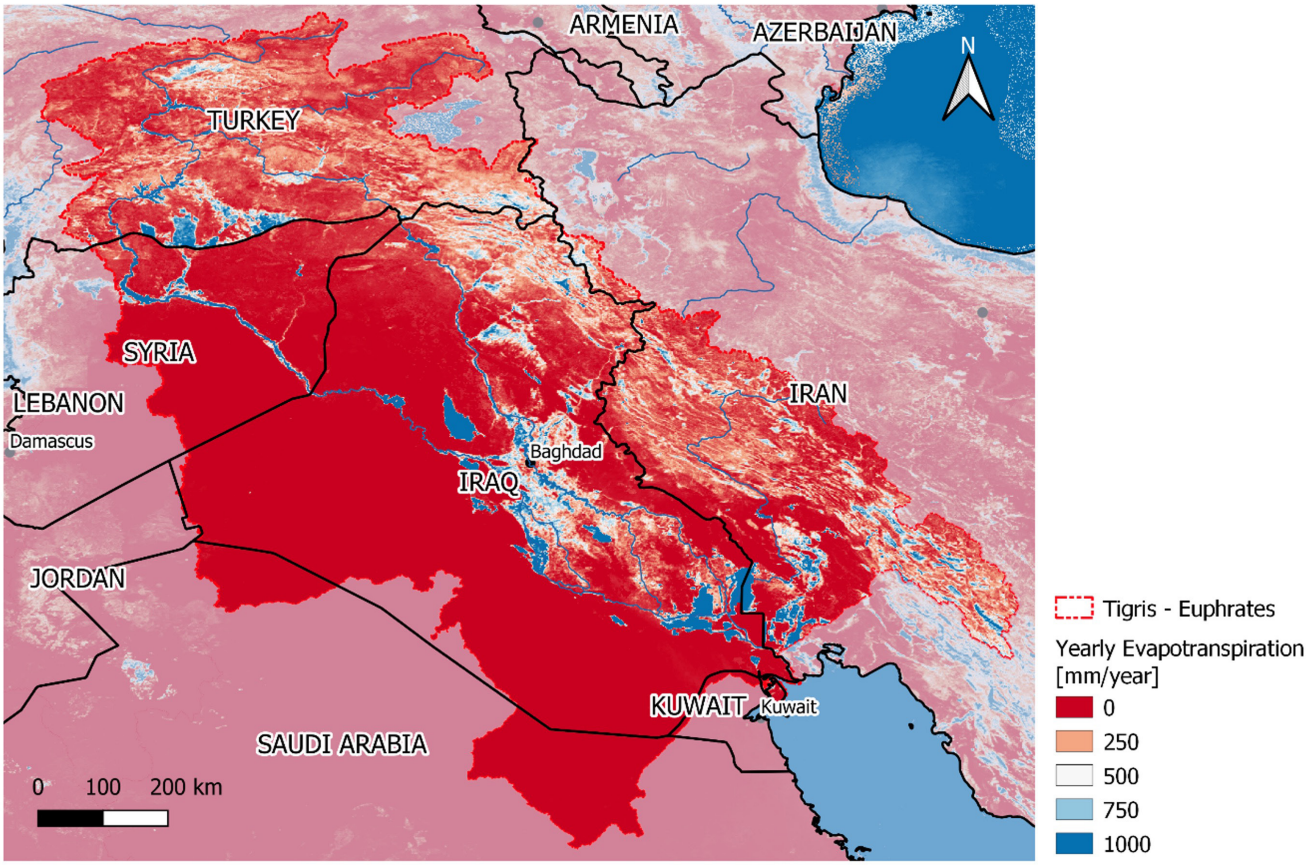

Data: Evsapotranspiration data from SSEBop (Senay et al., 2013); Major hydrological basins of the world, FAO Land and Water Division; Made with Natural Earth data.

Figure 1. 2021 Evapotranspiration in the Euphrates and Tigris basin.

GAP and the Iranian dams have contributed to a significant decrease in Iraq's overall water supply and basically allow Turkey and Iran to control Iraq's water inflow (Al-Aloosy, 2021). Mechanisms for cooperation, especially in the form of treaties or institutions, that could address related challenges are missing. Ankara and Teheran have been reluctant to negotiate basin-wide and binding agreements over water distribution and utilisation of the shared resources (Klimes, 2020).

There are currently two provisional bilateral water allocation agreements related to the Euphrates in place: the Protocol of 1987 between Turkey and Syria that guarantees Damascus a minimum annual water inflow of 500m3/sec at the border (Kirscher & Tiroch, 2012, p. 348);[2] and the Joint Minutes concerning the provisional division of the Euphrates waters of 1989 between Syria and Iraq according to which Syria would use 42% of the Euphrates water inflow from Turkey and release 58% to Iraq (Kibaroglu, 2015; Kirscher & Tiroch, 2012, p. 348).[3] However, in the last two years, Syria repeatedly did not receive the amount agreed upon in the Protocol (Alarabiya, 2020). This also makes the latter arrangement between Syria and Iraq futile given that the amount of water released from Syria to Iraq ultimately depends on the outflow from Turkey to Syria. An increase of Syrian water consumption in the future could additionally decrease Iraq's de facto water share.

2 Para. 6 Protocol on Matters Pertaining to Economic Cooperation between Turkey and the Syrian Arab Republic (signed and entered into force 17 July 1987) UNTS Vol. 1724 No. 30069

3 Para 1 Joint Minutes Concerning the Provisional Division of the Waters of the Euphrates River (Iraq-Syria) (signed 17 April 1989).

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With bilateral, often provisional and mostly non-binding agreements, historical and unwritten practices, and the establishment of the exchange platform Joint Technical Committee (JTC), the basin is not totally devoid of cooperative structures. The JTC was mostly used in the 1980s and 1990s to exchange information about water flow, infrastructure projects, etc., but in an ad-hoc manner rather than by pursuing a coordinated and integrated basin management approach. The vital need for basin-wide water management and coordinated planning would require a permanent, legally binding and comprehensive treaty between all – or some of – the riparian states (von Lossow, 2018). This pattern continued over the last decade, as inter-state water politics in the basin have been mainly based on ad-hoc meetings leaving Baghdad dependent on concessions by Ankara or Teheran, such as asking Turkey for a postponement of filling the reservoir behind Ilisu Dam in 2018 and 2019 (Karadeniz & Aboulenein, 2018; Reuters, 2019).

After signing several bilateral Memoranda of Understanding (MoU) since 2009, Turkey ratified a MoU in 2021 that requires Ankara to release "a fair share" of Tigris and Euphrates waters to Iraq (Iraqi News Agency, 2021a, 2021b; Middle East Monitor, 2021). Neither this MoU nor any other legal or political instrument in the basin includes reference to key international water law principles, namely the principle of equitable and reasonable utilization and the principle of no significant harm. And while Iraq and Syria are parties to the UN Watercourses Convention, Turkey has outright rejected the Convention by voting against it in 1997 in the UN General Assembly, one of only three countries to do so. The MoU creates a framework isolated from internationally recognized and accepted norms (Dawood, 2019). Rather, it highlights cooperation in "joint projects", particularly three dams to be built at the Turkish-Iraqi border as well as giving the Turkish private sector a more prominent role in modernizing the Iraqi water sector.

Iran, which has been suffering from a severe water crisis in the past years (Schmeier et al., 2021), has also not shown interest in entering into negotiations of any form for a more institutionalized cooperation with Iraq over shared waters. The dire water situation in Iran has severely impacted people's livelihoods and the economy, leading people to resort to violence against other users as well as protests against the government. This has left no room for sharing water with their downstream neighbour. Instead, Iran is pursuing an ambitious infrastructure development strategy which aims to divert water towards the centre of the country. In response to this, Iraq has considered taking Iran to the International Court of Justice over violation of international water law (Bahar, 2021). Such a step would certainly sour relations between the two countries further.

Despite international efforts to promote and establish a permanent, basin-wide framework for water management, Turkey and Iran have repeatedly rejected such an institutionalized approach. Being in the comparatively comfortable upstream situation, facing similar domestic water challenges and planning to even expand domestic water use, the incentives to guarantee binding amounts or shares of water to downstream Iraq are low. Baghdad has little room to manoeuvre around pushing water negotiations towards substantial results in terms of such an agreement (von Lossow, 2018). A breakthrough is unlikely to happen over the upcoming years given the wider political landscape and regional climatic and hydrological developments. In general, bilateral arrangements might be slightly more probable. Although they are not the preferred option from a basin-wide water management perspective, any move towards institutionalized cooperation would be helpful for Iraq's water situation and the basin as a whole.

It is important to keep the water diplomacy channels with Turkey and Iran open, to continue with exchange and dialogue, with negotiations and cooperation over water-related challenges. The process initiated at the Bagdad Water Conference in 2021 (continued with another conference in 2022) is an important step, but

expectations should remain realistic. Benefit-sharing will remain at the centre of potential agreements, with the aim to move beyond an absolute sharing of water quantities – which are likely to reduce or become even more variable in the future and therefore reinforce zero-sum-game considerations by each party. Instead, sharing the benefits that the water resources provide to all riparian states in a more equitable manner is a more viable approach, possibly even involving sectors other than water.

Cooperative climate change adaptation might also be an avenue for cooperation that goes beyond resource distribution and water quotas. Joint multi-purpose projects, for example, could contribute to manage remaining water resources in a more efficient way. A focus on a basin-wide disaster/emergency response – including Turkey and Iran – could also provide an entry point to more substantial and concrete forms of cooperation, aside from (usually bilateral) MoUs or declarations of intent (Republic of Türkiye Ministry of Foreign Affairs, 2011). Natural disasters, such as droughts, heat waves, dust storms, flash floods, etc., have repeatedly hit the whole region. As such events are likely to intensify and occur more often as a consequence of climate change (Adamo et al., 2018), they might provide incentives for cooperation in water-related fields, which might be easier and more realistic to achieve than comprehensive water sharing agreements.

Water pollution

Declining water quality has become one of Iraq's major challenges, particularly in the south. As a looming issue for decades, water pollution incidents in Iraq have been increasing in frequency, affecting public health, livelihoods and ecosystems. For instance, during the 2018 water crisis in Basra, more than 120.000 people were hospitalized with water-borne diseases, following similar incidents in 2009 and 2015 (Human Rights Watch, 2019). Insufficient water quality for irrigation (Human Rights Watch, 2019; UN Iraq, 2013) and periods of mass fish deaths (Arab News, 2020) and animal diseases have also affected the region, especially in the marshes and surrounding farming communities. These water quality impacts have contributed to urban migration (International Organization for Migration & Deltares, 2020; UN Iraq, 2013) and public demonstrations (Human Rights Watch, 2019) that shape political and security dynamics in the region. While multiple factors degrade water quality, including declining water levels in the Tigris and Euphrates Rivers, water pollution can be addressed at the national level.

A wide range of sources impair water quality, including the discharge of wastewater, poor waste management, agricultural runoff, and elevated salinity as a result of water quantity, storage, and return flows (International Organization for Migration & Deltares, 2020). The various, partly pathogenic and toxic, compounds create a very dangerous cocktail of pollutants that achieve higher concentrations due to the decline in precipitation and water discharge in the rivers. Insufficiently treated domestic and industrial wastewater are some of the most common sources (Alyaseri, 2016). It is estimated that approximately two thirds of industrial and household wastewaters are discharged untreated (Jaber Al-Atta, n.d.). Therefore, a high fraction of the approximate five million cubic meters wastewater, which equates to 2,000 Olympic-sized swimming pools, is unprocessed and dumped into Iraqi rivers daily.

Insufficiently treated domestic wastewater is prevalent throughout all regions of Iraq. In rural areas, residents are often not connected to sewage systems and thus discharge wastewater directly into water ways or septic systems (Fanack Water, 2016). As of 2013, it was estimated that only 2% of the population outside of Basra City had access to wastewater treatment (Dunia Frontier Consultants, 2013). Although a greater fraction of the population is connected to sewer systems in urban areas, treatment rates still lag as a result of operational gaps and rapid population growth that overwhelms plant capacity (Dunia Frontier Consultants, 2013). The Municipality of Baghdad, for example, treats only 53% of the approximately 1.4 million cubic

meters of household wastewater that is disposed of daily (Jaber Al-Atta, n.d.). Treatment rates are even lower in slums, which often lack sufficient wastewater disposal systems and require residents to improvise their own sewage systems that usually end up in canals and rivers. With a rapid proliferation of slums since 2003, there are currently around 4,000 slums (Sky News Arabia, 2021) across Iraq that host more than three million residents who do not have proper access to water infrastructure, power, and wastewater disposal systems. Baghdad hosts the largest share of these slums followed by Basra, leading to increased wastewater pollutants in these areas.

Simultaneously, untreated and poorly treated industrial wastewater also present risks to the water quality of rivers and canals. Various sectors, such as construction and housing, electricity generation, health, oil and manufacturing industries, are responsible for polluting water resources. These sectors, can introduce a range of chemicals including radioactive material, heavy metals, and other toxins (Human Rights Watch, 2019; Kamal, 2019). Such chemicals are dangerous to public health and often require specialized water treatment. Also, the agricultural sector contributes to water pollution as fertilizers and pesticides are washed into the main rivers. The amount of wastewater and the extent of treatment vary by sector. For instance, the construction and housing sector only treats approximately 18% of its 4.5 million cubic meters of wastewater each day (Jaber Al-Atta, n.d.) whereas only 31% of wastewater is treated from the 80 thousand cubic meters produced daily by the health sector (Jaber Al-Atta, n.d.). Along with industrial spills, these discharges have direct ramifications on water quality.

Against the background of these discharges, laws have been established to prohibit pollution and unlawful disposal of wastes and wastewaters in Iraq. Building on past legislation, the government passed Law No. 27 on the Protection and Improvement of the Environment in 2009, which was seen as a promising step towards improving public health and protecting natural resources, biodiversity, and natural heritage (Iraqi Government, n.d.). The law foresees fines, ranging from 680 to 6850 US dollars, and imprisonment of a maximum three months, if the polluting facility does not respond to the initial warning within ten days or a maximum of thirty days (The Presidency Council, n.d.). However, these penalties barely deter polluters from contaminating water or the environment.

The widespread lack of compliance observed is in violation of the body of law, demonstrating the need to support regulatory implementation. While polluting industries are in some cases identified by the authorities, local and national law enforcement are often weak and authorities tend to turn a blind eye to this challenge. Various factors contribute to this enforcement gap such as limited capacity of personnel, limited staffing, insufficient funding (Dunia Frontier Consultants, 2013) and insufficient testing of water quality (Human Rights Watch, 2019). To address enforcement gaps, greater coordination and administrative enforcement frameworks are needed amongst environmental agencies (Earth & Marine Environmental Consultants, 2014), as well as between the national and the local levels. Local environmental authorities including the environmental police established in 2015, could play a bigger role in enforcing the regulations of Environmental Protection and Improvement law.

Insufficient treatment capacity is a primary issue for untreated wastewater discharges that is often related to limited budgets for construction and operation, unstable electrical sources, planning, and the capacity of personnel (Dunia Frontier Consultants, 2013). Countrywide, there are 314 stations (Annabaa, 2018) that lack fully functional treatment units and, thus, treat wastewater only partially. Upgrades to the treatment processes of existing plants (International Organization for Migration & Deltares, 2020) and preventative maintenance (Alyaseri, 2016) would improve the wastewater systems. However, wastewater flows regularly exceed the capacity of existing plants, therefore requiring further expansion and construction of new systems that can be

cost-prohibitive. For instance, in the south where pollution is threatening the livelihoods of the Marshland communities, there was a plan to establish two new treatment stations, but implementation halted due to the financial crisis (Al Jazeera, 2021a). These high costs are a challenge across regions. According to the environmental authorities in Dhi Qar (Al Jazeera, 2021a), the cost of establishing one modern treatment station in the region is about 69 million dollars, which the government has yet to approve. Therefore, an important step for the central government is to allocate a budget to establish modern treatment stations and maintain existing ones. While government investments can support the propagation of domestic wastewater treatment, the costs of industrial treatment processes should also be considered. Industrial discharges often require separate treatment chains, and therefore, environmental authorities should engage in step-by-step planning process with industrial dischargers to reach compliance as expensive treatment technology is being acquired.

Finally, it is difficult to change behaviours and practices that have been accepted over years or even decades. Practices such as that of direct wastewater discharge and waste disposal generated from households, slaughterhouses, private businesses like carwash stations and restaurants, may be entrenched from patterns of non-compliance. To counter this challenge and build broader stakeholder support, awareness-raising programs could be implemented to sensitize all actors to the consequences of pollution. This process, including participatory dialogues, can help to motivate industries and private citizens to reduce their environmental discharges and feel accountable, potentially reducing the burden of enforcement. In addition to understanding source reduction, public awareness campaigns can also seek to mitigate the risks of water quality impacts. In line with recent efforts to share updates on the water quality status and warnings (Human Rights Watch, 2019), improved public awareness of potential water quality events and concrete steps to mitigate illness can act as a break on the ramifications of extreme events when they occur. Such campaigns can help to build resilience and trust within the public as ongoing steps are being taken to improve water quality management in the region.

Despite efforts to improve water quality and reduce water pollution, the water shortage crises in the last years have made the pollution challenge more pressing. To mitigate (the impacts of) pollution, a combined approach is needed that bolsters infrastructure, monitoring law enforcement, and public awareness. The steps require a wide range of actions, such as data collection and monitoring, capacity development and training, financial investments, enhanced coordination amongst government agencies and civil society and addressing resource-related security concerns – also to ensure the long-term viability of treatment (Dunia Frontier Consultants, 2013). For example, environmental authorities in the south – where pollution accumulates downstream in the river basins – could engage in broader sampling campaigns, work with all stakeholders to establish tiered and conflict sensitive plans to bring parties into compliance, or develop stricter rules to hold the various polluters accountable. These efforts would provide a more active role besides handling a hazardous substance and providing protection to environmental employees through inspections. Such a wider approach can build collaborative processes to mitigate long-term water quality sources and impacts while simultaneously managing the existing and changing water quality challenges.

Inefficient water use

The prioritization of and dependency on water-intensive sectors, such as agriculture and the oil industry, combined with poor and outdated water infrastructures, are key factors that drive the inefficient use of water. Given that water availability in Iraq is decreasing, the remaining resources should be utilized in a sustainable and efficient way. This is an absolute must to effectively cope with the water crisis and to

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prevent national and regional instability. At times of acute shortages, inefficient water use can also amplify local frustrations over the lack of basic services that easily feed into or fuel wider grievances against the government and other groups, expressed in protests, which can escalate into violent clashes between the population and security forces, threatening government legitimacy, stability and peace.

Water infrastructure is largely outdated, not sufficiently maintained and left damaged as a consequence of inadequate monitoring, financial and technical constraints, violent conflicts, and foreign military interventions. Iraq's water infrastructure is one of the poorest in the world, remaining in complete decay after three wars and the Islamic State (IS) occupation, as well as 13 years of UN sanctions (Hamid et al., 2010). Moreover, the budget priorities of Saddam Hussein's regime and subsequent governments have been mainly centred around military and oil-related expenditures, which came at the cost of the necessary investments needed in the water sector, among others (Hamid et al., 2010). The presence of the IS has exacerbated the issue as water was used as a tool to strengthen its political and military aims, forcibly taking control of essential water facilities and controlling the flow (von Lossow, 2016; Wilson Center, 2019).

The Ministry of Water Resources (MoWR) in Iraq estimates a value of USD 600 million worth of direct damages to hydraulic infrastructure as a result of the IS occupation (UN Environment, 2017). However, the Ministry has been unable to invest in water infrastructure in the last years due to financial constraints related to the temporary decline in oil prices and increased military expenditures dedicated to the anti-IS campaign (UN Environment, 2017). Iraq's national development plan 2018-2022 specifies that only half of the estimated annual investments (49.5%) are directed at the various infrastructure sectors (electricity, water, buildings, construction, transportation and communications), which is hardly enough to address the massive challenges in these sectors (The Ministry of Planning, 2018). This gives way to a significant loss of water due to old technology, leaky pipelines, the siltation of canal systems and broken pumps. Moreover, Iraq also lacks an effective national water monitoring network and documentation of the decaying infrastructure throughout the country (Hamid et al., 2010), making it difficult to effectively identify the various sources of pollution and inefficiencies (Al-Dabbas, n.d.).

Aside from infrastructure, inefficient water use largely lies with water-intensive sectors, which use substantial amounts of water for their processes. Agriculture is by far the largest water consumer, with an estimated 91% of the total water withdrawal in Iraq, while industries and households withdrew 5% and 3%, respectively (Al-Ansari et al., 2021; Food and Agriculture Organization of the United Nations, n.d.). Agriculture still employs the majority of the rural population (75%) (Kapita & Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), 2019), despite declining production due to considerable damage to irrigation and drainage infrastructure (Lucani, 2012). Whereas the amount of agricultural water demand is not an outlier compared to neighbouring countries (but compared to the global average of 70%) (OECD, n.d.), it is particularly problematic in Iraq due to the decreasing water availability. Figure 2 exhibits the main irrigated areas in Iraq, located in the southern part of the country, compared to the northern area where agriculture is largely fed through rainfall.

Traditional flood irrigation systems are still the most popular technique in the country. Over 5.5 of the 8 million ha arable land is irrigated by flooding (Ewaid et al., 2021). This technique supplies water to the crop fields by way of pipes, ditches or other forms and does not stop until the entire field is covered. However, oftentimes only half of the water irrigates the field, with the other half being lost due to runoff, evaporation, and the filtration of uncultivated fields (Farm Dynamics Pakistan, 2019). In addition, flood irrigation can also contribute to increased salinization levels by washing salty residues from agricultural land into rivers (van den Akker et al., 2011).

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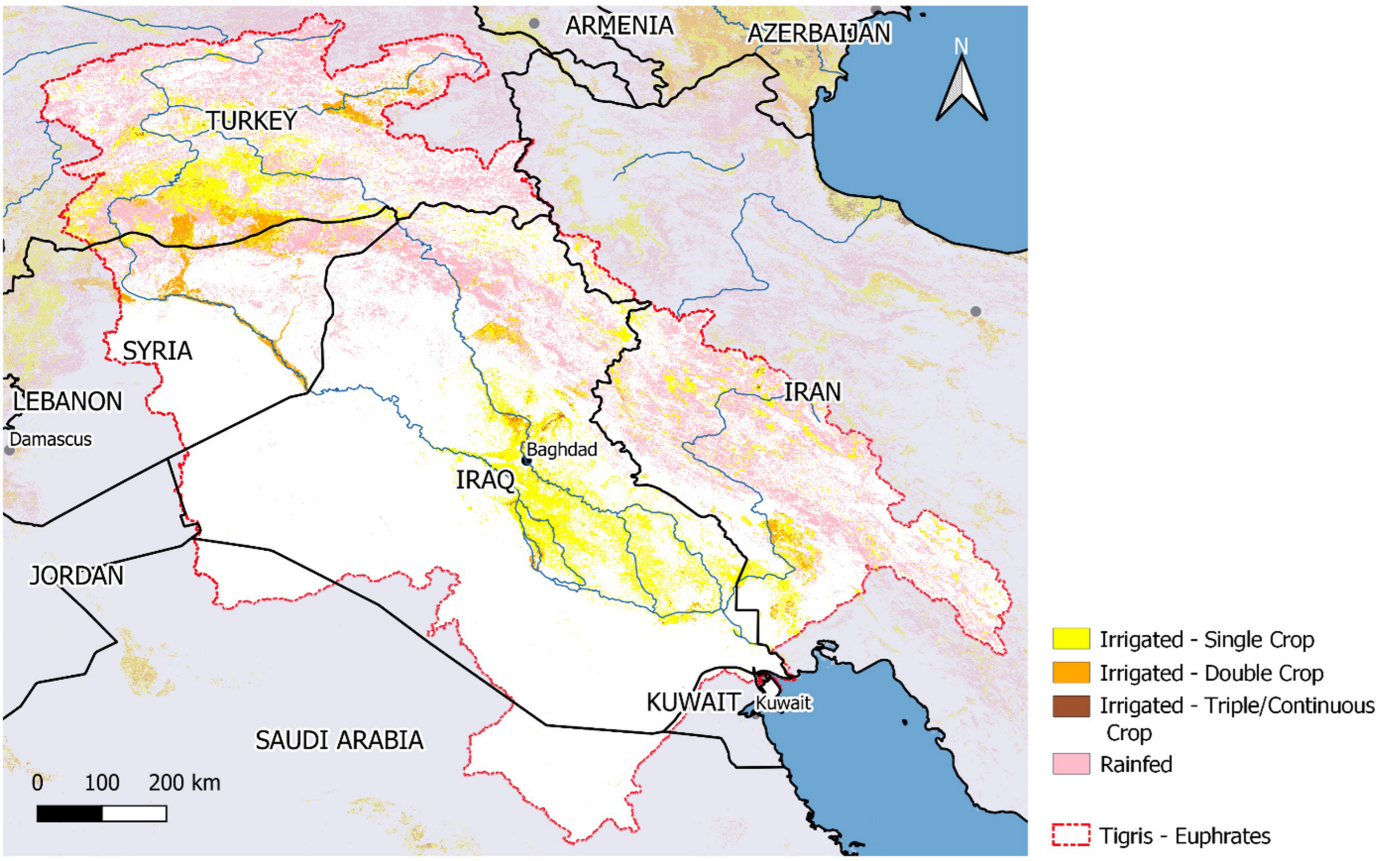

Data: Irrigated Area Map of Asia and Africa, IWMI; Major hydrological basins of the world, FAO Land and Water Division; Made with Natural Earth data.

Figure 2. Irrigated and Rainfed Areas of the Tigris-Euphrates.

Crop selection also contributes to the scale of water consumption in Iraq, as large amounts of water-intensive crops are cultivated, such as rice, wheat, corn, and cotton. While rice cultivation is generally problematic in arid and semi-arid areas, the specific crops cultivated in Iraq are particularly water-intensive. For example, in 2017, the water footprint[4] of Iraqi paddy rice was 3,072 m^3/ton compared to the global average of 1,325 m^3/ton, with approximately 816,704,748 m^3 water annually being used to irrigate this crop (Ewaid et al., 2021).

Oil is another water-intensive industry. Water is particularly needed for injection and cooling during the drilling process (Mehdi, 2020a). The oil industry not only contributes to water pollution due to its discharge of industrial wastewater into water streams, but it also decreases the quantity of water available for Iraqi residents and other sectors. High pressured water is injected into oil fields to increase recovery and production rates of oil. This injected water is meant to pressurize the reservoir and displace the oil into production wells for recovery (MOGAS, n.d.). It is estimated that 1.3 to 1.5 barrels of injected water equate to one barrel of extracted oil (Mehdi, 2020b). To mitigate the issue, some international oil companies have invested in water treatment plants, such as

4 Water footprint (WF) is an indicator of freshwater use that is utilized for the evaluation of the impact on both the volume of water and the distribution of human water consumption.

the Qarmat Ali Water Treatment Plant by BP, to provide alternative sources of clean water. The Common Seawater Supply Project (CSSP), despite repeated delays since 2011, has been taken over by the Iraqi oil company BOC in 2019, with the aim to treat and transport clean water from the Gulf to oil fields and support domestic oil production (IEA, 2019, p. 25).

Moving forward, the extreme weather conditions and poor infrastructures may lead farmers to expand water-intensive irrigation methods to address declining crop yields, which produce larger short-term gains at the expense of long-term sustainability (Lucani, 2012). Greater pressures might be placed on the rural population as food demand rises and arable land decreases, for example due to increased salinization. Therefore, greater investments in modern water and irrigation infrastructure can mitigate this issue. While the latter would be relatively easy to obtain from cooperation between international organizations, its implementation and the corresponding shift in agricultural practices and behaviours would require public support and the political will to change the status quo at local and national level. Strengthening monitoring and law enforcement mechanisms for wasting water could also mitigate this issue, increasing accountability and transparency on the harmful practices that encourage the inefficient use of water.

In the oil sector, projects like the CSSP, that should become operational in 2023, would increase the water availability for industrial production (IEA, 2019, p. 25). Increasing efforts to reuse and recycle produced water is another key recommendation. Such measures are vital as water use is expected to increase given that Iraq plans to expand its oil production to eight million barrels per day (mb/d) until 2027 (Wang & al-Khayat, 2021). This will undoubtedly place additional pressure on Iraq's rapidly dwindling water supply as the expansion of production to 6 mb/d of oil would require the sourcing of 3 mb/d of water, in addition to the current 5 mb/d (IEA, 2019, p. 7).

Conclusion: Towards inclusive water governance

This paper identifies three priorities that can help mitigate some of Iraq's most pressing water challenges. The priority of keeping water diplomacy channels open for transboundary exchange and negotiation is key to secure the water inflow of the Euphrates and Tigris, the backbone of Iraq's water resources, but also to promote regional cooperation, stability and peace. Located downstream, Iraq is highly impacted by the water policies and infrastructures in Turkey and Iran, namely their dam-building, irrigation projects, etc. Progress in that area – negotiating basin-wide or bilateral agreements – is not only in Iraqi hands but also depends on Turkey, Iran and Syria, which makes planning and policy implementation difficult to predict. Contrastingly, the two other priorities, water pollution and water use inefficiency, can be fully addressed on a purely domestic level. That's why the latter two are more likely to bring gains and required changes in the short-run.

Pollution, another priority, is a longstanding water challenge that has resulted in harm to people and ecosystems. While there are laws in place that prohibit pollution and unlawful disposal of waste, insufficient infrastructure, weak law enforcement, and limited public awareness hamper compliance. Participatory dialogue processes that engage key stakeholders directly are the best way to ensure people's trust and to obtain ownership of any agreements reached. Whereas unintended consequences cannot always be avoided, participatory consultation processes and dialogues ensure that grievances are brought forward and can be mitigated, for instance, in relation to the lack of capacity to treat current discharges. Through concrete steps to modernize and expand treatment plants, support enforcement frameworks, and engage in public awareness campaigns and dialogue, collective efforts can be made to target pollution and mitigate risks.

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Addressing the priority of inefficient water use or even waste due to outdated and damaged water infrastructures as well as water-intensive industries is equally important. Agriculture is the main water user in Iraq and employs the majority of the rural population. Investments in water and irrigation infrastructure as well as innovative irrigation practices need to be expanded in order to mitigate this issue. The oil industry is also water intensive as it requires significant amounts of water for the injection into oil fields and cooling during the drilling process. Iraq's plans to expand its oil production requires additional water – an estimated increase by two thirds of today's water use – would place further pressures on water resources in the future. Investments in water treatment plants along with the operationalization of projects such as CSSP could increase the water availability for industrial production.

Inclusive and effective water governance through centralized processes should always include local knowledge (Chaffin et al., 2014, p. 55). Bottom-up approaches engaging local actors and community leaders can complement centralized governance in addressing inefficient water use. More attention should be given to a national water monitoring system that identifies and reports failing infrastructure throughout the country on a regular basis. The promotion of more sustainable water use practices, particularly in relation to the agricultural sector, among which crop selection, irrigation technology, land management, offers a wide spectrum of options. This way, sources of inefficiency and pollution could be better addressed.

As cross-cutting issues, water pollution prevention and efficient water use require mainstreaming across various ministries and institutions. This could be done through promotional campaigns on sustainable water usage and non-polluting practices – both for the ministries as well as for citizens. Awareness raising can help to uncover unintended consequences. For example, illegal water tapping leads to other households and farmers having insufficient water, whilst dumping waste into rivers can have significant health consequences for others downstream. A shared understanding of the water issues can lead to a cooperative rather than competitive approach toward sustainably using Iraq's water resources. Addressing these aforementioned water challenges will mitigate the dire consequences for sanitation and freshwater needs, as well as for the agricultural sector and hydroelectric production, which may ultimately culminate in widespread unrest and instability.

Meaningful opportunities exist to address water pollution and water use inefficiency and prevent related tensions and instability. Despite Iraq's water supply decreasing at a rapid pace, the situation can be improved if swift action is taken by the central government in collaboration with local actors. These priorities are a feasible start to the pursuit of water, climate, and human security.

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