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TRANSBOUNDARY WATERS AND TURKEY

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PREFACE

Water, which has been the most essential matter for mankind's survival since the beginning of its first existence, continues to be ever more important in our lives. Nothing is more indispensable than water in maintaining life on earth.

Water also plays an important role in socio-economic development of nations. Therefore, it is crucial to use water effectively without wastage, and to develop the water resources properly on the way to developing of the nations. Unfortunately, the continuing increase in the world population, the disturbance of the ecological balance due to environmental pollution, and the changes in precipitation and stream flow patterns due to global climate change have further increased the need for water. In fact, the situation is most threatening in arid and semi-arid regions of the world.

Both surface and ground waters may flow over several official boundaries between countries, following natural courses before reaching their final destination. As a result, watersheds, or catchment basins that may concern more than a single country have emerged. Today, 236 such watersheds world-wide are being shared between two or more countries, and they are referred to in the literature as "transboundary waters". The water body that is shared by the highest number of countries is Danube River with 17 riparian countries. These 236 transboundary waters serve about 50% of the world population settled in the lands that constitute 50% of the entire world. The transboundary ground waters (aquifers) are not even included in these figures. Hence, the likelihood of emergence of international conflicts over the transboundary waters is quite high. In order to minimize such conflicts, it will be necessary for the countries sharing the transboundary waters to collaborate towards the development of common projects for joint management of the water resources, for identification of real water needs over the entire watersheds, and for effective use of water.

Over the last century, the world population has tripled, the world-wide water needs increased by seven folds, and the irrigable lands enlarged by six folds. In contrast, usable water resources have decreased in magnitude due to increased pollution of the resources. Accordingly, the trend is towards a higher water demand compared to the availability of usable water. The usage of water for different purposes, its transboundary characteristics, and the seasonal and locational variations in the availability of water supply have created tension among the users of these water resources. The change in global climate further exasperates the problem.

The major reasons for increasing conflicts are withdrawal of ground waters, water pollution, construction of dams and other water storage facilities, decisions related to flooding, and deviations in water beds. Yet, these are not the only reasons for the disputes. Increasing population, reducing available water, power disparity, political, economic and cultural dependences, ideological differences, and countries' political structures all play a role in contributing to the tension.

Water-related disputes instigated by so many different factors beg for answers from technical experts. Particularly, hydrologists can play an important role towards resolving the disputes among the nations sharing the transboundary watersheds by determining the real water budget in these watersheds. Hence, the first step towards resolutions should start with developing good relations and professional contact among the hydrologists from the riparian countries. Hydrologists and other water professionals can evaluate the entire watershed as a whole and exchange and collaboratively assess information obtained as a result of research and observations of the watershed. Especially, sharing information during the periods of flood, spill over and drought conditions becomes vital in development of trust.

The riparian nations should pay attention to hydrologic inventory, the climate and morphology of the region, ground water resources, hydrogeology, soil characteristics, plant coverage, land use practices, rate of water withdrawal, wastewater discharge, and monitoring of quality and quantity of water resources. The distribution of hydrological conditions with respect to time and location should be recorded and the information should be shared among the riparian countries on order to understand the variations and stabilize them. The shared operation of the pollution control monitoring systems will help identify ecological impact and determine the common preventive measures to be taken.

It is obvious that bringing together the technical experts of the riparian countries to manage the jointly planned projects will contribute towards elimination and/or resolution of the disputes.

In addition, minimization of the disputes requires the water resources to be co-managed transparently by the riparian countries following a model jointly agreed upon. Particularly, hydrologists, ecologists, socio-economists and other groups from the riparian countries in arid regions should jointly play a role in the drawing up of such models. The involvement of technical experts in this role will ensure the application of scientific principles at the foundation of the models. Development of simple but sound models is important not only for management of water resources but also for operation of the water facilities.

Natural disasters such as flooding have the capability of bringing people of riparian nations together to move towards resolution of such problems. For this, both the upstream and downstream countries should be able to share the information obtained from early warning systems. Particularly, people living downstream should have access to the early warning systems in order to take the necessary precautions for protection of their livelihood. Another natural disaster that is opposite of flooding is drought. People living in arid regions may want to work together with the upstream riparian countries towards producing joint projects and to contribute financially towards the construction costs of facilities to alleviate drought conditions. To minimize the impact of the drought conditions, it is crucial to establish the management structure that will define optimum use of existing water and the necessary precautions to be taken. In addition, the riparian countries need to be notified about possible accidental pollution of water, damage to structures of dams, breakdown in wastewater treatment systems, etc., that might emerge during or after the natural disasters.

The fundamental reason behind water-related conflicts is water shortages. Therefore, the most effective precaution to be taken is saving existing water through its optimum use. Considering the fact that agriculture is the largest consumptive user of water, efforts in water savings should focus on this sector. For this, irrigational techniques with the least wastage should be applied, and salinization of the surface and ground waters should be minimized.

On 13 October 2008, Gebze Institute of Technology's Environmental Engineering Department organized a workshop titled "Transboundary Waters and Turkey". This workshop has aimed at shedding light to the problems expressed above by covering available scientific data, various applications in different countries and possible solutions towards resolving water conflicts on Transboundary Waters, which will also be a topic of discussion at the 5th World Water Forum to be held on 16-22 March 2009 in Istanbul. Technical experts and technocrats knowledgeable in this subject were invited to make oral presentations at this workshop. The subject of transboundary waters was covered from various angles, including national, international, legal, socio-economic, technical, hydro-politic and climatic dimensions. However, the opinions expressed at the workshop are solely those of the authors. The workshop was held at the conference halls of DSI 14th Regional Directorate Building, and for this we thank Mr. A Cuneyt Gerek, the Regional Director.

On behalf of the Organizing Committee
Prof. Dr. Mehmet Karpuzcu

INTERNATIONAL DIMENSION OF TRANSBOUNDARY WATERCOURSES

Yaşar Yakış

INTERNATIONAL DIMENSION OF TRANSBOUNDARY WATERCOURSES

Yaşar Yakış*

ABSTRACT

The global climate change affecting more or less all countries of the world and the drought caused in some regions by this climate change have increased the importance of the efficient and effective use of the world's water resources. As a recent example, one reason of the rise of the food prices and the consequent food crises in some countries is the decrease in the production due to drought effect. This situation forced Turkey to give higher priority to the water issues that are already very important for it.

1. INTRODUCTION

At the outset I would like to express my pleasure to address such a distinguished audience on the occasion of this meeting. It is a very appropriate initiative to have a debate in this meeting by the experts on the international dimension of Turkey's water. I therefore would like to congratulate the organizers of this meeting.

The world's water supply, which amounts 1,360,000,000 km^3, consists of seas and oceans (97%) and of fresh water (3%); and only 8% of the fresh water sources is used as potable water. Every year almost 40,000 km3 of water is transferred from the sea to the land by water cycle and this amount constitutes the world's renewable water resources. Almost the total of the water used in the world comes from the fresh water resources. 70% of the world's water supply is used in agriculture, 22% in industry and the remaining 8% is used for drinking and domestic purposes. As we can see, because of the inadequate water resources, high population growth rate and irrational use of the water resources, water will be the most important issue in the future.

This issue constitutes a problem for Turkey because of the limited water resources. Furthermore, because of the existence of the transboundary watercourses, water issues attain an international dimension. When Turkey's geographical location and its neighbours are taken into consideration, this dimension becomes all the more important.

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2. WATER RESOURCES IN TURKEY

Turkey is situated in a region that is poor in water resources. In countries such as Canada and Norway, which are considered as rich in water resources, the amount of water consumption per person per year for drinking and domestic purposes is 8 to 10 thousand m^3. This amount is 1,570 m^3 per person per year in Turkey and it may decrease in the future because Turkey is in the drought belt. This quantity is one fifth of the water potentials of the countries rich in water resources. However, when compared to Turkey's neighbours, it is higher than that of Syria and lower than that of Iraq and Georgia. Briefly, Turkey is considered richer in water supplies than some countries in the region, and is poorer than others.

When the factors such as the percentage of the size of hydroelectric energy in total power generation, urbanization and increase in population's needs and the growing demand for water in the agricultural sector of Turkey with a fast developing economy and industry are taken into consideration, the problem of the already limited resources becomes all the more important.

Turkey is the upstream country of the Euphrates and Tigris Rivers, which are the most important watercourses of the Middle East together with the Nile. But along with these two rivers that stand in the forefront because of their size, Turkey is also the upstream country for the Çoruh and Kura Rivers which flow to Georgia, and the Arax River that forms a border between Turkey and Armenia and which flows to Azerbaijan and its tributary the Arpatchai River, the Sarısu River that flows to Iran, the Zap River, Hezil and Şemdinli streams that flow to Iraq. Turkey is a downstream country for the River Maritsa and Tundzha that flows from Bulgaria and for the River Arda that flows from Greece as well as the River Orontes that flows from Syria.

Another important point about Turkey's water resources that has to be emphasized is the unbalanced distribution of the precipitations throughout the year and among the regions. The amount of yearly precipitation in the Eastern Black Sea region is estimated to be around 2500 mm/y. This amount decreases down to 230 mm in Central Anatolia. The flow of some rivers at dry periods moves very slowly, some rivers even dry out, some rivers in high precipitation periods tend to cause floods. Therefore, the flow of the watercourses is also very important for Turkey.

The picture that I have tried to depict shows how the issue and the water policies that will be followed and specially integrated water management policies are of multiple aspects from Turkey's standpoint. Turkey is in both an upstream and downstream country. Depending on the country compared to, in terms of resources, it can be

ranked as rich or poor at the same time. Water resources are regionally and periodically unevenly distributed. Because of these features, Turkey is not in a position to try to protect the interests of upstream countries and to ignore the interests of the downstream countries. Since Turkey's major problem is linked to the water of the Euphrates, it has significant stake in its capacity as an upstream country. Since, Turkey demands nothing more than what it is entitled to either as an upstream country or a downstream country, it has to pursue a policy that does not give up its legitimate interests in neither respects.

3. INTERNATIONAL ARRANGEMENTS

When we look at the international dimension of the matter, the outlook is as follows: the international arrangements that have been made so far pertain mainly to the purpose of the protection and management of the water resources. Besides it has to be admitted that each of these arrangements has to be taken into consideration in the context of the special conditions of the water resource, special condition of the countries that are parties to the arrangement and the regional and international environment prevailing at the time these arrangements were made. That is why an arrangement that is applicable to one watercourse should not be taken as a reference for another watercourse. There is an international convention that deals specifically with all aspects of the subject of the transboundary watercourses, namely the Convention on the Law of the Non-navigational Uses of International Watercourses. This Convention is not ratified by sufficient number of countries. But Turkey, should not ignore the principles enshrined in this Convention and should not underestimate these principles on the grounds that the Convention has not been ratified by sufficient number of countries and that it is not a party to this Convention. Because, even though Turkey is not party to this Convention, the international norms in the field of transboundary watercourses, will most probably develop in the general direction envisaged by this Convention. This is why Turkey, has to focus on how to interpret to its benefit the clauses of the Convention that are in favour of upstream countries.

There are disputes on transboundry water issues in different parts of the world, such as the disputes that have arisen regarding the Rio Grande and Colorado Rivers between the USA and Mexico; St. Mary and Milk Rivers and Michigan Lake between the USA and Canada; and Inn, Saalach and Salzach Rivers between Austria and Bavaria.

The most important problem for Turkey is the dispute that it has with Iraq and Syria about the use of the waters of the Euphrates and Tigris Rivers. This dispute started when

the Southeast Anatolia Project (GAP), which is Turkey's most important project, was initiated in the early 1970's. This project covers an area of 70 thousand km^2 and includes the provinces of Gaziantep, Şırnak, Adıyaman, Batman, Şanlıurfa, Diyarbakır, Mardin, Siirt. The tension increased when the first of the dams that were going to supply water to this project, namely the Keban Dam, started to hold water and when at the same time Syria started to hold water for the Tabqa Dam. Syria and Iraq without gathering sufficient information about the program of filling up the reservoir of the Keban Dam, were worried that they would suffer damage and would not be able to get enough water after the construction of this dam is completed. They tried to block this project by taking initiatives targeting the enterprises that would finance this project and claiming that their consent had to be sought for financing this project.

Syria and Iraq were worried when Turkey, which had its own technology and financial means, started to build first the Keban Dam and than the Atatürk Dam. Some disturbances were observed as a result of these developments.

According to the relevant provisions of the Protocol signed between Turkey and Syria at the end of the Joint Economic Committee meeting in 1987, Turkey has committed itself to give to Syria 500 m^3/s water on a monthly basis from the main body of the Euphrates River, until the Atatürk Dam's reservoir is filled and until a final agreement is reached. In case this amount of water could not be provided in a given month the shortfall was going to be provided in the following month. Turkey is still fulfilling this commitment. The average amount of water given to Syria has been 789 m^3/s in 2006 and 793 m^3/s in 2007. At present there is a more positive atmosphere between Turkey and Syria.

4. TURKISH ATTITUDE

Within the framework of the new political climate that settled in the region after the war in Iraq, the US interest in the water resources and transboundary watercourses has increased.

In this context, we can make the following observations about the position of Turkey which is emphasizing on every occasion that it is ready to cooperate on matters of water resources and transboundary watercourses: It's widely recognized that Euphrates and Tigris, which flow to the sea as a single river, form one single basin. In fact, Iraq, by linking these two rivers with two canals in its territories, has demonstrated that it considers these two rivers as parts of one single basin. "Two rivers one basin" is an indispensable principle for Turkey. In this context Turkey believes that the total water

potential of the two rivers is enough to meet the needs of the three riparian countries. Turkey supports the idea that the water should be used in an equitable, rational and "optimal" manner and that no "significant damage" should be caused to the downstream countries. By the terms "optimal use" Turkey understands the use of water in a manner to produce the highest benefit.

By taking into consideration these criteria, Turkey developed a concept called the "Three Stage Plan". According to this plan, which has entered the international literature, the first stage would be to determine the total water potential of the basin of Euphrates and Tigris. The second stage is to determine the irrigation water needed in Turkey, Iraq and Syria. And the third stage is to allocate equitably the calculated amount of water according to the determined needs.

Turkey is ready to discuss the question of the Euphrates and Tigris's waters with an integral approach and in all its dimensions. In this context, as an act of good will, Turkey has forwarded to the other riparian countries the data and information that they requested and emphasized that the exchange information should be on the basis of reciprocity and should cover the entire basin of the rivers.

The subject of the transboundary watercourses is not confined to the use of water. This matter has an important environmental dimension as well that gained importance nowadays.

The sustainable use of natural resources in long term, prevention of pollution, protection of the environment and the natural areas are elements that have to be taken into consideration in the politics pursued. At the present day environmental problems are affecting every country in the region and are rendering the cooperation necessary between these countries for solutions. Due to its location, as a Mediterranean and Black Sea country, Turkey is affected by the pollution of the rivers that are flowing into these two seas. This aspect should be borne in mind in all fields from tourism to fishing, from biodiversity to human health and in many other fields.

5. CONCLUSION

Agreements on transboundary watercourses cannot be reached without the good intentioned regional and international cooperation of the concerned countries. International agreements that will be adopted can be implemented only through this cooperation.

TURKEY'S TRANSBOUNDARY WATERCOURSES AND THE EUPHRATES-TIGRIS BASIN

Ünal Öziş
Yalçın Özdemir

TURKEY'S TRANSBOUNDARY WATERCOURSES AND THE EUPHRATES-TIGRIS BASIN

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ABSTRACT

Transboundary watercourses provide roughly 70 km³/year or 40 % of the gross water potential originating in Turkey; the Euphrates-Tigris basin represents about 4/5th of this figure. Development projects in such basins, including the Southeastern Anatolian Project (G.A.P.), basically comply with U.N.'s principles of equitable and reasonable use. Moreover, dams in Turkey provide significant benefits to downstream countries; such as sediment retention, flood mitigation and temporarily low flow augmentation. The average water potential of Euphrates and Tigris in Turkey is around 32 km³/y and 24 km³/y, respectively, including the tributaries flowing directly to downstream countries. Ultimately, under average conditions, about 40 % in Euphrates and 65 % in Tigris will continue to flow towards downstream countries. However, because of the significant stochastic variation of discharges in spite of the huge reservoirs in Turkey, the amount of water in any allocation agreement should be set according to different levels of probabilities. The water potential of the transboundary Euphrates-Tigris basin is quoted with large differences according to various sources; hence the determination of the accurate water potential is an essential prerequisite for any allocation among riparian states and eventual diversions to other middle-eastern countries.

Keywords: Euphrates, Tigris, transboundary watercourse, Middle-East, hydropolitics.

1. INTRODUCTION

More than 200 watercourses in the world are of 'transboundary' and/or 'boundary forming' nature; they cover almost half of the continents. The 1997 U.N.-Convention use the unfortunate, misleading term 'international' for these watercourses, although they have been called 'transboundary' watercourses during several decades of preceding drafts and discussions. The term 'multinational' watercourse could have been a rational compromise, if the expression 'national' were to be maintained in the terminology.

Most of the transboundary and/or boundary-forming watercourses cause often conflicts of interest among the riparian countries, and around 300 treaties between various states have been so far concluded for the use of these watercourses (Biswas 1994).

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The world's renewable annual water potential per capita was in the order of 7,000 m^3/y/capita at the turn of the century, but its distribution in time and space is highly varying so that several countries, including those in the Middle-East, have potentials well below the world's average.

As an example, the domestic water potential was 2,900 m^3/y/capita for Turkey, 500 m^3/y/capita for Syria, and 1,400 m^3/y/capita for Iraq, when only waters originating within the country are considered. The rapid population growth in middle-eastern countries on one hand, the qualitative deterioration of fresh water resources on the other hand, significantly accelerate the water scarcity in these countries, to be still worsened by anticipated negative effects of climate change processes.

In such comparisons, the figures will be misleading, when waters originating in upstream countries are also taken into account. The inclusion of discharges of the Euphrates and its tributaries, the Afrin tributary of Orontes from Turkey, and Upper Orontes from Lebanon, would increase the water potential of Syria to 3,000 m^3/y/capita. Similarly, the inclusion of the discharges of Euphrates from Turkey and Syria, Tigris and tributaries from Turkey and Iran, would increase the water potential of Iraq to 5,200 m^3/y/capita (Öziş, 1997).

Although the domestic water potential of Turkey appears to be quite high when compared to her neighbors, it is less than half of the world's average; and its distribution in time and space is so unbalanced, that Turkey can beneficially control only two thirds of her water potential.

Turkey is confronted by pressure from the outside, primarily related to the Euphrates-Tigris basin, although she voted (with China and Burundi) against the 1997 Convention of United Nations, requiring several permissions and restrictions, beyond the 'equitable and reasonable use' and 'causing no significant harm' principles. In this context, Turkey has to put utmost emphasis in evaluating her necessities, opportunities and foreign policy with regard to transboundary water courses.

The development of land and water resources in Turkey causes worries in downstream countries with regard to an anticipated decrease in quantity and deterioration in quality of the water. These are especially related to the implementation of the Southeastern Anatolia Project (Turkish acronym: G.A.P.) in the Euphrates-Tigris basin, where Turkey is the upstream riparian in both main rivers. The worries are based on: (a) evaporation losses from reservoir surfaces, created by large dams in order

to regulate beneficially the highly varying discharges of Euphrates & Tigris and control the floods; (b) the diversion to and consumption by large irrigation systems in the basin; and (c) substantial urban and industrial water supply requirements in the region.

On the other hand, dams in Turkey provide significant benefits to downstream countries as well; such as sediment retention, flood mitigation, temporarily low flow augmentation. Moreover, development projects in such basins, including the G.A.P., basically comply with U.N.'s principles of equitable and reasonable use. In fact, the Mesopotamian part of the middle-eastern water crisis appears to be an irrelevantly exaggerated problem, compared to other conflicts in the region. However, water allocation disputes among riparians on one hand, water diversion issues from Tigris to Euphrates and eventually from Euphrates to the neighboring Jordan basin on the other hand, put the Euphrates-Tigris basin in the foreground of international interests.

2. TRANSBOUNDARY WATERCOURSES IN TURKEY

2.1. General

Transboundary, also partly boundary-forming, watercourses are located in the north-western, north-eastern, and the south-eastern regions of Turkey. The principal basins are: (a) Maritza (Meriç); (b) Çoruh; (c) Kura-Arax (Aras); (d) Orontes (Asi); (e) Euphrates-Tigris (Fırat-Dicle). Furthermore, there are some singular small creeks adjacent to the above-mentioned basins.

Turkey is basically the upper-riparian state in Euphrates-Tigris, Çoruh, Kura-Arax basins and the small creeks; and the lower-riparian state in Maritza and Orontes basins.

Transboundary watercourses cover with 256,000 km^2 almost one third of Turkey and provide roughly 70 km^3/year or 40 % of the gross water potential originating in Turkey.

2.2. Maritza basin

The water potential of Maritza originating from 14,560 km^2 drainage area in Turkey is about 1.2 km^3/y from the tributary Ergene, 0.4 km^3/y from the tributary Tunca, and 0.2 km^3/y from the creeks on the east bank of Maritza; thus totaling 1.8 km^3/y (Öziş et al., 1997). The drainage area of the Maritza basin is about 35,000 km^2 in Bulgaria, 4,000 km^2 in Greece, and 14,600 km^2 in Turkey; so that the total area is roughly 54,000 km^2.

In the upper-riparian Bulgaria, the water potential of Maritza and the tributary Arda is about 5.1 km³/y, of the tributary Tunca 0.6 km³/y; the additionnal water potential of Maritza and Arda from the interim-riparian Greece is 0.5 km³/y; hence the total water potential of the entire Maritza basin (Fig.1), including Turkey, is in the order of 8 km³/y (Öziş 1997).

Figure 1. *Maritza basin (Öziş et al., 2006)*

Turkey has 1,200,000 ha irrigable agricultural land in this basin and anticipates to irrigate one third of it (D.S.İ. 1995). The insufficiency of the domestic water potential and the inconveniences in its areal distribution necessitate to harness the water of the main river. However, diversions in Bulgaria and Greece cause often water shortages in the river. Turkey even 'bought' during the drought of 1993 water released from the reservoirs of Bulgaria's dams.

The lower-riparian Turkey has to manage the situation in the Maritza basin within a broader frame, considering her sensitive relation with Bulgaria and Greece, the importance of the river and its tributary for Bulgaria and the use of Arda waters in Greece. The regulation of excess waters by off-stream reservoirs in Turkey, unregulated by the dams of upstream riparians, may partly contribute to the physical solution of the problem.

On the north-eastern slopes of the Istranca mountains adjacent to the Maritza basin,

among the creeks flowing to the Black Sea, the Rezve (Kocadere) Creek originates in Turkey and then forms the boundary between Turkey and Bulgaria, and the Velika (Mutlu) Creek originates in Turkey and flow to Bulgaria (Öziş 1997). These creeks with 0.1 km^3/y water potential from 400 km^2 drainage area in Turkey can be used for the water supply diversions of Kırklareli-İstanbul area, and this may affect the neighbor state.

2.3. Çoruh basin

The Çoruh basin is located to the great extent in Turkey, with a drainage area of 19,872 km^2 and a water potential of 6.1 km^3/y (Öziş et al., 1997). This is close to one tenth of the total domestic transboundary water potential of Turkey.

Çoruh crosses the border to Georgia, receives there its last major tributary from Adzharskaya, and discharges into Black Sea near Batumi (Fig.2). The additional water potential originating from the 2,090 km^2 drainage area in Georgia appears to be in the order of 2,5-3,0 km^3/y.

Turkey foresees to irrigate 160,000 hectares of land, and is constructing water power schemes generating a total of 12 billion kWh/year electrical energy in Çoruh basin; twelve of them forming a cascade of dams with almost 1500 m head difference along the main river (E.İ.E. 1985; D.S.İ. 1995; Sucu & Dinç 2008; Saraç & Eciroğlu 2008).

The irrigation of this land, compared to the water potential of Çoruh, will not cause a handicap for the downstream riparian Georgia; moreover, the flow regulation through the dam cascades will augment the low flows, trap the sediments and mitigate the floods also for the benefit of Georgia. However, the effect of sediment reduction on the formation of the delta near Batumi should be studied carefully. In addition, the prevention of any eventual pollution by mines and industry to the Lower Çoruh from its tributaries should be controlled by taking necessary measures.

Figure 2. *Çoruh and Kura–Arax basins (Öziş et al., 2006)*

The small Sarp Creek flowing to the Black Sea at the north-eastern corner of Turkey, adjacent to Çoruh basin, forms the border between Turkey and Georgia. Çakal Creek, the last tributary of Çoruh at the left bank, crosses directly the boundary, and joins the main river near the delta.

2.4. Kura-Arax basin

The flow originating from Turkey in the Kura-Arax basin with 28,380 km^2 is about 0.9 km^3/y in Upper Kura, 1.8 in Upper Arax, 0.6 in Kars, 0.1 in Sarısu, 0.1 in Kotur tributaries, hence totaling 3.5 km^3/y (Öziş, et al., 1997) This is about one twentieth of the total domestic transboundary water potential of the country.

Kura crosses Turkey's border to Georgia, then to Azerbaidjan, and flows into the Caspian Sea. The tributary Arpaçay originates from Armenia and Turkey, forms the border between Turkey and Armenia, receives the tributary Kars from Turkey; Arax originates from Turkey, joins Arpaçay at the border with Armenia, forms then the border between Turkey and Armenia, shortly between Turkey and Azerbaidjan (Nakhicevan), then between Iran and Azerbaidjan (Nakhichevan), Armenia, again Azerbaidjan, and joins finally Kura in Azerbaidjan (Fig.2).

The drainage area of the main tributary Arax is about 24,000 km^2 in Turkey, 22,000 km^2 in Armenia, 35,000 km^2 in Iran and 21,000 km^2 in Azerbaidjan, thus totaling 102,000 km^2; the drainage area in Kura is about 4,000 km^2 in Turkey, 33,000 km^2 in

Georgia, 8,000 km² in Armenia and 41,000 km² in Azerbaidjan, thus totaling 86,000 km²; so that the entire Kura-Arax basin's drainage area east of Black Sea and discharging into the Caspian Sea is roughly 190,000 km². Reliable data about the distribution of the water potential, which might total 40 km³/y, could not be obtained.

Turkey plans to generate 2.3 billion kWh/year electrical energy and irrigate 480,000 hectares of land in the Kura-Arax basin (D.S.İ. 1995). The water potential in Turkey will barely meet the entire irrigation demand, even if water distribution variations are resolved.

The Arpaçay Dam at the boundary-forming stretch, providing flow regulation for the Serdarabat weir to irrigate the Iğdır plain, was constructed in 1980's, according to the 1927 treaty between Turkey and USSR, stipulating the equal use of the waters of Arpaçay. The release of 1.5 m³/sec from Turkey to Iran in Sarısu could not be realized during some dry periods.

The Kura-Arax basin bears, beyond the water resources, great importance for Turkey with regard to political and economical relations with Georgia, Armenia, Iran, and especially Azerbaidjan, so its development will be affected by multilateral approaches in the region.

2.5. Orontes basin

The water potential of Orontes originating from about 5,500 km² drainage area in Turkey is in the order of 1.2 km³/y, including 0.2 km³/y from roughly 1,000 km² drainage area of the Afrin tributary's upper creeks (Fig.3) (Baran et al., 1997).

Figure 3. *Orontes basin (Öziş, et al., 2006)*

The water potential of the upper riparian Lebanon is 0.4 km^3/y from about 2,200 km^2 drainage area; Orontes enter then into Syria, forms later the border for a short stretch with Turkey, and discharges to the Mediterranean sea in Turkey; the tributary Afrin crosses the border from Turkey to Syria and reenters then into Turkey; the water potential originating from about 15,600 km^2 drainage area in Syria is 1.0 km^3/y. Hence the entire water potential of Orontes is 2.6 km^3/y (Baran, et al., 2006).

Turkey intends to irrigate 165,000 ha of land in Orontes basin (D.S.İ. 1995), which cannot be achieved only through the use of the domestic water potential. On the other hand, Syria's Ghab development and other projects on Orontes affect significantly the discharges, leaving virtually quite limited amounts of water to enter Turkey, especially on dry seasons, and releasing flood discharges on wet seasons; similar activities are anticipated in the tributary Afrin.

The Hatay province of Turkey, located largely in Orontes basin, is printed as part of Syria on many Syrian maps; and Syria systematically refuses to discuss water issues related to Orontes basin. Although at different scales, the reciprocal positions of the two countries in Orontes and Euphrates, necessitate the inclusion of the Orontes basin in discussions about Euphrates-Tigris basin in particular, and of middle-eastern water problems in general.

The Qweik (Balık) Creek between the Orontes and Euphrates basins, ending in deserted land near Aleppo in Syria, has a potential of about 0.2 km^3/y originating from about 1,000 km^2 in Turkey (Öziş 1997). Although a treaty from 1921 depicts the equal use for the water supply of Aleppo, the city is actually supplied from the reservoir of the Tabqa (At-Thawra) Dam on Euphrates.

2.6 Euphrates-Tigris basin

Euphrates and Tigris are the two principal branches of the transboundary river basin, joining each other 70 km north of Bassorah in Iraq, to form the Shatt-al-arab, and discharging 100 km thereafter into the Gulf.

Turkey is the upstream riparian of both Euphrates and Tigris; Iran is the upstream riparian of certain eastern tributaries of Tigris; Saudi Arabia is the upstream riparian of some virtually non-contributing creeks southwest of Euphrates; Syria is largely the upper downstream riparian of Euphrates and for a short stretch the boundary riparian to Tigris; and Iraq is the main downstream riparian of Tigris and Euphrates (Fig.4).

It should be mentioned for sake of completeness, that the Baradost Creek, adjacent to Tigris basin, originates near Yüksekova and has a water potential of 0.2 km³/y in Turkey; it crosses the border to Iran and flows to the Urumiye Lake.

The total water potential of the Euphrates subbasin is 37 km³/y; Turkey provides 32 km³/y, i.e., about 85 % of this potential from less than 30 % of the total drainage area. The total water potential of the Tigris subbasin is 57 km³/y; Turkey provides 24 km³/y, i.e., about 40 % of this potential from less than 25 % of the total drainage area. Hence, Turkey provides about 60 % of the total water potential of Euphrates-Tigris basin from 25 % of the entire drainage area (Öziş, et al., 1999).

Water scarcity in the Middle-East in general, water allocation claims of the riparian states in particular, enhanced by international geopolitical and energy issues from states and organizations outside the region, make the Euphrates-Tigris basin one of the foremost conflict focus' of the world. In this context, the details concerning the waters of the transboundary Euphrates-Tigris basin will be dealt with in the next chapters.

Figure 4. *Euphrates-Tigris basin (Öziş & Özdemir 2008)*

3. WATER POTENTIAL OF EUPHRATES-TIGRIS BASIN

The Euphrates-Tigris basin is by far the most important transboundary watercourse in Turkey, because 56 km^3/y originating from Turkey represents about 4/5th of the total domestic transboundary water potential (Bilen 1996, Dışişleri 1996).

The average water potential of Euphrates is around 32 km^3/y, that of Tigris around 24 km^3/y in Turkey, the upstream country of both rivers, including tributaries flowing directly to downstream countries (Baran et al., 1995).

The total water potential of Euphrates is in the order of 37 km^3/y, when 4 km^3/y contributed by Syria and 1 km^3/y from Iraq is added (there is virtually no contribution from Saudi Arabia); that of Tigris is in the order of 57 km^3/y, where 10 km^3/y from Iran and 23 km^3/y from Iraq are added, neglecting the very small contribution from Syria; excluding Karkeh and Karun in Iran (Öziş, et al., 1997). Thus, for the entire Mesopotamian basin of Euphrates-Tigris, the total water potential is in the order of 94 km^3/y.

The authors' investigations on the entire Euphrates-Tigris water potential, based on various data and approaches resulted in the following information: (a) 31.9 km^3/y from 121,560 km^2 in Turkey; (b) 4.3 km^3/y from 87,300 km^2 in Syria; (c) 0.8 km^3/y from 182,300 km2 in Iraq; (d) virtually no flow from 58,000 km2 in Saudi Arabia; so that the total becomes 37 km^3/y for the Euphrates arm. For the Tigris arm, the results were: (a) 24.1 km^3/y from 57,615 km^2 in Turkey; (b) 0.1 km^3/y from 850 km^2 in Syria; (c) 10.4 km^3/y from 39,400 km^2 in Iran; (d) 23.2 km^3/y from 146,150 km^2 in Iraq; so that the total becomes 57 km^3/y.

In various publications dealing with the middle-eastern water conflict, the figures for the total water potential of Euphrates varied from 29 to 37 km^3/y, those of Tigris from 42 to 58 km^3/y. The Euphrates water potential is quoted as 29.0 (Shahin, 1989), 29.5 (Kolars & Mitchell, 1991), 31.8 (Starr & Stoll, 1987; Beaumont, 1992), 32 (Kutan, 1996), 35 (Bilen, 1996), 35.6 (Akmandor et al., 1994; Dışişleri, 1996), 29.5-35.4 (Öziş, 1994), 37 km^3/y (Öziş et al., 1998).

The Tigris water potential is quoted as 42.2 (Starr & Stoll, 1987; Kutan, 1996), 48.7 (Shahin, 1989; Akmandor et al., 1994; Dışişleri, 1996), 52.7 (Beaumont, 1992; Bilen, 1996), 47-56 (Öziş, 1994), 57-58 (Öziş et al., 1998), 60 km^3/y (Öziş et al., 1997).

The differences between 37 and 29 km^3/y, thus up to 8 km^3/y for Euphrates on one hand, between 58 and 42 km^3/y, up to 16 km^3/y for Tigris on the other hand, were

due to classified observations, lack of information, data bias and disinformation. These discrepancies should definitely be clarified and the accurate long-term water potential of the Euphrates-Tigris basin has to be determined, by contribution of all parties involved, before entering the discussions on any water allocation agreement.

This corresponds basically to the first stage of the "three-stage plan" proposed by Turkey to her neighbors since 1980's, related to the development of the Euphrates-Tigris water and land resources.

4. DEVELOPMENT OF EUPHRATES-TIGRIS BASIN

4.1. Development in Turkey

More than one hundred dams, mostly for irrigation and/or energy production are proposed, some of them already in operation, in the Upper Euphrates basin in Turkey on Karasu, Murat, Peri, Munzur and Tohma Rivers and their tributaries. The rockfill Keban Dam, marking the end of Upper Euphrates, with 6 TWh/y energy generation, has an active storage capacity up to 25 km^3, being the key element in the regulation of river flows (D.S.İ. 1995).

The development of the Lower Euphrates in Turkey, within the context of G.A.P., together with Western and Central Tigris, serve as the driving force of the socio-economic development of the region. Hence, 53 dams in Lower Euphrates, 15 dams in Western and Central Tigris in Turkey will regulate the flows for flood control, irrigation and/or energy production, as well as certain urban and industrial water supply schemes.

About 1.8 million hectares of agricultural land will be irrigated in the context of G.A.P., two-thirds in Lower Euphrates and one third in Western and Central Tigris. 18 hydroelectric power plants with 20 TWh/y in Lower Euphrates, 12 plants with 8 TWh/y in Western and Central Tigris in Turkey are anticipated. Outside the scope of the G.A.P., 22 dams and 30 hydroelectric schemes with 9 TWh/y are planned on Eastern Tigris tributaries in Turkey.

Noteworthy are the rockfill Atatürk Dam with 85 million m^3 embankment, creating a reservoir of 48 km3 and generating 9 TWh/y (Öziş et al., 1990), the Şanlıurfa twin tunnels, each with 26.4 km length, conveying 330 m^3/sec (Tanrıverdi 1992; Kurt 1992); the 173 m high arched-gravity Karakaya Dam, generating 8 TWh/y (Öziş & Özel 1989). Some of the dams, power plants, irrigation schemes are already in operation. Keban -

Karakaya - Atatürk - Birecik - Karkamış Dams and power plants form a continuous series of reservoirs on the Euphrates main river, down to the border with Syria. Among the major dams of the Upper Tigris, the Kralkızı, Dicle and Batman Dams are in operation.

4.2. Development in other riparian countries

Three dams are located on the mainstream Euphrates in Syria; these are Teshreen with the maximal reservoir level reaching the Turkish border; At-Thawra (Tabqa) as the key dam for irrigation, energy production and urban water supply to Aleppo; Al-Baath to regulate the discharge of the former dam. Turkey's proposal to set up jointly a high dam (Yusufpaşa) using the head of Teshreen Dam in Syria and Karkamış Dam in Turkey, which will be more beneficial to both countries, has not been received favorably by her downstream neighbour. Three dams for irrigation (Saab, Taaf, Shuhey) are located on Khabur and two tributaries in Syria, originating as Cırcıp & Zerkan and Çağçağ tributaries of Euphrates in Turkey (Kolars & Mitchel 1991; Karadamur & Hadid 1992; Wakil 1993; Bilen 1996). Syria anticipates to irrigate 800,000 ha of land; however various factors, especially the soil quality appears to limit it to 300,000-400,000 ha. The application of the second stage of the "three-stage-plan" proposed by Turkey would have clarified this critical issue. Turkey's proposal to heighten and shift the location of the Cizre Dam towards the end of the Turkish-Syrian border formed by Tigris, in order to divert part of Tigris waters to supplement Syria's irrigation needs in Khabur region, has also not been received favorably by her neighbor.

Hadithia Dam is located upstream of the Hit stream-gaging station on Euphrates in Iraq; followed by Ramadi weir, Habbaniyah off-stream reservoir, Hindiyah and Nassiriyah weirs near Kerbela, all supplying irrigation systems (Hadithi 1978; Yussif 1983; Bilen 1996; Altınbilek 2004).

No significant water scheme is apparently possible nor anticipated on the ephemeral dry creeks at the south-west regions of the Lower Euphrates in Saudi Arabia.

The hydroelectric potential of the upper stretches of certain eastern tributaries of Tigris in Iran could eventually be harnessed by high-head diversion plants, diverted either by weirs or partly regulated by dams. There is no accurate information about such hydroelectric schemes; however, their operation might not cause serious problems, as long as the diverted discharges flow back to the same basin.
Mossul (formerly Saddam) Dam, Fattah and Samarra weirs are located on the main River Tigris in Iraq. On eastern tributaries of Tigris in Iraq are located, some equipped

with power plants, Bekme Dam on Greater Zap, Dokan and Dibbis Dams on Lesser Zap, Derbendikhan and Hamreen Dams, Adheim and Diyala weirs on Diyala; south of Baghdad on Lower Tigris in Iraq are located Kut, Dibban and Gharraf weirs; all supplying irrigation systems (Yussif 1983; Bilen 1996). The Thartar closed basin in northwestern Iraq is used to store excess flood waters of Tigris; it is also linked with Euphrates, and might be used among other options, to transfer water from Tigris to Euphrates for irrigation along its banks (Kolars & Michell 1991; Beaumont 1992). The link between the two canals can better be directly established, bypassing the turbid waters of the Thartar Lake and avoiding excessive evaporation losses. Between Euphrates and Tigris in Iraq a long canal, called also the "Third river", was built to provide an efficient collection of the drainage systems. In this context, the marshlands of the Shatt-al-arab's delta have been significantly reduced; thus, environmental concerns of the "environmentalists", that the dams in Turkey cause significant reduction of the Shatt-al-arab marshlands, is substantially lacking evidence.

5. IMPACT OF TURKEY'S SCHEMES TO DOWNSTREAM COUNTRIES

5.1. Discharge regulation in Turkey

The discharges of the Euphrates-Tigris basin in Turkey show significant seasonal variations as well as year-to-year fluctuations, although they are largely fed, besides rain, from snowmelt and spring discharges (E.İ.E. 1955-1993; D.S.İ. 1961-1995; Baran et al., 1987; Bilen 1996; Öziş et al., 1999).

The discharges of Euphrates at the location of Dutluca gaging station, just downstream of the Atatürk Dam, which represents about five sixths of the Euphrates subbasin flows originating from Turkey, showed an average value of about 870 m^3/sec during 1937-1980 water years, the annual averages varying from 460 to 1500 m^3/sec. Monthly mean discharges, rising up to 4360 m^3/sec (May 1969), were usually about 300 to 500 m^3/sec during 8 months from July to February, well below the average; and much less during months like August and September, even decreasing to around 170 m^3/sec (Öziş, et al., 2000). Large reservoirs have therefore to be created by dams on the two main rivers and their tributaries in order to regulate the discharges for water power, irrigation and flood control (D.S.İ. 1980, 1995; Fıstıkoğlu, et al., 2008). The firm energy of the hydroelectric plant at the foot of the Tabqa Dam in Syria is increased yearly by several hundreds of GWh since more than thirty years, benefiting primarily from the regulation at the Keban Reservoir in Turkey.

The total active storage capacity in Turkey will ultimately reach the order of 60-70 km^3 in Euphrates, thus almost twice the average annual flow volume, and 20 km^3 in Tigris, close to the average annual flow volume.

The topography in downstream countries, especially in Euphrates, does not permit to create such large storages; and moreover, the unit evaporation rate from water surface is significantly higher than that in Turkey. The total active storage in downstream countries will be around 15 km^3 in Euphrates (mainly in Syria), and 20 km^3 in Tigris (basically in Iraq). The annual average evaporation from reservoir surfaces in Turkey will be about 5 km^3/y in Euphrates, 1.5 km^3/y in Tigris; that in downstream countries about 2 km^3/y in Euphrates and 6 km^3/y in Tigris (Özis 1994).

Reservoirs created in Turkey provide significant benefits to downstream countries, such as the retention of sediments, mitigation of floods and temporary augmentation of low flows. Hence, the evaporation from these reservoirs has neither to be considered as an unnecessary loss of water, nor to be solely debited to Turkey.

After completion of all anticipated schemes, from the waters originating in Turkey, around 13 km^3/y or 40 % in Euphrates and 16 km^3/y or 65 % in Tigris, will continue to flow downstream, as long-term average values. However, it should be kept in mind that any water allocation has to be timely staged according to probability levels because of the highly varying stochastic nature of the discharges, even after the regulation by the huge reservoirs in Turkey.

5.2. Water use in riparian states

Turkey will use, as long-term average, 32-13= 19 km^3/y in Euphrates sub-basin, corresponding to about (19/37=) 50 % of the total Euphrates potential; 24-16= 8 km^3/y in Tigris sub-basin, corresponding to about (8/57=) less than 15 % of the total Tigris potential. The ratio is [(19+8)/(37+57)= 27/94] less than 30 % of the entire Euphrates-Tigris average water potential. This is quite an equitable and reasonable water use for such an upper riparian.

The water potential in Euphrates sub-basin will serve, besides energy production and urban and industrial water supply, to irrigate 1.6 million hectares in Turkey (450,000 ha in Upper, 1,150,000 in Lower Euphrates) (Ünver 1994; D.S.İ. 1995; Altınbilek 1997), without causing significant harm to other riparians. However, if Syria irrigates the anticipated 800,000 ha (although the soil quality appears to limit it to 300-400,000 ha), a very small part of the Euphrates water will flow to Iraq. A diversion of surplus Tigris discharges into Khabur sub-basin in Syria might also be investigated, upstream of eventual diversions in Iraq.

Anyhow, Iraq may use about 85 % of the 57 km3/y water potential of Tigris, since Turkey will only irrigate 650,000 ha from Tigris. Thus, Iraq can irrigate a total of around 3,500,000 ha, even much more by modern water-saving irrigation techniques, along both Tigris and Euphrates, the latter requiring the diversion of surplus Tigris waters to Euphrates. Any downstream claims of related additional expenses from the upper riparian, should also take into account the benefits accrued by Turkish dams to downstream countries (Öziş, et al., 1997).

The water and land developments in Turkey, Syria and Iraq will ultimately exhaust the fresh water potential of the Euphrates-Tigris basin; so, the discharge into the Gulf, if any, will mainly be the last part of the irrigation return flows, especially in dry years. Besides Iran and Saudi Arabia, the other Gulf States, Kuwait, Bahrain, Qatar, United Arab Emirates, and even Oman, would theoretically claim environmental degradation. However, the actual situation in the Gulf, with oil refineries at its coasts and tankers cruising along the sea, is already far from being environmentally pleasant.

The water balance for a year of average hydraulic data, after the ultimate development under equitable and reasonable considerations, is given in Table 1 for Euphrates and in Table 2 for Tigris sub-basins (without significant diversions in Iran from eastern Tigris tributaries; excluding Karkeh and Karun, the latter considered as a separate basin).

5.3. Hydropolitical issues among riparians

Turkey and Iraq have signed in 1946 a protocol, setting certain conditions related to the development of Tigris and Euphrates; however, it has not been applied by the Iraqi side and became obsolete in the meantime. Turkey proposed since 1980's a "three-stage plan" to Syria and Iraq for the ultimate development of Euphrates-Tigris in an equitable and reasonable context, without been able to reach a consensus (Tekeli 1990; Turan 1993; Dışişleri Bakanlığı 1996; Bilen 1996; Bağış 1997).

With regard to water quality, the salinity in Euphrates after all irrigation activities in Turkey, will be in the order of 700 ppm, thus not causing significant harm to Syria (Bilen 1996).

Turkey and Syria signed an economic cooperation protocol in 1987, covering a provisional clause (Art.6), that during the filling of Atatürk Reservoir and until the three riparians reach an agreement on the final allocation of Euphrates waters, Turkey will release as monthly average of 500 m3/sec at the Syrian border, while deficiencies in any month will be compensated the following month. Syria and Iraq agreed in 1990 that 42 % of the water released from Turkey will be used by Syria and 58 % by Iraq (Bilen 1996).

Table 1. *Approximate Water Balance for a Year of Average Hydraulic Data in Euphrates Subbasin (in km³/year)*

Natural flow at Karkamış in Turkey	30.5
Natural flow of tributaries flowing to Syria	1.5
Total natural flow originating from Turkey	**+32.0**
Evaporation from Upper Euphrates reservoirs	-1.0
Irrigation in Upper Euphrates (450,000 ha)	-4.0
Return flow in Upper Euphrates	+1.0
Evaporation from Keban reservoir	-1.0
Evaporation from Lower Euphrates reservoirs	-3.0
Irrigation in Lower Euphrates (1,150,000 ha)	-12.5
Return flow in Lower Euphrates (to main river)	+0.5
Return flow in Lower Euphrates (to tributaries)	+1.0
Water losses in urban & industrial uses	-0.5
Flow from Turkey to Syria in Euphrates	**+12.5**
Flow originating from Syria	+4.0
Evaporation from reservoirs in Syria	-2.0
Irrigation in Syria (800,000 ha)	-11.0
Return flow in Syria	+2.0
Water losses in urban & industrial uses	-0.5
Flow from Syria to Iraq in Euphrates	**+5.0**
Flow originating from Saudi Arabia	0.0
Flow originating from Iraq	+1.0
Evaporation from reservoirs in Iraq	-0.5
Small-scale irrigation in Iraq	-1.5
Flow from Euphrates to Shatt-al-arab and Gulf delta	**+4.0**

The impoundment of Atatürk Reservoir required that the bottom outlet be kept closed for about one month due to technical reasons. Downstream riparians have been informed on this matter and the release has been increased to 830 m³/sec

on 23 November 1989 in order to compensate the cut 50 days in advance. The impoundment began on 13 January 1990, a flood of hostile allegations that "Turks have cut the water of Euphrates" inundated most of the press in the Arab world and other countries. The cries of "water wars" did not even ceased after resuming the release of 500 m^3/sec on 12 February 1990 (Bilen 2000a,b; Öziş, et al., 2004a).

Syria considers 13 km^3/y of Euphrates waters as her 'share'. The provisional 500 m^3/sec depicted in the 1987 protocol between Turkey and Syria corresponds to about slightly less than 16 km^3/y. On the other hand, Syria agreed in 2000 to release 58 % of the Euphrates flows coming from Turkey further to Iraq; so she will let flow 9 km^3/y to Iraq and use 7 km^3/y in Syria. Since the part of the Euphrates waters originating in Syria is about 4 km^3/y, Syria requires an increase of at least 2 km^3/y additional water; either from Euphrates or through diversion from Tigris.

Iraq considers Tigris as totally her own and refuses to deal with both rivers as a single watercourse basin. Iraq claims that Turkey should increase the 500 m^3/sec discharge to 700 m^3/sec, thus to about 22 km^3/y, in order to receive 13 km^3/y in Euphrates through Syria. It should be kept in mind, however, that the 500 m^3/sec flow is provisional, and the long-term average allocation can only be in the order of 400m^3/sec. Moreover, any such allocation should be timely staged according to probability levels, because of the highly varying stochastic nature of the discharges, in spite of the huge reservoirs. Turkey may release additional water in very dry years, against indemnity of some temporarily refrained Turkish irrigation activities (Öziş 1994).

Turkey's G.A.P. Regional Development Administration (G.A.P.B.K.İ.) and Syria's General Organization for Land Development agreed in 2001 to cooperate on rather small-scale joint activities. There are also proposals to broaden the scope of the Joint Technical Committee to create an effective joint institution for conflict resolution between Turkey, Syria and Iraq (Kibaroğlu 2000, 2002).

Table 2. *Approximate Water Balance for a Year of Average Hydraulicity in Tigris Subbasin (in km³/year)*

Natural flow at Cizre in Turkey	17.5
Natural flow of Greater Zap from Turkey	4.5
Natural flow of other tributaries from Turkey	2.0
Total natural flow originating from Turkey	**+24.0**
Evaporation from Middle Tigris reservoirs	-1.0
Irrigation in Middle Tigris (650,000 ha)	-6.5
Return flow in Middle Tigris (to main river)	+0.5
Return flow in Middle Tigris (to tributaries)	+0.5
Evaporation from Eastern Tigris reservoirs	-0.5
Water losses in urban & industrial uses	-0.5
Flow from Turkey to Syria & Iraq in Tigris	**+16.5**
Flow originating from Syria	0.0
Irrigation in Syria	-0.5
Flow to Iraq in Tigris	**+16.0**
Flow originating from Iran	+10.0
Flow originating from Iraq	+23.0
Evaporation from reservoirs in Iraq	-6.0
Irrigation in Iraq (incl.Euphrates) (3,500,000ha)	-45.0
Return flow in Iraq (_)	+7.0
Water losses in urban & industrial uses	-1.0
Flow from Tigris to Shatt-al-arab and Gulf delta	**+4.0**

In the context of the development of Euphrates-Tigris basin, Turkey has been accused to act according to the absolute sovereignty doctrine. However, the water claimed by Turkish schemes is well in the range of equitable and reasonable use doctrine; especially when the economical feasibility of the projects prepared for the State Water Authority (D.S.İ.), the application of modern irrigation techniques consuming less water, the activities of G.A.P.B.K.İ. in the frame of the gigantic plan for the social and economic development of that region of Turkey, are considered (Ünver & Voron 1993: Ünver, et al., 1993, Ünver 1994; Öziş 1994, 1997; Bilen 1996; Altınbilek & Akçakoca 1997; Öziş, et al., 2002).

6. EFFECT OF THE MIDDLE-EAST WATER CONFLICT

The impact of the water scarcity in the Jordan basin led to a flood of publications from 1980's onwards, covering also the Euphrates-Tigris basin, some of them considering it as the emergency resource to alleviate the water shortages in Jordan basin (Naff & Matson 1984; Starr & Stoll 1987, 1988; Shahin 1989; Kolars & Mitchell 1991; Gruen 1991; University of Waterloo 1992; University of Illinois 1993; Şen 1993; Kut 1993; Bulloch & Darwish 1993; Biswas 1994; Kolars 1994; Wolf 1994; Akmandor, Pazarcı, Köni 1994; Bilen 1994, 1996, 1997, 2000a,b, 2002; Kliot 1994; Bağış 1994, 1997; Ünver 1994, 1997a,b; Öziş 1994, 1997; Kibaroğlu 1995, 1997, 2000, 2002, 2008b; Dışişleri Bakanlığı 1996; Aydınlar Ocağı 1996; Kutan 1996; Karakaya 1996; Yakış 1996; Müftüoğlu 1997; C.B.Ü. 1997; Yılmaz & Kadılar 1997; Avcı & Yanık 1997; Altınbilek 1997, 2004; Kulga & Çakmak 1997; Çınar & Türkman 1997; Türkman 1998; Öziş, Özdemir, a.o. 1998, 2002, 2004a,b; Tomanbay 1998; Alpaslan 1999; Öziş, Türkman, a.o. 1999, 2001, 2002, 2006; Pamukçu 2000; Bastian 2001; Alpaslan & Harmancıoğlu 2001; Su Vakfı 2002; Avcı 2002; Zehir 2002, Birpınar & Ekşi 2002; Durmazuçar 2002; Yıldız 2003; Tiryaki 2004; Kibaroğlu, Klaphake, et al., 2005; Salman 2006; Acatay 2006; Boz & Volkan 2006; Yenigün & Gerger 2006; Volkan & Boz 2006; Aytemiz & Kodaman 2006; Öz 2006; Sert & Opan 2006; Öktem 2006; Özdemir, Öziş, et al., 2006; İ.M.O. 2006, 2008; Aydoğdu & Yenigün 2008; Kuruçim 2008; Öziş & Özdemir 2008a,b; Abay & Baykan 2008).

The relatively small Orontes river basin, with a potential close to 3 km^3/y, should also be taken into account, when dealing with water allocations in the Middle-East, because Turkey is rather a downstream riparian in this basin (Baran, et al., 1997). Proposals such as through long-distance pipelines from Seyhan & Ceyhan basins (Duna 1988), by seaway from Manavgat basin (Yavuz 1997; Yıldız 2006) and by pipeline from Atatürk Dam's reservoir (Wachtel 1993, 1994) have been made to transfer water from Turkey to the Middle-East.

Approaches, ranging from adoption of water as a commercial good also before bottling, to pointing out that water cannot be a tradable commodity according to the Islamic Law and should be provided to those who need it; thus questioning any additional requirement of Turkey for asking a price for the resource itself beyond the expenses to provide it to foreign countries, have been raised in dealing with the Middle-East water issue (University of Waterloo 1992; University of Illinois 1993).

Furthermore, the use of water-saving technologies and the import of agricultural goods instead of large scale irrigation developments are coming into foreground in areas with water scarcity and limited drainage capacity. In this context, refraining from the expansion of irrigated areas in Iraq and importing 'virtual water' as agricultural products from Turkey's G.A.P. areas in exchange of oil, can be considered as an example.

In search of an equitable and reasonable solution to the water problem in the Middle-East, affected by the water scarcity in the Jordan river basin, enhanced by the downstream riparians Syria and Iraq, as well as other countries and organizations in and outside the region, putting pressures on Turkey that she should release more water in Euphrates, especially increase the temporarily allocated 500 m^3/sec, it is a necessity that the water potential of Euphrates and Tigris should be evaluated together. This is also conforming to the physical nature of the watercourses, since they are two main rivers forming the two principal su-bbasins of the Euphrates-Tigris basin; joining together before Bassorah, flowing for 170 km as the unique watercourse Shatt-al-arab, and discharging from the delta to the Gulf.

Countries interested in the Jordan basin are looking for about 2 km^3/y in addition to the basin's 1,5-2 km^3/y to alleviate the core issue of the Middle-East water crisis, where the words 'water wars' were spelled. On the other hand, there are still differences of 37-29=8 km^3/y for Euphrates and 58-42=16 km^3/y for Tigris concerning the estimated water potential of the Euphrates-Tigris basin. The total difference is about 24 km^3/y and about ten times the additionally needed water for the Jordan basin countries. Thus the determination of the accurate water potential of the Euphrates-Tigris basin becomes a 'prerequisite' for any 'reasonable and equitable' solution towards a sustainable peace in the Middle-East (Öziş, et al., 2004a,b; Özdemir, et al., 2006; İ.M.O. 2008; Öziş & Özdemir 2008a,b).

7. HYDROPOLITICAL ATTITUDES OF OTHER COUNTRIES AND ORGANIZATIONS

7.1. United Nations

The development of transboundary watercourses, especially when large diversions were involved, has caused dissents and disputes among riparians. Two opposite doctrines, that of 'absolute sovereignty' favored by upstream countries, versus 'territorial integrity' favored by downstream countries, struggled to dominate during several decades. A rather technically sound approach of 'maximal basin development' did not receive the interest it merited.

The discussions on the 'equitable and reasonable use' principle, 'without causing significant harm' to other riparians, was launched in 1966 by the International Law Association. It was supported by the International Law Commission of the United Nations, enhanced in 1992 by UNCED's 'sustainable development' concept.
Finally, the United Nations reached in 1997 the 'Convention on the law of the non-navigational uses of international rivers' (Cano 1989; Dışişleri Bakanlığı 1996; U.N. 1997;

Öziş 1997; Wouters 2000). The definition of these watercourses as 'international' instead of 'transboundary' was an unfortunately misleading term; various clauses and restrictions can be abused by some riparians; the inclusion of regional economic integration organizations as parties may cause troubles; and the accepting votes were far from being a solid absolute majority, although only three countries (Turkey, China, Burundi) voted against it. Many states did not participate in voting, many states voted as abstention, some articles are accepted by affirmative votes of even one third of member states. Most of the states with transboundary watercourses act according to their riparian position in such basins. It should be noted that, after more than a decade elapsed, the Convention has not yet entered into force, because its ratification, acceptance, approval and accession did not occur as stipulated, by at least thirty-five states.

Among some interesting cases of large transboundary watercourses in the world, with or without parallels to Euphrates-Tigris, are: (a) the Nile basin, with six equatorial states (Tanzania, Burundi, Ruanda, Congo D.R., Kenya, Uganda) and Ethiopia, Sudan, Egypt; (b) the Indus basin, with India, Pakistan; (c) the Mekong basin, with China, Myanmar, Thailand, Laos, Cambodia, Vietnam; (d) the Plata-Parana basin, with Brazil, Bolivia, Paraguay, Uruguay, Argentina; (e) the Danube basin, with Germany, Austria, Czech Rep., Slovakia, Hungary, Slovenia, Croatia, Bosnia-Herzegovina, Montenegro, Kosovo, Serbia, Bulgaria, Romania, Ukraine, Moldova (with Poland, Switzerland, Italy, Albania, Macedonia being upper riparians of some secondary tributaries).

7.2. Permanent members of U.N. Security Council

The Colorado basin has a special place in the hydropolitical history of the United States of America, both with regard to disputes between the Union's States as well as between U.S. and Mexico. In fact, the agreement on Colorado waters, where U.S. is the upstream, Mexico the downstream riparian, is one of the famous examples on regulated water allocations. The U.S. is also the upper riparian of Rio Grande, which later forms a large part of the boundary with Mexico. The U.S. is the downstream riparian in Columbia basin, where Canada is the upstream riparian.

In the case of the Euphrates-Tigris basin, the U.S. does not support its 'strategic' ally Turkey, but favor Iraq (rather the northern region in Iraq) as well as certain Jordan basin states. The discussion of the establishment of an independent new state in northern Iraq in order to strengthen the position of Israel in the Arab-Israeli confrontation, and of the setting of a regional block as the Greater Middle-East Project (of which Turkey is supposed to share the presidency) to secure Middle-East oil

and natural gas resources and pipelines, are beyond the scope of this paper. However, the publishing of an article in the U.S. Armed Forces Journal (Peters 2006), with a map showing most of the Euphrates-Tigris, Kura-Arax, Çoruh basins as territories of a future 'Free Kurdistan' state, cannot be simply explained as the sole opinion of that article's retired colonel author, nor it is compatible by the more than half a century long alliance of U.S.A. and Turkey in NATO and other matters. One should only imagine the reactions in foreign countries, if the Turkish Armed Forces Journal publishes an article, with a map showing the entire Mesopotamia as 'Greater Turkey', declaring that the most effective management of the Euphrates-Tigris basin will be realized when it stays under a common authority as it was under the Ottoman Empire!

The Russian Federation is basically the downstream riparian in Ob-Irtysh basin with Kazakhstan as the upper riparian; in Don with Ukraine as the upper riparian on some tributaries; in Peipus Lake (Maden 2006), forming the boundary with Estonia, and Latvia being the upper riparian. The 1927 treaty between Turkey and the former Soviet Union on the development of the Kura-Arax basin's Arpaçay tributary has already been mentioned. Russia conducts, beyond water issues, delicate relations with Turkey on one hand, with the Middle-East countries on the other hand.

The People's Republic of China holds a special position in matters of transboundary watercourses. Five large rivers originate in the Tibet plateau. Two of them, the Huang-He (Yellow river) and the Chang-Jiang (Yangtze River) flow entirely in China. The remaining three are transboundary watercourses, China being the upper riparian. Lancang-Jiang (Mekong River) forms the border with Myanmar, then between Myanmar and Laos, Thailand and Laos, flows into Cambodia, then into Vietnam and ends in the South China Sea. The Nu-Jiang (Salween River) flows to Myanmar and ends in the Andaman Sea. The Zangpu-Jiang (Brahmaputra River) crosses the border to India, then to Bangladesh; with Bhutan as the upper riparian on some creeks, joins the delta of the Ganges river and flows to the Bay of Bengal. China voted, with Turkey and Burundi, against the 1997 Convention of U.N. But her needs in oil imports, thus her interest to the Gulf region oil resources, appears eventually to limit her support to Turkey regarding the Euphrates-Tigris basin.

The attitudes of the remaining two permanent members of the U.N. Security Council, namely the United Kingdom and France, will be dealt with the European Union.

7.3. European Union

Turkey has been accepted more than forty years ago as a candidate state to the European Union; but is still negotiating for full membership. Some member countries are strongly opposing Turkey's membership, causing significant frustration in Turkey and diminishing the enthusiasm for the entrance to E.U. It is beyond the scope of this paper to deal with the issue of membership; but certain attitudes are more or less related to the Euphrates-Tigris basin.

First, it should be noted that, in several European Union's member states, some of them supposedly being also an ally of Turkey in NATO, open or covered support was given to terrorist organizations for many decades. Such terrorist activities all over Turkey, but focused mainly on the southeastern regions, were intensified, when Turkey began to develop her water resources in that region. This is especially true with regard to the construction of the Atatürk Dam and related irrigation schemes, which will be the driving force in the social and economic development of that region. More than 30,000 Turkish citizens of diverse ethnic origins, either civilians or belonging to security forces, have lost their lives by terrorist attacks during the last quarter of a century. In some foreign countries, including many members of the E.U., the 'terrorist' activities in Turkey are still continued to be called as conducted by 'rebels', even by 'freedom fighters'!

The decline of the six-century long Ottoman Empire resulted in 1920 in the treaty of Sèvres, dictated by the United Kingdom, France and some other European states, dividing the empire in several new states and control zones, leaving a small territory in Central Anatolia for the Turkish state. The treaty depicted that, among others, even the rivers in this territory have to be under control of the European states. The war of independence resulted in 1923 by signing of the Lausanne treaty, obsoleting Sèvres and giving way to the present Republic of Turkey. Declarations by the E.U., proposing joint management of the Euphrates-Tigris basin, evoke reminders of Sèvres and are upsetting Turkey. Even a country like Germany, which was not involved in Sèvres and has the largest number of immigrants from Turkey, does not support her in the matters of Euphrates-Tigris basin.

The Economic Commission for Europe of the U.N. has adopted from 1992 onwards, a series of resolutions and guidelines, mostly with regard to water quality and environmental impacts (UN/ECE 1997; Bosnjakovic 2000; Kibaroğlu, et al., 2006; Akkaya, et al., 2006; Şorman 2006; Karadağ 2006; Öztürk 2006; Arapkirlioğlu 2006; Yalçın & Eken 2006; Yalçınkaya 2006; İ.M.O. 2006; Turan & Eren 2008; Dalkılıç & Harmancıoğlu 2008). Some groups in the E.U. take the

environment-friendly attitude as a pretext to hinder dam construction in the Euphrates-Tigris basin; the case of the Ilısu dam on Tigris is a typical example (Bilen 2003).

Turkey expects that the E.U. regulations on environmental protection will serve to create a transboundary Danube no more flowing as the main sewer conduit of Central Europe.

7.4. Other international organizations

The 1997 U.N. Convention accepts regional economic integration organizations to be parties of the Convention, thus enter into negotiations in matters of transboundary watercourses. Besides the European Union, other organizations, whether Turkey is a member or not, such as the Black Sea Economic Cooperation Organization, Conference of Islamic States, Arab League, and others might like to affect Euphrates-Tigris matters.

Besides activities by existing international professional organizations, like the International Water Resources Association and the European Water Resources Association, political emphasis came into foreground in 1996 by the foundation of two important international, apparently non-governmental organizations. The 'World Water Council' was founded in Marseille, and later obtained the support of the governments of many states. The World Water Council is regularly organizing the 'World Water Forum's; the fifth being held in 2009 in İstanbul. The 'Global Water Partnership' was founded in Stockholm, at the occasion of that year's Stockholm Water Symposium.

Several non-governmental organizations, international or national, primarily dealing with environmental protection, acting by good will or by some afterthoughts, are trying to hinder dam constructions, as has been experienced on some large projects in the Euphrates-Tigris basin.

8. CONCLUSION

Development projects in transboundary watercourses of Turkey, including the Southeastern Anatolian Project (G.A.P.), basically comply with U.N.'s principles of equitable and reasonable use. Moreover, dams in Turkey provide also significant benefits to downstream countries; such as sediment retention, flood mitigation and temporarily low flow augmentation.

The development of the Euphrates-Tigris basin in Turkey is in fact, a means of cooperation rather than a cause of conflict in the region. The agricultural and industrial products will serve to satisfy the needs of many middle-eastern countries. The generation of surplus secondary hydroelectric energy in wet years would serve to reduce oil and other fossil fuel consumption at many locations. In very dry years, Turkey may release additional water against indemnity of some temporarily refrained domestic irrigation activities. Thus, the Mesopotamian part of the Middle-east water crisis appears to be an exaggerated issue, compared to other disputes in the region.

Water allocation disputes among riparians, water diversion issues from Tigris to Euphrates and eventually from Euphrates to the Jordan basin, put the Euphrates-Tigris basin in the foreground of international interests. The water potential of the transboundary Euphrates-Tigris basin is quoted with large variations according to various sources; hence the determination of the accurate water potential is an essential prerequisite for any allocation among riparian states and eventual diversions to other middle-eastern countries. Furthermore, any water allocation has to be timely staged according to probability levels, because of the highly varying stochastic nature of the discharges, even after the regulation by the huge reservoirs in Turkey.

Beyond the watercourse states, a large number of domestic and especially foreign 'actors' are trying to affect the situation at the Euphrates-Tigris basin, mostly against Turkey's legitimate, equitable and reasonable projects, so that her foreign policy has to be closely tied with hydropolitics.

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A HYDRO-CLIMATE MODEL OF THE TIGRIS-EUPHRATES WATERSHED FOR THE STUDY OF WATER BALANCES

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ABSTRACT

In this study, following the recommendations of UNEP and World Bank, the Tigris-Euphrates watershed was considered as one hydrologic unit, and a comprehensive scientific assessment of the watershed's water resources was performed. Accordingly, a) an inventory of the land use/land cover, vegetation, soils, and the existing hydraulic structures in the watershed was performed; b) a regional hydroclimate model, RegHCM-TE, of the watershed was developed, and used to reconstruct the historical precipitation data, to perform land hydrologic water balance computations for infiltration, soil water storage, actual evapotranspiration, direct runoff as input for the hydrologic model's streamflow computations, and to estimate irrigation water demands; and d) a hydrologic model was developed to route the streamflows within the whole river network of the watershed. Also, an algorithm for operating the system of reservoirs within the watershed was developed, and utilized (along with the hydrologic model) to perform dynamic water balance studies of the whole watershed under various water supply/demand scenarios in order to establish efficient utilization of the watershed's water resources to meet the water demands of the riparian countries in the basin. Within this dynamic water balance framework, it is possible to assess and quantify the effect of sequential river flows on the chronologically sequential water balances over the whole watershed. The water balance study for the case that corresponds to the natural flow conditions prior to the development of the large dams within the TE basin, during the 1957-1969 critical period is presented.

Keywords: hydroclimate model, snow model, hydrological model, data reconstruction, GIS, Tigris-Euphrates watershed, water balances, reservoir operation

1. BACKGROUND

Due to various political issues in the Tigris-Euphrates (TE) river basin, historical hydrometeorological data over this region, necessary for reliable water balance studies over the region, are not available internationally at the desired fine time-space coverage. Such hydrometeorological data can be reconstructed by downscaling available historical very-coarse-spatial-resolution (~285km) atmospheric data from US National Center for Environmental Prediction (NCEP) to a grid resolution of

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~15km over the 967,341 km^2 Tigris-Euphrates (TE) river basin by means of a regional hydroclimate model. Besides reconstructing historical atmospheric data (precipitation, air temperature, wind, radiation, relative humidity), such a regional hydroclimate model (RegHCM) can also be used for simulating hydrologic processes, such as snowmelt, interception, infiltration, soil water flow, direct runoff, evapotranspiration, and irrigation water demand conditions over the whole TE watershed region. The flows at lands bordering the stream network of the watershed, that are simulated by RegHCM, can then be routed by means of a river routing module in order to simulate streamflow at selected river locations over the watershed. By means of the RegHCM one can then study the water balances over the TE watershed under various water resources development scenarios. Accordingly, a regional hydroclimate model for the watershed, to be called as RegHCM-TE, was developed. This model has 5 major modules: an atmospheric module, a snow module, a soil/ vegetation module, and a river module. The atmospheric module of the RegHCM-TE is able to provide the soil/vegetation module with the necessary atmospheric inputs, such as the spatially distributed precipitation, temperature, radiation, specific humidity and wind fields in time and space. These inputs are essential for the computations of such hydrologic processes as evapotranspiration, infiltration, runoff, etc. The snow module of RegHCM-TE estimates the snowpack depth, snowmelt and snow cover fraction by applying the energy balance approach. The soil/vegetation module of RegHCM is capable of predicting the distribution patterns of infiltration, soil water content profile, soil water storage, direct runoff volume, soil temperature, and evapotranspiration rates as areally-averaged hydrologic quantities at the scale of each computational grid area (Kavvas et. al.1998). The soil/vegetation module is fully coupled with the lower part of the MM5 atmospheric module through a boundary layer component which is based upon Monin-Obukhov parameterization and Blackadar's vertical divergence scheme (Kavvas et. al.1998). The soil/vegetation module of RegHCM-TE also computes consumptive water use by crops in the region and the required net water withdrawal quantities from the rivers. The river module is capable of routing river flow through the stream network, lakes and reservoirs in the basin. It can also handle diversions from the rivers. The application of RegHCM-TE to a water balance study for the case that corresponds to the natural flow conditions prior to the development of the large dams within the TE basin, during the 1957-1969 critical period will be presented.

2. CRITICAL PERIOD ANALYSIS OVER THE TIGRIS-EUPHRATES WATERSHED

Since it is necessary to have an assessment of the water availability in the Tigris-Euphrates river basin under historically most adverse water deficit and flood conditions, to form a basis for the decisions on water allocation among the riparian countries in the basin, it is necessary to select a historically critical dry period and a historically critical wet period over the whole basin. The critical dry period may be defined as the period that has the least amount of water resources available in the historical record. Meanwhile, the critical wet period may be defined as the period with the largest water surplus during the historical record. Such periods represent the most extreme hydrologic conditions that have occurred in the basin. It is during these extreme conditions that the greatest challenges for meeting water resource demands occur. Precipitation and streamflow data are quite limited over the whole TE river basin. It is important to note that for water balance studies that will cover the whole TE river basin, it is necessary to obtain historical streamflow data at all important river locations (important to water balance and flood studies) within the basin. After an extensive and exhaustive international search for streamflow data over the whole Euphrates-Tigris basin, it was found that the most comprehensive data under the natural conditions (prior to the onset of dams in the basin) are available during the 1937 – 1972 period. Hence, the authors have studied the available streamflow records of the basin during this period in order to distinguish the critical periods. Since they are at the headwaters to both the Tigris and Euphrates rivers, the critical period analyses at river stations at the Turkish sector of the Tigris and Euphrates rivers were performed in order to identify the critical dry/wet periods in the TE watershed. Then the identified critical periods were compared against the record at Hit station, the longest available record in the TE watershed, for verification. From the mass curve analyses and the analyses of monthly flow surpluses/deficits from the historical mean flows at various sites at the Turkish sector, 1957-1968 (in terms of water years) was identified as the critical dry period, while the 1969 water year was identified as the critical wet period. The streamflow record at Hit station in Iraq was then examined. From this examination, it was found that indeed the wettest month during the 1924-1973 continuous record of Hit station is in May 1969. From the analysis of the Hit record it is seen that the driest year since the year 1937 when the Turkish streamflow observations start is the water year 1960-1961 (during the 1937-1973 period). Consequently, within the framework of limited streamflow data within the TE watershed, the 1957-1969 critical dry/wet period (in terms of water years) is considered to be the best choice for dynamic water balance/dam operation studies over the whole TE river basin.

3. ATMOSPHERIC CONDITIONS OVER TIGRIS-EUPHRATES WATERSHED

In recent years, US National Center for Atmospheric Research (NCAR) and NCEP have recreated historical atmospheric data over the whole world at 2.5o latitude x 2.5o longitude spatial grid resolution and at 6-hr time increments from 1948 to the present. The NCEP/ NCAR reanalysis data results from the analysis of data sources such as land surface, ship, rawinsonde, pibal, aircraft, and satellite. These data are assimilated into a global circulation model to create an atmospheric database that is uniform in space and time. Over the TE basin, the 2.5o resolution corresponds approximately to a distance of about 285 km. At such coarse spatial resolution it is impossible to obtain the necessary spatial detail for the historical atmospheric conditions since the atmospheric variables are significantly influenced by the complex topography and land surface conditions over the basin. However, those coarse resolution atmospheric data sets can be used as initial and boundary conditions for mesoscale atmospheric dynamics models in order to reconstruct historical atmospheric data at fine spatial and temporal resolutions. We have successfully downscaled the coarse resolution NCEP/NCAR historical atmospheric data sets to the TE watershed region at fine temporal (hourly) and spatial (15 km) resolutions for the October 1956- September1969 historical critical period. An atmospheric-hydrologic dataset of TE basin at a spatial resolution fine enough to be able to carry out the water balance studies has thus been reconstructed for this period. The atmospheric module of RegHCM employs MM5 (Dudhia, 1993) as the atmospheric model component of RegHCM and the land hydrologic components in the original IRSHAM (Kavvas et al. 1998) as its land hydrologic components. MM5 (The Fifth-Generation NCAR / Penn State Mesoscale Model) is capable of dynamically downscaling the coarse resolution atmospheric data sets to a region at very fine spatial resolution. MM5 is a nonhydrostatic, terrain-following sigma-coordinate model designed to simulate or predict mesoscale and regional-scale atmospheric circulation over any area on earth. As examples of validation, here the simulated historical atmospheric conditions in the TE watershed during periods within 1965 –1967 are compared with the available, spatially interpolated historical observations during this period. In Figure 1 the observed (top) and the simulated (bottom) monthly precipitation (mm) in the TE watershed for the January 1967 – March 1967 are compared as a typical case. It may be seen from this figure that the simulated precipitation fields match the observation fields quite well. It can also been seen in these figures that precipitation in the TE watershed takes place not only in Turkey but also over the Zagros Mountains range near the Iran-Iraq border. Hence, the tributaries near the Iran-Iraq border supply significant amount of water to the TE basin. A comparison of observed and simulated time series of monthly temperatures, which are averaged

over the whole TE watershed, is given for the three-year period from 1965 to 1967 in Figure 2. The annual cycle of the monthly temperature is simulated well by the model.

4. SNOW AND SNOWMELT OVER TIGRIS-EUPHRATES WATERSHED

The water resources in most of the TE watershed rely on winter precipitation and snowmelt. The winter precipitation is mostly stored on Taurus and Zagros mountains as snow until spring comes; that is to say, snow plays the role of a "natural dam". A physically-based distributed snowmelt model (Ohara and Kavvas, 2006) has been applied to the TE basin. In this model, the snowmelt process is essentially described by three equations: the energy conservation equation for snow surface temperature, the mass conservation equation for snow depth, and the depth-averaged snow density equation. The snowpack is assumed to be made up of three layers: a skin layer, a top active layer and a lower inactive layer. The point scale snowmelt equations are solved at each computational node in order to evaluate snowmelt water in the study region with the spatially distributed atmospheric and topographic information. Air temperature, wind speed, precipitation, short wave/long wave radiation and relative humidity are the required inputs to the snow model, which are provided by the atmospheric module of the RegHCM-TE. It is noted that no calibration is required in this snowmelt model. Since no spatially distributed historical snow data over the mountains of TE watershed could be retrieved by the authors, in order to check the plausibility of model computations for the spatial distribution of snow cover a comparison was made by the satellite observations of snow cover versus the model simulations of snow cover. Below in Figure 3, a comparison of satellite observed spatial distribution of snow cover during April, 2002 is made against the model computed spatial distribution of snow cover during April, 1957. It is encouraging to note that the observed and modeled spatial distributions of snow cover over the TE watershed are quite similar although they correspond to different years.

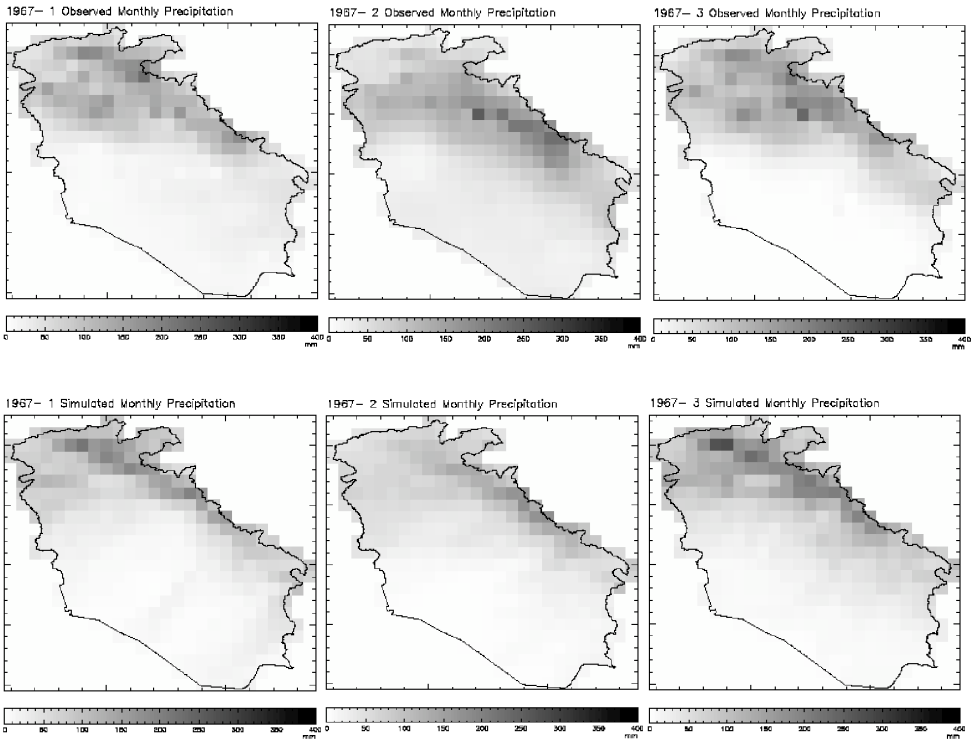


Figure 1. *Observed (top) and simulated (bottom) monthly precipitation (mm) in Tigris-Euphrates basin from January 1967 to March 1967*

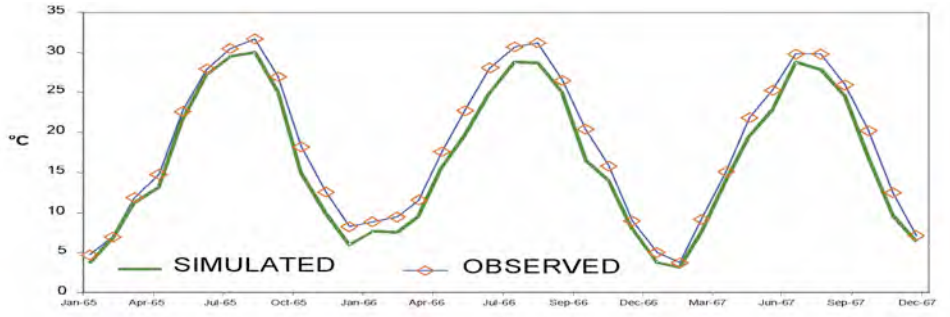


Figure 2. *Comparison of the time series of simulated and observed monthly mean temperatures averaged over Tigris-Euphrates basin from 1965 to 1967.*

5. HYDROLOGIC CONDITIONS IN TIGRIS-EUPHRATES WATERSHED

RegHCM-TE takes the historical atmospheric conditions that have been reconstructed by its atmospheric module, as input into its land surface hydrologic module, and predicts the historical land hydrologic conditions at a grid scale of 15 km x 15 km. The land surface hydrologic flow processes in the current soil/vegetation module of RegHCM-TE are described by five model components: an atmospheric boundary layer model which does the coupling between the land surface and the atmosphere, a heat balance model for the top soil layer, a vegetation model for precipitation interception by vegetation, an evapotranspiration model, and a soil water flow model for infiltration and direct runoff.

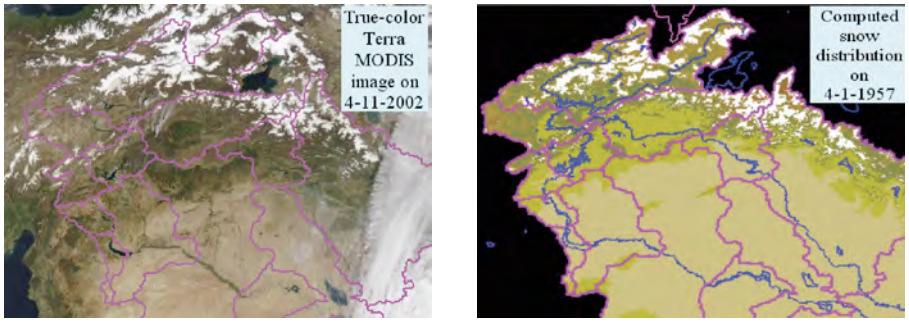


Figure 3. *A comparison of satellite-observed and model-simulated spatial distribution of snow cover over Tigris-Euphrates watershed*

The first two models deal with both moisture fluxes and heat fluxes while the last three models deal only with moisture (water) fluxes. Since the moisture fluxes and heat fluxes are closely related, all five models are coupled with each other and are solved together in RegHCM-TE. The vegetation model computes interception of precipitation by vegetation, throughfall to the ground, and direct evaporation from vegetation leaves which requires the temperature values that are estimated from the heat balance model and boundary layer model. On the other hand, the heat balance model requires the evapotranspiration values, which are estimated from the soil water flow model and the evapotranspiration model. The soil water flow model predicts the ground surface water content and the soil water storage, and the direct runoff volumes at the land surface which are calculated from the infiltration excess of rainfall by means of the areally-averaged Green-Ampt equations in the soil water flow model (Kavvas et al.1998; Chen et al. 1994a,b).

RegHCM-TE's boundary layer model uses a modified Monin-Obukhov similarity theory (Kavvas et al.1998) to describe the temperature, wind, and moisture distributions in the vertical direction between the lower atmosphere and the land surface. This boundary layer model, together with its atmospheric module and the land surface heat balance model, supplies the land surface water flow model with the temperature and humidity of the air above the plant canopy, the ground surface temperature, the bulk transfer coefficient, and the surface pressure which are used to determine the saturated mixing ratio at the ground surface. The boundary layer parameters are dependent upon the aerodynamic roughness height, the potential temperature of the first layer of the atmospheric model, and the temperature of the soil surface. The land surface moisture flux to the atmosphere (evapotranspiration), is estimated from the turbulent velocity scale and the humidity scale of the boundary layer on one hand, and from the soil water flow process and plant physiology that dictate the soil moisture availability, on the other. Consequently, in order to be able to predict the future evapotranspiration fluxes from the land surfaces to the atmosphere under various atmospheric boundary layer states (unstable, neutral, etc.) it is necessary to have a fully coupled atmospheric boundary layer/land surface hydrology model that is then coupled to the model of the upper atmosphere (Kavvas et al.1998). The heat balance model estimates the surface temperature in top soil layer by taking into account all of the surface heat fluxes, i.e., solar radiation, long wave radiation, sensible heat flux, latent heat flux and heat conduction from (to) deep ground to (from) the surface soil layer. The sensible heat flux is estimated by means of the boundary layer model with the estimated land surface temperature, and it is computed using the turbulent velocity scale and temperature scale of the Monin-Obukhov similarity theory.

The vegetation model is based on the physical concepts proposed by Deardorff (1978). A single layer with negligible heat capacity is used to represent vegetation in this model. The interception component of this model is used to estimate the liquid water storage on vegetation leaves (see Kavvas et al. 1998 for details).

The core of the land surface water flow model in RegHCM-TE is the spatially horizontally averaged Green-Ampt model for computing infiltration/unsaturated flow over areally heterogeneous soils (Chen et al. (1994a,b)). Spatial variability of soil parameters that govern moisture availability becomes very significant at the grid scales typically used in such regional models. The soil/vegetation module of RegHCM-TE treats the spatial variability of hydraulic conductivity as the primary cause of spatial variability in soil water content profiles, and treats the soil as composed of independent vertically homogeneous columns since at a grid scale as large as 15km x 15 km the

variability of soil hydraulic properties in the horizontal directions is much larger than in the vertical direction. The soil water flow model predicts infiltration to the soil layer, the direct runoff over the soil surface, the soil water flow/profile conditions in the soil layer, and evapotranspiration to the atmosphere over the land surface. The evapotranspiration rate is estimated according to the concept of moisture availability and the atmospheric conditions, following the approach of Noilhan and Planton, (1989). The details of the evapotranspiration component of RegHCM-PM are given in Kavvas et al.(1998). A detailed description of the parameters for the soil/vegetation module of RegHCM-PM is given by Kavvas et al. (1998).

In order to simulate the historical runoff in the Tigris-Euphrates river system, an HEC-HMS (Hydrologic Engineering Center Hydrologic Modeling System) model was constructed as part of the regional hydroclimate model RegHCM-TE. The HEC-HMS model is made up of 27 subwatersheds and 20 channel routing segments covering the Euphrates and Tigris rivers and their tributaries. Direct runoff results from RegHCM-TE were used as inputs into the HEC-HMS model of the Tigris-Euphrates basin stream network to simulate the system runoff during 1957-1969. Monthly irrigation diversions within the system, computed by RegHCM-TE, were also subtracted from streamflows within the system. For the channel routing segments, the Muskingum method was used to route the flows.

Here, due to limitations in space, only the case that corresponds to the natural flow conditions prior to the development of the large dams within the TE basin, during the 1957-1969 critical period will be presented. This case is important both for validating the modeling technology by means of observations over the whole critical period over the entire watershed, and for establishing the base conditions to compare the results of the current and future water resources development scenarios within the basin. However, before the discussion of the water balance case study, it is important to discuss the estimation methodology for irrigation water demands within the TE watershed, since the irrigation water demands are much larger than other possible water demands (urban, industrial, etc.) within the watershed.

6. IRRIGATION WATER DEMAND FOR THE TIGRIS-EUPHRATES WATERSHED

For the case study that corresponds to natural flows prior to the development of large dams in the watershed, the historical diversions during the critical period of water years 1957 to 1969 both by Syria and Iraq are required when streamflows from Turkey over Tigris and Euphrates are given. Figure 4 provides a schematic overview of the process for computing the crop water demand. The Blaney-Criddle formula has been

widely used for estimating crop consumptive use (potential crop evapotranspiration) in the TE watershed (Kharrufa et. al, 1970).The Blaney-Criddle formula (Brouwer and Heibloem, 1986) was adopted in this study. The empirical effective precipitation is traditionally subtracted from the computed monthly potential evapotranspiration (ET) in order to obtain the irrigation water demand. However, in this study, the estimated actual evapotranspiration (computed by RegHCM-TE) under natural water conditions (without irrigation) was subtracted from potential ET in order to obtain the irrigation water demand since the irrigation water need can be regarded as the extra evapotranspiration needed by the plant to grow. A scientifically sound method for estimating actual evapotranspiration over a study area requires knowledge of the wind, radiation, atmospheric relative humidity gradient, soil water state, and crop pattern over that area, which can be obtained by means of a regional hydroclimate model, such as the RegHCM-TE of Tigris- Euphrates watershed, and by a satellite-data based geographic information system (GIS) on the land use/land cover of the watershed, that was developed in this study. In order to estimate the irrigation water quantity withdrawn from the Euphrates and Tigris rivers in Syria and Iraq under natural conditions, the monthly crop consumptive use of water in the subbasins were estimated by the Blaney-Criddle formula. At the monthly time scale, the actual evapotranspiration is computed by the hydroclimate model RegHCM-TE. For a given area, the amount of water that is needed for irrigation in order to satisfy the crop water requirement, can be estimated by subtracting the actual evapotranspiration from the potential evapotranspiration of the crops in the area. This water is also called “deficit replacement”. When the consumptive water use for crops is smaller than the available moisture for crops at the monthly scale, the deficit replacement is set to zero. In order to account for conveyance losses in the tertiary agricultural channels, the deficit replacement values were multiplied by 2.5.

7. WATER BALANCE STUDY OF THE NATURAL CONDITIONS DURING 1957-1969 PERIOD

In the first case study for the dynamic water balances of the Euphrates-Tigris watershed, the water balance associated with the critical hydrologic period of water years 1957 through 1969 is presented. The time period of water years 1957 through 1969 represents a historical period prior to the construction of large dams in the Tigris-Euphrates basin. For this case study, the goal is to match the observed flow values at specified locations where data are available for comparison. For this scenario the historical irrigation demand during the critical period of water years 1957-1969 was computed over Syria and Iraq, using the pertinent information from FAO tables, along with the above-described procedure. Below, the procedure is explained in terms of the irrigation demand estimations for the Syrian sector of the watershed.

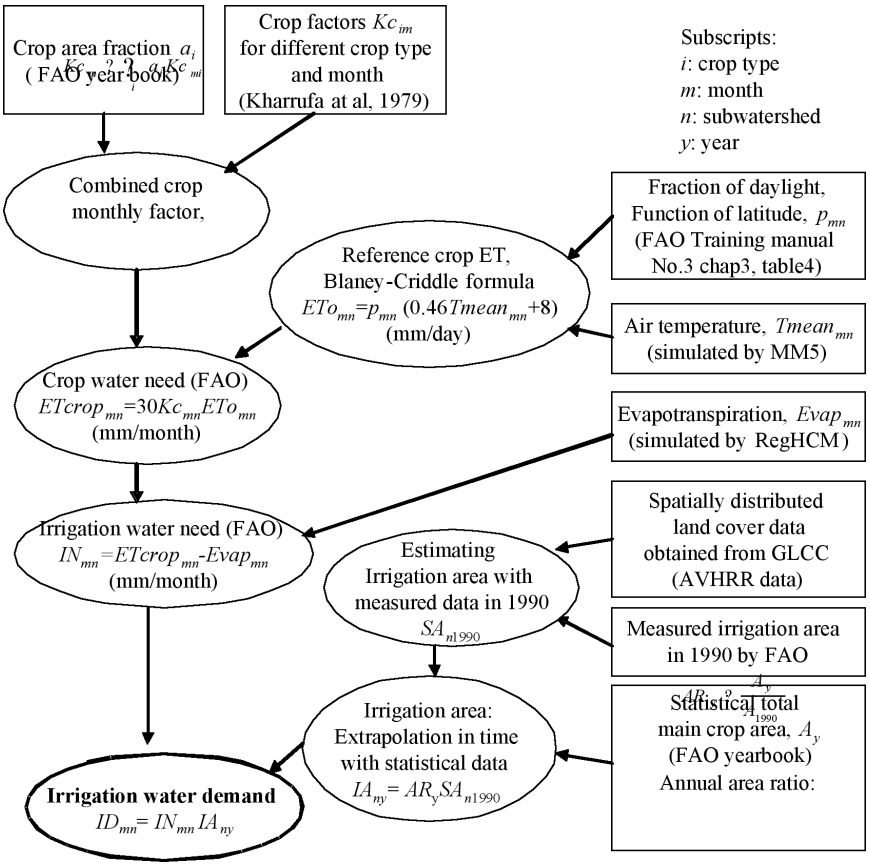


Figure 4. *Schematic description of the process for computing irrigation water demand*

In order to estimate the water quantity withdrawn from Euphrates for agriculture in Syria, the catchment area of Euphrates in Syria was divided into three subwatersheds: Tabka, Deir Ez-Zor, and Abu-Kemal, within the RegHCM-TE. Monthly crop consumptive use of water in the three subwatersheds were estimated by the Blaney-Criddle formula. In the use of the Blaney-Criddle formula monthly mean air temperatures were obtained directly from the regional hydroclimate model RegHCM-TE. The monthly percentages of daytime hours were computed based on the latitudes of the region. The crop coefficients were estimated based on FAO publications, and were adapted to the local conditions of the region. At monthly time scale, the actual evapotranspiration, which is computed by the hydroclimate model RegHCM-TE, is equivalent to the naturally available moisture for crops. Therefore, for a given area the amount of water that is needed for irrigation in order to satisfy the crop water requirement, can be estimated by subtracting the actual

evapotranspiration from the potential evapotranspiration of the crops in the area. This water is also called "Deficit Replacement". When the consumptive water use for crops is smaller than the available moisture for crops at monthly scale, the deficit replacement is set to zero. Table 1 gives the estimated monthly Deficit Replacement for crops in the three subwatersheds during 1965-1967. Taking into consideration the additional water loss during water transfers from the river to individual agricultural fields, the amount of water withdrawn from the river is estimated to be 2.5 times the Deficit Replacement.

Table 1. *Monthly and annual deficit replacement in Syria during 1965-1967*

M m^3	1965			1966			1967	
	Tabka	Deir Ez-Zor	Abu-Kemal	Tabka	Deir Ez-Zor	Abu-Kemal	Tabka	Deir Ez-Zor
January	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
February	0.00	0.00	0.63	0.00	0.00	0.00	0.00	0.00
March	7.51	2.06	7.60	5.31	5.26	9.20	0.00	0.00
April	24.99	25.38	33.58	28.19	28.29	29.74	32.87	41.21
May	57.57	81.84	87.74	55.47	79.76	83.14	30.78	37.64
June	60.83	87.74	97.81	47.57	72.45	87.03	52.25	80.16
July	13.48	19.46	24.29	8.86	15.40	23.53	14.33	23.51
August	2.59	0.45	0.00	2.04	7.56	11.45	4.97	11.07
September	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
October	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
November	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
December	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Annual	167.0	216.9	251.7	147.5	208.7	244.1	135.2	193.6

In order to obtain the spatial distribution of acreage as it evolved in time for the natural conditions, a yearly multiplier was obtained using the FAO main crop area values. Figure 5 illustrates a representative comparison of observed to RegHCM-TE simulated annual flow volumes at Hit gauging station within TE watershed during water years 1957 to 1968. The modeling results at other sites are similar to those at Hit station. From Figure 5 it may be inferred that the model provides an accurate depiction of the annual flow volumes in the rivers at Tigris-Euphrates watershed. For the critical wet water year 1969, as a representative example, the observed and modeled flows are shown in Figure 6 for the Al Nasiriyah station since this station provides the inflow conditions to the Al Hammar marshland at the downstream of the Euphrates subwatershed.

Figure 5. *Modeled and observed annual runoff for the critical period at Hit station*

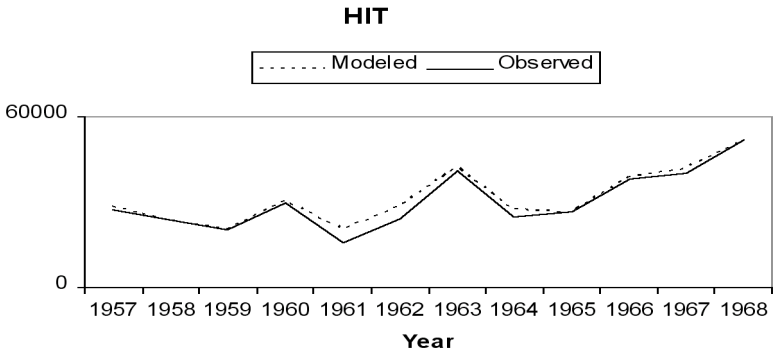
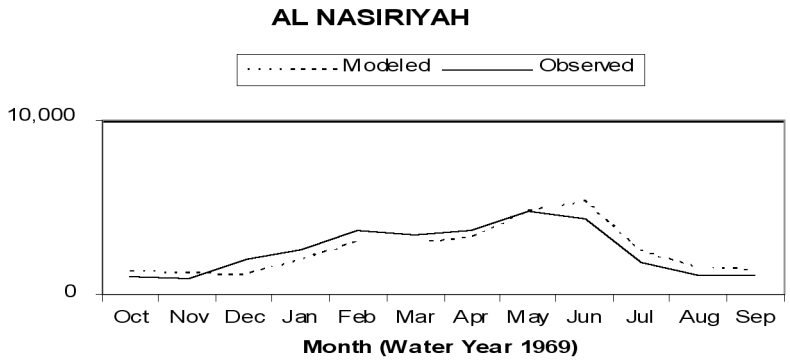


Figure 6. *Observed versus modeled monthly flows at Al Nasiriyah during wet water year 1969*



The first case study also provides an opportunity to compare the dynamic water balances presented here, to actual observed water balances and to static water balances conducted by other authors and published elsewhere. Tables 2, 3 and 4 give the "observed" and modeled water balances of the TE watershed under the 1957-1969 critical period "natural flow" conditions. "Observed values" came from the actual observed flow data at DSI Archives, and from reported values by Naff and Hanna (2001), and Kolars and Mitchell (1991). In Table 2, available observed data were compiled to obtain the percent contributions of the main stem and tributary flows in the Tigris- Euphrates watershed. Table 2 shows that approximately 90% of the Euphrates flow originates in Turkey compared to only 46% of the Tigris flow originating in Turkey. The Syrian tributaries made up of the Balikh, Sajur, and Khabur rivers provide another 10% of the Euphrates flow. Iraq does not contribute significantly to flows on the Euphrates river. However, on the Tigris river, Iraq contributes the majority of the total flow to the Tigris river via the Greater and

Lesser Zap, the Adhaim, and the Diyala rivers. In terms of flow volumes shown in Table 4, Turkey on average provides 31.4 of 35 billion cubic meters (BCM) of flow for the Euphrates and 22.1 of 49 BCM of flow for the Tigris. For the critical hydrologic period, identified as water years 1957 to 1969, 1961 was the driest year and 1969 was the wettest. In water year 1961, the total flow on the Euphrates was 18 BCM of which 15.4 BCM originated in Turkey. In 1969, the estimated flow on the Euphrates was 60 BCM of which 56 BCM originated in Turkey. Due to lack of information on the flows of the Tigris tributaries in 1961 and 1969, no observed flow volumes are provided for these years.

Table 2 *Observed Flow Percentages for TE watershed during water years 1957 – 1969*

River	Euphrates	Tigris	Karkheh	Combined Basin
Euphrates at Birecik	88%	-		36%
Total Turkey Euphrates	90%			37%
Syrian Tributaries	10%	-		5%
Tigris at Ilisu	-	34%		20%
Total Turkey Tigris		45%		25%
Greater Zap	-	26%		15%
Lesser Zap	-	14%		8%
Adhaim	-	2%		1%
Diyala	-	13%		7%
Karkheh	-	-	100%	2%
Tigris % Basin	57%			
Euphrates % Basin	41%			
Karkheh % Basin	2%			

Note: Data used from various available sources with time periods of varying lengths

Table 3 *RegHCM-TE modeled flow percentages for water years 1957 – 1969*

River	Euphrates	Tigris	Karkheh	Combined Basin
Euphrates at Birecik	90%	-		36%
Total Turkey Euphrates	91%			37%
Syrian Tributaries	9%	-		4%
Tigris at Ilisu	-	36%		20%
Total Turkey Tigris		46%		26%
Greater Zap	-	24%		13%
Lesser Zap	-	15%		8%
Adhaim	-	2%		2%
Diyala	-	13%		7%
Karkheh	-	-	100%	3%
Tigris % Basin	56%			
Euphrates % Basin	41%			
Karkheh % Basin	3%			

Note: Data used from various available sources with time periods of varying lengths

Table 4 *Observed flow volumes in BCM during water years 1957-1969*

Location	1961	Average	1969
Birecik	15	31	55
Total Turkey Euphrates	15.4	31.4	56
Total Euphrates	18	35	60
Ilisu	6	17	34
Total Turkey Tigris	11	22.1	40
Total Tigris	-	49	-

Table 3 provides representative results of the water balance modeling completed during this study for comparison to values in Table 2. As can be seen from Tables 2 and 3, the relative contributions of the total flows of both rivers were simulated adequately. Differences are less than three percent for all sites.

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THE EUPHRATES-TIGRIS RIVERS AND THE DETERMINATION OF TURKEY

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THE EUPHRATES-TIGRIS RIVERS AND THE DETERMINATION OF TURKEY

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ABSTRACT

The Euphrates and Tigris Rivers are two transboundary bodies of water that spring from eastern Turkey and flow into the Persian Gulf. The total amount of water that originates in Turkey and carried by these two rivers to the border is 48-50 billion m^3/year, and this constitutes approximately 60% of the water carried by Shatt-al Arab. Turkey has started working on the Euphrates and Tigris Rivers in 1930s to produce energy and to irrigate land, and has produced 30 billion kWh of energy and opened 300 thousand hectare of agricultural land to irrigation to-date. Turkey pays extreme attention to the water rights of its downstream countries. Turkey wishes these waters to bring peace to her neighbors, and for this, has proposed to develop common scientific and technology-based strategies in a three-phase plan to Syria and Iraq. The three countries, sharing a common religion, culture and several hundred years of common history should be able to also share peacefully the waters of the two rivers. This paper, which was prepared by a engineer who worked actively on the largest structure on Euphrates, the Ataturk Dam and the hydroelectric power plant, presents how the people of the three countries sharing the resources of the Euphrates and Tigris can collaborate with good will for their mutual future benefit.

1. INTRODUCTION

The Euphrates and Tigris Rivers are two transboundary bodies of water that spring from eastern Turkey and flow into the Persian Gulf. The Euphrates River springs from high mountain ranges in northern parts of the East Anatolian Region in Turkey in two tributaries. These tributaries join after 400-500 km to form what is called Euphrates. The river flows within Turkey a distance of 500 km from its spring site until the Syria-Turkey border and then enters Iraq through Syria to join the Tigris. The Tigris River springs out from the highlands of the southern part of East Anatolian Region, flows through a distance of around 530 km within Turkey and joins the Euphrates River in Iraq. The point where these two rivers join is called Shatt-al Arab, and this single water body discharges into the Persian Gulf after a distance of about 100-150 km.

In terms of the water load, the Euphrates and Tigris rivers are the two largest rivers in Turkey. The annual water load the Euphrates carries from Turkey into Syria is 30 – 31 m^3/year, whereas the Tigris has an annual water flow load into Iraq of 18-19

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m^3/year. The total amount of water these two rivers carry outside Turkish borders is 48-50 m^3/year; considering the total water capacity of Shatt-al Arab being 85 billion m^3/ year, we estimate that almost 60% of the water flowing in these two rivers should spring from Turkey.

2. HISTORY

Flowing for centuries, these rivers have given life to the Lower Mesopotamia region where the first civilizations in history have flourished. The Euphrates and Tigris Rivers springing from the highlands of East Anatolian Region of Turkey have caused erosion for centuries as they have flown through high slopes in Turkey and formed vast alluvium plains in Iraq where the land has developed lower slopes with the sediments. As a result of such natural flows, Turkey has faced severe erosion and desertification, whereas Iraq and Syria have made use of fertile plains rich in alluvium.

2.1. Works on the Euphrates River

Works of Turkey on the Euphrates River to make use of the river with the advantages provided by technology date back to 1930s. These works have commenced with hydrology and geology research necessary for energy production tasks. Those tasks were carried out by experts invited from technologically more advanced countries at that time and these initiatives by Turkey to generate energy on the Euphrates River has continuously been hindered by foreign experts and powers behind them with a number of excuses.

Manifesting the decisiveness on the Euphrates River in 1960s and constructing Keban Dam and Hydroelectric Plant, Turkey managed generation of 6 billion Kwh of energy upon the completion of Keban Dam in 1974. This is the first serious and strong step in Turkey's struggle on utilizing the Euphrates River.

Turkey re-shaped planning and project tasks commenced under the name of Lower Euphrates Project together with the country's own technical ability upon including the Tigris River into the process in the 70s under the name of Southeastern Anatolia Project (GAP) thus, has manifested its commitment to utilize the capacity of these rivers in prevention of floods, generation of energy and irrigation. The very first product of this commitment is the Karakaya Dam and Hydroelectric Plant constructed after Keban Dam on the Euphrates River, which commenced operation in 1987 with an annual capacity of 7.5 Kwh.

The biggest step in GAP is the construction of Atatürk Dam and Hydroelectric Plant. Foreign assistance was used only for the electromechanical devices of energy generation; the rest of the project was financed completely by national resources. While the project, construction and technical maintenance for Keban and Karakaya Dams were conducted by foreign companies, the project and maintenance of Atatürk Dam was a joint work of Turkish and foreign companies, construction by Turkish firms, and production as well as mounting of the electromechanical systems were made by foreign companies.

Atatürk Dam and Hydroelectric Plant have great importance in the history of Turkish engineering. That importance can be seen as follows: The construction work of this world-scale dam was conducted completely by Turkish technical labor. Turkey gained a respectable position within the World Dams League by constructing this dam of 169 m in height and 83 million m3 in volume in a period of only 10 years. The real important feature of this project is that it made possible for the first time in history to transfer Euphrates waters to the plains of Upper Mesopotamia through Şanlıurfa irrigation pipes of 2 x 26.4 km long, that were also constructed by Turkish labor.

Other dams constructed on the main tributary of the Euphrates River are Birecik and Karkamış Dams and Hydroelectric Plants, which provide 2.8 + 0.652 = 3.452 billion Kwh energy annually. With the completion of these dams, the overall dam construction on the Euphrates River is complete. Facilities that need to be constructed on the tributaries of the river are planned and constructed within the framework of a plan and program and with the use of national sources and labor. Turkey has progressed far in its struggle to develop the watershed of Euphrates. The installed capacity and annual energy generation rates of the plants and facilities built on the main tributary of Euphrates River are presented in Table 1. The use of the river for irrigation will be presented under the title of GAP.

Table 1. Installed Capapcity, Annual Generation and Generation-to-date of the Plants and the Facilities Built on the Main Tributary of Euphrates River

	Installed Capasity (MW)	Annual Generation (kWh/yıl)	Generation-to-date (kWh)
Keban	1330	6.0 billion	204 billion
Karakaya	1800	7.5 billion	158 billion
Atatürk	2400	8.9 billion	126 billion
Birecik	672	2.83 billion	25 billion
Karkamış	189	0.65 billion	6 billion
Total	**6391 MW**		**519 bilion kWh**

2.2. Works on the Tigris River

Works that commenced on the Tigris River during 1970-80s have failed to be completed on schedule due to financial challenges and primarily the separatist terror acts.

The construction of Ilısu Dam and Hydroelectric Plant together with the Batman Dam and Hydroelectric Plant on the main tributary of Tigris, which is the most important production chain ring of this project, as well as Kral Kızı and Dicle Dam and Hydroelectric Plant on the secondary tributary have commenced in 2006. After long and challenging struggles, foreign credit was made available for the project. The counselor of the project is a Turkish-foreign partnership and the construction work is conducted by Turkish companies. Electromechanical system will be established by foreign companies. There have been strong oppositions as to the construction of Ilısu Dam and Hydroelectric Plant, especially from abroad. This author believes that Turkish public knows the actual intentions for blocking this project by claims, such as human rights, environmental status, resettlement of the communities and protection of historical heritage. This author believes that Turkey is determined to take the Ilısu Dam that will provide generation of 3.83 Kwh of energy annually, into operation by 2013.

The installed capacity and annual energy generation rates of the plants and facilities built on the main tributary of the Tigris River are presented in Table 2.

Table 2. Installed Capacity, Annual Generation and Generation-to-date of the Plants and the Facilities Built on the Main Tributary of Tigris River

	Installed Capacity (MW)	Annual Generation (kWh/y)	Generation-to-date (kWh)
Kralkızı	204	444 million	4.4 billion
Dicle	110	146 million	1.3 billion
Batman	198	483 million	2.4 billion
Total	**512 MW**		**8,1 billion**

The information for the hydroelectric plants planned for the future is presented in Table 3.

Table 3. Planned Htdroelectric Plants

	Installed Capacity (MW)	Annual Generation (kWh/y)
Ilısu	1200	3.833 billion
Cizre	240	1.280 billion

3. WATER STRUCTURES

Rivers can be used for irrigation, provision of drinking and industrial water, energy generation, tourism, fishery, transportation, etc. Certain structures can be built on rivers to facilitate their use, the most important of these being dams and regulators, as water collection structures. Thousands of dams were and are still being built all over the world in various sizes and heights in order to collect and store water. This enables hydroelectric generation through the energy generated by flowing water, and the water stored is used for irrigation during periods of need. Dams also have quite a number of disadvantages. The benefits and disadvantages of dams can be summarized as in Table 4.

Before the construction of a dam, first an income-loss analysis is conducted, in general, to decide on its feasibility. Areas downstream usually benefit from the construction of a dam whereas areas upstream are usually harmed.

Table 4. *The Benefits and Disadvantages of Dams*

Benefits	Disadvantages
• Prevents floods • Regulatse the flow regime • Provides hydropower generation • Provides irrigation water • Decreases drought impacts • Provides drinking, municipal, industrial water for residential areas • Creates new tourism alternatives • Increases transportation options • Creates new ecosystems, new fauna and floras	• Areas under the reservoir destroy flora, such areas cannot be utilized for other purposes • Historical remnants remain under water • Local people are forced to resettle, causing humanitarian problems • They change downstream flow, forming new ecosystems.

3.1. The Effects of Dams Constructed by Turkey on the Euphrates and Tigris Rivers on Downstream Countries Syria and Iraq

Do dams constructed on Euphrates by Turkey have any benefits to downstream countries?
Yes, they have. Annual flow regimes of rivers are regulated with the dams constructed, and the river downstream receives relatively steady amounts of water according to the season of the year. Therefore, countries downstream of the river:

- are prevented from damages of floods
- are prevented from droughts
- their hydropower capacity will increase by receiving steady flow for their hydropower plants and dams
- their water projects become more affordable since they work on steady flows

The flow rate of the Euphrates River before the construction of the dams used to fall as low as 150 m^3/second in summer, and go up to over 3000 m^3/second. Upon the completion of the dams, the flow rate averaged at about 500-700 m^3/second.

Do dams constructed on Euphrates by Turkey have any disadvantages to downstream countries ?
Yes, they might have. Benefiting from the floods is over. Since the flow of sediments stops, the expansion of alluvium plains halts as well. Yet the cleaner and steady flow of water into these plains should have positive effects on the wetland ecosystems.

Furthermore, the amount of water downstream of the river decreases while water is stored upstream during the water collection phase. The amount of the water released downstream during water collection phase should be sufficient to meet the demands of the countries downstream. These demand figures are determined among those countries. For instance, Turkey and Syria have agreed on releasing at least 500 m^3/second during water collection phase of Atatürk Dam, and this amount was maintained during the period of 23 November 1989 until 26 July 1992 – the date when energy generation commenced.

It should be mentioned that Syria experienced energy losses from its dams on the Euphrates River during this period of 2.5 years. However, since 1992, namely for 16 years now, Syria gained excess power from these plants and this excess will continue to increase in the future. Therefore, when one mentioning of the losses, one should also present the gains, to put things into perspective.

Another potential problem for downstream countries could be the deterioration of water quality due to the returned irrigation water upstream. However, it was measured that water reaching Syria after receiving irrigation drainage at Şanlıurfa-Harran Plain had a salinity below 0.75 dss, namely acceptable quality for further irrigation.

To sum up, Turkey has provided more benefit than harm to the countries downstream the rivers with the dams it constructed in Southern Anatolia. While doing this, Turkey lost considerable areas from its own territories to reservoir lakes. In return for the labor and expenditures made for these dams, Turkey asks for nothing from the countries downstream. With this fact so clear, the squalls of these countries stating they are damaged by GAP are unacceptable. This is an improper act, against all humanity and moral values. We consider such acts of accusations from countries, which we have considered as friends, but which we understand were never so friendly, as unfair and wrong. Turkish people do not have any intention to do injustice to anyone on making use of the Euphrates and Tigris Rivers.

Now let us focus on the main aspects of Southeastern Anatolia Project GAP which is a global scale regional development project, having great importance for not only Turkey but also all humanity.

4. SOUTHEASTERN ANATOLIA PROJECT (GAP)

As seen in Figure 1, GAP, which is an integrated development project, aims at developing the region on a socio-economical basis in sectors of urban-rural infrastructure, agricultural infrastructure, transportation, industry, education, health, accommodation and tourism. It is being constructed solely with national resources in order to generate 27,378 Gwh with an installed capacity of 7,490 MW and to irrigate 1,820,358 ha of agricultural land.

The hydroelectric potential of GAP constitutes 25 % of the total hydraulic energy potential in Turkey, whereas the irrigation potential of the project constitutes 20 % of the total irrigable land in Turkey. These rates show the importance of the project for Turkey. The actualization rate of the project in energy generation in 2008 has been 74%, whereas the same rate for irrigation has been 15%. Turkey is committed to complete the GAP Project by 2023. This will bring along food, work, social security, peace and welfare to the people of the region, and will provide a self-respecting life standard for the Turkish citizens living in the region.

4.1. Social Conditions of the Region:

According to the 2007 address-based census, total population of Turkey is 70,586,256, and the region hosts 10 % of this population. The per capita income of the region is lower than the average rate of Turkey.

Unemployment rate in the region is well over the average Turkey rate. Educational, medical and social services are not sufficiently provided to people in the region. To sum up, the region severely needs an economic and social development project like GAP.

4.2. State of the Land and Production Patterns:

Agricultural classification of the lands to be irrigated in Southeastern Anatolia Project area is as follows:

1. class land rate	2 %
2. class land rate	65 %
3. class land rate	18 %_____ 85 %
4. class land rate	2 %
5. class land rate	5 %
6. class land rate	8 %

With this project, 85 percent of the land to be irrigated consists of high quality agricultural land. Main products to be produced are beet, oilseed, corn, fresh vegetables, animal feed, cotton, rice, pistachio and fruit. Thanks to Southeastern Anatolia Project, the following increases are expected in the production of beet: 29%, oilseed: 3%, corn: 8%, fresh vegetables: 28%, animal feed: 23%, cotton: 118%, rice: 10%, pistachio: 286%, and fruit: 54%.

4.3. Irrigation Principles in Southeastern Anatolia Project:

Two indispensable principles in Southeastern Anatolia Project are:

- **Irrigation water should be used in the most appropriate way. Water shouldn't be wasted, and**
- **Soil should be protected. With an appropriate irrigation technique, necessary amount of water should be supplied for the soil while preventing salinization of the soil.**

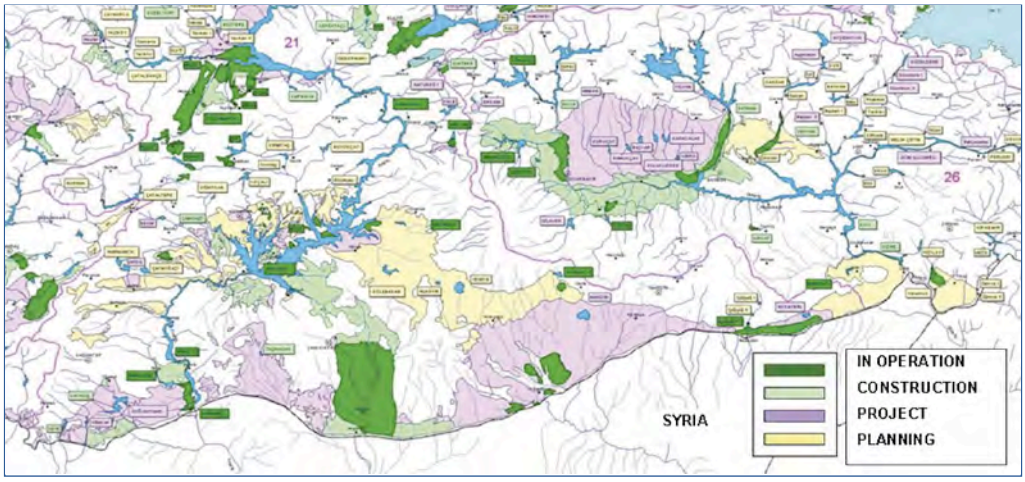

Figure 1. *Map of GAP General Outlook*

To be able to satisfy these principles,

- The most advanced irrigation technique should be applied.
- The most appropriate crop should be selected for the soil and the amount of water available.
- The farmer should be educated and made aware of the facts about the selected crops.
- From field to factory, agricultural activities should be executed by employing scientific methods.

Closed irrigation system (sprinkling, drip irrigation) is an advanced technology that provides water savings. Investment costs of these systems are 50-100 % more than the open systems. However, as they enable the controlled use of water in the facility and enable water savings, open systems were not preferred in the Southeastern Anatolia Project. Open irrigation systems provided up to now will be turned into closed irrigation systems and also from now on, irrigation systems will be constructed as closed irrigation systems.

4.4. Targets of Turkey in Southeastern Anatolia Project:

Three targets of Turkey in Southeastern Anatolia are:

- Humanitarian target of Southeastern Anatolia Project: Everyone should benefit from this water equally.
- Social target of Southeastern Anatolia Project: Social welfare level of region's population should be augmented with economic opportunities gained via the project.
- Economic target of Southeastern Anatolia Project: Economic strength of Turkey must be augmented with this project.

For these targets to be realized, Turkey invested 20 billion US dollars up till now. For the project to be completed it will invest somewhat 20 billion US dollars again and by doing so, it will augment the life standard of the region's population. Turkey is determined in this subject.

5. TRANSBOUNDARY WATERS / THE EUPHRATES AND TIGRIS RIVERS

The future of Euphrates and Tigris is a concern for only Turkey, Syria and Iraq. The reason for this is that these rivers originate from the lands of these countries and at the same time they nourish the lands of these countries. There is no sense for others, apart from these three countries, to get involved in the discussions on this subject and furthermore they are not entitled to any legal rights. However, some circles feel they

have the rights to govern the world and put forward some scenarios on this matter, claiming they are protecting the rights of some people and speaking on their behalf. These circles make systematical propagandas to the world public opinion against Turkey claiming that "Turkey cuts the water of downstream countries with the Southeastern Anatolia Project".

Some Arabic countries, including Syria and Iraq, are directors and supporters of this propaganda which has influenced the third world countries. The European countries, USA and Israel also would like to openly intervene in the use of Euphrates and Tigris water and take side with the parties accusing Turkey.

5.1. Irrigable Lands

Irrigable lands with Euphrates and Tigris Rivers in Turkey have been determined by earlier studies conducted by Turkey. No such information has been made available from Syria and Iraq. Does this information exist? If it is, why it is not being made available? The situation is unknown.

Areas that will be irrigated with Euphrates and Tigris Rivers are shown in Table 5 with estimated and approximate figures for Syria and Iraq:

Table 5. *Irrigable Lands with Euphrates and Tigris*

Country	Euphrates (ha)	Tigris (ha)	Total (ha))
Turkey	1,800,000	650,000	2,450,000
Syria	800,000	150,000	950,000*
Iraq	2,500,000**	1,500,000	4,000,000
Total	5,100,000	2,300,000	7,400,000

(*)In the calculation of these areas, soils which have agricultural land classification values between 1 and 6 should be taken into consideration.
(**)Lands that Iraq will irrigate using the water of Euphrates are highly exaggerated.

5.2. Water Usage from the Euphrates and Tigris Rivers in the aftermath of GAP:

Hydrological changes that will occur in Euphrates and Tigris after the Southeastern Anatolia Project is completed fully have been examined and various water budgets have been proposed by the experts of the subject or organizations related to this work. In Table 6, the water budgets of Euphrates and Tigris Rivers for open irrigation and for closed irrigation with 20% and 30% water are presented by using information from Kolars (1994) and Kliot (1994).

Table 6. *Estimated Water Budgets for Euphrates and Tigris Rivers*

	Kolars (1994)			**Kliot (1994)**			**US Corps of Engineers**		
	Open System %20 Closed System %30			Open System %20 Closed System %30			Open System %20 Closed System %30		
EUPHRATES									
Natural stream between Turkey and Syria border	30.67	30.67	30.67	28.20	28.20	28.20	28.20	28.20	28.20
Water drawn by Turkey	-21.60	-17.28	-15.12	-21.50	-17.20	-15.05	-21.50	-17.20	-15.05
Flowing through Syria	9.07	13.39	15.55	6.70	11.00	13.15	6.70	11.00	13.15
Water joining to Euphrates from Syria	9.484	9.484	9.484	10.70	10.70	10.70	4.50	4.50	4.50
Water drawn by Syria	-11.995	-9.596	-8.397	-13.40	-10.72	-9.38	-4.30	-3.44	-3.01
Flowing through Iraq	6.559	13.278	16.637	4.00	10.98	14.47	6.90	12.06	14.64
Water drawn by Iraq	-13.00	-10.40	-9.100	-16.00	-12.80	-11.20	-17.60	-14.08	12.32
Flowing to Shatt Al-Arab	-6.441	+2.878	+7.537	-12.00	-1.82	+3.27	-10.70	-2.02	+2.32
TIGRIS									
Amount of water joining to Tigris from Turkey	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50
Water drawn by- Turkey and Syria	-6.70	-5.36	-4.69	-7.20	-5.76	-5.04	-6.70	-5.36	-4.69
Flowing through Iraq	11.80	13.14	13.81	11.30	12.74	13.46	11.80	13.14	13.81
Water joining to Tigris in Iraq from river reaches	30.70	30.70	30.70	31.70	31.70	31.70	30.70	30.70	30.70
Water drawn by Iraq	-33.40	-26.72	-21.49	-40.00	-32.00	-28.00	-32.8	-26.24	-22.96
Flowing through Shatt Al-Arab	9.10	17.12	23.02	8.00	12.44	17.16	9.70	17.60	21.55
EUPHRATES + TIGRIS	+2.659	+19.998	+30.557	-4.00	+10.62	+20.43	-1.00	15.58	23.87

Note1: Water returned from irrigation hasn't been taken into account. The scientific studies carried on by Turkish Harran University, faculty members of Agriculture, showed that the quality of the water returned from Harran irrigation (irrigation tail) is acceptable for a second irrigation.
Note 2: Ground water potential of the region hasn't been taken into account.

A close evaluation of the table indicates that

- In comparison with Tigris River, Euphrates River is unsatisfactory in meeting the needs; as a result, transferring some water from Tigris to Euphrates within Iraq will be necessary,
- By means of expanding the application of closed system irrigation facilities, and under the condition that all three countries use water carefully, even according to the worst scenario, Euphrates and Tigris will be capable of meeting the needs of the people in the three countries, and furthermore, the needs of the wetlands will be met.

As such, it is impossible to understand the reasons of the negative opinions on Euphrates and Tigris water. The best way to avoid such opinions would be if Turkey, Syria and Iraq cooperate rapidly to develop a mutual management and execution plan to achieve water savings in the region, and urge for the realization of scientific and realistic studies on the use of Euphrates and Tigris waters.

6. TURKEY'S VIEWS ON THE USE OF EUPHRATES AND TIGRIS WATER – A PLAN OF THREE STAGES

Since Euphrates and Tigris rivers flow beyond the borders, their use concerns Turkey, Syria and Iraq. For these two rivers to be used in the augmentation of these countries' welfare, all three countries should agree on the common principles of the use of water. Turkey has presented her opinions and attitudes on this subject with her **"three-phase plan"**.

To-date no clear agreement has been reached among Turkey, Syria and Iraq on the subject of peaceful use of these waters. Syria has softened its objections in the last few years and has started to take side with Turkey. However, Iraq hasn't yet shown a compromise on this subject, which might as well be due to the political instability in the last fifty years. In addition, the USA and the EU countries exhibit a deceitful approach by appearing to protect the interests of Arab countries and influencing the people of these countries against Turkey. Unfortunately, many third world countries have been taken by this deceitful act.

The battles between Israel and Arabs in the Middle East for over fifty years have not been able to awaken the Iraqi people to the truth to recognize where their benefits lie. It is hoped that the last Crusade to Iraq carried on by the USA and its allies, and their looting and pillaging of Iraq have made Arab people recognize what is at stake so that they will look at the relations between Turkey and Iraq in a more positive way.

The "3 phase plan" offered by Turkey is a holistic approach for the region, and scope and the goal of the plan are presented as a collaborative work to be carried out by the three countries for rational and optimum use of Euphrates and Tigris water in a judicious way. The following is the outline of the 3-phase plan on Turkey's use of Euphrates and Tigris water basin - presented by Turkey to Syria and Iraq in 1984 via a joint technical committee of Turkey, Syria and Iraq:

- Euphrates and Tigris watersheds should be regarded as a single water basin.
- In order for all three countries to use this water judiciously, it is necessary to establish common scientific and technical committees that will employ scientific methods to provide the most appropriate solutions for the single basin by following a scientific approach as outlined below:

  1. Gathering all kinds of hydrological information, e.g., the amount of water carried by the water basin, rain-flow relations, evaporation and water losses, sediment flows.

  2. By using common data and criteria, determining the water demands for irrigation, drinking, and municipal and industrial use, and the demand needed for sustainability of the wetlands.

  3. In the light of this information, developing joint projects under the condition that the most appropriate techniques are used, establishing the most economical operations models and putting them into practice, and providing the required coordination and organizations with collaboration of these three countries.
- This plan aims at benefiting each of the three countries objectively. The plan is humanistic, reasonable and fair. We hope that Turkey's plan will be received positively by Iraq, and concrete steps will be taken by the three countries in order to use these waters for the benefit of their people.

In the use of Euphrates and Tigris waters, Turkey has good intentions for the region, and looks at the future with hope for collaboration of the three countries. The good will of Turkey has become obvious during the Atatürk Dam water retention works, as presented below:

- The construction work of Atatürk Dam was started with the construction of derivation tunnels in 1981 and afterwards Euphrates water was directed towards these tunnels in June 16, 1986.

- No flow restrictions of Euphrates River were applied until the first and second tunnels of three derivation tunnels were closed in 1989, at which time water was channel downstream through the third derivation tunnel. The capacity of the third tunnel was 700 – 1000 m^3/s.
- It is stated in item 6 of the Economic Cooperation Protocol between Turkey and Syria dated 07.17.1987, that during the process of water retention and filling of Atatürk Dam, "The Turkish side guarantees that on an average it will leave more than 500 m^3/s water on a yearly basis at Syrian border until the Euphrates water is allocated among the three countries. If the monthly flow drops below 500 m^3/s, then the missing amount will be compensated the following month".
- In Atatürk Dam, before water retention took place, an average of 768 m^3/s of water flow and a total of 3.453 billion m^3 water was released to Euphrates riverbed for 52 days between November 23, 1989 and January 13, 1990.
- The third derivation tunnel was closed on January 13, 1990. During water retention period, the water level upstream was 392.20. Therefore, no water was released downstream until water reached number 1 and 2 derivation tunnels' inlet on February 13, 1990.
- As of February 14, 1990, the guaranteed amount of water was released downstream by opening valves of number 1 and 2 derivation tunnels. This operation has continued until July 26, 1992, at which time the energy production was realized in the dam.
- During this period, the water level was 508.07 m and water accumulated in reservoir was 25.871 billion m^3. During this phase, the amount of water released to the downstream was over 40 billion m^3, and the flow rate was over 500 m^3/s. This information was summarized in Table 7.
- After July 26, 1992, energy production was started in the dam and the turbines were put into use every four months. On average 200 – 220 m^3/s water could be released downstream from each turbine. When guaranteed amount of water was met by the amount of water released downstream from turbines, the derivation tunnel valves were closed gradually.
- Currently, water passing through the turbines is released downstream; although the amount of this water released varies according to the number of turbines working, it is, in fact, far more than 500 m^3/s.

Above numbers show explicitly that Turkey was able to compensate the deficit realized during water collection for a period of 30 days by averaging at about 509 m^3/s over a period of 82 days, and hence was loyal to its promise.

Tablo 7. Atatürk Barajı'nda Su Tutma Sırasında Suriye'ye Bırakılan Su Miktarı

1-Before Water Retention	
23-30 November 1989	625 m3/s x 8 days= 0.432 x 109 m^3
01-31 December 1989	818 m3/s x 31 days= 2.190 x 109 m^3
01-13 January 1990	740 m3/s x 13 days= 0.831 x 109 m^3
Sub Total	52 days 3.453 x 109 m^3
2-During Water Retention	
14-31 January 1990	65 m^3/s x 18 days= 0.102 x 109 m^3
01-12 February 1990	50 m^3/s x 12 days= 0.052 x 109 m^3
Sub Total	30 days 0.154 x 109 m^3
3-Final TOPLAM	82 days 3.607 x 109 m^3
Q Average	**3.607.000.000/82*86.400=509.120 m^3/sn**

7. CONCLUSIONS

The discussion of water rights has started with the construction of Atatürk Dam and the hydroelectric plants in the region of Southeastern Anatolia Project to tame the Euphrates River. Syria and Iraq, backed by the Arab countries and supported by major world propaganda centers, still continue to bring charges against Turkey and try to mold the world public opinion in their favor. The western press believes that tension between Turkey and other countries will augment because of water issues leading to possibly close combat. The western world provokes this subject since it sees itself as the spokesman of water rights and tries to set the agenda. It is necessary for Turkey to approach this subject decisively and prevent it from being an international problem.

Waters in question should be waters making countries closer and their people close friends. They will all benefit if these waters stay away from being controversial.

Therefore, this subject is very important and deserves close attention. For these waters to remain as "peaceful" waters, the following are suggested:

- **The role of engineers** is to produce and then submit to the leaders of the three countries the most favorable projects.
- **The role of country leaders** is to provide the cooperation between the countries in the light of these projects and put these projects into service.
- **The role of people** is to come to the realization that only they will protect their interests in the best manner.

In the light of the last 16 years the following evaluations can be made. If the subjects mentioned above are realized by each of the three country, then:

- Looting and pillaging going on in the region for nearly a century will be terminated.
- People of the region will use their resources for their own interests, and these regions will regain the peace, trust and welfare they long for.

Turkey's push in the field of civilization with Southeastern Anatolia Project has undergone important delays due to the activities of the foreign-supported terrorist organization, Kongra-Gel. Turkish public knows the identity and the intentions of these foreign supporters. Yet, this situation hasn't reduced the national will of Turkey in the realization of Southeastern Anatolia Project; on the contrary, it only enforced it.

In spite of these obstacles, Turkey is determined to provide its population the desired life standards and is so determined to realize this project, while protecting the interests of the region's population as a principle. Turkey is ready for close cooperation with the countries of the region on the use of Euphrates and Tigris rivers, and it is determined not to take side in the case of conflicts arising on these rivers. This will is guaranteed by the Turkish people who see the entire humanity as one.

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TRANSBOUNDARY WATERS IN AND AROUND TURKEY, HISTORICAL DEVELOPMENT, LEGAL DIMENSIONS AND PROPOSED SOLUTIONS

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TRANSBOUNDARY WATERS IN AND AROUND TURKEY, HISTORICAL DEVELOPMENT, LEGAL DIMENSIONS AND PROPOSED SOLUTIONS

Cemal Zehir[1] and Mehmet Emin Birpınar[2]

ABSTRACT

This report focuses on the issue of transboundary waters in and around Turkey. The Danube River water issue in Europe, Syr Darya and Amu Darya in Asia, and the Nile in Africa were used as examples for transboundary water issues in the world. For the Middle East, water issues concerning Rivers of Orontes (Asi), Tigris, Euphrates, Sheria and tributaries as well as River Litani are covered in detail with the historical and legal dimensions in perspective.

1. INTRODUCTION

Water is a renewable natural resource. Although it could be counted as a globally inexhaustible resource, it is exhaustible as a regional and local resource. The existence of a water resource does not necessarily mean the existence of a usable water resource. The definition of a usable water resource depends on the existence of water in adequate quality and quantity in a given location and period with an identifiable demand or the possibility of providing such an existence.

2. DEFINITION OF MIDDLE EAST AND BORDERS

The concept of "Middle East" was first introduced by the American marine historian A. T. Mahan in 1902 (Kurtulus, 1989) Since the second half of the previous century, European countries; Britain and France in particular, have considered Europe as a center and have grouped other countries in three categories: Until the 1st World War, Greece, Bulgaria, Eastern Mediterranean countries (Lebanon and Syria) and Egypt were grouped under the term "Near East", and the term Middle East replaced Near East by also covering areas of Mesopotamia, Arabic Peninsula, Iran and sometimes Afghanistan. Greece and Bulgaria were removed from the extent of this concept (Dursun, 1991). Middle East contains the area stretching from Morocco to Indonesia, where the Islamic culture is dominant. Although this usage is popular for the Anglo-Saxon world, generally the concept also comes to include the area from the east of Libya to Pakistan, including Afghanistan, Iran and Turkey. This definition then embodies an area of 8 million km^2, including Egypt, Yemen, Oman, United Arabic Emirates, Bahrain, Qatar, Kuwait, Saudi Arabia, Iraq, Syria, Lebanon, Israel, Palestine, Turkey and Iran.

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3. WATER ISSUE IN THE MIDDLE EAST

The facts that Middle East is poor in water resources and that the existing resources belong to certain countries make water a problem. There are five water resources that yield life to the Middle East. These are; the Nile flowing through Egypt and the neighboring African states, Ethiopia, Sudan, Kenya, Uganda, Tanzania, Burundi, Rwanda and Zaire; Jordan River flowing through Israel, Jordan and Palestine; Asi River flowing through Turkey, Syria and Lebanon; Tigris and Euphrates River flowing through Turkey, Iraq and Syria. In the Middle East, where sharing of water resources is regarded as a political power share, if the parties involved in water conflicts cannot find an agreement, an unprecedented deadlock and chaos is foreseen within the next 25 years in the region (Wolf, 1998). Water resources in the Middle East, therefore, have vital importance.

The founder of the Global Water Summit Initiative Joyce R Starr, who is also an expert in the areas of Middle East and water security, stated "Could the water issues be discussed seriously without discussing larger political issues in the region? The question has one single answer: The passive administrative approaches reflected upon the water scarcity issues in the Middle East shall bring infertility to peacemaking efforts in the region. The Middle East is on a turning point on water problems. Negotiations are crucial for the economical and political stability in the region. An innovative solution leading to cooperation in water issues would lead a new path to peace" (Starr, 1991; Woller, 2004).

Several criteria have been developed to measure how much of a threat water scarcity in any region on Earth would cause. The drought index is one of these criteria (Naff, 1993). The drought index consists of four different indexes reflecting four variables. These indexes are respectively (Tomanbay, 1998):

- Ratio of water demand over water supply
- Water per capita in relation to population increase
- Availability of more than 1000 m^3 of consumable water per capita per year
- Ratio of imported water supply over domestic water supply

According to the first index, if the water consumed as a result of the water demand is more than 1/3 of the total renewable water resources in a country, there is considered to be water scarcity or an increase in danger of water scarcity. Therefore, the following 12 Middle East countries receiving little rain, water scarcity: Egypt, Iran, Iraq, Jordan, Yemen, Kuwait, Libya, Saudi Arabia, Tunisia, UAE and Bahrain. Yet Iraq suffers no water scarcity since the country is well-fed with the

waters of Tigris and Euphrates Rivers flowing into the country. The second index takes into account the ratio of water used over the population. Considering that the countries that experience water scarcity according to this index shall double their populations by 2025, a real water scarcity threat is at hand. Countries possessing less than 1000 m^3 of usable water per head are considered to have water shortage according to the third index. Accordingly, countries except for Egypt, Iran, Iraq, Sudan and Turkey, experience water scarcity in the Middle East today. According to future population projections, Egypt shall also be a country with scarce water. The fourth index compares transboundary waters within usable waters. More than 1/3 of the water used in particularly Iraq, Syria, Jordan, Sudan and Egypt in the Middle East flow from outside of their borders.

Almost all of these indexes show that every country in the Middle East is facing water scarcity. The amount of consumable surface and ground water in Turkey is 110 billion m^3 and this amounts to 1692 m^3 of water per head (Sen, 2002). Home to the 5 % of the world population, the Middle East has only 1% of the world's water resources (Ward, 2002). This reveals the probability of a crisis in the mid or long run. National interests, traditional rivalries, urbanization and industrialization in the region could be the reasons for having the foreseen crisis happen earlier than expected. This general outlook shows that instability exists in the Middle East (Bullockh, 1994).

3.1. Middle-East Water Issues

Water, a natural resource, is quickly becoming a political tool introduced to the Middle-East by the EU, the USA and Israel.

In a report submitted to Pentagon by the American research institute RAND, the focus is on a scenario of joint attack by Iraq, Iran and Syria to Turkey (Sabah Newspaper, 18.9.1992). Foreign Ministers of Arab countries have founded committees aiming at protection of the rights of Syria and Iraq. During the same year, experts from the USA have held an interesting conference in Jeddah King Abdullaziz University. In the conference held with the support and organization of the US Department of State, the speaker Dr. Clores have, in a provocative manner, stated that water and food shall be much more valuable than anything in the region including oil, and that Turkey's possible accession of water saving rights on the Euphrates River through the GAP project may in the future lead to a conflict (Cumhuriyet Newspaper, 15.9.1992). In order to define the approaches of the countries in the region towards water issues within the framework of the peace-making process in the Middle East, various meetings were held under the name of "Water Resources Working Group" before and after the Madrid Conference with the initiatives of the USA, Japan, Canada and

several Arab states. The working group made its first meeting in Vienna in 1992. Turkey was represented as an observant country in the meeting (Bilen, 1996). The issues covered in the meeting were:

- Mid- and long term measures against water scarcity in the Middle East
- Establishing a system for the solution of conflicts arising from water issues
- Seeking possible ways of cooperation on the management of regional water resources
- Establishing an institutional structure to conduct research to gather data on water resources and to share these data.

The Tigris and Euphrates Rivers were often mentioned during the meetings as water resources for the entire region, and Turkey was claimed to be a country with abundant (!) water resources.

The USA is closely interested in issues of water resources in various regions around the world, and particularly the Middle-East and Central Asia. Although the US has adopted a water basin approach similar that of the EU on transboundary waters, it does not fully implement that approach in its relations with its neighbors (Woller, 2004). The Chairman of the US Council of Military Engineers Board, Lieutenant General Robert W. Flowers concludes the following for the water resources of Iraq: "The Board has supplied significantly in the amelioration efforts of water resource management in Iraq. As of 18 April 2003, an expert team consisting of several civil working groups on water flooding control expertise as well as Vicksburg District, Engineer Research and Development Center, the Hydropower Design Center, St. Louis Archives Research, the Hydrologic Engineering Center and the Mobile District was established. The Board also works with USAID to develop a hydrological model for flooding. The objective is to foresee the flow fluctuations of Euphrates and Tigris Rivers." (Flowers, 2004; Woller, 2004). These statements clearly show that the USA wants to play a decisive role on the management of Iraq's water resources.

3.2 The Orontes River (Asi Nehri)

Orontes River, of which Syria is an upper riparian and Turkey a lower riparian, is one of the major reasons of conflict and distrust between two countries. Although the River itself is a small one, it is of vital importance for the towns of Homs and Hama on the western part of Syria.

One reason of Syria's military existence in Lebanon is mentioned by Syrian authorities as protection of the natural spring of the Orontes River due to the importance paid by the country for the River (Cowell, 1989). Turkey consumes the water of the River in irrigation whereas Syria and Lebanon use the River for generating electricity in addition to irrigation.

The average annual flow of the Orontes River is 1.2 billion m^3. Syria uses 90% of the water of Orontes and leaves an average of 120 million m^3 of water on the Turkish-Syrian border (T.C. Dis Isleri Bakanligi, 1994). The amount of water on the Turkish-Syrian border decreased to 25 million m3 upon the construction of the Ziezoun and Kostoun reservoirs on the Syrian side of the River. This implies a few consequences:

The total amount of the flowing water in Orontes River originates in Lebanon (6%), Syria (92%) and Turkey (2%), which means Syria and Lebanon should consume 98% of water and Turkey 2%. Syria, coming up with these figures as far as the Orontes River is concerned, claims a demand of 22 % of the water basin resources on the Euphrates River. This manner of double standard reflects the opinion and approach of Syria towards water (Akmandor, 1994). When the amount of water from the Orontes River for which Syria is an upper riparian country and the water from Tigris and Euphrates Rivers springing within Turkey are compared, it can be concluded that Turkey allows water from Tigris and Euphrates Rivers much more than Syria allows from the Orontes River.

In line with the agreement signed between Syria and Lebanon in 1972, it was agreed to supply 80 million m^3 of water annually to Lebanon from the Orontes River. However, the agreement failed to be taken into force due to a number of political reasons at that time. In another agreement signed between the two countries on 20 September 1994, 80 million m^3 of the 403 million m^3 of water on the Syrian-Lebanese border was left for Lebanon (T.C. Dis Isleri Bakanligi, 1994), which implies the official implementation of the previous 1972 agreement.

According to the International Strategic Research Institute in England, Turkey has maintained a balanced and peaceful policy although the country has lost time in its affairs with its neighbors. Turkey's efforts to maintain a parallel link between the issues of the Orontes River and the Euphrates River have not been accepted by Syria (Koni, 1994). Turkey's requests on the Orontes River have not received a positive response from Syria. The current positive high level politic efforts between Syria and Turkey have not yet resulted in anything tangible in solving this water problem.

3.3 Tigris and Euphrates Rivers

Before an evaluation of the water issues regarding the Tigris and Euphrates Rivers, we need to examine the water consumption demand of the related countries.

Contributing 11.3% of the water of the Euphrates River, Syria demands 11.50 billion m^3/year of the water on the Euphrates. Iraq, with no apparent contribution to the River flow, demands 23 billion m^3 /year, whereas Turkey, home to 88.7% of the River water demands 18.42 billion m^3. Since the total water capacity of the Euphrates River is 35.58 billion m^3/year, the amount of water demanded by these three countries is 17.3 billion m^3 more than the actual amount in the River (DSI, 1984).

Contributing 51.9% of the water of the Tigris River, Turkey demands 6.87 billion m^3/year of the water on the Euphrates. Iraq, with a contribution to the River flow of 48.1% demands 45 billion m^3 /year, whereas Syria, with no contribution to the River demands 2.60 billion m^3/year. The total water capacity of the Tigris River is 48.67 billion m^3/year, and the total demand is 5.8 billion m^3/year more than the river capacity (DSI, 1984). Accordingly, all the amounts demanded by Turkey, Syria and Iraq on these two Rivers exceed the actual amount available. Considering the contribution of each country into these two Rivers versus their claims, it becomes obvious that only Turkey contributes more than it demands. Yet, ironically, Iraq and Syria have continuously objected to every facility constructed by Turkey on these two Rivers. Their main reason for their objection is the fear that the water available to them from these Rivers might decrease because of these constructions. However, the facts point out the opposite.

The flow in Euphrates would range from 100 m^3/s in summer to 7000 m^3/s in winter, causing flooding and casualties downstream during high season. An agreement between Iraq and Turkey titled "Amity and Good Neighborliness" agreement was signed in 1946 to protect Iraq from flooding by informing Iraq of high flows. The Keban, Karakaya and Atatürk dams constructed on the Euphrates River by Turkey prevent sudden fluctuations of the water level and regulate the River flow (Akmandor, 1994). These constructions now prevent flooding on the Syrian and Iraq side.

The reason for the placement of the Tigris and Euphrates Rivers as an issue on the international agenda is Turkey's launch of the GAP (Southeast Anatolia Project). GAP is a long term and comprehensive development plan covering the socio - economic aspects of the area, aiming at optimal utilization of the production opportunities in the southeast part of Turkey. The Master Plan of GAP was prepared and put into effect in 1989 by the State Planning Organization.

The project covers an area of 75,000 km^2 in the provinces of Adıyaman, Diyarbakır, Batman, Gaziantep, Kilis, Şırnak, Mardin, Siirt ve Şanlıurfa, provinces of large agricultural area potential in Southeast Turkey (GAP, 2007). This area is home for 1/11th of the Turkey's population. Part of the reason for the launch of GAP is regulation of the water flow in Tigris and Euphrates Rivers, benefiting not only Turkey, but also Iraq and Syria. The overall GAP project consists of 6 sub-projects on the Tigris River and 7 on the Euphrates River. The 22 dams and 19 hydroelectric plants are also within the scope of the project (Unver, 1999). Upon the completion of the Tigris and Euphrates River basin projects, an area of 1.82 million hectares is to be irrigated, in addition to generation of 27 billion Kw-hour of power, and an expected increase in the per capita income by 209% and the employment of 3.8 million people.

Dams constructed or to be constructed on the Tigris and Euphrates Rivers by Turkey shall contribute not only for Turkey's irrigation needs but also to stabilize the water supply in Syria and Iraq. The dams constructed by Turkey on the Euphrates River are assessed by international experts to be efficient in terms of its low vaporization losses, and geographical and topographic aspects (Kolars, 1994). Despite the obvious benefits of these dams, during the construction of the Keban and Karakaya Dams (1960-1970) Syria and Iraq claimed they would be negatively affected from the project and have objected the construction. Their objection also continued during the filling of the Atatürk dam and the construction of the Birecik dam (Dis Isleri Bakanligi, 1994).

The productivity level of the agricultural areas to be irrigated in Turkey, Iraq and Syria by the Tigris and Euphrates Rivers is defined by international experts as follows (Kollars and Mitchell, 1994):

- Highest maximum productivity can be obtained on the agricultural land Turkey is planning to irrigate.
- A maximum productivity can be obtained in 48% of the agricultural land Syria is planning to irrigate.
- A maximum productivity can be obtained in 65% of the agricultural land Syria is planning to irrigate.

While evaluating water needs and water sharing, these points need to be considered.

Upon years of negotiations between Turkey, Syria and Iraq; a regulation was issued on sharing the water of Euphrates River. With the Economic Cooperation Protocol signed between Syria and Turkey in 1987, Turkey accepted providing 500 m^3/second of water to Syria. This amounts to 56 % of the total water potential on

the Euphrates River. Syria and Iraq have agreed sharing the water coming from Turkey through these two Rivers as 42 % for Syria and 58 % for Iraq (Tiryaki, 1994). The implementation of these agreements was blocked since Iraq was not a party to the former of these agreements; Turkey did not agree on common sovereignty over transboundary waters, the lower riparian states have asked for more water in spite of Turkey's favoring the case for providing water to meet the water demand of each relevant country.

Turkey bears no political intention to act on a political or military basis against its neighbors. Turkey has shown its good-intentioned approach for neighboring countries during the Iran-Iraq war by avoiding selling weapons to either side. Turkey also allowed 5 million m^3 of water to Syria and Iraq from Keban and Karakaya dams during the drought years in 1988 and 1989, enabling Syria and Iraq to store water (Inan, 1990). And, yet, the most noteworthy development in the Middle East on water was the diplomatic note issued unjustly by the Arab League led by Egypt, Iraq and Syria to blame Turkey's for "polluting and reducing the water on the Tigris and Euphrates Rivers".

3.3.1 Tigris and Euphrates within International Law

The UN International Law Commission has issued the "Law on Non-Navigational Uses of International Watercourses" to provide a solution for transboundary water problems. This law also includes provision for industrial and agricultural usage of transboundary waters. The proposal was voted in the UN Plenary Session on 21 May 1997 and accepted with 103 approvals against 3 disapprovals. Out of 185 countries, 133 of them attended the voting and 27 countries abstained (Aksoy, 2006). Countries with water conflicts including the USA and several European countries have abstained, whereas China, Turkey and Burundi voted against the proposal. The Turkish delegation at the voting declared that the proposal has no validity in line with international law and demanded this be recorded in the plenary session minutes. Syria was one of the countries voting for the proposal; therefore these two countries are at an opposing position.

The "Law on Non-Navigational Uses of International Watercourses" leaves little independent decision making to individual countries on water issues. Since this law has no binding power, it only serves as a recommendation. Only when the countries demand, only then the law shall be binding. As such, this law brings along no legal restrictions for Turkey. Turkey has the right to act on these Rivers according to its own decision. The UN International Law Commission has, at the very beginning of its efforts, fully rejected the notion that international water courses are shareable

natural resources. Countries, upon signing this document can unilaterally apply to the International Court of Justice or international audits. The law cannot be taken into force before being voted and approved in parliaments of 35 countries. This number was never met since 1997, which implies a tendency by the international community to forego the law due to failure of its applicability.

Recently the works conducted by the UN, EU and Economic Commission of Europe on transboundary waters are coming to the forefront. The first legally binding document on transboundary waters is the "Convention on Use and Protection of Transboundary Waters and International Lakes" issued by the UN/ECE. It was opened to signing in Helsinki in 1992, and upon completion of signing by the 16 stipulated countries, it took effect in 1997.

The ECE Convention foresees management of the transboundary water resources through a common organ consisting of the countries within the basin in question. It also bears an obligation for the upstream countries to inform downstream countries and obtain their approval on projects they may develop on water resources. In the 3rd Health and Environment Ministers Meeting held in London on 17 June 1999, the "Water and Health" Protocol was signed by 35 countries. It was an additional text to the UN/ECE "Convention on Use and Protection of Transboundary Waters and International Lakes", reflecting the same understanding of the UN /ECE convention, even containing a number of expressions towards limiting the use of transboundary waters. The Convention was therefore not signed by Turkey (Kus, 2007). The EU Water Framework Directive bears the statement that conflicts arising from transboundary waters should be settled within the framework of the "Convention on Use and Protection of Transboundary Waters and International Lakes" also known as the Helsinki Convention, of which the EU is a party. The EU may also ask Turkey to approve the Espoo and Aarhus Conventions, which it is a party of. The EU especially wants to establish a stable legal rule by asking all the countries in the world to become a party of the Aarhus Convention. The convention focuses on public access to information, participation to decision making and providing transparency (Bilen, 2006).

The wishes of Syria and Iraq on demanding more water over Tigris and Euphrates Rivers are based on the following (T.C. Disisleri Bakanligi, 1994):

- Iraq claims to have "Acquired Rights" over these Rivers due to "Archaic Irrigations" over the Tigris and Euphrates Rivers. Since these two Rivers have yielded life to Mesopotamia for thousands of years, it is believed to be an acquired

right. Besides, Iraq has constructed many facilities to irrigate an area of 1.9 million ha. Therefore Iraq has the opinion that Turkey should not dispossess Iraq of the rights in question.

- The second opinion Syria and Iraq favor is that these two Rivers are international water courses and have a "common resource" aspect among the riparian countries. Therefore the water resources of the Tigris and Euphrates Rivers should be shared based on a mathematical formula. Iraq and Syria is trying to impose political and economic pressure on Turkey by expressing these opinions at international arenas and by means of the media.

These opinions of Iraq and Syria have no validity at international arena since they are not part of the language of the UN International Law Commission. Furthermore, these opinions are in conflict with the views of the UN International Law Commission on "Rational and Rightful Use of Transboundary Waters". Turkey proposed a Three Stage Plan for the rational, rightful and optimum use of transboundary waters in the Tigris and Euphrates River basins in 1984 (Altinbilek, 2004). Turkey is also in full accordance with the UN International Law Commission's "Rational and Rightful Use of Transboundary Waters", which offers terms acceptable at international platforms. This document takes the Tigris and Euphrates Rivers as a single basin. The single basin approach is close to the opinions of the EU on transboundary waters.

The Tigris and Euphrates Rivers join on the north part of Lake Hammas, close to the Persian Gulf to take the single name of Shatt-al-Arab River. The watercourse from this joining point until the discharge point at Persian Gulf is 200 km, following varying width of the riverbed. The fact that these two rivers join naturally makes it necessary to evaluate the Tigris and Euphrates Rivers as a single river basin.

This proposal of Turkey was rejected by Iraq who feared that its water demand on Euphrates River would be blocked. The fact that this approach, prepared in line with the principles and rules of providing solutions to water issues, disables the efforts to find a solution to the problem (Dis Isleri Bakanligi, 1994). Iraq opposes the idea that the issue of Tigris River can be evaluated as a common issue among Turkey, Syria and Iraq, favoring that the two rivers should be evaluated separately. Iraq also demands Syria have no say on Tigris River (Kut, 1991) for Tigris and Euphrates, according to Iraq, are two different basins, and it claims that it has historical rights of pre-use on Tigris.

Therefore, Iraq is uncomfortable about the projects of Turkey on Tigris and is not willing for a bargain on water flow through negotiations. However, Turkey's 6 projects on Tigris River as part of the GAP project will not cause a decrease on the

amount of the water Iraq receives through Tigris (Savage, 1991) because the Tigris River basin is not suitable for irrigated farming.

The peaceful politics Turkey maintains towards its neighbors at the international arena should be appreciated. The conflicts concerning Tigris and Euphrates Rivers should be resolved through the "Rational, Rightful and Optimum Use of Transboundary Waters", which is the most conciliatory approach in the international law in resolution of conflicts, while keeping in mind the sovereignty of Turkey on transboundary waters.

3.4 Jordan River

The water issue in the Golan Hills, Israel and Jordan Valley which is fed with Jordan River along with its tributaries and Yarmouk River, has been a factor increasing the political tension among Israel and its Arab neighbors. The parties agreed in 1955 on sharing the Jordan River and its tributaries under the mediatorship of the USA as 35 million m^3 for Lebanon, 132 million m^3 for Syria, 720 million m^3 for Jordan and 326 million m^3 for Israel for a total water amount of 1.213 million m^3 (Kut, 1993).

The second agreement signed between countries in the region was the secret agreement signed between Israel and Jordan in 1979-1980. The agreement covers the issues of sharing the water of the Yarmouk River and cleaning the King Abdullah channel. Israel allowed its own engineers to join the task of cleaning the channel (Beschorner, 1992). As it is seen, although the legitimacy of the Arab countries' governments at that time was based on tasks trying to throw Israel out of its lands, water has forced both sides to sit on the table of negotiations.

One of the reasons for the wars between Israel and its Arab neighbors seemed to be the conflicts on sharing of the Jordan River waters. At the end of what historical literature calls as The Six Days War, Israel gained this strategic superiority (Bilen, 1996): The project, developed by Syria to transfer the waters of Banias and Hasbani on the upstream of Jordan River onto the Yarmouk River, was blocked.

The main target of Israel's expansionism in the Middle East is access to water resources. Therefore; Israel has always designed its plans to include water resources within its boundaries. One reason of the invasion of the Golan Heights was strategic; whereas another was the resources of the Banias River. Israel's invasion of the West Bank enabled its becoming a shareholder of the Jordan River. It can be also concluded that Israel invaded Lebanon to control the Hasbani and Litani Rivers. The fact that Israel supplies 40 % of its water use from West Bank and Golan Heights also confirms this conclusion (Nasrallah,1990).

West Bank and Gaza Strip of Israel and Jordan face 300 – 400 million m^3 of water deficit each year. According to some experts, this deficit increases to at least 500 – 600 million m^3. Israel now uses 95% of its renewable water resources. Israel benefits from advanced technology to meet water needs. Israel also tries to satisfy this deficit by means of water importation. Increasing water reservoirs of Jordan is one of the most crucial issues of Israel. Keeping this in mind, constructing new dams, exploring new ground water resources and accumulating rainwater and treating this water for urgent water demands of Amman are planned. However, the fact that the financial situation of the country isn't good enough causes financing problems (Tiryaki, 2004). There are two reasons forcing Jordan to increase its water reservoirs. First one is that Jordan doesn't have enough water for its increasing population. Secondly, the lack of sufficient waste treatment in this country has caused water pollution. In addition, salinity of water used by Jordan is greater than that of other countries.

Israel provides 40% of its drinking water from West Bank and Gaza Strip that it occupies. Over 6 million people live on the strip between Jordan River and Mediterranean. This population consumes 1.9 billion m3 water from existing sources. Israel alone consumes 1.7 billion m3 water for a population of 4.5 million people. By doing so, Israel limits the water needed by Palestine people living in the region. Israel uses 90% of West Bank's water reservoirs for its own aims. Palestinians who are deprived of their water resources can only use 200 million m^3 of Jordan River's water. 200 million m3 water is supplied from nonrenewable resources. Nonrenewable resources will be exhausted soon (Tiryaki, 2004).

After Madrid Conference, within the framework of bilateral peace talks, although an important step was taken in 13 September 1993 with the help of the agreement signed in Washington between Israel and Palestine, there are still some issues which haven't been resolved. The "Declaration of Principles" on decentralization foresees the establishment of Land and Water Administration by Palestinians and the identification of this administration's power and responsibilities by a common committee. Also it is decided that this committee will act as an audit on the subject of use of groundwater in West Bank and Gaza. With this declaration Israel, within the scope of its auditing role, reserves the right to veto initiatives which will harm the water use in Jewish settlements (Bilen 1996).

As it is clear, supposing that the population of the region increased rapidly in 2000s, it can be said that especially Jordan, Syria and Israel can not use water sources rationally due to conflicts resulting from these countries' making no concessions.

Arab countries in the region need technology and funds in order to benefit from water sources efficiently. Cooperation with Israel, which is developed in terms of funds and technology, is inevitable. Resolving the water issue in Jordan River and its tributaries can be achieved through the cooperation of countries in the region.

3.5. River Nile

Nile water flows through 9 countries and with respect to the use of this water there are disagreements among Ethiopia, Kenya, Uganda, Tanzania, Burundi, Rwanda, Zaire, Sudan and Egypt. Especially a large population using the Nile water for industrial and agricultural purposes is attracted by the Nile valley (Gali, 1993).

The fact that Nile River, which bears vital importance for Egypt, springs from other countries subjects Egypt's chance to use its agricultural and industrial potential dependent on these countries. As a result of its great population potential and rapidly increasing population, one of the most important issues of Egypt is creating new agricultural areas. This can be solved by using the Nile River's water more. However, the fact that almost all of the Nile water springs from Uganda, Ethiopia and Sudan makes it difficult for Egypt to solve its water problems.

Egypt refuses the construction of all kinds of facilities in the Nile water basin since they are against its interests. Egypt also doesn't fail to show that it is the sovereign country in the Nile water basin. In order to be ready against any opposition regarding the use of Nile River, "Military Intervention Plans" have been prepared in Nasser Military Academy and they are taught as courses. Within the scope of these plans, it is suggested that the one aimed at Ethiopia is called the "Aida Plan" and the one aimed at Sudan is called the "El-Timsah" intervention plan (Tiryaki, 1994). Since the Nile River is the only water source of Egypt, Egypt dictates its opinions on water to other countries. Its military plans exist for this purpose. There is still no agreement signed among the 9 countries benefiting from Nile water how to use this water. The first agreement between the parties was the one signed in 1929 between Egypt and Sudan. Riparian nations of the Nile River claim that since this agreement was signed among the colonial administrations of the past, it doesn't obligate current national governments and they refuse this agreement. After getting rid of colonial administrations, Nile basin countries have started working towards industrialization. For this purpose, they try to satisfy their energy needs by constructing dams on the Nile River. When these countries attempt to construct dams, then there arise conflicts among Egypt and the rest (Bulloch and Darwish, 1994). The second agreement on sharing of Nile water was signed in 1959 between Egypt and Sudan. With this agreement, it was decided that total water share of Egypt was 55 billion m^3 and that of Sudan was 18,5 billion m^3 (Tiryaki, 2004).

In order to regulate the use of Nile River, Sudan, Uganda, Zaire, Ruanda, Egypt and Republic of Central Africa, which are all White Nile Basin countries, have come together and formed "UNDUGU Group". Tanzania and Burundi attended the meetings of this group as an observer. Yet Ethiopia, from which 85 % of the Nile River water springs, has not participated in such collaboration. Formation of "UNDUGU Group" has been Egypt's most important diplomatic initiative and its target is stated "to create a forum in order to provide a medium of opinion and knowledge exchange on the issues related to the common interests of member countries and to contribute to the social and economical developments through regional cooperation (Gali, 1993). The main aim of the group is to regulate the use of Nile water.

Egypt will try to use the Nile River water for multiple purposes and also use ground water in order to meet the needs of its population. Due to the civil war in Sudan, the great project called "Jonglei Channel" hasn't been implemented and as a result, Sudan and Egypt cannot benefit from two billion m^3 more water on a yearly basis (Vesilind, 1993). Egypt has opened El Salaam Channel in order to irrigate the north of the Sinai Peninsula from under the Suez Canal. By this way, Nile water has reached Israel borders. Water needed for agriculture and industry by Middle East countries is thought to be provided from the Nile River which is the closest source. The Nile River carries more than 12 billion m^3 of water from Egypt to Mediterranean yearly. It seems possible to transfer more water to Middle East countries with improvement of groundwater and with the help of new technologies providing water savings. Taking this into consideration, it seems likely to ensure irrigation water to Jordan, Israel, Saudi Arabia and even Kuwait. Cooperation among the countries to benefit from the Nile water can economically solve the problem of irrigation water (Akmandor, 1994).

4. CENTRAL ASIA WATER SOURCES

Insufficiency of water sources in Central Asia was experienced in the last thirty years to a great extent. Especially in Turkish Republics of Central Asia, in addition to insufficiency of water sources, the borders defined during the Soviet Union period have contributed to the water problems. In the Central Asia Republics, or rather with its historical name in the geography of Turkistan, it is commonly cited in international articles that Kyrgyzstan and Tajikistan have surplus of water and yet there is water scarcity in Kazakhstan, Turkmenistan and Uzbekistan (Ahmer, 1999).

There are two important water sources in Central Asia. These are the two rivers, Amu Darya, Syr Darya and the Aral Sea. Aral Sea was formed with accumulation of Syr Darya and Amu Darya waters of Karakalpakstan in a closed basin. Aral Sea,

which is an important water source, has lost since 1960s some of its water due to diversions of Syr Darya and Amu Darya Rivers for use for growing cotton and for hydropower production (Altan, 1995).

Authorities of the countries in the region have executed numerous meetings on Syr Darya and Amu Darya Rivers since the Soviet Union period and especially after 1990. Uzbekistan, Kazakhstan and Turkmenistan set the agenda with these proposals in order for the region to develop in environmental, ecological, health and economical areas, and to eliminate negative impacts. The following were proposed at their meetings (Kaser, 1997):

1. Changing the economy's sole dependence on cotton.
2. Giving up the idea of creating new cultivation areas for agriculture
3. Taking sustainable development model that is environment friendly as a basis for industrial development.
4. Using modern technologies in the irrigation system in order to reduce water consumption.

In order to fight against regional drought and to prevent water-related fights, the International Help Society, under the leadership of the USA, has supported the five countries in this region since 1993 to establish a proper water sharing system. In January 1996 five countries agreed on a water administration plan. Although Afghanistan controls the water sources of the region, it wasn't included in the negotiation process. Each planning that will reconstruct Afghanistan should definitely include agricultural development that will require increased water use. Afghanistan will threaten the applicability of current water administration plan in Central Asia by benefiting from the tributaries of Amu Darya (Jones-Luong & Weinthal, 2002). The underlying reason why Afghanistan was not included in the process was that Taliban Regime had not gained the acceptance by the international community at that time.

There is a conflict between Kazakhstan and Uzbekistan because of limited water resources. Another conflict is ongoing between Kyrgyzstan and Uzbekistan on the Syr Darya River. Although the dispute between Turkmenistan and Uzbekistan was settled in January 1996 on the use of Amu Darya, it is possible to resurface in the future. These countries have also exchanged natural gas in exchange for water among themselves due to water scarcity.

5. THE WATERS OF DANUBE RIVER

The Danube River, with a length of 2850 km just in the Middle Europe, a basin area of 800,000 km^2 and an average flow rate of about 6,500 m^3/sec, is the second largest river of Europe. The Danube River discharging into the Black Sea flows from West to East and never cuts its connection with the largest mountain system of Europe. Despite the fact that it displays several regimes between its upper basin and the Black Sea, all of them stay within the ice-snow regime. The drainage reaches its highest level in springs and at the beginning of summers; though it is again pretty abundant in winters, the waters decrease a little; and a significant flow decrease is seen in autumns especially in the lower basin.

The Danube River springs from the region of Germany known as the Black Forest at an elevation of 678 m. It crosses the lands of eight states or flows along their borders. These countries are Germany, Austria, Slovakia, Hungary, Serbia, Romania, Bulgaria and Ukraine.

In 1856, by the Paris Agreement, it was decided for the Danube River to put into force the free transportation principle set forth for the Rhine River agreed in the Congress of Vienna in 1815. Two international commissions were formed in order to assure to abide by this principle. Later, by the decisions taken in the Congress of Paris dated 23th of July, 1921, the status and the authority of these commissions were changed without any amendment to the free transportation principle (Great Larousse, 1986).

Under the leadership of Soviet Union which left Austria, the only non-communist riperian state, out of the Belgrade Conference, a new agreement was concluded on 18 August 1948. This agreement objected to the free transportation principle and gave the right of management and utilization to only the riperian states actually leaving the Danube to the Soviet governance. However, with the application of bilateral agreements, especially the ones concluded between Germany and Soviet Union in 1957 and 1962, Germany like Austria gained the transportation right on the Danube (Büyük Larousse, 1986). Because of the problems resulting from the ideological differences between the East and West Block countries in the Soviet Period in terms of the transportation and utilization rights, the Danube could not serve the people in the region and the world with its full potential.

One of the most important industrial and agricultural projects on Tuna is the Gabcikovo–Nagymaros Project. This project was started in 1977 with the conclusion of an Agreement on the Construction and Joint Operation of the Gabcikovo and Nagymaros System of Locks between Hungary and Czechoslovakia (Toklu, 1999).

In 1989, the Hungarian Parliament announced that the ecological benefits were more important than the economical ones, and has stopped the project which had been continuing since 1977. The construction of Nagymaros Dam and Dunakiliti reservoir was halted unilaterally and Czechoslovakia was asked to also stop its works. Czechoslovakian Government declared that it would continue with the project unilaterally by claiming that the amount having been spent that far was too much and it might lose 300 million Dollars and 2000 kwh/year annually if it did not continue with the project. So, Hungary terminated 1977 Agreement unilaterally on 19 May 1992 (Toklu, 1999). Concerning the Gabcikovo (BSS) Dam being constructed on the Danube, Hungary applied to the International Court of Justice in 1993 by claiming that Slovakia wanted to take more than the water amount decided by the agreement between the two countries and thus, changed the direction of the river bed.

The International Court of Justice concluded the case on 25 September 1997. The Court adjudged that Hungary did not have the right to terminate the 1977 Agreement unilaterally, that the termination decision attributed to environmental damages did not have valid grounds, and hence both parties would compensate the damages that they had caused, and the parties would hold friendly negotiations and necessary precautions would be taken in order to implement the provisions of 1977 Agreement (Toklu, 1999). The International Court of Justice delivered this judgment after UN General Assembly approved the "UN Convention on the Non-navigational Uses of International Watercourses". By accepting the applications of Hungary and Slovakia, International Court of Justice, the highest international judicial place applying the international law, accepted that the problem was not the problem of all the countries using the Danube, it was rather the problem of two countries which are the parties of this conflict. With the collapse of the Soviet Union, the Danube basin was opened to free transport and trade and the 8 countries on the river contributes to the growing trade.

6. PROPOSED SOLUTIONS TO WATER ISSUES

Today while water issues are being recited frequently because of regional conflicts, development of a regional water strategy may actually push the nations towards a comprehensive peace. Most of the governments in the Middle East find it necessary to tackle the water issues including the wastewater discharge, salinization, pollution of the water resources and water distribution systems. Domestic usage of water has a priority over other types of water use (Şehsuvaroğlu, 1997). In order to solve the water issues, the countries in the region have to apply a policy towards a regional water strategy.

The water problems of the Middle East will also be resolved by increasing the water supply, while limiting the water withdrawal (Zehir, 1998). Parties to the conflict can apply to a legal entity such as a judge or a arbitrator for the resolution of the conflict if they regard this conflict as a legal dispute. No country can be enforced to solve any conflict by legal or political means, but by its own political will. For instance, although there is no mutual or multilateral agreement over the solution of the conflicts among Turkey, Syria and Iraq, these countries still have to show their good intentions to solve the conflicts by peaceful means (Bağış, 2003). The Middle East and North Africa not only struggle with water shortages but also with political tensions. Although cooperation is needed for the issues other than water and environment, water is a tool that has the power to start peace negotiations (Birpınar, 2002). In order to supply the water need of the region, the countries in the region should cooperate to establish a water supply management system among themselves (Uluatam, 1998). To help alleviate the present water shortage in the Middle East, Turkey proposed in 1986 the Peace Water Project that can divert the waters of the Seyhan and Ceyhan Rivers that discharge to the Mediterranean to the countries experiencing water shortages. The second project aiming to supply water to the region is the Manavgat Project.

Importing water is a solution to water shortages. One example to water importing is the pipeline to be laid to a pumping station in Iran from Pakistan via Belucistan. Water first is moved with tankers from the Strait of Hormuz to Ra's al Khaymah, to United Arab Emirates and to Oman and later pipeline would be laid onto the sea bottom. Sheikh Zayıd from UAE who was the financier of the project changed his mind because of the events developed after Iraq attacked Kuwait. Another example is the establishment of projects regarding exporting of waters from the Karun located in West Iran to the countries willing to get it. In this subject, Iran and Qatar agreed upon the project and Qatar accepted to take on the project cost worth 13 Billion dollars (Bulloch and Darwish,1994). Another example is the Saddam Canal Project in which Iraq discharges the waters of Tigris to the Euphrates. This way, Iraq has eliminated the water shortage in the lower parts of the Euphrates. By sending some of the waters of the Nile to Gaza Strip that is under invasion the water shortage in the region has been alleviated.

Turkey has a strategic importance because of its geopolitical position between the continents of Asia and Europe and being close to the Balkans, Caucasia and the Middle East. The water shortages in the south of the border adds to the geopolitical importance of Turkey (Şen, 2003). Yet, neither the Peace Water Project and Manavgat Project nor other water projects proposed by Turkey will have any implementation as long as the instabilityin the region continues to exist.

7. CONCLUSIONS

When we examine the transboundary water issues in Turkey and the Middle East economically, politically and legally, we can reach the following conclusions:

No significant conflicts over the transboundary waters have been recorded until the end of the XIXth century. With the beginning of the XXth Century, the transboundary waters were started to be used for industrial and agricultural purposes resulting the emergence of the conflicts. The International Law Association, International Law Institute, United Nations International Law Commission and European Community have performed studies in order to resolve these conflicts. Even the World Bank and the Lahey Court of Justice have tried to contribute to the solution of transboundary water issues. Yet, there is still no widely accepted international law about the use of transboundary waters. The solution of the conflicts by the riparian countries among themselves has been regarded as the best approach so far.

For the sharing of the waters of the Euphrates and the Tigris, the ideas brought forward by Iraq and Syria, such as the idea of historical initial use right, mathematical sharing and the sharing of the joint resources, could not be approved by existing international law. These ideas do not comply with the idea of "Rational and Equitable Use of Transboundary Waters" approved by the the international law.

When considered from the point of transboundary water issues, no serious conflicts exist over Aras, Çoruh and Maritsa between Turkey and its neighbors. Turkey has concluded agreements about the aforementioned rivers with the relevant countries and applies these agreements. Still it has some problems with Bulgaria because of the floods in the Maritsa River.

In the solution of the transboundary water issues of the Tigris and the Euphrates, the "Three Level Plan" proposed by Turkey is the most coherent of the ideas proposed for the solution of the problem in the framework of "the Equitable, Rational and Optimal use of the Transboundary Waters".

The water issue of Jordan is caused because of the water shortage in the region. It is understood from the regional conjunctures that the Jordan would continue to be a problem between Israel, Syria and Jordon.

There is a conflict between over Nile among the 9 riparian counties. Egypt is trying to continue its control over Nile by claiming the right for historical initial use. It

is anticipated that the other that will neen Nile for industrial and agricultural purposes will have major conflicts with Egypt.

There are two important water resources in Central Asia. These are the Amu Darya and the Syr Darya and the Aral Sea. The waters of the Aral Sea, an important water resource and a large drinking water supply, has been decreasing since 1960 as Syr Darya and Amu Darya were diverted to cotton fields hydroelectric production facilities. In order to relieve the water problems, the Central Asian countries have to reverse this action.

The historical conflicts over the use of the waters of Danube have not yet come to an end. One of the last examples of these conflicts is the one between Hungary and Slovakia over the use of the waters of the Danube over which extremely detailed judicial and technical regulations have been applied for centuries. Hungary applied to the International Court of Justice in 1993 when the Gabcikovo (BSS) Dam was started to be constructed on Danube. The Court of Justice The Court adjudged in 1997. This judgment should be regraded as a norm in water issues.

Water shortages in the Middle East should be tackled with the following in mind: While trying to increase the water supply, precautions to limit the water demand should also be taken. When examining the means of increasing the water supply, we can come up with six options. These are increasing rain by cloud seeding, more widely use of ground waters, cleaning and reusing wastewaters, desalinization, transporting iceberg from the poles, importing water from other countries. The most economical of these options would be importing water from other countries.

In order to meet the water demand in the region, the countries should establish cooperation and collaboration. A regional water supply management unit should carry out the following tasks: Estimating the future water requirements, making a detailed list of the water resources, creating projects which would put the water resources into effect with minimum cost and within the shortest time, planning when and how each project would be put into effect, carrying out works to find required financial and technical support.

The Peace Water and Manavgat Projects proposed by Turkey in order to solve the water problems in the Middle East are very important projects from both economic and strategic points of view. Other projects have also been proposed by Pakistan and Iran. Although being delayed, these proposals are still being assessed by the relevant countries. Besides, Israel wants the waters of the Nile to be transported to the Gaza

Strip. It seems inevitable that some of these proposals will be applied. The Middle East countries of which populations are increasing rapidly need good quality, inexpensive and abundant water.

We believe that what lies under the policies carried out in Northern Iraq is sharing of water as well as oil. It can even be claimed that the 2nd Gulf War was the last war fought in the Middle East for oil. From now on, water will have a major role in shaping the Middle East. For instance, at the end of the war the new Iraqi Government may have different demands over Tigris and Euphrates. In the event that this government is founded under the control of USA, piping the waters of Euphrates to Israel over Jordan can be brought to the agenda.

All of these show clearly that the "Water Conflicts in the Middle East" might become for Turkey one of the most important foreign policy issue. Some of the criteria for Turkey's approach to the water issues in the Middle East should be as follows.

- Turkey is not a country rich in water. The total annual water potential of Turkey is 186 Billion cubic meters.
- The issues over Euphrates, Tigris and Orontes should only be dealt among Turkey, Syria and Iraq.
- Turkey is a country with rapidly increasing population. Increasing population, and agricultural and industrial development require higher water demands.

Today while water issues are being recited frequently because of regional conflicts, development of a regional water strategy may actually push the nations towards a comprehensive peace. Most of the governments in the Middle East find it necessary to tackle the water issues including the wastewater discharge, salinization, pollution of the water resources and water distribution systems. In order to solve the water issues, the countries in the region have to apply a policy towards a regional water strategy. Furthermore, these countries need to resolve their conflicts among themselves rather than looking for help from international powers. Those seeking input from international powers may face the risk of being dominated, as it happened in the past.

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EU WATER FRAMEWORK DIRECTIVE, TRANSBOUNDARY RIVERS AND TURKEY

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EU WATER FRAMEWORK DIRECTIVE, TRANSBOUNDARY RIVERS AND TURKEY

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ABSTRACT

The WFD, which pursues effective use and management of water as well as securing coordination between member-countries, was accepted by the EU and came into force in 2000. The WFD imposes very definite obligations on member-countries. Among them is the obligation to improve water quality, to prevent pollution and to set up mechanisms on a basin-wide scale. The EU has departed from the terms of the WFD and has made a number of determinations and recommendations concerning Turkey's transboundary rivers.

As well as being unable to form a connection between the latter and the WFD, the EU approach to the subject is also worthy of attention. It appears that in order for Turkey not to encounter problems in this area in the future, she will have to develop her own water resources as soon as possible.

1. INTRODUCTION

The approach of the EU to joint use and management of water dates back to the 1980's. A Community Water Policy Ministerial Seminar held in Frankfurt in 1988 emphasized the need for Community Regulations encompassing the ecological quality of water. With a decision taken on 28 September 1988 the Council asked the Commission to make recommendations relating to development of the ecological qualities of surface waters. (OJ 209, 9.8.1988) The communiqué issued after the Ministerial Seminar for ground waters held in The Hague in 1991 also underlined the need for measures to be taken to prevent qualitative and quantitative degradation of water in the long term. With the decisions taken by the Council in 1992 and 1995 a request was made for preparation of an action program for ground waters. (OJ C 59, 6.3.1992 and OJ C 49 28.2.1995) It must be borne in mind that the legal texts prepared by the EU either make distinctions between surface waters and ground waters or deal with the need to prohibit or reduce pollution and discharge of certain kinds of waste in utilization of water. Thus, by failing to adopt an approach which deals with all aspects of water resources as a whole, the EU has manifested a non-holistic approach.

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In 1995 it was decided by the Council that a sustainable water policy be adopted on community scale in order the overcome the scattered, non-holistic approach of previous years and the Commission was requested to make proposals. It was in 1996 that the Commission was given the task of preparing a proposal setting out a framework for a European water policy. The member-states, the European Parliament and the European Commission arrived at the unanimous conclusion that in the future water should be dealt with in an integrated manner. With this purpose in mind, all directives relating to water needed to be brought together in one set of regulations and as a result the Water Framework Directive (WFD) was drawn up. The WFD came into force on 22 November 2000 with the purpose of creating a framework for integrated water management on community scale. Together with unification of the other existing directives, the WFD introduced new factors as well. The most important of these new factors was river basin management. In order to achieve river basin management, a method involving a step by step approach which included measures on a river (sub) basin basis was adopted because the boundaries of river basin areas usually differ from administrative boundaries, and river basin management requires collaboration between different provinces, regions and nations.

2. WFD AND INTERNATIONAL RIVERS

The function of the WFD is in fact to enhance the quality of river and stream water in the member-states. (WFD, Preamble para. 19) One way of doing this has been to adopt a basin approach which exceeds administrative borders. The basin approach will be applied to transboundary (international) rivers flowing through the borders of more than one member-state, just as it is to rivers flowing only within the borders of such a state (articles 3/2 and 3). Member-states will set up an international river basin district (IRBD) for the management of river basins which lie in more than one state. The Commission will undertake a facilitating role to overcome the difficulties encountered in this implementation (Article 3/3). Each member-state will make the necessary administrative arrangements with the purpose of implementing the IRBD in the basin district within its own borders and also create an appropriate authorized administration in order to implement the obligations contained in the WFD. In order to achieve the aims relating to the environment (Article 4), member-states are obliged to secure coordination, bearing in mind the whole of the river in the IRBD. With this aim in mind, use may be made of the structures stemming from existing international agreements signed between them. Again, the Commission may assume a facilitating role on the request of one of the states involved (Article 3/4). It is evident that implementation of WFD on an IRBD is the main point, and the

obligation to ensure that this is realized is imposed both on the states concerned and on the EU Commission. Member-states may appoint an existing national or international body as the authorized body (Article 3/6).

The EU Commission has an important function in terms of implementation of obligations introduced by the WFD. In addition to the facilitating role mentioned above, when a member-state encounters a problem which affects water management and is unable to find a solution, it has the right to report the matter to the Commission and to the other member-state concerned. At the same time, the state which has been affected may make recommendations regarding solutions (Article 12/1). The Commission is obliged to reply within one month when such an application or recommendation is made (Article 12/2). It should be pointed out that in Article 12 it is clearly stated that when transboundary waters affecting more than one state are involved, even though the term "international" may not be used, the authority of the Commission includes the IRBD. Moreover, as the authority of the Commission is valid only for member-states and as there is no reference in the text of the article to obligations of states other than member-states, it can be assumed that the intervention of the Commission is limited to matters of management involving only member-states. At the same time, when a state which is not a member is affected in an IRBD extending beyond the borders of the member-states, according to WFD even though such a right is not granted to this state, should it decide to apply to the Commission it is possible for the Commission to intervene, though this is not obligatory.

Although the IRBD in the WFD is applied per se to rivers passing through more than one member-state, the term "international river basin" has been used for rivers flowing into the territories of non-members of the EU. Doubtless, while the directives of the EU are binding for its members because of their intrinsic nature, they can only act as recommendations for non-member states. At the same time they can also impose obligations on member-states with regard to IRBD, which also includes non-EU countries. Thus, according to Article 3/5 of the WFD, in situations where a river extends into a country or countries outside the borders of the EU, it is stated that the member-states concerned will make efforts to secure appropriate coordination with non-member states. In such situations member-states are bound to enforce the rules of the directive in their own countries. If it is borne in mind that in situations where the IRBD includes non-member states, the basin-wide implementation imposed on member-states is only in the nature of a recommendation. This is quite clear from the text of the article. Thus, the obligation to "make efforts" is sufficient for states. In a similar way, the "appropriate coordination" referred to in the article

will be determined according to the situation existing. Any idea to the contrary is unthinkable. In any case if another country that is not a member and is thus not bound by the terms of the WFD demonstrates reluctance to engage in coordination, neither the member-states nor the Union as an international institution have any way of enforcement. The reason for this is that the obligations set out in the WFD are not binding in terms of international law. In a similar way, it is also stated in the introduction to the WFD that in situations where use of water has cross-border effects it is recommended that coordinated efforts be made on a basin-wide scale to achieve environmental objectives (the term used is "should", not "shall"), going on to say that "member- states should endeavor to ensure the appropriate coordination with non-member states". (paragraph 35). In all circumstances, as it forms part of the rights and obligations stemming from EU membership (acquis), a member-state shall ensure implementation of WFD in its own territory even if a non-member state is reluctant to implement it. (Article 5/3). It should be borne in mind that in this situation it is not provisions relating to management of a basin in such a way that the territory of a non-member state will also be included, but it is provisions such as water quality, of which unilateral implementation is possible, will be implemented by member states.

Another article of the WFD which includes provisions regarding international rivers is Article 13. This article is entitled "River Basin Management Plans". Under the terms of this article, member-states are obliged to prepare river basin management plans for river basins on their own territories (Article 13/1), and to publish them within (a maximum of) nine years of the WFD coming into force (2009) (Article 13/6); to review these plans after 15 years at the latest (2015), and thenceforth to review and update them every six years (2011), (Article 13/7). Without going into details at this stage it can be stated that the plans must contain the information in Appendix VII (Article 13/3). In addition to the basin management plans, member-states may also prepare more detailed plans and programs dealing with different aspects of water management under headings such as sub-basin, sectors, issues and water-types (Article 13/5). However, their preparation is not obligatory according to the WFD and is left to the judgment of individual states.

As far as IRBD's which are entirely located within the territory of the EU are concerned, Article 13 provides that member-states shall secure coordination with the objective of forming a single international river basin management plan. The obligation contained therein is not an obligation to prepare a joint management plan, it is an obligation to ensure coordination ("shall ensure coordination"). Consequently, even though coordination may exist, it may not be possible to prepare these plans

because of differences of opinion between states and differences in approach. Thus, in such situations member-states shall prepare river basin management plans for the parts of the IRBD that are in their own territories in order to implement the obligations stemming from the WFD. (Article 13/2). There is no discretion granted to states in this respect, for they are bound to prepare plans for the parts (of the river basin) which lie within their own borders. Attention should be drawn to the fact that if a single international plan is not prepared for the whole of the IRBD, the plans which the member-states will themselves prepare are not international management plans. They are referred to only as management plans.

In situations where the IRBD extends beyond the borders of the EU, member-states shall make efforts to prepare a single management plan which will embrace the entire basin. Again, here the obligation to prepare plan is not an absolute one. In situations where the preparation of such plans is not possible, the member-state will at least draw up a management plan for the part of the IRBD which lies in its territory. (Article 13/3) Because of its character, this plan obviously is not an international management plan.

3. TRANSBOUNDARY RIVERS OF TURKEY

The Report of the European Parliament dated 20 May 2003 recommends that "Turkey arrive at a settlement, based on the findings of the UN General Assembly's International Law Commission, of the disputes with its neighbors Iraq and Syria concerning water" (Paragraph 50).

The Report of the European Parliament dated 15 December 2004 asks Turkey to "to be sensitive to the water requirements of these countries, with particular reference to the lower Mesopotamian Marshes in Iraq and Iran, where water flows have been significantly reduced by the construction of the Ataturk Dam; requests that Turkey set up working groups with her neighbors, including Syria, to ensure the fair and equitable distribution of water from rivers with their headwaters rising in Turkey" (Paragraph 42).

The Impact Report dated 6 October 2004 requests further geographical expansion in Turkey's transboundary (international) waters policy. According to this, "A key issue in the region is access to water for development and irrigation. Water in the Middle East will increasingly become a strategic issue in the years to come, and with Turkey's accession one could expect international management of water resources and infrastructures (dams and irrigation schemes in the Euphrates and Tigris river

basins, cross border water cooperation between Israel and its neighboring countries) to become a major issue for the EU" (p. 8).

There is an opinion in Turkey that EU would like the management of the waters of the Euphrates and Tigris rivers be left to an international organization (Ankara Chamber of Commerce, Water Report).

4. WATER MANAGEMENT IN TURKEY AND IMPLEMENTATION OF THE WFD

A study on implementation of the WFD in Turkey which could be considered important was carried out by the Dutch firm Grontmij Consulting Engineers between January 2002 and November 2003 and published in December 2003. (Grontmij, 2003) The report, though establishing important facts and making recommendations, failed to dwell sufficiently on the matter of transboundary rivers, which is the actual subject of this paper. An effort will now be made to explain the relationship between the WFD and Turkey's management and use of transboundary rivers. It is natural that while this is being done a brief outline of water management in Turkey be presented.

The WFD envisages integrated management of water. Due to the nature of its definition, integrated water management necessitates collaboration between organizations. A National Platform has been established in order to coordinate activities which have to be performed at national level. The Platform was established in 2002 and its full name is "The National Platform for Water Management". The bodies of which this structure is composed are listed below:

- The General Directorate of State Hydraulic Works
- The Ministry of the Environment and Forestry
- The Ministry of Agriculture and Rural Services
- The Ministry of Health
- The Ministry of Tourism
- The State Planning Organization
- The General Secretariat of the European Union
- Other state bodies to be determined during the work of the National Platform

It is immediately obvious that the absence of the Ministry of Foreign Affairs in this structure is a deficiency. Much of Turkey's geography is included in the definition of an "international river basin district" according to WFD terminology. The exclusion of this ministry is a major omission in these terms. The importance of the subject is

evident when one looks at the map in Figure 1, which divides Turkey into six river basin districts and was accepted by the National Platform in 2003.

Figure 1. *The map, which divides Turkey into six river basin districts and was accepted by the National Platform in 2003* *(Grontmij, 2003)*

According to this map, the national river basin districts are defined as follows:

1. Basins discharging into the Sea of Marmara: Marmara and Susurluk
2. Basins discharging into the Black Sea: West Black Sea, Kızılırmak River, Yeşilırmak River, East Black Sea
3. Basins discharging into the Mediterranean Sea: Ceyhan, Seyhan, East Mediterranean, Antalya
4. Basins discharging into the Aegean Sea: Büyük Menderes, Küçük Menderes, Gediz, North Aegean
5. Endogenic Basins: Burdur, the Lake District, the Konya Endogenic and Van Endogenic basins

The international basin districts which lie to the west and east consist of two parts and are as follows:

1. Basins discharging into Syria, Iraq, Iran, Georgia and Armenia: Orontes, Euphrates, Tigris, Aras, Çoruh
2. Basins discharging into Greece: Maritza-Evros

As is evident from the map, the international river basins of Turkey cover an extremely large area and the absence of the Ministry of Foreign Affairs in the list of bodies comprising the National Platform cannot be satisfactorily explained. Apart from this, the naming of the districts shown on the map contradicts Turkey's official policy regarding the Euphrates-Tigris basin. Turkey regards the Euphrates-Tigris as one single basin. However, the placing of a comma instead of a hyphen between the words "Euphrates" and "Tigris" indicates that here they have been regarded as two separate basins.

A look at the map tells us that the Tigris-Euphrates Basin has not been included, a fact for which it is difficult to find a logical explanation. It must be emphasized that before Turkey was included in the WFD in 2000 this country had been given "eligibility" status for membership and in consequence, should membership negotiations be successfully concluded, Turkey will become a member and all the rights and obligations of EU membership will be applied, including the WFD. Again, the map shows that regions 24 and 25 in particular include certain regions whose membership of the EU has not been on the agenda in the period that has elapsed since 2000. Moreover, Region 24 encompasses the parts of the Aras and Çoruh rivers that are outside of Turkey's boundaries, and the parts which are in Turkey have been excluded. However, it cannot be said that the map excludes Turkey entirely, as Region 7 (the Maritza and Evros rivers) has been shown as also including Turkey.

One map which is an appendix to the WFD (Appendix XI) shows the EU countries and ecoregions related to the surface waters adjoining them. The map is as in Figure 2.

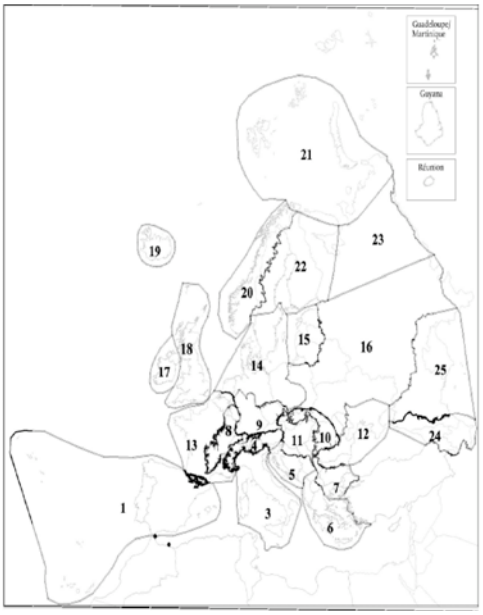

Figure 2. *The EU countries and ecoregions related to the surface waters adjoining them (OJ L 327, 22.12.2000)*

The numbered regions shown in Figure 2 are as follows:

1. Iberic-Macaronesian region
2. Pyrenees
3. Italy, Corsica and Malta
4 Alps
5. Dinaric western Balkan
6. Hellenic western Balkan
7. Eastern Balkan
8. Western highlands
9. Central highlands
10. The Carpathians
11. Hungarian lowlands
12. Pontic province
13. Western plains
14. Central plains
15. Baltic province
16. Eastern plains
17. Ireland and Northern Ireland
18. Great Britain
19. Iceland
20. Borealic uplands
21. Tundra
22. Fenno-Scandian shield
23. Taiga
24. The Caucasus
25. Caspic depression

5. CONCLUSIONS

The WFD, which pursues effective use and management of water as well as securing coordination between member-countries, was accepted by the EU and came into force in 2000. Contrary to the international legal rules in this field, the WFD imposes very definite obligations on member-countries. Among them is the obligation to improve water quality, to prevent pollution and to set up mechanisms on a basin-wide scale. The WFD is not a mass of rules and objectives to be immediately applied, but to be applied in the course of time. Indeed, a timetable for implementation is laid out together with the WFD.

There is no doubt that while EU directives are binding for member-states, because of their very nature they can only serve as recommendations for non-members. At the same time, as far as international basins, which also embrace non-member states, are concerned, obligations may be imposed on member-states. In such situations member-states are obliged to implement the rules of the directive in their own countries. Attention is drawn to the fact that when IRBD also includes non-member states, the basin-wide obligations imposed on member-states are only in the nature of recommendations. Thus, in such situations, it is not obligations regarding management of the basin which include the territory of a non-member state, but only obligations which can be implemented, such as water quality that will be implemented unilaterally.

The EU has departed from the terms of the WFD and has made a number of determinations and recommendations concerning Turkey's transboundary rivers. As well as being unable to form a connection between the latter and the WFD, the EU approach to the subject is also worthy of attention. It appears that in order for Turkey not to encounter problems in this area in the future, she will have to develop her own water resources as soon as possible.

Turkey, which conducts negotiations for EU membership, must insist on implementation of the WFD by neighboring member-states. Just as this will protect Turkey's interests in terms of water quality and management, Turkey will acquire valuable experience as far as implementation of the WFD is concerned.

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WATER ISSUES AND HEGEMONIC POLICIES

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ABSTRACT

Thirteen out of the twenty nine countries worldwide suffering from extreme drought conditions are located in the Middle East, and in the past water shortages has led to armed conflicts among the countries in the region. A case is made in this paper regarding the capability of the regional countries affected by water shortages to resolve water problems, especially over the transboundary waters, among themselves without any interference from the world-dominant international powers.

1. INTRODUCTION

Sharing of earth's important natural resources has always been a matter of dispute. It is well known how claims on natural energy resources, primarily oil, coal and natural gas have led to continuous destructive wars. Similarly, the depletion and pollution of natural water resources will provoke fights over this life sustaining entity.

Water has a high strategic value and has been at the top of the security priorities in most countries. According to the existing historical records, the oldest water contracts, drawn to solve the disputes among towns and countries, go back to 4500 years ago (Lilliana, 2007).[1] A study of the history of water law literature will show the existence of 3600 important water contracts to date. The number of water contracts on transboundary waters made in the last 70-80 years is around 300 (Biswas, 1994). According to the political boundaries that existed before the fall of the Soviet Union and Yugoslavia, 214 rivers in the world could be counted as being located in more than one country, and pass through two or more countries. This number has increased to 261 with the birth of new countries after 1990s(Pamukcu, 2000). Of those countries 14 share the Danube River watershed, 10 share the Niger, 10 share the Congo, 10 share the Nile, 8 share the Rhine, 8 share the Zambezi, 7 share the Amazon, 6 share the Mekong, 5 share the Ganges, 5 share the Elbe, 5 share the La Plata River watersheds, and 6 share the Chad Lake watershed. This political scene is a clear indicator of how frequently disputes can arise over transboundary water resources and affect the international relations. Currently, at least 158 transboundary watersheds can be counted as sources of unresolved disputes.

* Turkiye Newspaper29 Ekim Cad. No.23, Yenibosna, Istanbul

1 Generally, water contracts between the city governments of Lagash and Umma in the Sumerian era are considered the beginning of water agreements.

The issue of water usage has been discussed with increasing frequency at international platforms since the beginning of the 20th century, because the usage of water has increased dramatically with increasing industrialism and improvement of life styles. For example, the amount of water used globally in 1900s was around 95 cubic miles; this number has increased to 215 cubic miles in 1940 and to 1240 cubic miles in the 2000s. Several governmental institutions and non-governmental organizations work at the international level for protection and proper usage of natural water resources. The aim of such projects is, in reality, to create water jurisprudence in order to avoid frequent struggles and international disputes among countries over water rights. However, water laws have not yet reached the level to deal with problems of international stature. Since the second half of the 19th century, the countries have adopted the doctrines that suited their own interest, choosing from several that have been named as "Absolute Sovereignty ", "Absolute Territorial Integrity" "Doctrine of Prior Appropriation", "Historical Usage Rights", "Fair Usage", and the last but not the least "The Doctrine of Equitable and Reasonable Utilization". For example, the United States, an upstream country on the Rio Grande River, pushed for the "Absolute Territorial Sovereignty" - also known as the "Harmon Doctrine"; whereas being a downstream country on the Columbia River, has implemented the "Fair Usage" doctrine in its dealings with Canada. Similarly, the water agreement concluded over the Nile in 1929 has adopted the "Absolute Territorial Integrity" doctrine, and, England, being the colonizer of Egypt, has pushed this doctrine first on Ethiopia (which houses the source of Blue Nile Tributary), and later on Sudan. While defending its rights on the Indus, India has also used the "Doctrine of Absolute Territorial Sovereignty "(Kapan, 2007). India has continued to defend this doctrine while drawing the Indus Water Agreement with Pakistan in 1960.

On the other hand the codification of "water laws" has taken a faster turn since the beginning of the 20th century. The major stepping stones in the area of water laws are the 1911 Madrid Declaration published by the International Law Institute and the steps taken by the International Law Foundation, pushed by the 1961 Salzburg Decisions, in 1956, 1958, 1960 and especially in 1966 declarations -known as the Helsinki Rules.

The United Nations began to formally deal with water issues 15 years after its establishment. Even though the UN brought the matter to the Council in 1959, there has been no serious effort apart from a report written by the General Secretary. The UN International Law Commission started to formally work on the matter after 1971 and in 1991 was able to produce the "Provisional Articles Draft". And after 27 years of study, in May 1997 a single framework agreement was passed through the UN Council. And as the name suggests this was only a framework and was too far from

meeting the expectations except a few general principles. This agreement is still not in effect. For some, this text was dead on arrival, and the result of the vote in the UN council showed how inadequate the agreement was. Out of the 185 members in the Council, it was approved by only 103. France, China and Turkey refused the agreement and 27 countries remained indecisive. During the negotiations over the agreement, Turkey raised serious objections and comments on the concept of "International Water Courses" in Article 2 and the contents of Article 6 which dealt with cross border water decisions (Kapan, 2007).

In conclusion, the decisions brought on by the framework agreement have not been agreed upon. We should also not forget the difficulty, and perhaps impossibility of preparing international water jurisprudence that can resolve conflicts ensuing over 261 cross-border river systems in the world. This is perhaps the most problematic aspect of managing transboundary water resources. This is partially why some of the water disputes among various countries have not been resolved by an internationally accepted system of water laws. Regional problems are usually dealt with regionally accepted jurisprudence, which involve different rules and regulations for each water body.

Also, in spite of the existence of agreements on certain transboundary waters, new disputes may still arise. For example, the agreement concluded over the Nile in 1929 lost its significance with changing circumstances and with rising of new issues. In 1959 another agreement was reached between Egypt and Sudan. However the rest of the 8 countries who share the upstream Nile, including Ethiopia, have tried to raise their voices in every opportunity available against it.

Similarly, a 12 year dispute between India and Pakistan over one of the longest rivers in the world - the Indus River, was resolved with the help of the World Bank. The most important feature of the Indus Agreement was the fact that it was based on valid data and was approached with a technical point of view from the beginning of the negotiations (Bilen, 2000).

2. PROBLEMS ASSOCIATED WITH TRANSBOUNDARY WATERS

The problems that arise from transboundary water resources have found their ways to different continents and regions. A half century old dispute between the United States of America and Mexico over the Rio Grande was resolved by a single agreement in 1944. In comparison, the Jordan River that contains 1/45 of the water of Nile and 1/20 of the water of Euphrates has become an impossible case to resolve with the host

of disputes and wars going back over half a century.[2] Through the clear advantage acquired by Israel after the 6 day war in 1967, all branches of the Jordan and the Tiberius Lake (Sea of Galilee) were brought fully under Israel's control. The fresh water springs in strategically important Golan Heights have become a major source of water for Israeli farmers.

The Jordan River lies in the heart of the Middle East water problem. It is a small river that produces about 1.5 billion metric cubes of water annually. However it is the only surface water source for Jordan, Lebanon, Syria, Israel and the Palestinian territories. This obviously makes Jordan an inadequate water source for these countries, not to mention the fact that due to the military and political presence in the river's watershed, the problem has become exceedingly difficult to resolve over the years. The annual water demand of Israel is 600 billion metric cubes, and this is more than the Jordan River output. Hence, Israel meets 40% of its water needs from surface waters and 60% from underground water resources. The majority of ground waters used by Israel come from under the occupied territories. On one hand, Israel limits the amount of water Palestinians can use, and on the other hand, depletes the water resources right under the West Bank. Along with this, Israel was known to have illegally taken water from the Litany River during its occupation of Lebanon from 1982 to 2000, although, the Litany River is obviously one of Lebanon's national water. Again, as usual the complaints sent off to the UN have fallen on deaf ears due to the one-sided policies of U.S.A. in the Council.

The plans involving the three other rivers in the area have also been a matter of dispute largely because of the way U.S.A and Europe have supported Israel in its efforts. Even though Israel does not share a shore of Tigris, Euphrates and the Nile Rivers, it continuously tries to turn the Tigris-Euphrates into a Middle East Peace issue, and it receives limitless support from the US and EU in this regard. We can clearly observe in every book, article or supposedly scientific study or conference conducted on the subject of Middle East water resources, the case for water has been used by world-dominant powers as a political tool to keep the region under control. One wonders if wild ideas like "transportation of 1.1 billion cubic meters of water from the Ataturk Damn to the Golan heights and using it to fill up a trench 60 km long and 4-5 meters wide to prevent tanks from entering Golan also help Golan farmers in acquiring water" would serve anyone but Israel in its attempt to use water as a political tool in the Middle East.

If the intention is really to use Turkey's water for peace, the "Peace Water Project"[3] can be implemented by using Seyhan and Ceyhan Rivers, as suggested by the late

2 The debilitating 1967 Arap-Israeli war was admitted by the İsraili Defense Minister of the time, Moshe Dayan, to have been made over water disputes.

President of Turkey, Turgut Özal. With this project approximately 6 million cubic meters of water (3.5 millions from Seyhan and 2.5 million from Ceyhan) can be transferred by two separate pipelines to the countries of East Mediterranean and the Gulf to serve 16 million people (which is more than the total population of Israel, Jordan and Palestine) based on 400 liters of water per capita per day water use. But for some reason neither Arabs nor Israel have supported this project and as a result, it has been shelved.

On the other hand, the actions of both Israel and America in Ethiopia, where the Blue Nile stream, which constitutes the 76 percent of the Nile River, originates, in order to keep Israel's rival, Egypt under control, are noticeable. It is obvious to many that countless research projects performed in US and European universities, and many collective research projects conducted by many experts from the countries including Japan, Australia, Canada and China show signs of hegemonic tendencies. Following are two examples: The voluntary group assembled in 1983 to conduct a comprehensive research on transboundary rivers of the Middle-East, which Thomas Naff , a professor of Pennsylvania University, joined as the director and which (AMER)[4] "Associates for Middle East Research Inc." has sponsored, issued its first publication in 1984 under the following title: "Water in the Middle East, Conflict or Cooperation!". This research was supported and directed by the Defense Intelligence Agency of the Department of Defense, but ironically it is emphasized that the opinions stated in the book don't officially belong to the US Government nor the Defense Ministry . As for the second example: In the book written by John F. Kolars and William Mitchell (1991), "The Euphrates River and the Southeast Anatolia Project", which has been discussed intensively in Turkey, Thomas Naff remarks as the editor: " This book is a product of a huge strive to explain water matters which can no longer be ignored by the world and the regional people". The project that brought on this book gathered many experts of hydrology, geography, geology, engineering, history, political sciences, economy, sociology, demography, international affairs, and international law and management from the Middle East, Europe, US and Australia..." At first sight, it might be delightful that so many experts worked hard on a project about an important river of our country; but in reality, it makes one question why so many foreign scientists from overseas are interested in Turkey's waters. For example, no research at the international level has been conducted over the controversy between the USA and Mexico that lasted from 1895 to 1944 over the Colorado and Rio Grande

3 GAP, Middleeast and Water Matter; İntellectuals Association Issue (inside) İ. Ertan Yülek, "Middle-East Water Matter and Middle-East Water Projects", pp. 72 -73.

4 Some of the associations supporting the nonprofit AMER are the following : The Pheobe W. Haas Foundation, Ford Foundation, Mobil Foundation, The University of Pennysylvania Research Foundation, Bechtel Corporation, Conoco Oil Company, Dow Chemical, Dresser Industries, E.I. Du Pont de Nemours and Company, Exxon Corporation ve Flour Corporation." Refer to . Müftüoğlu, Ferruh, Middle-East Water Matters and Turkey, Marifet Publishing, İstanbul – 1997 page. 45.

Rivers. On the other hand, the Middle-East, which contains 68 percent of known oil resources and many other strategic underground resources, seems to be fair game for international players.

Yearly water capacity of the Danube River, which crosses over 12 countries, is 205 billion cubic meters - a capacity that is larger than the capacities of all transboundary rivers in the Middle East. The controversy between Hungary and Czechoslovakia (later, Slovakia) on "Gabcikova-Nagymaros Project" dated 1977 over the Danube has continued up until 1998. Although Hungary has proceeded with negotiations with its counter part under the supervision of the EU, has tried to put into work the European security and cooperation conference emergency state mechanism, and also attempted to take the matter to the international court of justice[5], no interference or no offers of mandatory mediation was put on the table by any foreign country over the period of 21 years. The same can be said for the water issue between India and Pakistan over the Indus River, which has a capacity of 208 billion cubic meters. This dispute between the two countries was concluded with reconciliation with the help of the World Bank.[6] The point we want to make here is the following: Why the water conflicts, for example on Asia's Mekong River or the Latin America's Parena River is never considered as an international research subject to be funded by foreign countries overseas, and especially by those with imperialistic intentions, and yet the transboundary waters of Turkey-Euphrates and Tigris Rivers-cause the funding of an avalanche of research! We believe that Turkey, Syria and Iraq can solve their own water problems among themselves just like India and Pakistan or Argentine and Brazil have done, without any forced intervention and unwanted mediations.

3. SOLUTION

All vanishing resources may become or forced to become weapons for countries to use against each other. The most rapidly disappearing resource which is fast becoming inadequate in meeting humans' needs is water (Koluman, 2003). As the threat from the environmental problems, such as the global climate change and the resulting drought conditions get more serious, the number of problems associated with the drought-susceptible watersheds increase, and the solutions get harder to implement. The extensiveness and the nature of the water-related problems result in a search for solutions of multi-nature in character. Currently, besides various official international associations, some civil organizations have also been conducting research projects on the subject on voluntary basis.

5 About this topic refer to Bilen, Ö., Ibid, pp. 189 -204.

6 For Treaty content please refer to. U. N. Treaty Provisions, pg. 300 -366.

During the period beginning with Argentina Mar del Plata in 1977, and continuing with Dublin and Rio, other dimensions were started to be added to the water problems. Within this scope, the World Water Council and the World Water Commission, which were founded and financed by the World Bank and some European states, has tried to establish the policies and the strategies that could be accepted by the world in general in order to secure a safe future for water. In addition, these organizations formed the "Global Water Partnership" in order to prepare plans and programs according to the established policies, and to initiate their implementation. There seems to be an ever increasing number of organizations being founded under various names, and yet, it is questionable if, in fact, these organizations contribute at all to the solutions of the water problems of the countries, especially of those that are developing or underdeveloped. For example, to what extent the following points that have been proposed by the "Global Water Partnership" under the title of "Global Water Security Targets" (Koluman, 2003) have been realized?

- The enforcement of the necessary policies and strategies for an integrated management of the water resources in 75 percent of the world countries by 2005, and in the rest of the world by 2015.
- The reduction of the number of people having no sanitary wastewater facilities by 50 percent by the year 2015.
- The reduction of the number of people having no reliable and safe water resource by 50 percent by the tear 2015.
- The reduction of the amount of irrigation water by 30 percent by the year 2015 via increasing the effectiveness of irrigational methods.
- The reduction of the flood risk for people living in flood-prone areas by 50 percent by the year 2015.

The Kyoto Protocol of 1994, which was prepared to reduce the emission of greenhouse gases, and which Turkey was expected to undersign, was dead on arrival, if examined carefully. That is because the fundamental provision that required the United States and Russia to undersign together for implementation of the Protocol has never materialized. The United States, which emits 37 percent of the total exhausted greenhouse gases, has not signed the Protocol; and Russia, which emits 16 percent of total gases, has signed it only recently. The group of the developed countries known as the G-8 is now engaged in a new development as an alternative to the Kyoto Protocol; although its outcome is not certain either. Yet, if the emission rate of the greenhouse gases continues at the current rate and no measure is taken to reduce it, a temperature increase of 2-5 degrees Centigrade will be expected by the year 2100

according to some scenarios, and this will most likely cause a significant reduction of 20-50 percent in the flow rates of rivers.

4. RELATED TREATIES

Another matter that concerns Turkey in connection with drought is the following: As can be recalled, after declaration in 1994 of 17 June as the "Day of Struggle against Desertification and Drought", the "Treaty to Struggle against Desertification and Drought" was signed in 1996. Turkey has signed this treaty in 1998, and yet the national action program that was supposed to be prepared according to this treaty has still not been finalized (Milliyet Newspaper, 2004).

Another matter which can trouble Turkey in the area of water and environment in the future is the reflections of the EU Water Directives. These directives, which were accepted in the year 2000, constitute the basic legal text about water for the EU. The Progress Report of October 6, 2004 of the EU Commission on Turkey regarding the deliberations for full membership of Turkey has caused much concern. The statement about Euphrates and Tigris Rivers under the title of "Geopolitical Dimensions" has caused much stir at many levels of the government, including the Turkish Assembly. The statement reads as: "One of the important matters in the region is to find water necessary for prosperity and irrigation. The strategic importance of water will increase in the Middle East in coming years. With joining of Turkey to the EU, the international management of Turkey's water resources and the infrastructure will gain importance for the EU.[7] This statement is based on the EU Water Directives, the 13th provision, the 3rd paragraph, which explains integrated management of transboundary water bodies[8]. This paragraph states "3-While considering an international river watershed that spreads over more than one country, the member countries will strive to establish a single river watershed management plan; and in case of failure, the plan will at least cover the part of the watershed which remains in the territory of the relevant member country." The implication of this report with respect to Turkey is the following: Turkey will strive to establish an integrated management program for the Euphrates and Tigris watersheds that would be mutually agreeable by the neighboring countries, Iraq and Syria. But since Syria and Iraq aren't members of the EU, the relevant directive will have no binding power, and therefore, the integrated watershed management program will not be compulsory. Consequently, Turkey will prepare this plan for the parts of the relevant rivers that remain within the Turkish territory.

7 Refer to www.belgenet.com/arsiv/ab/etki/2004.html.

8 Refer to. 23 october 2000 dated European Parlament and European Council directive number: 2000/60/EC

It is suspected that the EU's water related regulations were meant to be only for the developed countries. The statements of Professor Bilen (2008) at this point are relevant: "After developing all water resources, covering everywhere with roads and highways, accomplishing energy security with nuclear and thermal power plants, supplying their industry with high technology equipments, and increasing their national income to 30,000 dollars per citizen, the developed countries turn to the underdeveloped countries to tell them "we have made mistakes, now let us save the earth together". Not only the EU but all prosperous countries seem to be pushing on the developing ones opinions and policies about water matters, e.g., large dams, which tend to undermine their water-related investments. Of the 1196 large dams built on the soil of Spain, which takes the first place on the European Continent and 5th place in the world for the number of dams within its borders, 141 are located on transboundary waters. France with a land half of that of Turkey is home for 569 dams, and England, which is smaller than France, houses 517 big dams. The total number of the large dams located in the 25 member countries of the EU is 4277, whereas, Turkey currently has only 504 dams in operation (Bilen, 2008).

5. CONCLUSION

To summarize, the developing countries couldn't easily keep up with new policies on water and environment that have been brought forward by prosperous countries and imposed upon the developing ones. While contemplating over the 1966 Helsinki Rules, the developing countries have been forced to consider the new 2004 Berlin Provisions. Without yet clearly understanding of the "Integrated Water Resource Management" the new version called "Integrated Water Resource and Allocation Management" has been imposed (Allan Tony).

As for Middle East, 13 out of the 29 countries worldwide suffering from extreme drought conditions are located in this region. For some reason water problems in this area are always discussed coupled with war scenarios. It is obviously known that there have been wars over water in this region. The controversy between Israel and Syria Has surfaced in 1951, only three years after the establishment of Israel. This has led to the big war in 1967. In 1962 the Israeli foreign minister Levi Eskhol said "Water is like the blood in our veins; we fight if we are prohibited to have it". It looks like there has been no change in their thinking over the years. Here is what the Israel Water Commission Member, Meir Ben Meir said recently: "I can assure you that if people will have no water because of water shortages and droughts, doubtlessly we will face a war."[9] It is obvious that Israel's policy in the region about water is one of a kind.

9 http://news.bbc.co.uk/2/hi/middle_east/677547.stm.

It is also known that water has caused considerable tensions between Iraq and Syria, and between Syria and Turkey in the past. Yet, there has been no armed conflict between these countries. The countries in the region will solve their own water problems among themselves, if the hegemonic powers with desires to dominate the Middle East stay out of it. In fact, the controversy over the Orontes River has been on its way to be resolved with improving political relations between Syria and Turkey. As for the Euphrates -Tigris Watershed, "The Three Staged Plan" proposed by Turkey waits for consideration.

At the moment the political and the military equilibria of the world are fast changing. America is no more capable of directing the world by itself; instead a multi-polar world order is getting materialized again. The following remark of the French President Sarkozy is worth the attention: "After the global economic crisis is over, we need to reevaluate the UN and the G-8. These organizations need a reform. The voice of the developing countries should be heard and they should be collaborated with...". Who knows, may be one day a new universal political atmosphere dominated by logic and common sense will arise and the water problems of the Middle East get resolved as any other problem in the world. The Washington Post points out the financial problems as the potential cause for the next war. We wish for no war over financial or water problems.

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