

# The Euphrates–Tigris Basin: A Case Study in Surface Water Conflict Resolution

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## ABSTRACT

Historically, the Euphrates and Tigris waters have been a major source of freshwater conflict in the Middle East. Originating in Turkey, both rivers flow southwestward through Syria and Iraq, to discharge into the Persian Gulf. The irregularity in their seasonal flow necessitates the development of efficient storage and diversion systems to ensure adequate irrigation to the area's dominant agricultural sector. Consequently, water utilization projects undertaken by upstream riparian countries trigger confrontation, leading to hostilities and strained relations. These water development projects are best exemplified by the Turkish GAP project, which provides Turkey extensive control over the Euphrates water, through the construction of 22 dams and 19 hydropower plants. Located upstream, Turkey regards the Euphrates and Tigris Rivers as Turkish waters; the downstream countries, Syria and Iraq, view them as international rivers whose waters are to be mutually regulated. International politics, the typical East–West rivalry, and the continuous competition for leadership in the area further aggravates the conflict. This paper presents a decision case to be taken by an international committee composed of UN representatives, nongovernmental organization (NGO) mediators, and ministers of the involved riparian states. The committee (i.e., the participants) should set strategies for the resolution of the water conflict through the harmonious utilization of the Euphrates–Tigris waters. This case study targets a course of education at the graduate or senior undergraduate level based on water resources issues impacting stability in the Middle East.

WATER SCARCITY is evident in the Middle East, where inhabitants receive <math>1000\text{ m}^3</math> of water precipitation per year, and where the entire region is water-short. Currently, 9 out of 14 Middle Eastern countries experience water scarcity, with the others rapidly approaching this status, especially with potential global climate change and increased desertification (Samson and Charrier, 1997; Darwish, 1994). In the Middle East, water withdrawal as a percentage of renewable water supplies falls within the highest in the world, although the renewal rate is rather low because the region is arid (Darwish, 1994).

The incapability of current Middle Eastern water resources to meet growing demand is expected to continue in the future due to increases in population and consumption (Turkish Ministry of Foreign Affairs, 2001). Moreover, the sensitive water shortage issue is further complicated by the sharing of water among several, generally water-deficient, riparian states, which instigates political pressure and tensions over water

rights (Haddad and Mizyed, 1996). This, coupled with drying oases and shrinking aquifers, is likely to cause water to replace oil as the traditional driver of conflict in the Middle East (Mideast News, 1998).

In the context presented above, the Euphrates–Tigris Basin represents one of the critical water conflict issues in the Middle East. Turkey, Syria, and Iraq presently share the waters of this basin. There has been a history of disagreements among these countries concerning the nature of these waters, their fair and optimal distribution, and the rights of each nation to utilize these water resources.

While the conflict among the riparian countries is basically posed in the context of water, it is inevitably linked with international politics, the typical east–west rivalry, and the continuous competition for leadership in the area. Turkey regards the Euphrates and Tigris Rivers as Turkish waters, whereas Syria and Iraq view them as international rivers whose waters are to be shared. Turkey emphasizes the rational utilization of the Euphrates waters and demands the inclusion of the Orontes (Asi) river in the negotiations, a notion strictly opposed by Syria, due to the historical dispute over the Hatay province (Arab Iskanderun). Turkey's internal problem with the Kurds is further accentuated by Syria's continuous support to the Kurdish Workers' Party (PKK). Such Syrian action antagonizes Iraq as well because Iraq has similar problems with the Kurds. Furthermore, recent development projects on the Euphrates have revived animosities dating back to World Wars I and II. This paper presents a case study that focuses on the Turkish–Syrian–Iraqi conflict over the shared water resources of the Euphrates–Tigris Basin and considers the decision to be taken by an international committee<sup>1</sup> for the equitable distribution of these waters among the riparian states. The case can be used by graduate or senior undergraduate students to play roles as opponents, supporters, and/or mediators in a conflict resolution situation.

## Historical Background

In the early 1900s, Turkey, then governing the Ottoman Empire, controlled present day Saudi Arabia, Jordan, Iraq, Lebanon, Syria, and Palestine. Although Turks and Arabs share the same Islamic religion, they are the descendents of two distinct ethnic groups, speaking different languages. Following the outbreak of World War I in 1914, Turkey aligned itself with Germany against France and Britain. Meanwhile, Syrian groups protested against their suppression by Ottoman governors and demanded complete Arab independence. At the

<sup>1</sup> Composed of top-level ministers, in coordination with the foreign ministers of the three riparian countries (Turkey, Syria, and Iraq), United Nations' (UN) representatives, and several NGO mediators.

**Abbreviations:** NGO, nongovernmental organization; PKK, Kurdish Workers' Party; UN, United Nations; NATO, North Atlantic Treaty Organization; BCM, billion cubic meters; MCM, million cubic meters; GAP, Southeastern Anatolia Project; ECE, Economic Commission for Europe; ILA, International Law Association.

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same time, Britain had early interests in limiting Russian influence in northern Mesopotamia and in protecting its oil interests in the region (Library of Congress, 2001).

In 1915, Britain sought control over the Middle East and resorted to the Arabs to weaken Ottoman control in the region by instigating Arab revolts against the Turks, first in Palestine and then Hijaz, while promising to support Arab independence (Thornton, 2000). At the time, the Arabs were not aware that Britain and France had agreed to subdivide Middle Eastern states between them in the secret Sykes–Picot Agreement (16 May 1916), whereby France was to control Lebanon and Syria, and Britain was to control what became Iraq and Transjordan (Library of Congress, 2001; Thornton, 2000). These events later triggered feelings of Arab betrayal among the Turks and left the Arabs with long-term feelings of resentment for the West.

During the French Mandate, Syria was divided into five areas: Jabal ed Druze, Aleppo, Latakia, Damascus, and Alexandretta (Arab Iskenderun), in an attempt to weaken a burgeoning Arab nationalist movement. The latter district of Alexandretta, located at the border between Syria and Turkey, housed a Turkish minority and had a separate government. During the Syrian–French treaty negotiations of 1936, Turkey demanded reconsideration of the Syrian province of Alexandretta based on the large Turkish minority residing there and its particular administrative system implemented under the Franco–Turkish agreement (Franklin–Bouillon Agreement) of 1921. In 1939, France agreed to Turkish demands; Alexandretta has evolved since then into the long-disputed Hatay province between Syria and Turkey (Library of Congress, 2001).

It is also worth mentioning that under French rule, Syria became a shelter for groups persecuted from neighboring countries, mainly Kurds, Armenians, and Assyrians. The Kurds, who were promised a motherland in the 1920 Treaty of Sevres, fled from Turkey (to Syria and Iraq) between 1924 and 1938 when Mustapha Kemal (Ataturk) attempted to force his reform programs on them (Library of Congress, 2001; Thornton, 2000).

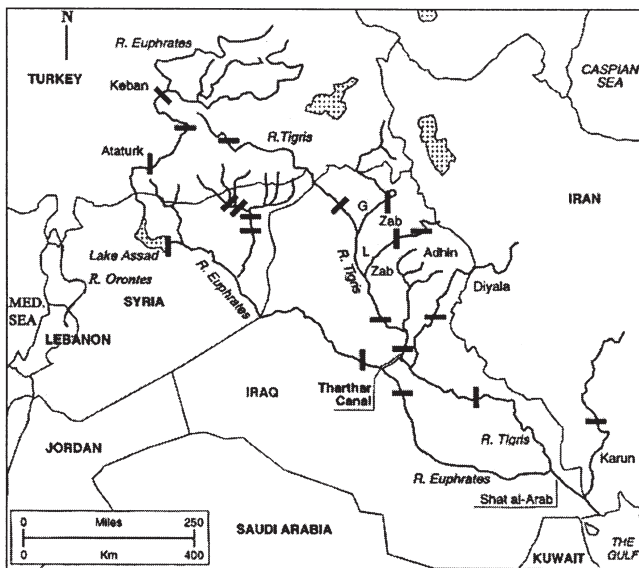


Fig. 1. The Euphrates–Tigris Basin (Dolatyar and Gray, 2000).

In summary, there is a long historical conflict between Turkey, Syria, and Iraq, starting with the Ottoman reign, and including the Arab rebellion, Syrian resentment for what they perceived as the arbitrary transfer of the province of Alexandretta to Turkey by the French, and finally the unwelcome immigration of Kurds to the neighboring Syrian state.

## THE CASE

The Euphrates–Tigris Basin, shared by Turkey, Syria and Iraq, represents a typical case of historical conflict related to water issues in the Middle East. At the root of the conflict lie the increasing population and the respective rising demand for water, accompanied by the desire for long-term food security and self-sufficiency. Political and historical animosities between the countries further amplify the problem.

### The Euphrates–Tigris Basin

The Euphrates River, at 2700 km, is the largest river in western Asia. It originates in the Armenian Plateau in Turkey and flows southeastward entering Syria at Karkamis, downstream from the Turkish town of Birecik, and southern Iraq near Qusaybah, where it joins the Tigris River near Qurna in Iraq to form the 193 km long Shatt al-Arab, which eventually discharges into the Persian Gulf (Fig. 1). Upon reaching the plains of Iraq, the Euphrates decreases in both volume and velocity (Chalabi and Majzoub, 1995; Britannica, 2001; Kaya, 1998). There is a clear imbalance in the supply of the river's waters (Table 1). It is worth mentioning that Saudi Arabia is usually excluded from the riparian states since its Euphrates stretch generally dries out in the summer (Kaya, 1998).

The 1900 km long Tigris River, on the other hand, is a typical mountain stream that rises from the Southeastern Taurus Mountains and other tributaries, some of which originate in Iran (Chalabi and Majzoub, 1995). It flows for 450 km through Turkey to the border city of Cizre, where it delineates the border between Turkey and Syria for 32 km, then crosses into Iraq at Faysh Khabur. Although Iran includes a large part of the catchment area, the main river does not flow through it (UNEP, 2001); hence, the country is generally ignored in studies of the Tigris Basin.

The economic life of the Euphrates–Tigris Basin remains reliant on the rivers' waters. Historically, the agriculture of southeastern Anatolia, as well as of northern Iraq and Syria, has been entirely dependent on rainfall, with some minor mechanical irrigation systems particularly in Syria. Another feature common to both rivers is the heavy concentration of suspended sediment in their waters, especially at the time of seasonal floods (Britannica, 2001; Dolatyar and Gray, 2000). Agricultural and hydropower potential of the rivers are disproportionately concentrated in Turkey (Table 2; similar data for Iraq are unavailable). There are considerable discrepancies among data pertaining to the basins' hydrologic configuration, depending on the reporting source. This is clearly depicted in Table 3, which compares data collected from several sources.

### History of Treaties and Conflicts

Along the Euphrates and Tigris Rivers, Turkey, Syria, and Iraq have experienced numerous confrontations over water resources. Strained relations and growing tensions have brought

**Table 1. River characteristics.**

	Euphrates				Tigris			
Length, † km	2 940				1 900			
Basin area, ‡ km <sup>2</sup>	579 314				371 562			
Annual average flow, BCM § yr <sup>-1</sup>	32 ¶				42 ¶			
Highest flow (April), ¶ % of average river flow	28.7–30.5 #				43–52.6 #			
Lowest flow (September), ¶ % of average river flow	275				260			
	33				23			
Country shares								
	Euphrates				Tigris			
Turkey	Syria	Iraq	Saudi Arabia	Turkey	Syria	Iraq	Iran	
Basin fraction, † %	21.0	16.5	48.8	13.3	14.0	0.3	38	47.2
Length, † km	1 176	604	1 160	--	440	44	1 400	--
Basin area, ‡ km <sup>2</sup>	1 21.8	95.4	282.5	77.1	53.0	0.9	1 42.2	175.4
Annual flow contribution, † ‡ %	89	11	--	--	51	--	39	10
† UNEP, 2000.	¶ Bagis, 1997.							
‡ UNEP, 2001.	# Kaya, 1998.							
§ BCM, billion cubic meters.	†† Chalabi and Majzoub, 1995.							

the riparian countries to the verge of war on several occasions. These tensions are due to a number of different variables, including the East–West rivalry characteristic of the area that fed political resentments and animosities (Berman and Wihbey, 1999). With regard to water management, however, Turkey did not disagree with either Syria or Iraq until the late 1980s, due to Turkey's unilateral minimum flow guarantees, which were kept to ensure international financing for building its dams. Besides, until the mid-1980s, hydroelectric developments actually benefitted the downstream states by regulating the river flow. Thus, as long as Turkey's projects were restricted to covering its energy requirements, the protests of the downstream countries remained limited to the period of dam filling (Çarkođlu and Eder, 1998).

The three countries have experienced various alliances in the past, forming a geopolitical approach to the conflict. Syria was loosely aligned with the former Soviet Union in the Cold War while Turkey was part of the North Atlantic Treaty Organization (NATO), a membership strongly opposed by Syria and Iraq (The Estimate, 1998). Next, Syria and Turkey opposed the Iraqi military actions of the 1970s against the Kurdish groups, which were receiving aid from Iran. During the 1980s, Turkey and Iraq joined forces against the Syrian military mobilization along the Syrian border; finally, Turkey and Syria sided with the allied forces against Iraq during the Persian Gulf War in the early 1990s (Kjeilen, 2001; Scheumann, 1998). Moreover, the Turkish–Israeli strategic military and commercial alliance, which has long been considered aimed directly at Damascus, has brought about an improvement in the relations between Syria and Iraq (Kor, 1997; The Estimate, 1998).

The first modern international agreement related to the use of water in Mesopotamia was the Franco–British convention of 1920 (also known as Luzon's Treaty, Paris), where the signatory powers agreed to establish a committee to examine and coordinate water utilization of the Euphrates and Tigris. In 1946, a Turkish–Iraqi Protocol was signed, the main purpose of which was the construction of protection and observation posts on Turkish territory to prevent downriver flooding and, thus, benefit Iraq.

The question of the Euphrates also stirred up tensions between Syria and Iraq. In 1975, the quantity of water entering Iraq fell by 25%, from 28 billion cubic meters (BCM) per

annum to approximately 21 BCM due to the filling of the Syrian Tabqa Dam. Baghdad responded by mobilizing its troops at the Syrian border (Chalabi and Majzoub, 1995).

Two phases can be distinguished in the exploitation of the Euphrates. During the first phase, from 1946 to 1960, no far-reaching projects were undertaken. In contrast, the second phase, from 1960 until now, has been marked by a series of projects, all of which were characterized by an almost complete lack of cooperation among the three riparian states. Table 4 highlights major events, as well as the agreed upon and still disputed issues among Turkey, Syria, and Iraq since 1946. The most controversial disputes are discussed individually below. It can be noted that each of the riparian countries has tended to develop its water use plans unilaterally, irrespective

**Table 2. Agricultural and hydropower potential of Turkey and Syria.**

State	River	Active reservoir storage capacity †	Irrigated area ‡	Annual hydro-power potential §
		BCM §	10 <sup>6</sup> ha ¶	GWh §
Turkey	Euphrates	42	1.74	38 940
	Tigris	15.5	0.65	16 880
Syria	Euphrates	16.1	0.31	
	Tigris		0.21	

† Bagis, 1997.

‡ Bayazit and Arci, 1997.

§ BCM = billion cubic meters, GWh = gigawatt hours.

¶ Values should be multiplied by 10<sup>6</sup> for the actual values.

**Table 3. Comparative hydrology of the Euphrates and Tigris Rivers.**

River	Length	Total discharge	Drainage area
	km	BCM yr <sup>-1</sup> †	km <sup>2</sup>
Euphrates	2 320–2 330 ‡ §	31.8 ‡	444 000 § ¶ #
	2 700 † †	33 ¶	
	2 940 ‡ ‡		
Tigris	1 658	42 #	
	1 840 ‡	49.2 ‡	378 850 ¶
	1 900 † †	47 ¶	471 606 ‡

† BCM yr<sup>-1</sup> = billion cubic meters per year.

‡ Lowi, 1993.

§ Anderson, 1991.

¶ Gleik, 1994.

# Starr and Stroll, 1988.

†† Hillel, 1994.

‡‡ UNEP, 2000.



**Table 4. Agreed and conflicting issues between the three riparian states.**

Year	Agreed issues	Conflicting issues	Parties
1911–1914†	Iraq was the first riparian to develop engineering projects in the basin (Hindiya barrage) for flood control and irrigation		
1946‡§	Flood control structures Turkey monitored flow of both rivers and shared obtained data		Turkey and Iraq Turkey, Syria and Iraq
Early 1950s†	Second Iraqi Euphrates barrage		
1956§		Syrian dam on Orontes river	Turkey vs. Syria
Late 1950s†	Russians researched Syrian reach of the Euphrates and proposed a dam at Tabqa		
1964§	Minimum release of 350 m <sup>3</sup> s <sup>-1</sup> (during the filling period of Keban Dam in Turkey)		Turkey and Iraq
1966†		Keban Dam	Syria and Turkey
1966†	Syrian–Soviet agreement started the construction of the High (al-Thawrah) Dam		Syria and the former Soviet Union
1973†	Syrian Tabqa dam completed		
1974–1975†§		Filling period Keban dam	Iraq vs. Syria mediated by the Soviet Union and Arab countries
1975–1976†§		Filling period Tabqa dam • Iraq threatened to bomb the dam • Troops massed on mutual borders	
1976‡	Unofficial deal reached with intervention of Saudi Arabia. Syria will keep 40% of water and allow 60% to flow to Iraq		Iraq and Syria
1980‡	Establishment of the Joint Technical Committee on Regional Waters		Turkey and Iraq
1983‡	Syria's inclusion into the committee¶		Turkey, Syria, and Iraq
1986§	Minimum release of 500 m <sup>3</sup> s <sup>-1</sup> (filling period Karakaya Dam in Turkey)		Turkey and Iraq
1987§	Minimum release of 500 m <sup>3</sup> s <sup>-1</sup> at Turkish–Syrian border (during the filling period of Ataturk Dam in Turkey)		Turkey and Syria
1990§	Proportional shares for Syria (42%) and Iraq (58%) from Turkish release		Syria and Iraq
1991§		700 m <sup>3</sup> s <sup>-1</sup> instead of 500 m <sup>3</sup> s <sup>-1</sup> Date and duration time of filling period Ataturk dam; minimum release not ensured	Syria/Iraq vs. Turkey Iraq/Syria vs. Turkey
1995–1996§		Birecik dam	Syria/Iraq, Arab League vs. Turkey

† Kaya, 1998.

‡ Larko'lu and Eder, 1998.

§ Scheumann, 1998.

¶ The JWC faced difficulties handling issues on its held meetings in Ankara, Baghdad, and Damascus. The completion of the Ataturk Dam led to conflicts and the eventual dismissal of the committee.

of the needs of other involved parties, the environment, or actual basin capacity (Chalabi and Majzoub, 1995).

### *Conflict over the Orontes (Asi) River*

The first conflict between Turkey and Syria was over the Orontes River (Asi in Arabic and Asi Nehri in Turkish) that arose when Syria applied for World Bank loans to build its Ghab Valley Project in the 1950s. Despite Syria's subsequent withdrawal of its request, the Orontes River remained a sensitive issue between the two countries (Çarkođlu and Eder, 1998).

The Orontes (Asi) River rises in Lebanon, and flows northward through Syria and Turkey through the Hatay Province<sup>2</sup> to discharge into the Mediterranean Sea. It flows 40 km in Lebanon, 120 km in Syria, and 88 km in Turkey. Its annual runoff at the boundary between Turkey and Syria is estimated to be about 1.2 BCM (Turkish Ministry of Foreign Affairs, 2001). To obtain water for irrigation, two water regulators have been placed in Lebanon on the Orontes and one regulator in the Syrian town of Jisr-Al-Sughur. There are also two Syrian dams on the Asi, the Destan and Maherde (Turkish Embassy, 2001).

Syria, the upstream country in this case, started with the construction of a dam in 1956 to provide water for irrigation. Turkey blames Syria for using up to 90% of the Orontes' flow, leaving none for Turkish farmers (Chalabi and Majzoub, 1995; Dolatyar and Gray, 2000). Turkey states that the Orontes

<sup>2</sup> Also known as Arab Iskanderun to the Arabs. Located at the Syrian–Turkish border, there has long been a territorial dispute between the two countries over this area.

water that actually enters Turkey is reduced to a mere 120 million cubic meters (MCM), due to excessive Syrian extraction, and that the construction of another two planned reservoirs threatens to further reduce this value to 25 MCM per year (Turkish Ministry of Foreign Affairs, 2001). Turkey also blames Syria for being cooperative only with Lebanon<sup>3</sup> on the issue of the Orontes river, although Syria claims to have continually negotiated with both Lebanon and Turkey (Kor, 1997).

The Orontes' issue remains disputed: Turkey wants it to be part of the Euphrates' negotiations, while Syria strictly refuses, since Syria still denies Turkey's right to the Hatay province, through which the Orontes passes (Çarkođlu and Eder, 1998).

### *Conflict over the Southeastern Anatolia Project (GAP)*

Syria and Iraq initiated a financial campaign against the upstream Turkish projects by securing an international financial blockade on the Southeastern Anatolia Project<sup>4</sup> (GAP). They managed to make Turkey bear the huge cost of its major projects without external funding (\$32 billion (U.S.) to date) by convincing the World Bank that it should not finance GAP

<sup>3</sup> Syria and Lebanon made an agreement on 20 Sept. 1994, according to which Lebanon is allowed to use 80 MCM of water from the Orontes River (Turkish Embassy, 2001).

<sup>4</sup> The Southeastern Anatolia Project (GAP), initiated in 1977, is the largest multisectoral integrated regional development complex in Turkey, lying at the lower reaches of the Euphrates and the Tigris Rivers. It involves the construction of 22 dams and 19 hydropower plants on the Euphrates and Tigris Rivers and an irrigation network for 1 693 027 ha of land. Out of the planned dams on the Euphrates, three are currently in operation, namely the Keban, Karakaya, and Attaturk dams (Altinbilek and Akcakoca, 1997; Bagis, 1997).

until Turkey works out a riparian treaty. This reflected negatively on the Turkish national economy and forced Turkey to postpone the implementation of the full project for at least 30 yr (Dolatyar and Gray, 2000).

The GAP Project provides the best example of Turkish developments that have increasingly threatened to diminish and even eliminate water access to its neighbors, despite the signed protocol of 1987 that ensures Syrian access to Euphrates water. Once fully operational, the GAP project would reduce the Euphrates water flow to Syria by 40% and to Iraq by up to 80% (Berman and Wihbey, 1999). This reduction threatens the continuity of Syria's irrigation programs and sufficiency of water levels in the Assad Lake that are necessary for the sustainable production of hydroelectricity (Kor, 1997).

Turkey stepped up the development of the GAP project in the 1980s. Turkey also shifted the emphasis of the project from mere hydroelectric use of water to integrated regional development, encompassing other economic and social improvements such as transportation, industrial employment opportunities, and improved education and health services. These new dimensions enlarged the scope and heightened the intensity of the conflict (Kaya, 1998; Çarkođlu and Eder, 1998).

Syria regards the GAP project as a threat to its agricultural and energy projects, while Iraq accuses Turkey of infringing on its acquired historical rights by utilizing more water than it is entitled to use (Newspot, 1997). In response, Turkey asserts that it has increased the flow before the filling of the dam, whereby the total amount released—when averaged over a period of a few weeks—exceeded the minimum water obligation to Syria. Turkey also claims that the cutoff did not affect the flow from tributaries entering the Euphrates below the dam (The Estimate, 1998).

### ***Conflict over the Kurdish Workers' Party***

Syrian vulnerability to Turkish control of upstream resources is further complicated by Syria's sustained support of the uprising Kurdish Workers' Party (PKK), a fact that has recently led Turkey to threaten a blockage of water (Berman and Wihbey, 1999). The conflict over the Kurds is the latest outstanding conflict dimension, whose stirring may be attributed either to the Syrian attempt to offset Turkish supremacy in other domains or to Syria's frustration at Turkey's unwillingness to commit to a written minimum flow commitment (The Estimate, 1998; Turkey Update, 1998). This conflict dimension is critical since >30 000 Turks have died in pursuit of an independent Kurdish state (The Wall Street Journal Europe, 1998).

While Iraq has also been involved in the past in supporting the PKK, it is Syria's involvement with the Kurdish group that infuriates and threatens the Turks (The Estimate, 1998). In this context, Turkey and Syria argue over three major points. First is Syria's support for the Kurdish rebels of the PKK in general. Second is the fact that the PKK leader Abdallah Ocalan<sup>5</sup> has long resided in Damascus, although Turkey insists he should be handed over for trial. Finally, Turkey demands the immediate closure of all training camps and sus-

<sup>5</sup> Finally, Abdallah Ocalan was apprehended by the Turks in Nairobi, Kenya on 15 Feb. 1999 and sentenced to death in a Turkish court. The Turkish government agreed to postpone carrying out the death sentence pending a ruling by the European Court of Human Rights on the appeal of Ocalan.

pension of all logistical and/or financial support for the guerillas (Turkey Update, 1998). It is worth mentioning, however, that there have been few if any clear instances of Kurdish operations occurring over the Syrian-Turkish border; almost all strikes originated in Iraq (The Estimate, 1998).

Syria denies Turkey's accusations of being a key source of support for the PKK; Turkey insists that Syria plays a vital role in financing and equipping the party and that it houses training camps in Syria as well as in the Lebanese Beqa'a Valley, over which Syria has effective control. In an agreement signed by both parties in October 1998, Syria agreed to close the Lebanese and Syrian training camps, prevent Ocalan from returning to Syria from his stay in Moscow, prevent all cross-border operations, and stop all forms of support to the PKK. However, Turkey remains skeptical of Syria's adherence to the treaty (The Estimate, 1998).

### **International or Turkish Waters?**

In short, the Arab-Turkish dispute over the legal status of the Euphrates' and Tigris' waters revolves around the following: Syria and Iraq regard these rivers as international, and thus, claim a share of their waters. Turkey, in contrast, refuses to concede the international character of these two rivers and only speaks of the rational utilization of trans-boundary waters. Furthermore, Turkey considers the unlimited use of these waters according to its needs as its natural right.

### ***The Syrian Perspective***

Syria claims historical rights to the rivers' waters based on ancient use (Kor, 1997). Syria declares that the Tigris and Euphrates Rivers are international watercourses that must be shared and proposes a simple formula<sup>6</sup> to resolve the issue (Newspot, 1997). The Syrians argue that there is a clear contradiction in Turkey's behavior in connection with settling the water question with Syria and Iraq. Sometimes Turkey regards the Tigris and Euphrates Rivers as international waters to be shared, and at other times it considers them Turkish waters. Moreover, Turkey offers technical solutions for the management of the two rivers according to its own conception of the rational usage of water. Turkey does not acknowledge the Syrian or Iraqi rights to these rivers (Arabic News, 1997). According to Syria, Turkey has violated long established international rules by disregarding the rights of other countries sharing the same river to use international river waters. Turkey has also violated the principle of "not harming others" through the construction of huge dams on both rivers, regardless of Syrian or Iraqi rights or needs in that respect. Syria also contends that Turkey misunderstood the principle of "notification," which represents the minimum level of necessary cooperation to avoid disputes (Arabic News, 1997). Further, Syria advocates a role for the UN in all negotiations and requests that the International Law Commission's studies be fi-

<sup>6</sup> Syria's mathematical formula foresees that:

- Each riparian State shall declare its demands on each river separately.
- The capacities of both rivers in each riparian State shall be calculated.
- If the total demand does not exceed the total supply, the water shall be shared according to stated figures.
- In case the total demand of water, declared by the three riparians, exceeds the water potential of a given river, the exceeding amount should be deducted proportionally from the demand of each riparian state (Kor, 1997).

**Table 5. Per capita surface water in the Euphrates–Tigris Basin.**

States	Total water/year	Population	Annual per capita water
	BCM†‡	millions§	m <sup>3</sup>
Turkey	100	65.7	1522
Syria	23	16.3	1411
Iraq	91.2	22.7	4017

† BCM = billion cubic meters.

‡ Bagis, 1997.

§ CIA, 2000.

nalized and strict rules and regulations be established (Kor, 1997).

### The Iraqi Perspective

Iraq claims that it possesses acquired historical rights to the waters of the Euphrates and Tigris that date back thousands of years (Newspot, 1997). The Iraqi attitude of the late 1990s may be characterized as somewhat calmer, due to Iraq's relative autonomy with respect to its access to the Tigris waters. This situation may not last, however, because Turkish acquisition efforts are expected to focus on the Tigris River water in the near future (Berman and Wihbey, 1999). Maintaining a low profile has, to date, served Iraq's interests in the best manner. This has been the case for three major reasons: (i) Iraq always had a Kurdish problem of its own; (ii) Iraq was engaged in an intense war with Iran in the 1980s; and finally (iii) Iraq had to remain on good terms with Turkey to market its oil to the west after the Gulf War (Dolatyar and Gray, 2000).

### The Turkish Perspective

Turkey acknowledges that it has more water than its neighboring countries, however, it claims that it will barely be able to meet its own needs in the near future. According to the Turks, the claim that Turkey is the region's richest country in water resources is greatly exaggerated; out of 186 BCM annual runoff, only 110 BCM are utilizable, due to various water losses. Turkey compares its available water per capita (1522 m<sup>3</sup> yr<sup>-1</sup>; Table 5) to that of the water-rich countries, which typically possess 8000 to 10 000 m<sup>3</sup> yr<sup>-1</sup>, to substantiate its claim of adequate vs. ample water supply. Further, Turkey focuses on its inability to fully utilize its available water whereby it uses only 25.9 of the 110 BCM available due to technological, topographical, and geological constraints (Bagis, 1997; Newspot, 1997; Tomanbay, 2000; Dolatyar and Gray, 2000).

Furthermore, to support its position, Turkey repeatedly compares its water rights to the Arab oil rights. Turkey's Minister of State, Kamran Inan, claims that Turkey possesses the same right to the waters of the Euphrates and the Tigris as the Arabs do their oil.

From the moment that Saudi Arabia stopped giving away its oil, Turkey could no longer regard its water as a present to be given away for free. The Turks do not claim Arab oil but they (the Arabs) claim our water. The Euphrates truly is a Turkish asset.

Colonel Alpasian Turkes

Turkey, in this sense, acknowledges the right of a country to a resource that originates within its territory, as in the Arab's right to their oil, and thus regards the Euphrates and Tigris Rivers, which have their sources in Turkey, as natural Turk-

ish rights. Turkey argues that it is already sharing its water with the Arabs without a legal obligation to do so (Chalabi and Majzoub, 1995).

In response to the Arabs' claim that the rivers are international, Turkey argues that the so-called *acquired rights* claimed by Syria to the *international* watercourses of the Euphrates and Tigris do not carry much weight when applied to water shared by several countries. This is due to the numerous factors influencing decisions of this nature. Turkey also rejects the use of any kind of mathematical formula for water allocation by appealing to the Report of the International Law Commission of the UN to the General Assembly on shared natural resources, which does not include phrases like "sharing common resources through a mathematical formula" (Newspot, 1997).

In contrast, Turkey recognizes the principle of *equitable utilization*, as determined by international law, for the allocation of shared water sources as the most acceptable, since it accounts for socioeconomic, geopolitical, and hydrologic factors. Turkey insists that water supplies have not been used to exert pressure on Syria and Iraq, and emphasizes the necessity of common criteria for the use of water from the Euphrates and Tigris Rivers. Accordingly, Turkey proposed to both Syria and Iraq that the equitable usage of water supplies be based on inventory studies by all three countries of their land and irrigation needs, evaluation, and information sharing. These shared scientific studies, designed to assess the real needs of the involved countries, are in Turkey's opinion, the sole means to achieve *equitable* or rational utilization of regional water supplies (Newspot, 1997).

Turkey criticizes the way Iraq and Syria have mutually agreed on the volume of water that each wants to receive. With respect to the demanded flow of 700 m<sup>3</sup> s<sup>-1</sup>, Turkey claims that a 500 m<sup>3</sup> s<sup>-1</sup> flow would be more than sufficient for the irrigation needs of Syria and Iraq, especially because the Syrians, claims Turkey, are wasting much of the 500 m<sup>3</sup> s<sup>-1</sup> anyway (According to Turkey, Syria requires only 250 m<sup>3</sup> s<sup>-1</sup>). In addition, Turkey directs Iraq to settle its water problem with Syria before negotiating with Turkey, since the Euphrates comes to Iraq after flowing through Syria (Chalabi and Majzoub, 1995).

## THE LEGAL ASPECT

In theory, water conflicts may be resolved through the application of international water laws that address the basic interests of the international community. These include the maintenance of international peace and security; development of friendly relations among riparian states; achievement of international cooperation on economic, social, and cultural problems; sovereign equality of all member states; and peaceful settlement of disputes. Nonetheless, the application of international laws is limited, since they tend to lack clarity and enforceability, and thus may be rendered ineffective when a nation ignores, or is not party to, the laws in question. Historically, upstream and downstream riparian states have advocated extreme and self-interested theories as outlined below.

### International Rivers Law

#### General Principles

Despite the urgent nature of the global water problems, the international law of water resources still lacks in maturity and



**Table 6. General principles of International law, implications, and advocates.**

Principle	Statement	Characteristics/implications	Adopted by	Riparian position
Absolute territorial sovereignty (Harmon Doctrine)	A state may freely utilize waters flowing over its territory, regardless of the adverse effects on other states.	Conflicts with principles of international law pertaining to the responsibility of states for acts committed on their territory, that may be harmful to other states	Turkey	Turkey is not obliged to share the waters of the Turkish Euphrates and Tigris Rivers with its Arab neighbors.
Absolute territorial integrity	A riparian state is forbidden from utilizing its waters to alter the course, flow rate, volume, or quality of the water delivered to the downstream state(s).	Favors downstream riparian states Implies that no state has the right to change the natural flow of a river in a manner that will negatively impact the downstream state(s) Prevents development by upstream state	Syria	Syria asks for a fair allocation of the rivers' waters, referring to the catastrophes that would result if every country were to diverge the stream of rivers originating on its territory.
Limited territorial sovereignty	A watercourse state can freely utilize waters flowing through its territory, provided that this use will not be harmful to the reasonable utilization of water by other watercourse states.	Prevailing theory in international law Sanctioned by doctrines of conventional law and supported by decisions of international tribunals, state practice, and a vast majority of international jurists An agreement remains necessary since limitations on sovereignty can only be voluntary	Iraq	Iraq claims its ancient right to the Euphrates and Tigris waters.
Community of coriparian states	The development of an integrated program for the entire watercourse system without the limits of political borders is recommended.	Accounts for interests of all riparian states through ensuring optimal water utilization Not legally binding in contemporary international law		

sophistication. The determination of the specific rights and obligations of riparian states requires that general principles apply to international rivers. These would also serve to resolve the issues of apportionment, consumption, and conservation of the waters flowing in these rivers. Four basic principles regarding the utilization of international fluvial waters have been formulated and are summarized in Table 6 (Chalabi and Majzoub, 1995; Hirsch and Housen-Couriel, 1993; Dolatyar and Gray, 2000).

In 1997, the UN General Assembly approved the Convention on the Law of the Non-Navigational Uses of International Watercourses<sup>7</sup>; that Convention included provisions on their protection, preservation, and management. The Convention does not provide definitive rules for water allocation, but rather lists several factors to be considered and adapted to specific local conditions. Preservation addresses the uses that lead to the water quality degradation due to various environmental factors such as erosion and sedimentation. Syria was in favor of the principles set forth by the Convention, while Turkey rejected it because of objections to its prologue as well as specific articles which Turkey asserted created an inequality between states and did not establish the dominance of equitable and reasonable utilization over the obligation not to cause significant harm (United Nations, 1997; Shumueli and Shamir, 2001).

<sup>7</sup> This convention was concluded within the United Nations Economic Commission for Europe (ECE), signed at Helsinki on 17 Mar. 1992, and entered into force in late 1996. There is also a valuable work by the International Law Association (1967), which was published as: Helsinki Rules on the uses of the Waters of International Rivers (Dolatyar and Gray, 2000). Widely adopted principles of the Framework Convention include (Turkish Ministry of Foreign Affairs, 2001):

**Article 5:** Trans-boundary rivers should be used in an equitable, reasonable, and optimum manner.

**Article 6:** Equity does not mean equal distribution. It rather depends on a wide range of factors that have to be taken into consideration.

**Article 7:** Individual watercourse states must exercise due diligence to make sure that they do not inflict significant harm to others.

**Articles 8 and 9:** Cooperation and the regular exchange of information between riparian states is vital.

### *Allocation of the Waters of International Rivers*

Ideally, waters of international rivers are to be shared *equitably* and *reasonably* among the riparian countries. This requires the consideration of various factors relating to the international watercourse, as stipulated by the Helsinki Rules<sup>8</sup> and the 1997 UN Convention on the Law of the Non-Navigational Uses of International Watercourses. These international Laws proposed the equitable and reasonable allocation of water, taking into account various factors including: (i) natural physical factors such as climate, geographic, hydrographic, and hydrologic factors; (ii) social and economic needs and gains of each watercourse state; (iii) population; (iv) past and present utilization, existing and potential use of the water; (v) the extent to which the needs of a riparian state can be met without significant damage to others; (vi) the availability of alternatives along with their respective value and cost; (vii) practicability of compensation in case of dispute; and (viii) how the needs of one riparian state may be fulfilled with minimal injury to another riparian state (Hirsch and Housen-Couriel, 1993; Kaya, 1998). While these rules are widely accepted and have a broad scope, they are still not binding in international law. They are simply articles that have been adopted by the International Law Association (Kaya, 1998).

### **International Rivers Law in the Euphrates–Tigris Case**

Syria and Iraq argue that current utilization of water must be distributed in accordance with the second principle of the Helsinki Rules, namely that “prior use determines water rights.” Both countries call for the estimation of the total potential water supply of each river and for comparing this total to the total water quantity demanded by the riparian states. If the total demand were to exceed the total supply of a particular river, which is very likely, the surplus would be deducted proportionally from the demand of each riparian state (Kaya, 1998).

<sup>8</sup>Adopted by the International Law Association (ILA) in 1966, which proposed that international waters have to be shared equitably and reasonably (Kaya, 1998).

From a Turkish perspective, the approach adopted by Iraq and Syria allows them to determine their own water requirements without external verification, which may lead to inflated demands that aim at the gain of additional water. Moreover, Turkey regards their position as strictly reflective of the theory of territorial integrity, which is not accepted by the rule of international law. According to Turkey, it has offered, since 1984, a “three-staged plan for optimal, equitable and reasonable utilization of the transboundary watercourses of the Euphrates–Tigris Basin” (Turkish Ministry of Foreign Affairs, 2001). This plan proposes the joining of all riparian states to achieve inventory studies for water resources (Stage 1), inventory studies for land resources (Stage 2), and evaluate water and land resources (Stage 3). This would lead to the accurate compilation of data, upon which proposed projects could be evaluated on the basis of their economic and social advantages. The most beneficial projects could then be implemented. In Turkey’s view, the three-staged plan conforms to the principle of equitable utilization by considering the basin as a whole system, underlining the interdependence of its elements, as required by the UN Watercourses Convention. However, Turkey fails to acknowledge the limited resources of some riparian states, which would be placed at a disadvantage in conducting these inventories, incurring substantial economic costs.

### THE DECISION

The sensitive conflict over the equitable allocation of the Euphrates–Tigris waters represents one of the most controversial issues in the history of the Middle East. Turkey regards the Euphrates and Tigris Rivers as strictly Turkish waters, whereas Syria and Iraq view them as international rivers whose waters are to be shared, claiming historical use rights. Based on the presented information, the international committee needs to develop a set of strategies for the resolution of the water conflict issue. The negotiations are to be held at an international level, and thus, decisions—which should consider the economic, environmental, political, and technical aspects of the three involved parties as well as forecasted shortages—are to be firmly implemented and respected. What strategies would the committee suggest for the resolution of the conflict?

### TEACHING NOTE

#### Case Objectives

This case study presents a contemporary and predominant conflict issue in the Middle East, which may threaten the stability of the region. The case should allow students to:

- Gain familiarity with the water status in the Middle East, especially with respect to the Euphrates–Tigris Basin
- Understand the various underlying factors of the water-related conflict in the framework of the Turkey–Syria–Iraq historical–political quarrel
- Recognize the interrelation between natural resources and politics
- Enhance their skills and objectivity in tackling sensitive sociopolitical water resources issues
- Recognize and review international laws and regulations related to cross-boundary waters

- Identify potential approaches to be adopted in water scarcity cases
- Define and evaluate implementation strategies for cooperation among conflicting nations

### Uses of the Case

This case primarily targets senior and graduate level students in natural and water resources management and environmental engineering and science. However, other students in political sciences, social studies, agricultural sciences, or related fields may find it equally beneficial. Students will employ crucial decision-making skills to link the scientific and sociopolitical components of the case. The case, based on region-specific data and historical events, provides students with an opportunity to study and evaluate water resources management in a water-scarce region. The extensive social and political considerations play a major role in this case due to the historical and long-standing conflict among the populations involved.

### Implementation of the Case

Given the delicate sociopolitical aspects of the case, scientific objectivity is vital in the implementation of this case. It is helpful if students are briefly introduced to the history of the Turkish–Syrian–Iraqi political conflict before being exposed to the case. Numerous books have been written in this regard and much information can be found on the Internet. The case was used in a graduate-level course on environmental case studies and conflict resolution at the American University of Beirut. The class was composed primarily of environmental science students with diverse backgrounds (chemistry, geology, physics, civil engineering, ecosystem management, and environmental education). Invariably, the feedback of students was important; in fact, their input was used to improve on the case and refine certain questions.

Case studies can be used in a variety of ways in a classroom setting (Herreid, 1994),<sup>9</sup> but the implementation should be appropriate to the background of the students and the objectives of the course. This particular case lends itself to role-playing whereby students assume the role of opponents or supporters of Turkish, Syrian, or Iraqi views. An outside panel totally unfamiliar with the case could be invited to listen to the debate and make a decision based on the arguments presented by the students. Role-playing offers the advantage of developing analytical skills, practicing public speaking, and promoting awareness of socioeconomic, political, and cultural constraints.

### DISCUSSION QUESTIONS

**1. What are the common drivers of freshwater conflict?** Freshwater is vital for food security and socioeconomic de-

<sup>9</sup> Case studies can be used in a variety of ways: (i) assign the case as outside reading, followed by a general class discussion with a decision that needs to be reached with the corresponding justification; (ii) require written reports for grading purposes and after correcting the reports, discuss the answers in class in the context of actual events and what the final decision could be; (iii) read the case in class (about a 3-h class, the case would be too long for a 1-h session) and then discuss all or selected questions, either as a whole class or in small groups. Although the latter approach requires the least amount of class time, it also provides the least chance for students to reflect on the issues raised in the case.



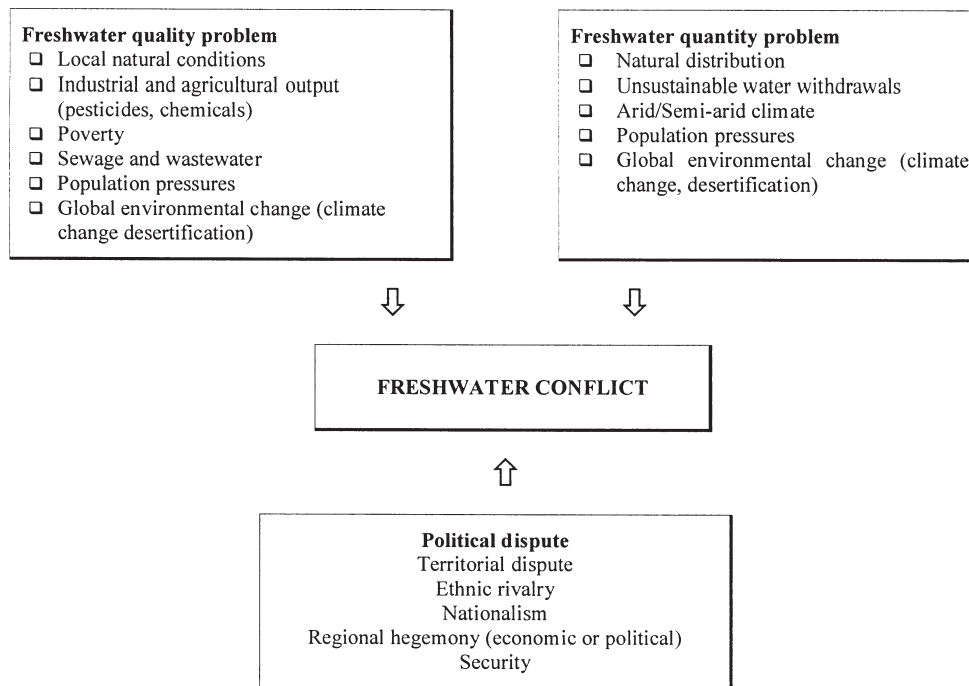


Fig. 2. Drivers of freshwater conflict (Samson and Charrier, 1997).

velopment. Due to water’s uneven spatial and temporal distribution, issues of its accessibility and quality represent significant driving forces behind conflict, the type and severity of which depends on the nature of the region. International freshwater conflicts are multidimensional, including ecological, technical, economic, and political drivers as shown in Fig. 2 (Samson and Charrier, 1997).

**2. Does the Euphrates–Tigris represent international or trans-boundary waters?** According to the definition of the *international river basins* contained in Article 2B of the UN Convention, an “international watercourse means a watercourse parts of which are situated in different states.” According to the Helsinki Convention and to the Permanent Court of International Justice, an “international river is a watercourse that separates or crosses the territories of several states” (Dolatyar and Gray, 2000). The Turkish definition of an international river as one that has its opposing banks under the sovereignty of different countries renders both rivers trans-boundary rather than international (Chalabi and Majzoub, 1995). It is evident that the latter definition of an international river is not in accordance with the former two.

**3. Is Turkey (the upstream country) harming Syria and Iraq by the GAP project?** The extensive development projects undertaken by Turkey on the upstream side of the Euphrates decreased the water share of Syria and Iraq, regardless of the latter’s consumption patterns. However, Turkey can argue that it was providing Syria and Iraq with more water than they required from the start. The adoption of the principle of optimal and sustainable utilization allows the upstream country additional power due to the absence of a clear definition of acceptable harm.

**4. What arguments are presented by each party in defending its water rights?** Table 7 outlines the main arguments

presented by Syria, Iraq, and Turkey with respect to defending their water rights.

**5. How should water scarcity issues in the Middle East be approached?** Water scarcity issues in the Middle East may be approached from several perspectives, at least including security, economic, legal, technological, and environmental (Dolatyar and Gray, 2000).

First, water is a natural resource that is often regarded as a source of power, since it is often linked with national security, socioeconomic development, and political influence. This perspective explains the insecurities of Syria and Iraq since they receive less water from the Euphrates than Turkey. On the other hand, this also clarifies Turkey’s resort to military threats for the protection and control of its water resources.

Second, economists often argue that water scarcity is basically an economic problem, which will be alleviated if nations treat water as an economic asset (through market mechanisms). Water marketing, however, may be problematic for agricultural workers. Moreover, the establishment of markets in the near term may threaten further instability in the area since it may seem unfair to the involved riparian countries, given the different social and economic status of their peoples.

Third, the root cause of the water crisis is the absence of proper international agreements among riparian countries that clearly define the system of property rights. The situation may be resolved by establishing water rights at the national and international levels, as well as the development of a legally binding agreement.

Fourth, the technological optimists advocate that the water scarcity problems are best solved by technological management of water resources, which eliminates the whole idea of shortages of these resources. Again, this may not be applica-

**Table 7. Arguments presented by each party defending its water rights.**

Syria	Iraq	Turkey
Allocation of water should be according to a mathematical formula.	Allocation of water should be according to a mathematical formula.	Rejects the use of mathematical formulas by appealing to the International Law Commission.
Water management should not take place according to Turkey's conception of rational usage. Claims historic rights based on ancient use.	Claims historic acquired rights to the Euphrates and Tigris waters.	Claims that the acquired rights argument does not carry much weight due to the complexity of contributing factors.
Contradiction in Turkey's characterization of the water (Turkish vs. International).	Somewhat calm attitude due to its relative autonomy provided by current access to the Tigris.	Proposes equitable water use based on inventory studies by all three countries.
Turkey violated the principle of no harm by constructing its dams.	Prefers to maintain good relations with Turkey to be able to market its oil to the west.	Criticizes the manner in which Iraq and Syria have mutually agreed on the amounts of water they want to receive.
Turkey violated the international rule allowing riparian countries to share international waters.	Prefers to maintain good relations with Syria, due to its own Kurdish problem.	Justifies the decreased flow to the downstream countries by addressing their inefficient water systems, which cause losses anyway.
Turkey misunderstands the principle of notification.		The downstream countries were notified and flows were increased for 2 months before dam filling. Compares its water to the Arabs' oil, on which there is no legal obligation to share. Acknowledges its relatively ample supplies, but claims it is not water rich and will face water scarcity in the near future. Claims its water seems ample due to incomplete utilization.

ble due to discrepancies in agricultural practices and irrigation techniques adopted by Turkey, Syria, and especially Iraq, which is unable to apply advanced water resources management techniques due to economic damages ensuing from the Gulf War.

Finally, water crisis is viewed as part of the whole environmental crisis, where the notions of limits to growth, sustainable development, and environmental security are introduced. From this perspective, water scarcity is an environmental problem that emanates from misguided conduct toward nature and unsustainable policies for exploitation of this resource.

Resorting to military, economic, legal, or technological solutions not only cannot solve the problem but also exacerbates the predicament. The solution is to understand the limits to growth of the eco-geographical regions to create sustainable societies.

**6. What is the effect of political factors on the water conflict?** The water conflict in the Euphrates–Tigris Basin is not an autonomous issue; rather, it is the product of different causes that are not directly related to water scarcity in the strict sense.

The three riparian states are at odds with each other for various reasons including:

- The historical territorial disputes between Turkey and Syria over the Hatay province (Arab Iskenderun).
- Internal problems of Turkey and Iraq concerning the Kurdish conflict with the respective governments.
- The typical East–West rivalry, whereby Syria was historically backed by the Soviets and Turkey by the Americans.
- External influences and international politics (Israeli–Turkish vs. Syrian–Iranian alliances).
- The continuous competition for leadership in the area (Iraq, Syria, Turkey, Israel, and Egypt).
- National safety and border protection.
- The historical friction resulting from Turkey's oppressive rule of the Arab world under the Ottoman regime.

- The perceived betrayal during World War I, whereby the Arabs sided with the allies against Turkey and the Central powers.
- Differences in religious sects, which constitute another source of friction, are often exploited by the riparian states. Sunnites are predominant in Turkey, Shiites are becoming predominant in Iraq, although the Sunnites are presently in power, and Sunnites are predominant in Syria; however, the minority Alawites are presently in power.

In conclusion, the lack of cooperation and trust between these riparian countries in their hydro policies is not necessarily the outcome of water shortages only. There is no acute water shortage and there remains a high potential for water savings within the agricultural sectors of all riparian states. This may ease the pressure on the resource but definitely not the tensions.

**7. An important dimension of the problem that is not adequately addressed in water conflicts is the environmental damage that may occur due to dam construction. Discuss these implications further.** Major environmental impacts associated with the construction of dams and increased drainage schemes are presented in Table 8. In less than a decade, one of the world's largest and most significant wetland ecosystems has completely collapsed and turned into fragmented parcels surrounded by drained spaces and barren land. Unless urgent remedial action is taken, the remaining traces of the marshlands are likely to dry up. This has far-reaching implications since the Euphrates–Tigris Basin is the largest river system draining into the Persian Gulf; reducing discharge and changing river flow patterns and quality will also impact the marine environment in the northwestern Gulf (UNEP, 2001).

**8. How may the conflict be resolved?** Resolving the Euphrates–Tigris Basin conflict is best promoted through a comprehensive and integrated regional plan for cooperation concerning water resources. This plan should involve negotiations among the involved parties to reach an agreement on equitable

**Table 8. Environmental impacts due to increased dam construction and drainage schemes.**

Impact	Description
Regional climate change	Potential sharp decrease in evaporation and humidity rates, which will modify rainfall patterns. Increase in temperature, particularly during the summer. Wind-blown dust laced with salt crusts, exposed soils, and impurities will increase, affecting large areas and resulting in environmental degradation. Negative impacts on human health will occur due to water scarcity and pollution, as well as increased exposure to thermal extremes and potentially toxic dust storms.
Habitat loss	Arable lands surrounding the former marshlands are expected to suffer from land degradation and desertification due to wind erosion and sand encroachment. Comparative analysis of Landsat imagery from 1973 to 1976 and 2000 showed that a total of 7600 km <sup>2</sup> of primary wetlands, excluding the seasonal and temporary flooded areas, have disappeared.
Wildlife decline and extinction	Destruction of the wetlands would lead to the global extinction of several species including the smooth coated otter, the bandicoot rat, and the endemic Babel. The marshlands serve as a staging and wintering area for migratory birds on the Western Siberia–Caspian–Nile flyway. Hence, the effects of desiccation are being felt from the Arctic to southern Africa; 66 species of birds that occurred in the marshlands in internationally significant numbers are at risk. Coastal fisheries in the northern Persian Gulf will be affected with potentially serious consequences; for example, 40% of Kuwait's shrimp catch originates from the marshes.
Refugees	Marsh Arabs were forced to flee from their homes as the marshlands began to rapidly dry out in the beginning of the 1990s. An estimated 200 000 to 250 000 Iraqis were internally displaced.

utilization and protection of the Basin's water resources. Due to the complexity of the intervening factors, any solution would require the establishment of an independent party—preferably a legal institution—to encourage the riparian countries to abide by its decisions. This committee should comprise various members representing all involved states and would optimally include the states' foreign ministers, members of the UN, scientists, and NGO intermediaries to ensure objectivity in decision-making. Furthermore, each riparian state would have to reinforce its legislation on water issues to ensure the implementation of the remaining components of the regional plan, including public awareness campaigns on regional water issues. In this context, several cooperative measures may be taken:

- Awareness building through an easily accessible interactive medium, which reports accurate, unbiased, and informed details. This would aid in expanding the knowledge base of decision-makers for achieving wise natural resources management, stressing the water scarcity issue, and exposing the population to the cost of producing, treating, and distributing water to achieve wise water utilization. The resulting regional database also would aid in responding to emerging water conditions and changes.
- Promotion of multisectoral partnerships among governments, international organizations, NGOs, local groups, business, industry, and academic institutions. This would aid in the formation of a specialized institution for the joint management of water resources and allow for the consideration of all perspectives on the issue.
- Rationalization of water sharing by the UN through the development of more flexible allocation mechanisms. This would encourage the development of cooperative water management plans, promote regional water security, and alleviate fears among the riparian states.
- Integrated assessment or management programs that are sociotechnical in nature and which target not only humans, but also the ecosystem in general.
- Implementation of strategies and formal agreements by making them legally binding. These strategies may include altering the types of crops grown and/or irrigation systems, inspecting the water losses of the different systems, ensuring efficiency of technical and managerial interventions, and

confirming the riparian states' abidance by their allocated share through direct systematic monitoring.

- Exchange of demand management practices among the riparian countries for the optimization of water use. Reducing water demand in turn reduces water scarcity and thus the potential for water conflicts. Practices involve the conservation and appropriate utilization of water supplies through monitoring for leakage to minimize water losses in distribution systems and improving the efficiency of existing irrigation systems (i.e., drip, sprinkler, and automation). Other measures that may be adopted consist of reclaiming domestic and industrial effluents for irrigation purposes, adopting water saving efforts (cascading changes, cooling methods, and conserving water at the municipal level through decreasing losses due to unaccounted-for-water), and utilizing demand reducing kits (Arlosoroff, 1996).

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