



Full length article

Water for Life Versus Water for Development

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ABSTRACT

At ancient times, when the population on planet Earth was scarce, there was little friction over water resources. This has changed over the past few decades with the exponential growth of population with no corresponding increase of water revenue from nature. Compounding the problem is the construction of dams on almost every river in the world. Dams are used to regulate water flow, store water for use in dry seasons, eliminate or moderate flood hazards, generate hydropower, or control navigation. Dams may also have negative side effects. Dams constructed on international trans-boundary rivers can be extremely controversial. International conventions regulate the exploitation of the water of trans-boundary rivers. There have been violations to these conventions. These violations were done in the name of development. The results were disastrous for downstream riparian countries. In addition to the socio-economic effects, environmental, political, and massive migratory pressures have also been observed. At issue is the question of survival versus development, and which one should have higher priority. Examples will be given of development projects constructed by Ethiopia on the Nile River, which impacted Sudan and Egypt, and of development projects constructed by Turkey on the Tigris and Euphrates Rivers, which impacted Iraq and Syria.

Introduction

Except for the continent of Australia, trans-boundary rivers exist in all other continents of the world (Figure 1). A trans-boundary river is one that crosses at least one political border, either a border within a state or an international boundary. Because of the controversial nature related to the distribution of the waters of such rivers, there has been several declarations related to how riparian countries can collectively and individually utilize the waters of these rivers without causing harm to other countries benefiting from the water within these basins.

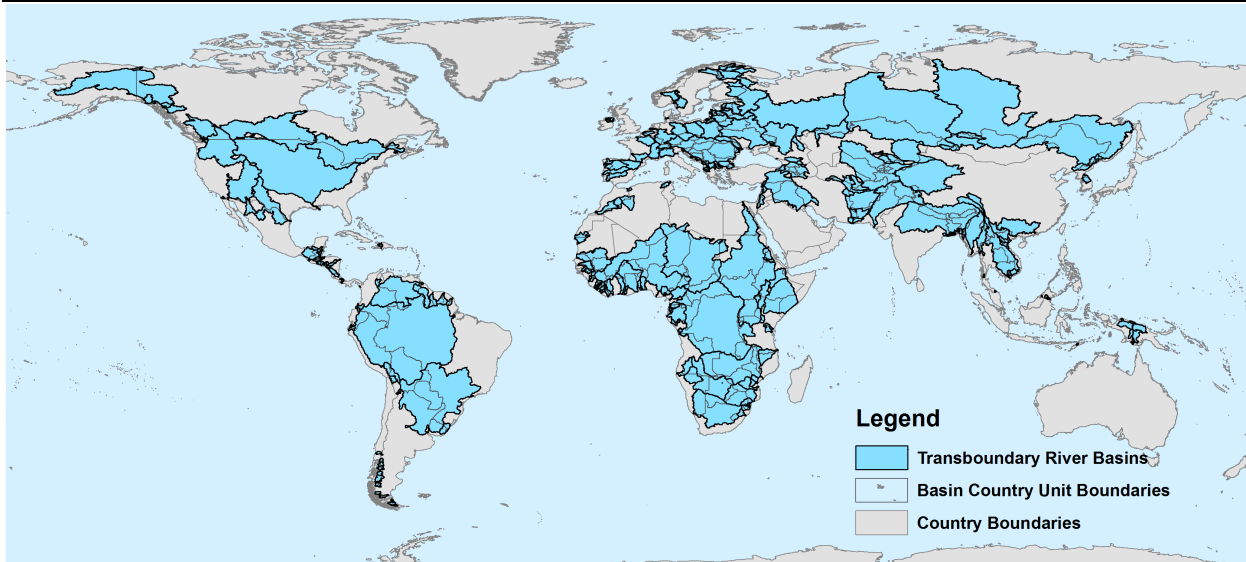


Figure 1. Trans-boundary rivers worldwide.

The Madrid Declaration of 1911 (Madrid 1911) makes it clear that “the regime of rivers and lakes, contiguous or successive, could not be altered by one state to the detriment of a co-riparian without the consent of the other”. Article 2 of the 1933 Montevideo Declaration (Montevideo 1933) indicates, “No state may, without the consent of the other riparian state, introduce into water courses of an international character, for industrial or agricultural exploitation of their waters, any alterations which may prove injurious to other interested states”. Article 4 of the 1966 of Helsinki Rules (Helsinki 1966) on the uses of the waters of international rivers, adopted by the International Law Association, asserts, “Each basin state is entitled, within its territory, to a reasonable and equitable share in the beneficial uses of the waters of an international drainage basin.”

The above declarations and rules paved the way for the 1997 United Nations (UN) Convention on the Law of the Non-navigational Uses of International Watercourses adopted by the General Assembly on May 21, 1997. It is the treaty that governs the use of shared freshwater resources and is universally applicable to all UN member states. The UN Convention contains 37 articles arranged in seven parts (UN 1997). Article 5 reflects the principle that is widely regarded as the cornerstone of the Convention. It requires that a State sharing an international watercourse with other States utilize the watercourse, in its territory, in a manner that is equitable and reasonable vis-à-vis the other States sharing it. Article 5 of the convention states “Watercourse States shall in their respective territories utilize an international watercourse in an equitable and reasonable manner. In particular, an international watercourse shall be used and developed by watercourse States with a view to attaining optimal and sustainable utilization thereof and benefits therefrom, taking into account the interests of the watercourse States concerned, consistent with adequate protection of the watercourse”. The convention adds “Watercourse States shall participate in the use, development and protection of an international watercourse in an equitable and reasonable manner. Such participation includes both the right to utilize the watercourse and the duty to cooperate in the protection and development thereof, as provided in the present Convention”. The UN Convention entered into force on August 17, 2014, having been ratified by 36 states after 17 years of adoption by the UN General Assembly. Although a majority of the UN member countries opted to remain outside the Convention’s scope, it establishes an important international law governing cross border watercourses declaring water rights of all riparian countries.

Under the Convention (UN 1997), the utilization of an international watercourse in an equitable and reasonable manner requires taking the following factors into consideration: (a) Geographic, hydrographic, hydrological, climatic, ecological and other factors of a natural character; (b) The social and economic needs of the watercourse States concerned; (c) The population dependent on the watercourse in each watercourse State; (d) The effects of the use or uses of the watercourses in one watercourse State on other watercourse States; (e) Existing and potential uses of the watercourse; (f) Conservation, protection, development and economy of use of the water resources of the watercourse and the costs of measures taken to that effect; and (g) The availability of alternatives, of comparable value, to a particular planned or existing use.

Article 7 of the UN Convention is entitled "Obligation not to cause significant harm". It emphasizes the following: (1) Watercourse States shall, in utilizing an international watercourse in their territories, take all appropriate measures to prevent the causing of significant harm to other watercourse States; and (2) Where significant harm nevertheless is caused to another watercourse State, the States whose use causes such harm shall, in the absence of agreement to such use, take all appropriate measures, having due regard for the provisions of articles 5 and 6, in consultation with the affected State, to eliminate or mitigate such harm and, where appropriate, to discuss the question of compensation.

McCaffrey (2023) indicates, this is "the most controversial provision" of the Convention, with conflict stemming from the fact that a state may have legitimate uses for a watercourse in its nation that can negatively impact other nations. McCaffery clarifies his statement using an example of an upstream State A has not significantly developed its water resources because of its mountainous terrain. The topography of the downstream states on the watercourse, B and C, is flatter, and they have used the watercourse extensively for irrigation for centuries, if not millennia. State A wishes to develop its water resources for hydroelectric and agricultural purposes. States B and C complain that this would significantly harm their established irrigation uses.

Based on the above discussion, it should be noted that the customary international law declarations, Helsinki rules, and UN Convention on the subject establish two important principles for all river basins: (1) that the first right over the water of the rivers is that of the people living in the basin, and (2) that the shared waters could neither be stopped nor diverted without the consent of the other riparian states.

The Nile River

With a length of about 6850 kilometers, the Nile is the longest river in Africa and the world. It flows northwardly in the northeastern part of the African continent. Despite its great length, the Nile has an average annual volume of about 84 billion cubic meters (BCM). The Nile's drainage basin has a total area of about 3,400,000 square kilometers (Figure 2) and covers eleven countries: the Democratic Republic of the Congo, Tanzania, Burundi, Rwanda, Uganda, Kenya, Ethiopia, Eritrea, South Sudan, the Republic of the Sudan, and Egypt (Figure 3). The last two riparian countries along the path of the Nile (Sudan and Egypt) are significantly dependent on the waters of the river due to a considerably smaller amount of rainfall relative to the rest of the riparian countries.

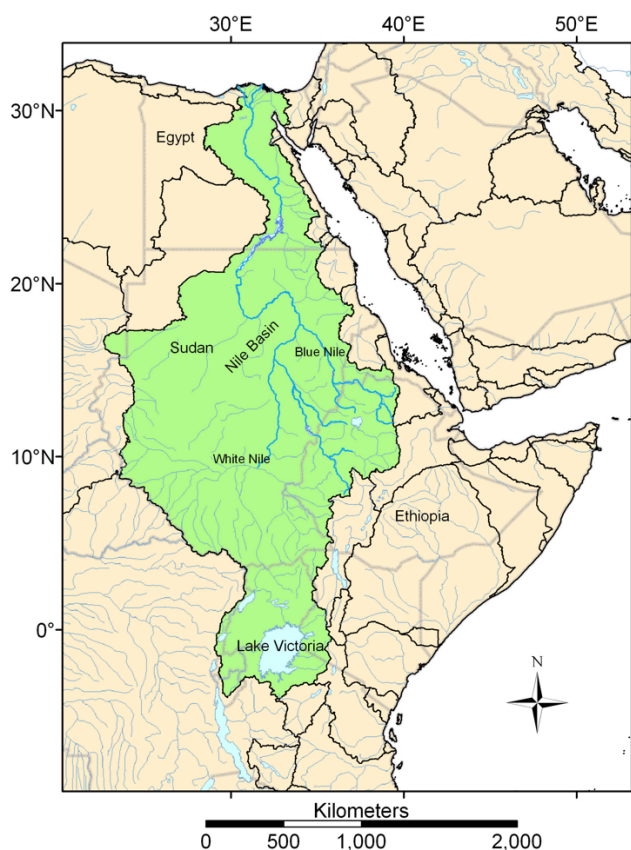


Figure 2. The basin of the Nile River.



Figure 3. The Nile River and its riparian countries.

The White Nile and the Blue Nile are the two major tributaries of the Nile. The White Nile is longer and rises in the Great Lakes region where it begins at Lake Victoria, which borders Tanzania, Kenya, and Uganda. The Blue Nile begins at Lake Tana in the Ethiopian Highlands and flows into Sudan from the southeast. The Blue Nile contributes about 75%-80% of the water that runs in the Nile. The White Nile travels north and the Blue Nile travels northwest until the two rivers meet at the Sudanese capital of Khartoum. The Nile continues its journey northward through the Nubian and Egyptian deserts until it reaches the Egyptian capital, Cairo, where it splits into two branches forming the large delta bounded at its base by the Mediterranean Sea. The Nile valley in Egypt is a narrow, heavily populated strip of land located east and west of the Nile in a country that is mainly a desert. The ancient Egyptian civilization has depended on the river and its annual flooding since the dawn of history. Almost 90% of the population of Egypt lives in the Nile Valley and its delta. Nearly all the cultural and historical sites of Ancient Egypt are found along the riverbanks where the water runs year-round.

Prior to the splitting of Sudan and South Sudan in 2011, there were ten riparian countries in the Nile River basin. Most of the statistical data related to the Nile River is related to the original ten riparian countries. Table 1 shows the mean average annual rainfall on each of the riparian countries and the percent of its dependency on the water of the Nile. The water dependency ratio represents the share of a country's total renewable freshwater that is generated outside its borders. The higher the figure is, the more reliant a country is on external water resources. Table 1 also shows the agriculture area under irrigation. A country with zero area of irrigated agriculture implies that agriculture is wholly rainfed. According to 2010 World Bank estimates (Swain 2011), the average annual population growth of the riparian countries is shown in Table 1. The total population of the

riparian countries in 2010 was 424 million people and is estimated to reach 648 million people by 2030. This is almost 53% increase in 20 years. This significant increase in population is not met with a corresponding increase in water revenue from nature. This is the main source of the problem being presently felt by the riparian countries. Considering the very wide variation of riparian countries' dependency on the Nile which ranges from 0% to almost 97%, and the large variability in rainfall as shown in Table 1, it is not surprising that some riparian countries consider the water of the Nile as a vital source of survival before being a means for development and economic growth.

Table 1 Key statistics of the Nile River basin and the riparian countries (FAO 1997, World Bank Statistics 2010).

| Country | Mean average annual rainfall (mm) | Dependency on the Nile water (%) | Agriculture area under irrigation (ha) | Agriculture irrigation potential (ha) | Average annual population growth (%) |
|-------------|-----------------------------------|----------------------------------|--|---------------------------------------|--------------------------------------|
| Burundi | 1,110 | 0 | 0 | 80,000 | 2.9 |
| D. R. Congo | 1,245 | 8.2 | 0 | 10,000 | 2.9 |
| Egypt | 15 | 96.9 | 3,078,000 | 4,420,000 | 1.9 |
| Eritrea | 520 | 68.2 | 15,124 | 150,000 | 3.6 |
| Ethiopia | 1,125 | 0 | 23,160 | 2,220,000 | 2.6 |
| Kenya | 1,260 | 33.1 | 6,000 | 180,000 | 2.6 |
| Rwanda | 1,105 | 0 | 2,000 | 150,000 | 2.2 |
| Sudan | 500 | 77.3 | 1,935,200 | 2,750,000 | 2.1 |
| Tanzania | 1,015 | 10.2 | 10,000 | 30,000 | 2.8 |
| Uganda | 1,140 | 40.9 | 9,120 | 202,000 | 3.3 |

Ever since the issues related to the fair and equitable distribution of the Nile water between the riparian countries came to the forefront over a century ago, there has been many agreements and treaties signed between different riparian countries and some of these treaties were negotiated and signed during the colonial era when third party colonial powers were involved in negotiating these deals. Table 2 (OSU 2023) shows all the treaties directly related to the water of the Nile, which were signed by Egypt, Ethiopia, and Sudan before it was split in 2011 to South Sudan and Sudan. It is worth noting that for almost a century there has been a history of cooperation in the management and sharing of the water of the Nile. The main driving factor behind the recent disputes is the significant increase in population of the riparian states which, according to Table 1, is projected to remain high for many years to come. This threatens of a worsening situation in the future.

Table 2. Treaties signed by the Nile River riparian countries on the management of water resources.

| Basin | Country | Description | Date Signed | Issue Area |
|-------|----------|--|-------------|----------------|
| Nile | Ethiopia | Treaties between Great Britain and Ethiopia relative to the frontiers between Anglo-Egyptian Sudan Ethiopia and Erythroea (Railway to connect Sudan with Uganda) | 15-May-1902 | Water Quantity |
| Nile | Sudan | Treaties between Great Britain and Ethiopia relative to the frontiers between Anglo-Egyptian Soudan Ethiopia and Erythroea (Railway to connect Soudan with Uganda) | 15-May-1902 | Water Quantity |

| | | | | |
|------|-------------|--|-------------|-------------------------------|
| Nile | Egypt | Exchange of notes between His Majesty's government in the United Kingdom and the Egyptian Government in regard to the use of the waters of the River Nile for irrigation purposes | 5-Jul-1929 | Water Quantity |
| Nile | South Sudan | Exchange of notes between His Majesty's government in the United Kingdom and the Egyptian Government in regard to the use of the waters of the River Nile for irrigation purposes | 5-Jul-1929 | Water Quantity |
| Nile | Sudan | Exchange of notes between His Majesty's government in the United Kingdom and the Egyptian Government in regard to the use of the waters of the River Nile for irrigation purposes | 5-Jul-1929 | Water Quantity |
| Nile | Egypt | Exchange of notes constituting an agreement between the United Kingdom of Great Britain and Northern Ireland and Egypt regarding the utilization of profits from the 1940 British government cotton buying commission and the 1941 joint Anglo-Egyptian cotton | 12-Oct-1946 | Water Quantity |
| Nile | Egypt | Exchanges of notes constituting an agreement between the government of the United Kingdom of Great Britain and Northern Ireland and the government of Egypt regarding the construction of the Owen Falls Dam Uganda | 31-Mar-1949 | Hydro-power/Hydro-electricity |
| Nile | Egypt | Exchange of notes constituting an agreement between the government of the United Kingdom of Great Britain and Northern Ireland and the government of Egypt regarding the construction of the Owen Falls Dam Uganda | 12-May-1949 | Hydro-power/Hydro-electricity |
| Nile | Uganda | Exchange of notes constituting an agreement between the government of the United Kingdom of Great Britain and Northern Ireland and the government of Egypt regarding the construction of the Owen Falls Dam Uganda | 12-May-1949 | Hydro-power/Hydro-electricity |
| Nile | Uganda | Exchanges of notes constituting an agreement between the government of the United Kingdom of Great Britain and Northern Ireland and the government of Egypt regarding the construction of the Owen Falls Dam Uganda | 31-May-1949 | Hydro-power/Hydro-electricity |
| Nile | Egypt | Exchange of notes constituting an agreement between the Government of the United Kingdom of Great Britain and Northern Ireland on behalf of the government of Uganda and the government of Egypt regarding cooperation in meteorological and hydrological surveys in certain parts of the Nile Basin | 20-Mar-1950 | Hydro-power/Hydro-electricity |
| Nile | Uganda | Exchange of notes constituting an agreement between the Government of the United Kingdom of Great Britain and Northern Ireland on behalf of the government of Uganda and the government of Egypt regarding | 20-Mar-1950 | Hydro-power/Hydro-electricity |

| | | | | |
|------|----------|---|-------------|--|
| | | cooperation in meteorological and hydrological surveys in certain parts of the Nile Basin | | |
| Nile | Egypt | Exchange of notes constituting an agreement between the government of the United Kingdom of Great Britain and Northern Ireland and the government of Egypt regarding the construction of the Owen Falls Dam in Uganda | 1-May-1953 | Hydro-power/Hydro-electricity |
| Nile | Uganda | Exchange of notes constituting an agreement between the government of the United Kingdom of Great Britain and Northern Ireland and the government of Egypt regarding the construction of the Owen Falls Dam in Uganda | 1-May-1953 | Hydro-power/Hydro-electricity |
| Nile | Egypt | Agreement between the government of the United Arab Republic and the government of Sudan for full utilization of the Nile waters | 11-Aug-1959 | Flood control/relief Water Quantity |
| Nile | Egypt | Framework for general co-operation between the Arab Republic of Egypt and Ethiopia | 7-Jan-1993 | Water Quantity |
| Nile | Ethiopia | Framework for general co-operation between the Arab Republic of Egypt and Ethiopia | 7-Jan-1993 | Water Quantity |

Almost all the negotiated deals were satisfactorily applied for many years, and none became a source of dispute until the problem of water shortage started to be a serious one as population increased and the need for more water became severe. The major issue facing the countries with greater dependency on the Nile today (mainly Egypt and Sudan) is the very serious threat to their water supply because of damming projects being built without coordination or consent, as the international law requires, from other riparian countries, especially downstream ones. As its government declared, Ethiopia for instance has been building many smaller dams within its territory to increase its food production and to meet the need of its growing population. This is to be expected from a government that aims to serve its people. Recently, however, Ethiopia embarked on building the Grand Renaissance Dam (GRD) on the Blue Nile (Figure 4), which supplies the Nile with about three quarters of its water discharge. The original declared capacity of the GRD reservoir was 13 billion cubic meters (BCM) and its goal was hydropower generation. Egypt and Sudan, the downstream riparian countries that could be impacted by building such a dam, had no objection to the building of the GRD at the declared capacity especially that its declared purpose was hydropower generation which means that the water at the reservoir will only be stored to be later allowed to pass through the dam for power generation (Al-Muqdadadi 2022).

During construction, the scope of the project was enlarged, and the capacity of the reservoir was gradually increased to 74 BCM from the originally declared 13 BCM. This became a major concern to Egypt and Sudan as it would severely and negatively impact the discharge that reaches both countries, especially if the rate of filling the reservoir is rapid to fill it in a short period of time (Salameh 2021). As the declared function of the GRD is hydropower generation, it is worth noting that such a huge reservoir capacity is not needed for the stated goal, and this made both Egypt and Sudan question the size of the reservoir capacity and Ethiopia's actual intention. The rate of filling the reservoir has also been a point of contention as Ethiopia announced that the reservoir would be filled in five years while Egypt and Sudan believe that twelve years would be more

appropriate to lessen the negative impact that they could face with a faster rate. The three countries have been locked in over a decade long of negotiations regarding the management of the water of the Nile. No deal was reached despite mediation from the African Union, the European Union, The United States, The United Nations Security Council, and many other countries that either individually or collectively attempted to help in reaching a deal.



Figure 4. Ethiopia's Grand Renaissance Dam.

Both Egypt and Sudan stated numerous times that they fully support Ethiopia's right to develop hydropower using their water resources. By the same token they insisted that economic development should never be at the expense of the survival of nations that are partially or fully dependent on the water of the Nile. Presently, these three countries are at an impasse and there seems to be little or no appetite for more negotiations especially when facts regarding dam building and reservoir filling are being created on the ground. There is no question that each of the three countries feels very strongly about their stance and believe they have valid and undisputable arguments. There are many external powers with interest in building the dam and have significant investments in this project. These powers have conflicting roles: they like to see the project completed to get a return on their investment, but they also like to see a deal reached between the conflicting countries to avoid escalation that could damage the prospect of their investment. In absence of a real desire, good faith, and determined will to find a solution that is satisfactory to all, this problem will not go away on its own. For countries like Egypt and Sudan, it is a life-related issue and a matter of to be or not to be.

The Tigris-Euphrates River Basin

The Tigris–Euphrates River system originates in the mountains of eastern Turkey in the Asian continent and discharges into the Persian Gulf. Its principal rivers are the Tigris and Euphrates along with smaller tributaries. The rivers descend through valleys and gorges to the uplands of Syria and northern Iraq and then to central Iraq. Other tributaries contributing to the system join the Tigris from sources in the Zagros Mountains to the east. The two major rivers flow in a south-easterly direction and combine at Al-Qurnah to form the area of Shatt al-Arab and discharge into the Persian Gulf. The rivers and their tributaries drain an area of 879,790 square kilometers. This area includes almost the entire area of Iraq as well as portions of Turkey, Syria, Iran, and Kuwait (Figure 5).

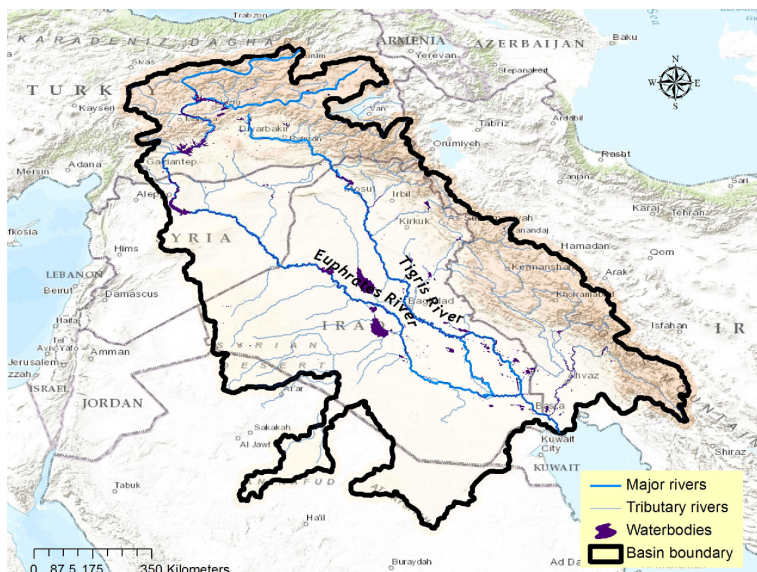


Figure 5. The basin of the Tigris-Euphrates River system.

The plain between the two rivers has historical importance as part of the Fertile Crescent region in which Mesopotamian civilization first emerged and is often described as the "Cradle of Civilization". The confluence of the Tigris and Euphrates rivers was a magnet for ancient empires where several arose and fell in this part of the world.

Although many Tigris tributaries originate in Iran and a Tigris–Euphrates confluence forms part of the Iraq–Kuwait border, the high mountains in the upper watershed receive more rain and snow than the lower watershed. Annual snow melt from the mountains brings spring floods and sustains permanent and seasonal marshes in the lowlands. The lower part of the basin is characterized by hot and arid climate. There is a large floodplain in the lower basin where the Euphrates, Tigris, and Karun rivers converge to create the Mesopotamian Marshes, which include lakes, marshes, and forests. The hydrology of these vast marshes is extremely important to the ecology of the entire upper Persian Gulf. About 71% of the Iraq’s water originates in Turkey, 4% in Syria, and 10% in Iran. This makes Iraq dependent on its neighbors for 85% of its water supplies. For the past 40 years, Turkey and Iran built dozens of dams on the Tigris-Euphrates River system and their tributaries. As a result of the dams built by Turkey on the Euphrates, Syria too built several dams on the Euphrates River in an attempt to save whatever it could of the river’s water before it flows downstream to Iraq. Presently, less than a quarter of the Euphrates normal flow reaches Iraq. This, coupled with significantly smaller amount of rainfall relative to other riparian states (Table 3), adds to the severe water shortages presently experienced in Iraq.

Table 3. Average rainfall on the riparian countries of the Tigris–Euphrates River system.

| Country | Mean average annual rainfall (mm) |
|---------|-----------------------------------|
| Turkey | 620 |
| Syria | 770 |
| Iraq | 100 |

In the 1960s Turkey began the Southeastern Anatolia Project (Kinfé 2014). The issue of water rights became a point of contention for Iraq, Turkey, and Syria as Turkey implemented this public-works project (the GAP project) which aimed at harvesting the water from the Tigris and Euphrates rivers through the construction of 22 dams

(14 dams on the Euphrates River and 8 on the Tigris River) and 19 hydroelectric power plants on both the Tigris and the Euphrates Rivers for irrigation and hydroelectric energy purposes (Figure 6). The goal was to add approximately 1.7 million hectares of irrigated land and to generate some 27 billion kWh of hydroelectric power on an annual basis.

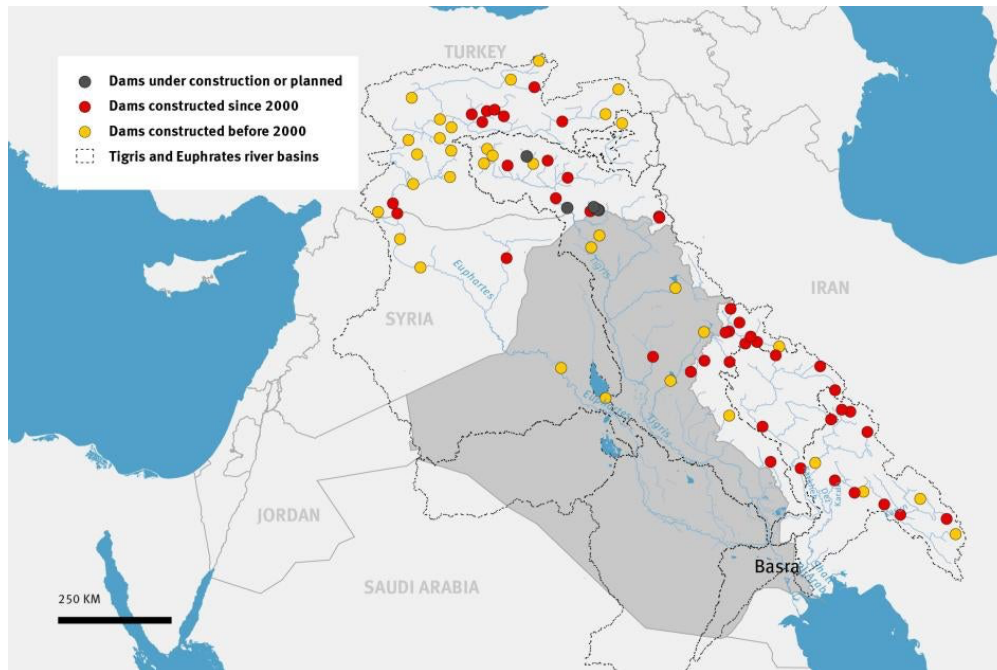


Figure 6. Dam construction on the Tigris-Euphrates Rivers and their tributaries.

As promoted by the Turkish government, the GAP project is a multi-sector integrated regional development project based on the concept of sustainable development for the people living in the Southeastern Anatolia region of Turkey. The aim of the project is to raise incomes and living standards and to contribute to the national development targets of social stability and economic growth. As envisioned by the Turkish government, the GAP project was meant for economic development and hydropower generation (Salameh 2021). The GAP project, however, did not only have severe impact on water supplies to both Syria and Iraq, but had also severe environmental impacts on many other regions including areas within Turkey itself. In addition, Syrian and Iranian dam construction has also contributed to severe reduction of the flow in the Tigris-Euphrates River system and a rise in the political tension within the basin, particularly during drought. Iraq suffers from desertification and soil salination due in large part to thousands of years of agricultural activity. There are also inadequate supplies of potable water.

There has been a long history of water disputes between Turkey and Syria but with the construction of the dams planned as part of the GAP, the tension between Turkey and Iraq increased precipitously. With the GAP project execution proceeding swiftly, issues related to water supplies to Syria and Iraq through the Tigris-Euphrates River system were heightened to unprecedented levels. A new round of negotiations between Iraq and Turkey over trans-boundary river flows due to the 2008 drought that had a severe effect on Iraq. Although the drought affected all riparian countries of the Tigris-Euphrates River system including Turkey, Syria, and Iran as well, Iraq complained regularly about reduced water flow. Iraq's major complaint was focused on the effect of building many Turkish dams, which hindered the flow of water in the Euphrates River. Iraq experienced significant declines in water storage and crop yields because of the drought. In addition, many years of war and conflict

resulted in the deterioration of Iraq's water infrastructure, which suffered from a considerable neglect. After rounds of difficult negotiations, Turkey agreed to increase the flow of the Euphrates River for only one month (from September 19, 2009 to October 20, 2009). In exchange, Iraq agreed to trade petroleum with Turkey and help curb Kurdish militant activity in their border region.

Presently, the GAP project is almost complete as originally envisioned with 16 dams being functional and the remaining 6 dams are at various stages of construction. The project included the construction of the enormous Ataturk Dam (completed in 1992, Figure 7) on the Euphrates River and the massive Ilisu Dam (completed in 2018, Figure 8) on the Tigris River. These two dams, in addition to the other smaller dams reduced the water flow in the Tigris-Euphrates River system by over 50% and the effects have been devastating on both Syria and Iraq. Water shortages in southern Iraq are believed to be behind an increasing rate of aridity and severe desertification that has reached some 70% in some southern and central provinces of Iraq (Al-Muqdadadi 2022). This situation is aggravated by Iraq's absence of a national water strategy to tackle the dramatic shortage that affects up to 90% of the country.



Figure 7. Aerial view of Turkey's Ataturk Dam.

Tension between Iraq and Turkey has risen since 1975 as Turkey's dam and hydropower construction on the two rivers have cut water to Iraq by 80 per cent, jeopardizing agriculture, and natural habitats in the country. This also resulted in displacing tens of thousands of families that relied for ages on farming as a source of their livelihood and were forced to sell or slaughter their cattle due to lack of water and grazing land.



Figure 8. Aerial view of Turkey’s Illisu Dam.

Table 4 lists in a chronological order the treaties signed by the countries of the Tigris-Euphrates-Shatt al Arab basin (OSU 2023). For almost a century, the listed treaties regulated water management and distribution between the three riparian countries and required Turkey to inform downstream riparian countries of any planned infrastructure along the rivers, and of getting consent for these projects. These treaties maintained an atmosphere of relative peace for the first half of the twentieth century. Later, as Turkey embarked on building the dams and the hydroelectric power plants of its GAP project, problems started to emerge as flow in the Tigris and Euphrates Rivers was substantially affected. At the inauguration of the Ataturk Dam in 1992, the Turkish president said *“neither Syria nor Iraq could lay claim to Turkey’s water, any more than Turkey could claim Arab oil. We have the right to do what we like.”* A similar situation developed in Syria where the severe shortage of water in the Euphrates River badly curtailed the agriculture activities in the eastern part of the country. This forced the displacement of over a million people from rural to urban areas, which heightened tension between ethnic and sectarian groups. Water and food shortages, coupled with political unrest ignited the civil war in Syria that has been fought since March 2011 to the present time. This war displaced almost half of the Syrian population, with 4 million are presently registered refugees in Turkey, and over 2 million sought refuge in the countries of the European Union, USA, Canada, and Australia. It is ironic that Turkey’s GAP project aimed at effecting economic growth and development through capturing the water that naturally flowed to Syria and Iraq for thousands of years, and in the process of doing so, an influx of millions of people crossed its borders and became refugees in Turkey itself.

Table 4. Chronological order of treaties signed by the countries of the Tigris-Euphrates-Shatt al Arab basin.

| Basin(s) | Country Name | Document Name | Date Signed | Signatories | Treaty Basin(s) | Issue Area |
|--|--------------|--|-------------|-----------------------|----------------------------------|---|
| Jordan, Tigris-Euphrates-Shatt al Arab | Iraq | Franco-British convention on certain points connected with the mandates for Syria and Lebanon, Palestine and Mesopotamia | 23-Dec-1920 | France, Great Britain | Jordan, Yarmuk, Tigris-Euphrates | Irrigation, Hydro-power/Hydro-electricity |
| Jordan, Tigris-Euphrates-Shatt al Arab | Syria | Franco-British convention on certain points connected with the mandates for Syria and Lebanon, Palestine and Mesopotamia | 23-Dec-1920 | France, Great Britain | Jordan, Yarmuk, Tigris-Euphrates | Irrigation, Hydro-power/Hydro-electricity |
| Tigris-Euphrates-Shatt al Arab | Iraq | Treaty of friendship and neighborly relations, and six annexed protocols, signed at Ankara | 29-Mar-1946 | Iraq, Turkey | Tigris-Euphrates | Infrastructure/Development |
| Tigris-Euphrates-Shatt al Arab | Turkey | Treaty of friendship and neighborly relations, and six annexed protocols, signed at Ankara | 29-Mar-1946 | Iraq, Turkey | Tigris-Euphrates | Infrastructure/Development |

| | | | | | | |
|--------------------------------|--------|--|-------------|---------------|---|-------------------------------|
| Tigris-Euphrates-Shatt al Arab | Iran | Treaty between Turkey and Iran on the Sarisu and Karasu River | 18-Nov-1955 | Iran, Turkey | Sarisu, Karasu | Water Quantity |
| Tigris-Euphrates-Shatt al Arab | Turkey | Treaty between Turkey and Iran on the Sarisu and Karasu River | 18-Nov-1955 | Iran, Turkey | Sarisu, Karasu | Water Quantity |
| Tigris-Euphrates-Shatt al Arab | Iran | Treaty concerning the state frontier and neighborly relations between Iran and Iraq and protocol | 13-Jun-1975 | Iran, Iraq | Shatt al'Arab | Border Issues |
| Tigris-Euphrates-Shatt al Arab | Iraq | Treaty concerning the state frontier and neighborly relations between Iran and Iraq and protocol | 13-Jun-1975 | Iran, Iraq | Shatt al'Arab | Border Issues |
| Tigris-Euphrates-Shatt al Arab | Iran | Agreement between Iran and Iraq concerning the use of frontier watercourses, and protocol | 26-Dec-1975 | Iran, Iraq | Bnava Suta, Qurahtu, Gangir, Alvend, Kanjan, Cham, Tib, Duverij | Water Quantity, Border Issues |
| Tigris-Euphrates-Shatt al Arab | Iran | Agreement between Iran and Iraq Concerning Frontier Commissioners | 26-Dec-1975 | Iran, Iraq | Bnava Suta, Qurahtu, Gangir, Alvend, Kanjan, Cham, Tib, Duverij | 0 |
| Tigris-Euphrates-Shatt al Arab | Iraq | Agreement between Iran and Iraq concerning the use of frontier watercourses, and protocol | 26-Dec-1975 | Iran, Iraq | Bnava Suta, Qurahtu, Gangir, Alvend, Kanjan, Cham, Tib, Duverij | Water Quantity, Border Issues |
| Tigris-Euphrates-Shatt al Arab | Iraq | Agreement between Iran and Iraq Concerning Frontier Commissioners | 26-Dec-1975 | Iran, Iraq | Bnava Suta, Qurahtu, Gangir, Alvend, Kanjan, Cham, Tib, Duverij | 0 |
| Tigris-Euphrates-Shatt al Arab | Syria | Protocol on matters pertaining to economic cooperation. Signed at Damascus | 17-Jul-1987 | Syria, Turkey | N.A. | Water Quantity, Hydro- |

| | | | | | | |
|--|--------|---|-------------|---------------|---------------------------|---|
| | | | | | | power/Hydro-electricity |
| Tigris-Euphrates-Shatt al Arab | Turkey | Protocol on matters pertaining to economic cooperation. Signed at Damascus | 17-Jul-1987 | Syria, Turkey | N.A. | Water Quantity, Hydro-power/Hydro-electricity |
| Tigris-Euphrates-Shatt al Arab | Iraq | Law No.14 of 1990, ratifying the Joint Minutes concerning the provisional division of the waters of the Euphrates River | 17-Apr-1989 | Iraq, Syria | Euphrates | Water Quantity |
| Tigris-Euphrates-Shatt al Arab | Syria | Law No.14 of 1990, ratifying the Joint Minutes concerning the provisional division of the waters of the Euphrates River | 17-Apr-1989 | Iraq, Syria | Euphrates | Water Quantity |
| Tigris-Euphrates-Shatt al Arab | Syria | Minutes between Syria and Turkey on cooperation in fighting terrorism, signed at Adana, including Annex 2 | 20-Oct-1998 | Syria, Turkey | Not specified | Water Quantity |
| Tigris-Euphrates-Shatt al Arab | Turkey | Minutes between Syria and Turkey on cooperation in fighting terrorism, signed at Adana, including Annex 2 | 20-Oct-1998 | Syria, Turkey | Not specified | Water Quantity |
| Asi/Orontes, Nahr El Kebir, Tigris-Euphrates-Shatt al Arab | Syria | Joint communique between Republic of Turkey Prime Ministry Southeastern Anatolia Project Regional Development Administration (GAP) and Arab Republic of Syria Ministry of Irrigation General Organization for Land Development (GOLD) | 23-Aug-2001 | Syria, Turkey | Frontier or shared waters | Technical Cooperation/ Assistance |
| Asi/Orontes, Nahr El Kebir, Tigris-Euphrates-Shatt al Arab | Turkey | Joint communique between Republic of Turkey Prime Ministry Southeastern Anatolia Project Regional Development Administration (GAP) and Arab Republic of Syria Ministry of Irrigation | 23-Aug-2001 | Syria, Turkey | Frontier or shared waters | Technical Cooperation/ Assistance |

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|--------------------------------|-------|---|------------|-------------|--------|---|
| | | General Organization for Land Development (GOLD) | | | | |
| Tigris-Euphrates-Shatt al Arab | Iraq | Bilateral Agreement between Syria and Iraq concerning the installation of a Syrian pump station on the Tigris River for irrigation purposes | 9-Apr-2002 | Syria, Iraq | Tigris | 0 |
| Tigris-Euphrates-Shatt al Arab | Syria | Bilateral Agreement between Syria and Iraq concerning the installation of a Syrian pump station on the Tigris River for irrigation purposes | 9-Apr-2002 | Syria, Iraq | Tigris | 0 |

Conclusions

Freshwater is a necessity for life. Since ancient times, people always looked for freshwater and settled lands where this water existed. Two of the oldest civilizations in history flourished at the banks of old mighty rivers; the Egyptian civilization made possible by the Nile River, and the Mesopotamians founded their presence in the fertile crescent between the Tigris and the Euphrates Rivers. At present, these three historical rivers are experiencing severe flow shortages and the countries depending on them face existential threats. Water disputes have been documented since early history and some of these disputes escalated to the level of full-scale wars. This paper argues that finding resolutions and methods of cooperation to share, manage, and distribute the water of trans-boundary international rivers is possible if negotiations are done in good faith and with no hidden agendas. Wars should not be fought over issues that peaceful diplomacy can resolve. Upstream riparian states that dam rivers with no regard to the international law or the livelihood of downstream states should refrain from such activities because what they deem to be a benefit could turn and become a full-blown liability that haunts them in the form of constant friction from those who have nothing to lose and may also propel an endless flood of refugees. A peaceful formula for sharing the water of rivers is probably the only conceivable and plausible way to eliminate feelings of animosity and distrust that may lead to hostilities between the countries that share the same resource. According to the UN 1997 convention, it is incumbent on States that cause harm “to eliminate or mitigate such harm and, where appropriate, to discuss the question of compensation” with affected States. This may be hard to accept but any other alternative will most likely be questionable, unrealistic, or unviable.

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