

# ERF Policy Brief

## Dams as Drivers of Droughts and Water Pollution: Evidence from the Euphrates-Tigris Basin in Turkey and Iraq

Eleftherios Giovanis and Oznur Ozdamar

### About the authors

Eleftherios Giovanis is Marie Skłodowska-Curie Research Fellow at the Aydın Adnan Menderes University, Nazilli Faculty of Economics and Administrative Sciences, Department of Public Finance and Assistant Professor of Economics at the Izmir University Bakircay, Department of International Trade and Business.

Oznur Ozdamar is an Associate Professor in Economics at the Izmir University Bakircay, Department of Economics.

### In a nutshell

- Drought has erupted across the Middle East as a result of climate change and global warming, leading to a considerable reduction in rainfall and snowfall, as well as a substantial drop in water resources.
- Climate change is, without a doubt, one of Iraq's most pressing issues, with considerable negative consequences for the environment, water resources, and the economy, particularly in the agricultural sector.
- Most of the water supplied for drinking, agriculture, and irrigation purposes in Iraq is coming from the Euphrates-Tigris basin and is being affected by climate change.
- Increased water withdrawals from other riparian countries, namely Turkey and Syria, have escalated the situation in recent decades and continue to be exacerbated today due to growing demand.
- Dams built in Iraq, Turkey, Iran and Syria increase the incidence of droughts and poor quality of drinking and agricultural water that further affect negatively the income, assets and food security of Iraqi households.

## Climate Change and Welfare

The global climate is increasingly changing, and no region or country is escaping its adverse effects. However, the degree of vulnerability varies widely, and this heterogeneity is explained by long-term transition and considerable variance in temperature, precipitation and wind patterns, which are consequences of climate change (IPCC, 2021). Climate change contributes to a rise in the frequency and severity of floods and droughts, insect alteration, crop failure, poor land performance, and livestock mortality (Giovanis and Ozdamar, 2021). Because smallholder farmers' household income is strongly tied to agricultural production, climate change makes them more vulnerable due to its negative influence on crop yields. As a result, climate change has an impact on agricultural output as well as global food security and well-being. Climate change is a crisis aggravator and threat multiplier for the world's most vulnerable groups. Its impact on food production, livelihoods, and health is anticipated to worsen child malnutrition and put more than 600 million people at risk of poverty and food insecurity by 2080 (IPCC, 2021).

Due to cross-border connectedness, climate effects in one country can offer possibilities as well as risks in other countries in terms of trade, labor mobility and migration, finance, and biophysical ecosystems. Adaptation measures in one part of the world may have positive or negative consequences in other parts of the world by affecting cross-border relations and flows. Drought has erupted across the Middle-East, as a result of climate change and global warming, leading to a considerable reduction in rainfall and snowfall, as well as a substantial drop in water resources. Climate change is one of Iraq's most pressing issues, and with a growing global population and other factors, the effects of climate change, water ownership and distribution will certainly become more critical (Adamo et al, 2018).

Reduced water availability for arable land has hit Iraq's agricultural sector hard so far, whether rain-fed lands in the north or irrigated lands in the south and middle parts, as a result of the Tigris and Euphrates Rivers' declining discharges. The unequal distribution practiced by Turkey, which supplies the majority of the water supply for the two rivers, has put additional pressure on these discharges. The present negative climate change trends seem to be continuing in the future (Adamo et al., 2018).

Climate change is affecting the Tigris and Euphrates Rivers' water flows at the moment. Because these rivers originate within Iraq's borders and their watersheds are located in areas affected by the same climate changes,

natural stream flow has diminished. Increased water withdrawals from neighboring riparian countries, particularly Turkey and Syria, have escalated the situation in recent decades and continue to be exacerbated today due to growing demand. Tigris and Euphrates Rivers originate in Turkey, and have experienced drastic reductions in water flows in recent years due, primarily, to dams built in Turkey for irrigation and hydro-engineering, and regional droughts. Dams may play an important role in mitigating climate change by producing clean energy but can also play a major role in adapting to climate change, if spillway operations are optimized.

We examine the impact of climate change in Iraq through the mechanism of sharing common water basin resources and the construction of dams across the Euphrates and Tigris rivers on income, assets, food production and stock, and life and food satisfaction of households in Iraq. The analysis relies on data derived from the 2012 Iraqi Household Socio-Economic Survey (IHSES) and the 2017 Rapid Welfare Monitoring Survey.

## Overview of the Tigris-Euphrates Water Basin

The Euphrates-Tigris River Basin, which spans 46 per cent of Iraq, 22 per cent of Turkey, 19 per cent of the Islamic Republic of Iran, 11 per cent of the Syrian Arab Republic, 1.9 per cent of Saudi Arabia, and 0.03 per cent of Jordan, is a trans-boundary basin with a total area of 879,790 km<sup>2</sup> (FAO, 2009). Both Euphrates and Tigris rivers have their origins in the mountains of eastern Turkey. The Euphrates-Tigris River Basin receives 335 mm of annual precipitation on average, and it varies by region. Summers can be extremely hot and dry, with midday temperatures approaching 50 degrees Celsius and relative humidity levels as low as 15 per cent. The annual average temperature in the Euphrates-Tigris River Basin is 18 degrees Celsius (FAO, 2009).

Based on the weather conditions, the number of dams built and their water capacity across both rivers determine the water supply and thus, droughts, and water quality. Households in the southeastern governorates of Iraq have experienced higher levels of temperature and low rainfall and snowfall levels that affect the water flows and supply from the Euphrates river. Since it mainly crosses those governorates, climate change shocks further exacerbate the droughts and water quality.

Natural factors include excessive evaporation, abrupt climate fluctuations, salt and sediment deposition, inadequate drainage, and poor soil quality in the lower reaches of the Euphrates and Tigris rivers. The Tigris River near the Syrian border in Iraq has good water quality,



which includes water from Turkey and Iraq. However, downstream, water quality deteriorates due to a lack of wastewater treatment infrastructure, with significant sewage and pollutant imports from metropolitan centers such as Baghdad. The Euphrates River entering Iraq has a lower water quality than the Tigris, influenced by the return flows from irrigation projects in Turkey, and is predicted to deteriorate further as more land comes under irrigation (FAO, 2009; Adamo et al., 2018).

### Dams in the Euphrates-Tigris River Basin and Climate Change

Turkey is strategically advantageous since it is the only country in the Euphrates-Tigris River Basin with vast surface and groundwater resources, whereas Iraq relies upon these rivers. Furthermore, as a downstream riparian country, Iraq is concerned about water quality, as Turkey mainly uses the water for irrigation through dams. Water contamination caused by irrigation return flow has an impact on potential downstream uses (FAO, 2009).

Overall, the study concludes that dams built in Iraq and Turkey have increased the frequency of droughts and decreased the quality of agricultural and drinking water in Iraqi households. This is due to the vast number of dams constructed in Turkey as part of the Southeastern Anatolia Project (GAP), which aims to utilize the basin's water for water supply, irrigation, hydropower, and flood control. According to the findings by Giovanis and Ozdamar (2021), droughts and poor water quality due to dams, as well as environmental conditions such as rising temperatures and limited precipitation, have reduced income, food production, stock, and the life satisfaction of Iraqi households.

The findings highlight the role of whether the households in Iraq are located in governorates receiving water from Tigris or Euphrates, and the importance of the number of riparian countries sharing a water basin area since 54 per cent of the Tigris basin lies in Iraq, while the respective percentage of the Euphrates basin is 40 per cent in Iraq and 17 per cent in the Syrian Arab Republic (FAO, 2009). However, Iraq is a downstream country implying that the water flows and quality can be affected from the use in the upstream countries like Turkey.

Because of data unavailability, the empirical analysis was focused on the welfare of Iraqi households. However, droughts and water pollution due to climatic conditions and the operation of dams also affect the well-being and welfare of households in Turkey and Syria. Therefore, the need of collecting data on households in these

countries is required to investigate further the impact of climate change and dams on welfare.

### Climate Change Challenges

In 1926, Iraq, Syria, and Turkey signed their first agreement. The United Nations General Assembly ratified the convention on the Law of Non-Navigational Uses of International Watercourses in 1997, which came into force on August 17, 2014. The convention urged countries to work together and create mutually beneficial agreements. However, certain nations, like Turkey, continued to oppose the convention, even though Iraq and the Syrian Arab Republic have ratified it (Al-Muqdad et al., 2016). As a result, one of the most critical steps in international coordination and cooperation required to solve the water supply and quality issues, droughts, and climate change is for all countries affected by the Euphrates-Tigris Basin, both upstream and downstream, to sign and join the agreement.

Overall, while both Turkey and Syria are very likely to experience a significant decrease in the annual surface runoff due to climate change, such as rising temperature, drop in rainfall and snowfall, Iraq is likely to suffer considerably more, given the fact that it is a downstream country, and the water supply relies mainly on Turkey. Significant changes in the basin's hydro-climate are anticipated to exacerbate the difficulty of managing several dam reservoirs and hydroelectric facilities, as well as the physical and biological components of the ecosystems that run alongside these rivers. These challenges will have a negative impact on agriculture, water supply and quality, and the economy, as well as they will lead to further deprivation and poverty.

### Shared Water Resources and Water Management Policies

Policies should focus on identifying and solving internal and external barriers. The former includes inefficient infrastructure, income inequalities, the education system, the role of state and the level of corruption, the democratic process, and the degree of market failures. External barriers can be erected as a result of transnational and multinational control over natural resources, international trade patterns, the activities of international financial institutions, state geopolitical interests and power, and economic policies. Stakeholders can identify and address hurdles early in the cooperative management and development process if they work together to analyze the barriers they confront.



Based market systems and investments in infrastructure that save water and increase efficiency and productivity should be implemented. This includes adequate drainage facilities, efficient irrigation applications that prevent over-irrigation and flooding of fields. Water conservation and water saving technologies can be subsidized or provided by central and regional governments to increase water conservation in municipal and industrial usage. Detecting and repairing leaks can help save water and energy by reducing the amount of water lost and the amount of water pumped.

Price and demand-side management can correct behavioral patterns in water demand and use. In particular, market policies and pricing strategies may divert the abundant production of crops that require large amounts of water and produce low values per unit to crops that need less water to grow and produce higher values. The lack of consonance between water intensity, volume and value is the root of the excessive water usage in agriculture and economic waste that arises from the misalignment between value and water intensity (Kubursi et al., 2011).

Incentives must be structured in such a way that overuse of water is avoided in all sectors, including subsidies that encourage the use of water-saving appliances in residential and industrial sectors. Additional policies include conservation incentives, and funding options that encourage producers in the agricultural sector to use innovative irrigation systems and crop patterns that are more compatible with low water intensity. Life cycle analyses can be valuable tools that determine and balance expected increases in demand for water with reduced availability. The study by Kubursi et al. (2011) shows that increasing the usage of non-conventional water sources save the maximum amount of resources. This includes rainwater harvesting and the domestic wastewater generated in households and office buildings known as greywater, which is easier and safer to treat and reuse it. These solutions are environmentally friendly, as they save the energy cost associated to water abstraction and transportation from more conventional sources. Finally, rainwater-harvesting systems is an additional tool that may increase the efficiency of the rainwater use and reduce water costs (Kubursi et al., 2011).

Apart from the internal barriers and domestic challenges there are external barriers concerning the management of the Euphrates-Tigris water basin. When it comes to the management of an international watercourse, the principle of equitable and reasonable utilization is the preeminent norm in international water law. States have the sovereign right to utilize a shared freshwater

resource inside their territory. However, the norm requires a state to use a water resource fairly and reasonably concerning other states. The goal is to maximize the use and benefits of a watercourse while also ensuring its long-term sustainability and adequate protection. The notion of equitable and appropriate utilization is widely accepted in state practice, and it has been applied and validated by numerous international and national court decisions. All watercourse states have an equal right to an equal part of an international watercourse's uses and benefits, and no state has a priori a superior claim on the shared resource. The commitment not to cause considerable harm to other riparian states, often known as the no-harm rule, is the second fundamental pillar of international water law. This rule refers to preventing harm to other riparian states as a result of actions involving an international watercourse. A decrease in water quantity and pollution owing to other activities not necessarily related to a state's direct utilization of a watercourse, such as deforestation, may result in harm. The obligation to notify compels a state to inform other watercourse countries in advance and promptly about planned operations on its territory or under its control that may have a major adverse impact. As a logical consequence, a state must be well informed to correctly analyze the potential environmental consequences of proposed measures (Kirschner and Tiroch, 2012).

The main rules of international law on shared international watercourse rely on Ostrom's (1990) principles of sustainable governance of common resources. Since 1960s political tensions and disputes between Iraq, Turkey, and Syria have prevented them from successfully co-managing the shared water basin. Despite cooperation efforts were renewed in the 2000s, no formal agreement on basin water management has yet to be reached. Thus, a trilateral agreement, based on Ostrom's principles, to address the basin's severe environmental concerns and challenges, especially with large temperature increases expected by the end of the century should be implemented.

Syria and Iraq would benefit from a long-term deal regulating water consumption given their midstream and downstream positions. While Turkey's goals are focused on regional security issues linking with a focus on mutual interests can result in more fair and ecological water-use agreements among all three states. Cooperation is still possible despite Turkey's leverage as an upstream state with greater political, economic, and military clout, and to cooperate on the issue to reduce negative environmental impacts and mitigate spillover effects that exacerbate them. Despite their relative weakness, Syria and Iraq might work together to persuade Turkey to adhere to more equitable water-use agreements by utilizing linkage techniques that emphasize joint interests.



*Further Reading*

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### Contact Information

#### ERF Office

**Address:** 21 Al-Sad Al-Aaly St. Dokki, Giza, Egypt  
 PO Box 12311  
**Tel:** 00 202 333 18 600 - 603  
**Fax:** 00 202 333 18 604  
**Email:** erf@erf.org.eg  
**Website:** <http://www.erf.org.eg>

#### ERF Dubai

Dubai International Financial Centre (DIFC)  
**Premises:** GV-00-1003-BC-42-0  
 Gate Village Building 10 - Dubai, UAE  
 PO Box 125115  
**Tel:** +971 4 4011980

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