SOME FACTS ABOUT WATER MANAGEMENT IN THE MIDDLE EAST AND PROSPECTS FOR COLLABORATION

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1- Introduction

It is a very common knowledge that the Middle East countries, like many other countries all ouer the world,is in need of water supplies for their domestic, industrial and agricultural requirements. However, the emphasis is generally put on the conflictual aspect of the topic. It is a widespread idea that the region as a whole is heading towards a critical shortage of water and it is often argued that use of water resources is by itself a reason for rivalry.

When dealing with the water resources in the Middle East, it is worth noting that, Turkey, Syria and Iraq are supplied by both the Euphrates and Tigris rivers which have a total potential of 85 billion cum and are much more fortunate then those in arid regions like Jordan, Israel or Nile basin countries. Therefore accepting the Middle East region, located on both Asia and Africa continents, as a unified whole and searching solutions to the water issues may not reflect the real situation in terms of hydropolitics and can make the issues more complex. Thus, manageable water issues would suffer from unrelevant and complicated problems in the whole region.

In this context, the first issue which needs to be realistically addressed relates to the identification of the problem, in terms of its scope and its nature.

2- The Role of the Euphrates-Tigris Basin in the Economy of Turkey and the Other Riparians

2.1 Water Resources

Numerous reviews and studies have appeared over the past decade adressing the water resources issues in the Middle East region. In most of these documents, Turkey is being cited as a water-rich country. Contrary to what has been tought, Turkey is not a water-rich country, and furthermore time and geographic distribution of water resources potential of the country does not provide appropriate conditions to easily meet present and anticipated needs both technically and economically.

Average annual rainfall is 643 mm but it is not evenly distributed over time and space. Precipitation varies from 250 mm in the inland areas of Central Anatolia to 2 500 mm on the Eastern Black sea. Although the average surface flows in the 26 river basins (Figure 1) are of the order of 186 billion cum, utilisable surface flows are much less, due to the fact that much of water flows off during the flood events and there are limitations for creating storages to accomodate all this quantity. The utilizable surface flows are calculated as 95 billion cum. Further, exploitable ground water and inflow from neighbouring countries, are about 11.6 and 3.4 billion cum. respectively. Thus, total exploitable water resources of the country is 110 billion cum. (Figure 2) On the demand side, in 1990, water requirements were estimated to be about 53 billion cum and were expected to rise to 74 billion cum by the year 2000.

The Euphrates and Tigris represent Turkey's most valuable surface water resources. Water potential of the Euphrates-Tigris river basin in Turkish territory is about 53 billion m^3 (11), of which 31.6 billion m^3 and 21.4 billon m^3 are the contributions of the Euphrates and the Tigris rivers, respectively.

53 billion m^3 of water. generated in this basin, accounts for 28.5 % and 56 % of total and exploitable water potential of Turkey's 26 river basins, respectively

The time and spatial distribution of the Country's water resource potential, however, will require substantial investment to provide for the needs of all areas. Due to the budgetary constraints on full exploitation, requirements do not match the water withdrawal as shown in Table 1.

Table 1. Outlook For Water Requirements and Withdrawal

	Water Requirements		Water Withdrawal	
	billion m^3	% of fully exploitable resources	billion m^3	% of fully exploitable resources
1990	53	48	32	28
2000	74	71	47	42

Source: The Ministry of Environment. Turkish Background Report On Selected Environmental Topics (1991)

Turkey is an oil-poor, energy importing country. Following the oil shock in the first half of 1970's, Governments embarked upon an indigeneous resource development program,particularly on hydropower development, to reduce the overburden of imported energy. In 1990, Turkey paid $ 3.5 billion a year for imported crude oil of 20 millions tons. (10)

It is very clear that future substitution of additional hydropower for thermal power will help us save larger amounts of much needed foreign currency.

In 1991, 23 billion kWh of electricity was generated by hydropower of which 14 billion kWh was produced by Keban and Karakaya dams on the Euphrates while 37 billion kWh being generated by thermal power plants, the contribution of hydropower to the total output of 60 billion kWh thus became 38 percent.

The feasible hydropotential of Turkey amounts to 122 billion kWh/year, and the Euphrates-Tigris basin with a total generating capacity of 6476 MW could produce annually 27 billion kWh energy which accounts for one fifth of total hydropotential of the country.

Based on foregoing facts, it concludes that the Euphrates Tigris basin forms Turkey's primary source of energy. The incentive to develop the basin emerges not only from agricultural goals but also a desire to provide much needed energy for its industrial base that would create alternative employment.

Conflict between the demands on water resources for energy and agricultural sector will stimulate measures to be taken to reduce future consumptive water requirements.

On the other hand, 1.6 million hectars of high quality irrigable land, out of total 8.5 millions hectars of irrigable land in Turkey, depends on both rivers.

2.2 Population Growth

A brief description of population growth of riparian countries is given in the folowing table:

Table 2 Population Growth

Country	Population (10^6) and annual intercensal growth (%)			
	1980	1985	1988	2000
Turkey [3]	44.74 (2.1)	50.66 (2.5)	54.07 (2.2)	69.69
Iraq [1]	13.24 (3.3)	15.59 (3.4)	17.25 5.6)	24.2 [2]
Syria [1]	8.70 (3.3)	10.27 (3.4)	11.34 (3.4)	17.2 [2]

Source: 1 Statistical Pocketbook of the Organization of the Islamic Conference Countries - 1991

2 World Population Data Sheet (Washington DC. The Population Reference Bureau Inc. 1986)

3 Statistical Indicators (State Institue of Statistics - 1992

In 1988, Turkey's population was about 3 times larger than Iraq's and 5 times larger than Syria's. If current population projections hold up, there will not be a significant change in the ratios mentioned above in the turn of the 20 th century and Turkey will remain having the largest population among other riparians.

2.3 An Overview of Natural Resources of Iraq and Syria

Looking through a broader perspective, the role of the Euphrates-Tigris rivers in the economies of Iraq and Syria, in addition to the availability of the water, availability of other natural resources and population of the whole country should also be examined. Since water issues both affect and are affected by two key factors, economic development (industry and agriculture) and population of the concerned countries.

Iraq is an oil-rich country and before the invasion of Kuwait, agriculture used to account for less then 10 % of the GNP which is largely dominated by the petroleum industry (10). It should be noted that Tigris recevies annually 29 billion m^3 of water from left bank tributaries throughout its course in Iraq, in addition to the 21 billion m^3 water which originates from Turkey. Existing and projected uses of both Turkey and Syria from Tigris river is rather low, comparing to the potential of the river and Iraq will be able to make the fullest use of Tigris for its own needs. This also explains why Iraq is able to divert a significant proportion of the flow of the Tigris through Tharthar canal to augment the water of the Euphrates.

Furthermore, population of Iraq is only one third of Turkey's population.Consequently, in the words of Prof.John KOLARS(5):

> " ... Iraq which might be considered the most favored of the three riparians because of its petroleum resources and its access to two major streams and vast arable lands, in reality is seriously at risk from wartime destruction and poorly managed irrigation practices... "

Water resources generated in Syria is indicated below (4)

Rivers and Seasonal Wadis	6.7 billion, m^3/year
Springs	1.0 "
Groundwater aquifers	1.9 "
Total	9,6 billion m^3/year

In addition to these water resources, Syria is being supplied by the Euphrates and Tigris rivers.

Irrigable land resources of Syria in the Euphrates-Tigris basin is rather limited, although Syria argues availibility of large arable lands. According to the USAID report:

> "... less than half of the (original) 640,000 ha is reasonably good land for irrigation purposes "

Turning to another source, Prof John Kolars (5) notes that

> "... Thus, estimates show an absolute maximum of 375 000 ha (240 000 ha on the Euphrates plus another 137 900 ha on the Khabur) that might receive water from the Euphrates and its tributaries..."

Area to be irrigated (given above) suggests a total removal of 4,5 billion m^3 of water from the Euphrates based on average use of irrigation water of 12,000 m^3/ha. Comparing this withdrawal with available water to Syria in the river, alarming and pessimistic prognostics about future of the water resources seems unrealistic.

3. Water Management Issues and Cooperatin in the Euphrates-Tigris Basin

3.1 Implications of Reservoirs in Turkish Territory

Implications of Turkish reservoirs and irrigation schemes on the Euphrates and Tigris rivers must be viewed within the context of the management of the entire Euphrates-Tigris system. The most significant hydrological feature of the Euphrates and Tigris rivers is the extreme variability of the both rivers flows. Snowmelt in the upper catchement areas in Turkey gives rise to flows in spring. 70 % of annual flow occurs in 4 months from march to July. Besides this seasonal variatinns, there is significant fluctuation in volume of flow year by year.

Timing of the floods on Tigris and Euphrates has never been ideal for crop production. Winter crops can often be severly damaged by high floods during the period prior to harvesting. Reservoirs in Turkey would essentially eleminate floods in Syria and Iraq providing important benefits to both riparian countries. On the other hand, the absence of large reservoirs in Syria and Iraq indicates that there is little practical use of reservoirs in those countries to carry water from high-flow years to low-flow years and floods will continue to end up at sea. Largest dam in Syria, (Tabqa) has only 9 billion m^3 active storage capacity which accounts for only 27 % of virgin flow of the Euphrates.

In 1988, the natural flow which passed the Turkish Syrian border was 58 billion m^3 and was two times of long-run average and four times of historic minumum of 14 km^3 in the year of 1974 .The low-lying plains in Syria and Iraq form a natural expansion zone for high

waters. The combined area of the lakes and swamps at the head of Gulf varies from 8 288 sq km at the end of dry season to 28 490 sq km during the spring flood, fed by winter rains and snowmelt in the mountains of Turkey. During, the 1946 flood, total inundated area reached 90 650 sq. km (8).

In Iraq, active storage is much less than this figure, Syria and Iraq are therefore unable to store water for use during droughts. The Turkish reservoirs would provide dowstream riparians with this water security. Moreover, the rate of siltation of downstream reservoirs would be much diminished.

From the dowstream riparian countries perspective, potential reductions in natural flows for Turkey's needs could be greatly mitigated by water savings that would come from the evaporation savings and regulation effect of reservoirs in Turkey.

At the time of negotiations of Colorado river compact between USA and Mexico, in view of allegations raised by Mexico, the Department of State OF USA released the following explanations on June 30, 1941 (7).

> "... The water it is proposed to deliver to Mexico from Colorado river in perpetuity is obviously worth many times a larger amount of uncontrolled normal and natural flow and hence would seem to be no less valuable than the 3 600 000 acre feet of normal and natural flow requested by Mexico in 1930. It is to be noted that there has been great variation in the annual flow of the river and that Boulder dam prevented serious shortages, even greater than those which would otherwise have occurred in 1937,1939 and 1940. Moreover, the construction of the Boulder dam and the maintenance of expensive storage facilities for the water to be delivered to Mexico have not involved any cost to that country and under the plan herein presented, no charge would be made to Mexico for storage costs at Boulder dam..."

This memorandum clearly underlines the importance of the upstream regulation for basin wide water resources management. It is interesting to note that in the case of Colorado,annual volume of Colarado river waters guaranteed to Mexico under the treaty of 1944, of 1 500 000 acre-feet (1 850 234 000 cubic meters) accounted for only 40 % of requested by Mexico in 1930.

3.2 Technical Implications of Joining the Euphrates and Tigris Rivers

It is misleading to focus on the River Euphrates or the River Tigris in isolation one from another. These two rivers form one single basin having an annual potential of 85 million cum and should be taken as the parts of the same system.They support each other and their complementarity can not be overlooked. These two rivers are linked not only by their natural course at Shatt-el-Arab but also man-made Thartar canal linked two rivers.

Consequently, all existing and future agricultural uses from Euphrates in Iraq need not necessarily be continued from Euphrates, some areas fed by Euphrates could be commanded by waters to be transferred from Tigris river. A system of link canals, canals to transfer water from the Tigris river to replace uses from Euphrates is to be constructed.

This assessment constitutes the most promising technical solution which will help provide supply and demand balance in water needed by the riparian countries.

3.3 Cooperation on Water Management Among Riparian Countries

The various initiatives in international collaboration in river basin development have met with mixed success. As a general observation, the more interested parties and outsiders involved the lower the effectiveness of the collaboration.

In this context, collecting and processing data on regional basis, covering the whole Middle East, should be approached with very much caution and seems impractical. In the case of the

controversial HYDROMET project set-up in 1967 to embrace the nine Nile basin countries, the final result was not succesful. (9)

Opportunites for cooperation in the Euphrates Tigris basin among riparian countries could be initiated in several subjects, some topics are:

(i) Improvement of present water utilization and exploitaion

Main components of study might include:

- recycling of drainage water back to the system (methods and management).Irrigation return flow is an important resource but quality of it should be carefully monitored and if necessary improved by blending it with fresh irrigation water.
- Improvement of control capabilities on various parts of the irrigation schemes,
- Preventing and monitoring water leakage,
- Conjuctive use of ground and surface waters

(ii) Specific Subjects

It is suggested to consider the following subtitles:

(i) Establishment of pilot projects,

(ii) Desalination and solar energy utilization,

(iii) Efficient irrigation and drainage methods (development of irrigation equipment),

(iv) Education and training,

(v) Drought and salt-resistant plants,

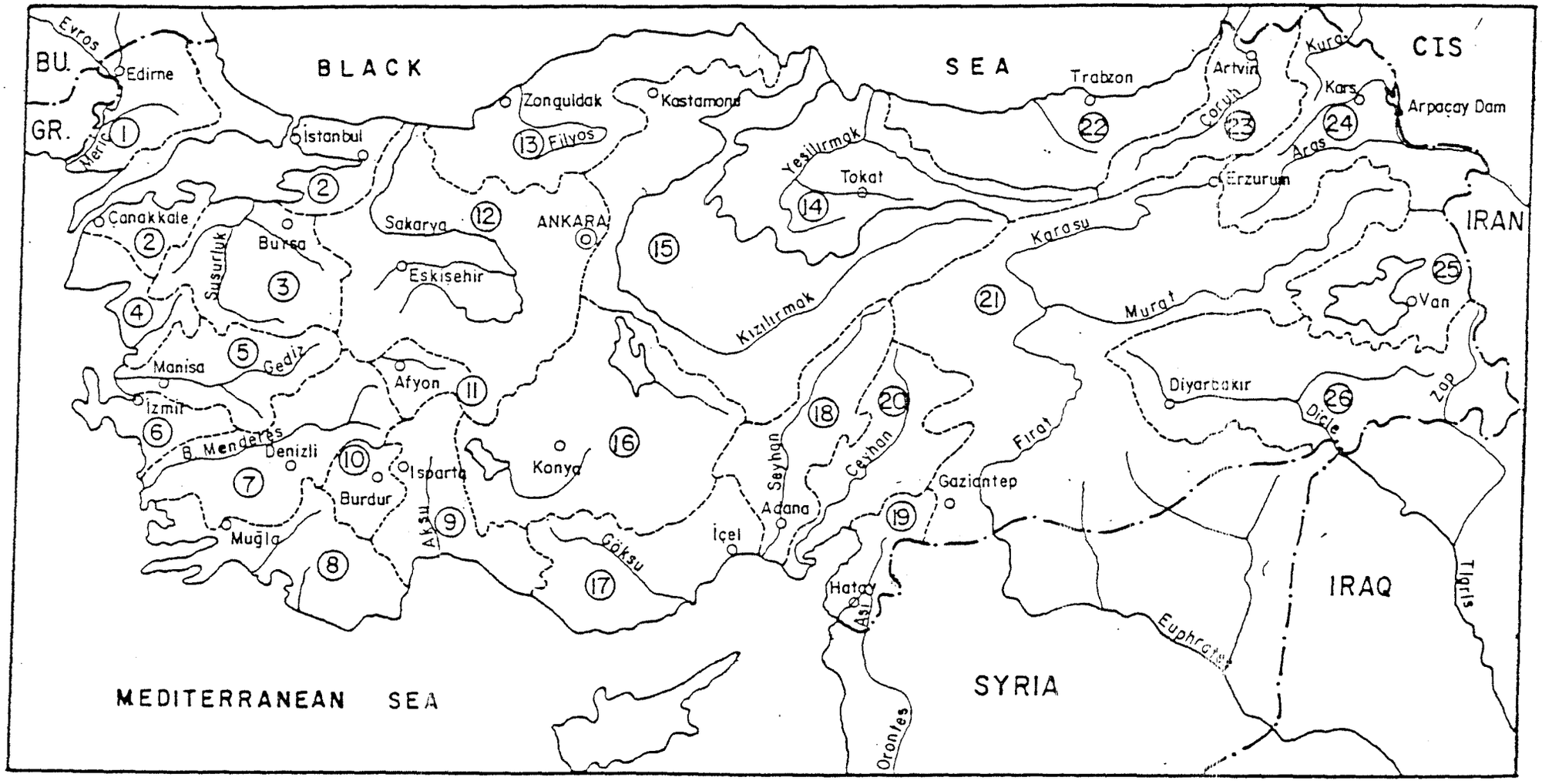
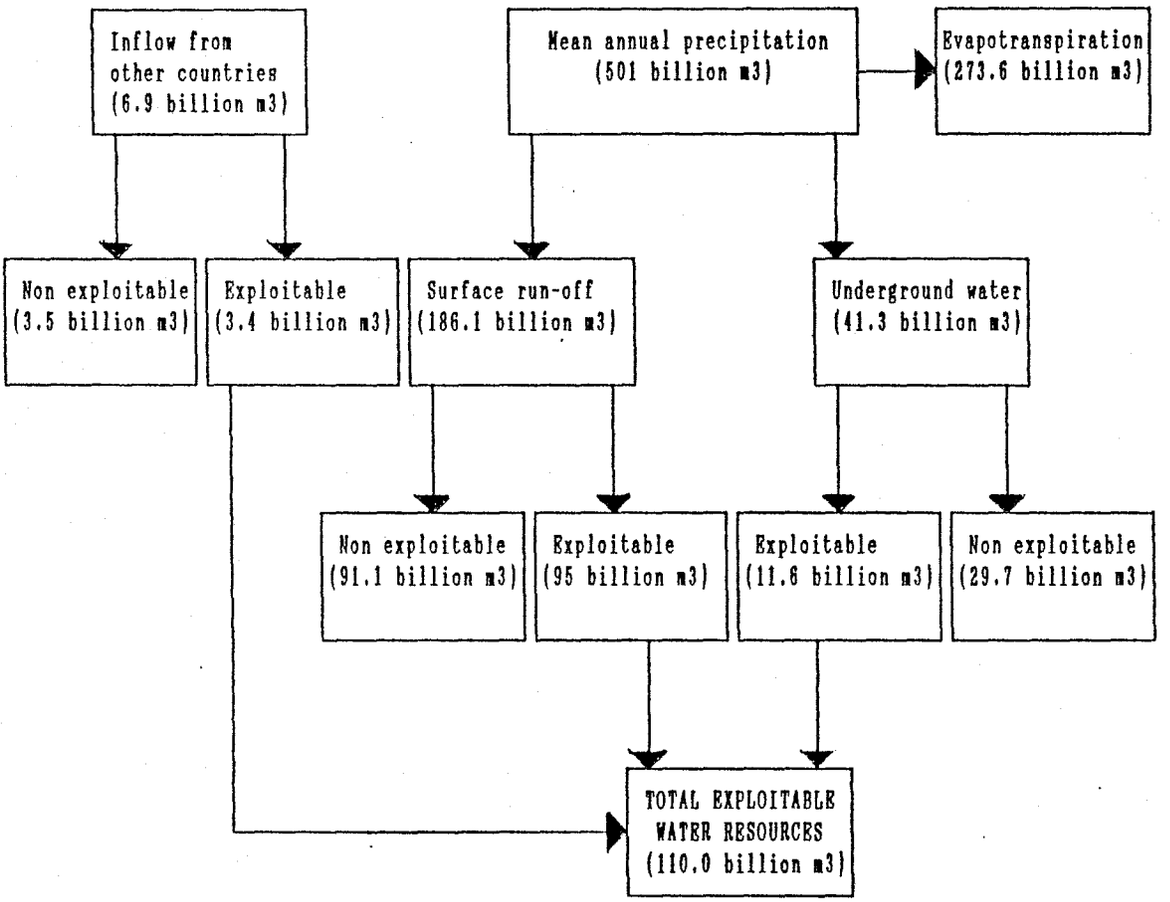


Figure 1 -RIVER BASINS IN TURKEY

Figure 2 WATER RESOURCES



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