The first edition of 'Turkey and Water Issues in the Middle East', a work dealing with various dimensions of water issues in the region, aroused interest both in Turkey and, through its English translation, abroad.

The second edition of this book has two new parts. These give a detailed analysis of treaties related to the use of the waters of such rivers as the Danube, Colorado, Indus and Jordan. Also, there are comparisons between the circumstances and approaches related to these transboundary waters and those pertaining to the Euphrates-Tigris Basin, in order to depict similarities and differences. The last part of the book is devoted to the water and environment agenda of the 21st century together with policies and strategies to work toward more efficient water utilization.

The author, Özden Bilen, was the General Director of the State Hydraulic Works (DSİ) after holding several offices in the same organization, and retired in 1995. From 1980 to 1992, Özden Bilen served as the head or member of the Turkish team in the Joint Technical Committee formed by Turkey, Syria and Iraq to manage the use of the waters of the Euphrates and the Tigris. In addition to authoring books in his profession, Özden Bilen has had many articles published in Turkey and abroad.

Following his retirement he worked as a consultant to the Food and Agriculture Organization of the United Nations (FAO) and was involved in several missions of the FAO.

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SOUTHEASTERN ANATOLIA PROJECT (GAP)
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ENLARGED AND REVISED 2nd EDITION

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Özden BİLEN

Ankara, 2000

Republic of Turkey
Prime Ministry
Southeastern Anatolia Project (GAP)
Regional Development Administration

REPUBLIC OF TURKEY
PRIME MINISTRY
SOUTHEASTERN ANATOLIA PROJECT (GAP)
REGIONAL DEVELOPMENT ADMINISTRATION

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In memory of my
beloved elder brother,

Özmen Bilen

Ö.B.

...Turkey and Water Issues in the Middle East, by Özden Bilen, is a more specifically focused presentation of Turkish attitudes and policies regarding that nation's position in the regional milieu. Although the author is careful to state that all the opinions in the book are his own and do not represent official policy, his position as former head of the Turkish State Hydraulic Works (DSI) and as an internationally recognized and respected authority on Middle East water issues lends significance to this book.

...Bilen, in turn, presents a detailed discussion of the modern hydraulic history of the Middle East as well as a "Hydro Political and Technical Assessment of the Waters of the Middle East," with specific references to the Orontes River; the Jordan River; groundwater resources in Israel, Jordan and Palestine; and possible technical adaptations suggested for the area. Unlike Shapland's discursive approach, Bilen marshals his data to counter Syrian and Iraqi claims. He also puts forward counter-arguments showing inconsistencies in Syrian attitudes regarding their use of the Orontes River on the one hand and their complaints regarding Turkish use of the Euphrates on the other.

The purpose of this reviewer's comments is not to side with one group or the other, but to indicate that Bilen's book gives a straightforward and articulate presentation of the Turkish argument. As mentioned earlier, it would be useful if a similar work were available expressing, in as cogent and careful a manner, Arab perspectives.

Prof. John KOLARS
Center for Middle Eastern and African Studies,
University of Michigan, Ann Arbon
Int. J. Middle East Stud. 31 (1999)
Book Reviews

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FOREWORD TO THE SECOND EDITION

As mankind steps into a new century, the demand for water, as well as problems arising from the mismanagement and wasteful use of water, continue to increase. The additional problem of population growth creates a scenario where serious water shortages await us all in the near future.

The wise use and management of natural resources -especially water- is of utmost importance for countries individually as well as mankind as a whole, for sustained development in a world of rapid globalization.

Water is one of our most precious assets, but because of its economic value it is easily politicized. The proper development and management of water resources must be considered as an integral part of a larger domain with a wide variety of sectors and stakeholders, in order to establish the proper basis for analyzing the challenges ahead for water resource professionals and decision makers.

This appreciation of the problems and potential surrounding water resources development is the spirit behind the Southeastern Anatolia Project (known by its Turkish acronym as "GAP"), which is one of the most ambitious integrated regional development programs in the world based on the development of water resources.

The well rescarched and illuminating work of Mr. Bilen makes a thorough technical analysis of a multitude of issues related to transboundary rivers in several countries and sheds light on the contradictions made in some analyses of transboundary river issues in Turkey.

İ.H. Olcay ÜNVER, Ph. D.
President
GAP Regional
Development Administration

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This study could not have been completed without help from many people. Although I can not possibly thank them all. I would like to take this opportunity to mention a few.

First, I owe tremendous depth of gratitude to Dr. İ.H. Olcay Ünver, President of the Southeastern Anatolia Project Regional Development Administration, for his interest and concern in the publication of this book.

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My thanks are also due to Sırrı Vural Bilen, my son and colleague, for his contributions as an advisor and proofreader, and to İpek Polat who typed the manuscript with utmost diligence.

Finally, I would like to thank Afife Bilen, my wife, for her enduring patience during the long period of time I devoted to the writing of this book.

PREFACE TO THE FIRST EDITION

Water, distinct from other natural resources, constitutes the essence of life; it embodies a social quality in addition to its economic value, and thus forms a setting which is prone to political manipulation divorced from relevant technical data. When an analysis is made within this overall framework, some of the water-related problems in the Middle East, a region which already presents a rather complex economic and social geography, appear as having been artificially created for political porposes. Hence, it is necessary, in order to distinguish real problems from artificial ones, to reveal the basic hydropolitics and technical differences existing among the waters of the region.

The water resources of the River Jordan, where Arab-Israeli hostility is expressed intensively, are far from meeting the needs of Jordan, Palestine and Israel even taking account of their ground water reserves. In the Nile basin there are problems created by the 1959 Nile Treaty which was shaped, starting from the early 20th century, by the influences and initiatives of the colonial administrations in a manner to safeguard the interests of Egypt only. In contrast when technical data and potentials are considered, it becomes clear that the Euphrates and Tigris together have the capacity to meet the needs of Turkey, Syria and Iraq. However, without paying due consideration to the basic differences, some publications engage in erroneous comments on the utilization of these two rivers by establishing artificial similarities and comparisons with the specific problems concerning the Jordan and Nile rivers. In this context, unrelated events are used arbitrarily to form a picture of a ruthless economic and power struggle. But behind this exciting facade, the cool and rational world of facts and figures tell an entirely different story.

It must be emphasized here that realistic and rationalistic assesments rather than sentiments and animosity should dominate international relations, so that unpleasant, imaginary consequences will not be inferred from decisions taken for purely technical reasons.

For instance, the insinuation that Turkey may cut off waters any time is based on misinformation, if not bad intention. Turkey needed to reduce the flow of the Euphrates only once for a period of four weeks to impound the Atatürk Dam, since technically it is impossible to do otherwise. However, Turkey would hardly want to deprive itself of much needed hydropower in order to make life difficult for its neighbours. Neither has it ever been greedy with its water as sometimes claimed.

Furthermore, Turkey has abided fully by the commitment it made in 1987 to release a yearly average of 500 cubic meters a second. In practice the flow often considerably exceeds this. In 1995, for example, the annual average flow was around 830 cubic meters a second. In the first half of 1996, Turkey was releasing water to Syria at between 1147 cubic meters and 1684 cubic meters a second, far above the natural flow of the Euphrates and the amount specified in the 1987 Protocol. However, claims are still made that "the Turks have just usurped the water of the Arab".

A question raised by many is: "Then why all the allegations completely severed from technical facts?"

The author in his book endeavors to analyze this question and expose speculative interpretations and contradictions in assessments.

The book was not envisaged as a text apealing only to experts on the issue. Rather, it had the aim of reaching wider sections of the international community. For this reason, I have tried not to bore the reader with too many figures. However, in the Middle East, it is a rather frequently used method for political purposes to distort facts by playing with figures related to water resources. Therefore, it was in some cases essential to support the text with numerical explanations. I have tried to overcome this difficulty with accompanying textual interpretations.

In order to assess the actual dimensions of the water problem in the Middle East, it is essential to undertake a historical review, starting from the First World War, to examine and explain how the map of the region was drawn by economic and military power centres. Consequently, Part I of the book deals with the shaping of our present day Middle East by emphasizing developments related to water issues. Part II deals, together with technical analyses of the rivers Euphrates, Tigris, Orontes, Jordan,

Litani and the Nile, with political approaches (hydropolitics) concerning these waters. Part III addresses global water issues and dwells on the prospective problems that await the world in the twenty-first century.

In the process of preparing this book, many publications have been studied with a stress on the biased and contradictory aspects of some of them. Necessary explanations and replies to false accusations follow in suit.

International relations are shaped not by eternal friendships or hostilities, but by common interests. Thus, views quoted in the book that reflect the anti-Turkey attitudes and policies of some countries should be evaluated by the reader in this overall frame of reference. I believe that conditions will change in the course of time and an environment for consensus will finally emerge.

I will be very happy if I could, through my observations and comments shed some light upon these long disputed and still disputable issues.

Özden BİLEN
November, 1996
Ankara

PREFACE TO THE SECOND EDITION

Transboundary waters are among the top items of our present world in terms of issues related to water resources development and environmental relations. Every year there are numerous international meetings, recommendations, articles and books dealing with these issues.

The new concept of 'virtual water' is being discussed widely; new projects are being launched to establish a global water partnership, for regional planning and management of water resources and for regional data banks. It is essential that such developments are closely followed by Turkey and other countries in order to develop pertinent policies and strategies

'Turkey and Water Issues in the Middle East' is the product of a long study devoted to the analysis of various dimensions of water issues. The book was first published in 1996 by TESAV (Foundation for Economic, Social and Political Research) and aroused interest from a wide range of readers. The GAP (Southeastern Anatolia Project) Administration published the English translation of the book in 1997.

In this second edition of the book, Parts I and II which are devoted to the technical and hydropolitical assessment of waters in the region and developments which led to the shaping of the Middle Eastern map, largely appear as they were in the first edition. Part II develops a more elaborate technical analysis of the 'Convention on the Law of the Non-Navigational Uses of International Watercourses', adopted by the UN in 1997.

Treaties enacted between various States are added to this edition as Part III under the heading 'Analysis of selected Treaties Relating to Transboundary Waters'. This part of the second edition gives a detailed analysis of treaties concerning the use of the Danube, Colorado, Indus and Jordan rivers. Comparison is then made between these treaties and

conditions existing in the Euphrates-Tigris basin to prove how sound, fair and responsive the proposed Turkish plan and approach for the utilization of the basin waters is.

Part IV, 'Water and the Environmental Agenda of the 21st Century' dwells on the process of change in the management of water resources and decisions taken at international meetings that influence this process of change. Here, the critical approach of the author focuses on the assertion that some decisions and recommendations reflected in the final documents of meetings organized under the initiative or leadership of those countries of the North, mostly located on temperate zones, are inconsistent with the facts and circumstances of the developing countries of the South, predominantly sited in arid and semi-arid zones. Part IV also discusses the position of radical environmentalists in the North, mostly from those countries that have already developed their water and other natural resources, who overlook the critical importance of projects for water resources development in the South. Finally, Part IV gives an overview of policies and strategies, together with physical infrastructures, to ensure efficient and economical use of water resources. These issues make up the water agenda of the 21st century and deserve close scrutiny.

It is with great pleasure that the author, for his part, offers this enlarged edition for the judgment of his readers.

Özden Bilen
December 31, 1999
Ankara

PART I

HISTORICAL BACKGROUND TO THE SHAPING OF THE MIDDLE EASTERN MAP

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In the Middle East Events Rarely Are What They Seem to Be

According to a worldwide survey conducted by the United Nations, there are 214 rivers of medium or large scale that either form national boundaries or transcend such boundaries (Biswas, 1994). Many problems have so far emerged between nations, especially in relation to transboundary waters. Among such problems, a few were settled permanently or temporarily, but only after negotiations which in some cases lasted for almost half a century. Presently, there are several rivers which are subject to on-going negotiations between states or whose navigational uses have not yet been resolved. One of the most recent examples of this is the conflict between Hungary and Slovakia over the use of the waters of the River Danube which has been for centuries subject to very detailed legal and technical regulations. Hungary appealed to the International Court of Justice in 1993 concerning the alleged catastrophic environmental impacts of the Nagymaros-Gabcikova project. Hungary tried to prevent the commissioning of the hydroeletric system on the Danube, built according to the an interstate Treaty, signed in 1977.

Further, many countries today are facing various forms of water problems brought about by rapid population growth, urbanisation and industrialisation. Water conflicts are now routine matters of life. They happen between regions in one country or among countries utilizing transboundary water courses, and could concern the quantity or quality of water. The Euphrates and the Tigris Rivers are similar to the many other transboundary rivers which have been potential sources of conflict. Such conflicts have surfaced from time to time and taken different forms, and have been dealt with as they have arisen.

In spite of the global features pointed out above, it is the Middle East with its complex political, economic and social geography where water problems are continuously being moved to the forefront and about

which war scenarios are being written. To cite an example, the book entitled 'Water Wars' written by John Bullock and Adel Darwish is full of such speculations.

Turkey's efforts towards economic and social development of Southeastern Anatolia are being distorted by Syria and some Western sources, and then misrepresented to other countries of the region and to world opinion as the desire of Turkey for hegemony over the region. Reducing the Euphrates flow for a short period during the initial impounding of the Atatürk Dam was a technical necessity, not a political matter, but it was presented in the book Water Wars as follows:

> *".....To show its ability to influence its neighbours, Turkey went out of its way to demonstrate the power conferred by ownership of water resources. The Turks did this peacefully and quite subtly, and have of course firmly denied that their action had any political overtones. Everyone else accepts that when the Turks stopped the flow of the Euphrates river for more than three weeks in January 1990, they were making a point". (Bullock and Darwish, 1993: p.30).*

These statements appear to be politically motivated and aimed at deepening conflicts in the region and creating rivalries among the countries. Thus, a purely technical process of initially filling the reservoir was used as an excuse for conflict, although Turkey had taken full precautions not to cause any harm to Syria and Iraq.

One can come across frequent examples which prove that events taking place in the Middle East are different in their essence to what they appear to be. While Egypt denies water amounting to only one percent of the yearly flow of the Nile to the Palestinians of the Gaza Strip who face serious shortages of water, Syria places Jordan in a difficult position by consuming the water of the Yarmuk, and Saudi Arabia is exhausting the drinking water supply of Amman by irrigating its wheat fields with the ground water sources located just on the Jordanian border. Despite such a state of affairs, an unjust campaign led by some Arabian countries, Syria being in the first place, continue to target Turkey even if the latter allocates Syria and Iraq half of the water of the Euphrates while 90% of its waters originate in Turkey.

Meanwhile, misleading statistics on water resources are presented and such distorted statistics are frequently used as a means for political ends. Let's take a look at some examples. Turkey's usable water resources are on average, about 91 billion cubic meters per annum after deducting the annual 16 billion cubic meters given to Syria and Iraq from the Euphrates (See, page 58). Yet, there are some publications which give this figure as high as 250 billion cubic meters (Shuval, 1994, p. 295). While the Lebanese water expert Behzad Hakim guantifies the average annual water potential of his country as 3.2 billion m^3, Professor Shuval again brings this figure up to 9 billion m^3. The idea behind this is to place Turkey and Lebanon in the category of so called 'water rich' countries (Shuval 1994, p. 295).

If we want to disclose what is behind these controdictory figures and see why there is the staging of a 'water game', particularly in this region, even though the problem exists in many other regions of the world, we must take a brief look at how the map of the Middle East was formed before going into technical analyses.

Therefore, in what follows, I will give an account of what happened in the period starting from the first Zionist Congress convened in Basle, Switzerland in 1897 up to the present time. Here, a special emphasis will be placed on the Arab-Israeli conflict regarding the use of the Jordan river, and on how the map of the Middle East was formed. Additionally, this account will also summarize the activities of the 'Working Group On Water Resources' which was established in 1991 within the framework of multi-lateral talks on the Middle East Peace Process.

The Shaping of the Middle Eastern Map

Political relations between Britain and the Ottoman Empire had always been affected by the fact that the land lying between Egypt and India was partly under the control of the Ottoman Empire and this could pose a threat to British interests in India. Moreover, the Suez Canal, opened in 1869 after the end of the Ottoman rule in Egypt, had a strategic prominence in controlling the sea route to India. Thus, the protection of the Canal against Germany and the Ottoman Empire had a specific importance for the British. In fact, the Canal became more important with

the discovery of the rich oil potential of the region and it thus sustained its strategic importance even after Britain lost its control over India. Upon the nationalization of the Canal in 1955 by the Nasser regime, Britain and France, together with Israel, did not hesitate to impose military sanctions upon Egypt.

The Hejaz Railway, constructed with the financial and technical support of Germany, also added to the worries of Britain even before the start of the First World War. This was considered as an important step towards the establishment of German hegemony over the whole region.

The British Empire then tried to maintain its stake by means of war. In this war, in addition to military operations, the idea of drawing new political boundaries in this particular region was also cherished by the British.

The plans of the British Government regarding the post-war Middle East had foreseen the formation of buffer states. In a letter written to the Ministry of War by Storrs, an expert on Eastern Affairs, the idea of a Moslem Kingdom of Palestine and a Jewish State were both considered. The concept of creating buffer states was elaborated as follows (Fromkin, 1989, p. 143):

"With regard to Palastine, I suppose that while we naturally do not want to burden ourselves with fresh responsibilities as would be imposed upon us by annexation, we are, I take it, averse to the prospect of a Russian advance Southwards into Syria, or of a too great extension of the inevitable French Protectorate over the Lebanon, etc. France would be a better neighbour than Russia, but we can not count on the permanence of any Entente, however Cordiale, when the generation that is full of war memories passes away. A buffer State is most desirable, but can we get one up? There is no visible indigenous elements out of which a Moslem Kingdom of Palestine can be constructed. The Jewish State is in theory an attractive idea; but the Jews, though they constitute a majority in Jerusalem itself are very much a minority in Palestine generally, and form indeed a bare sixth of the whole population."

Within the overall framework of the strategy of establishing buffer states, Sir Mark Sykes, the Advisor of Lord Kitchener, the War Minister of

the time, presented his report entitled *"Middle East After the War"* to the Cabinet in June 1915. Then there were talks between Sykes and Georges Picot, from France, which ended with a secret consensus, later known as the "Sykes-Picot Agreement". According to this agreement, pre-eminence over Syria and Lebanon, among the new states to be formed, would be given to France while Jordan and Iraq would be under British control. As for Jerusalem and Palestine, it was decided to accord them an international status whose details were yet to be clarified.

This plan of establishing several states out of Ottoman territory mainly aimed to forestall any prospective German and Russian activities detrimental to Britain's easy route to India. The actual size of the rich oil reserves in Iraq, the Gulf and the Arabian Peninsula had not yet been realized. In fact, 80% of the oil used by the British prior to the First World War and during it came from the United States. Iran's oil extraction was not considerable at that time. For example, the oil production of the US in 1913 was 140 times as much as that of Iran.

Emergence of the Palestine Problem

The core of the agreement between Britain and France in giving Jerusalem and Palestine an international status was the idea of forming a Jewish settlement area in this region. Political Zionism, or the idea of establishing a National Jewish State in Palestine, was addressed by Theodor Herzl in his book 'A Jewish State: An Attempt at a Modern Solution of the Jewish Question' first published in 1896. The first Zionist Congress convened in 1897, in Basle, Switzerland. Attempts at opening up Cyprus or the Sinai Peninsula for Jewish settlement did not receive the consent of the British Administration in Egypt. The counter proposal of the British of allocating a place for Jewish settlers in Uganda, one of its African colonies, was rejected by the 6th Zionist Congress held in 1904, although the very same idea had previously been accepted by Herzl.

Following these initiatives, the first important development can be seen in a letter dated 2 November 1917 written by Arthur Balfour, the British Foreign Secretary to Lord Rothschild, a Jewish member of the British Parliament. In his letter, the Foreign Secretary stated that (Mansfield, 1991, p. 159):

"His Majesty's Government view with favour the establishment in Palestine of a National Home for the Jewish people, and will use their best endeavours to facilitate the achievement of this object, it being clearly understood that nothing shall be done which may prejudice the civil and religious rights of existing non-Jewish communities in Palestine or the rights and political status enjoyed by Jews in any other country."

This official statement known as the 'Balfour Declaration' constituted one of the most important steps in the foundation of a Jewish State.

Especially with immigration from the Eastern Europe starting from the second half of the 19th century, the Jewish population in Palestine reached about 80,000 in 1914 while estimated Arab population in the same year was 650,000. Before the first Zionist Congress, during his visit to Palestine to check the potential and limitations of the land, Theodor Herzl met Kaiser Wilhelm, the German Emperor, in Jerusalem. In this encounter, Kaiser Wilhelm said, making reference to the extremely hot weather of the region:

"... But it needs water, plenty of water..."

These words could be considered as the first utterance referring to the water problem of Palestine (Wolf, 1994, p. 10).

Ambiguity over the borders of Palestine created by the Sykes-Picot Agreement and Balfour Declaration caused the emergence of many problems afterwards. Britain argued that since Palestine was divided into two parts by the Jordan River. The land between the river and the Mediterranean should be identified as the Jewish settlement area. The other part, to the east of the River, which was later to be known as the 'Hashemite Kingdom of Jordan', was to be ruled, under British pre-eminence, by Prince Abdullah, the elder son of Hüseyin, the Emir of Hejaz.

When the war was over in 1919 and talks over border requirements began, the Zionist delegation headed by Weizmann in the Paris peace conference had a different proposal. This plan called for historic, strategic and economic considerations in delineating the boundaries for Jewish settlement. The land identified in the Bible as extending from *"the Dan stream to the north and down to the Beersheba in the south"* was

proposed as the homeland of Jews. This territory had to be supplemented for military security purposes with desert areas to the east and south as well as the Beka'a Valley, a gateway between the Lebanon Range and Mount Hermon.

Economic security could be possible only by having adequate water resources. Especially those Jewish immigrants expected from Eastern Europe would be tied to the land by means of irrigated farming. All such plans were moulded so as to exercise hegemony over the sources of the Jordan River, its important tributaries including the Yarmuk, and the River Litani which presently flows within the boundaries of Lebanon.

It may be interesting to focus on the ideas put forward in 1919 by Aaron Aaronshon, an agricultural engineer who participated in the Paris peace talks as a water expert (Wolf, 1994, p. 15):

"In Palestine, like in any other country of arid and semi-arid character, animals and plant life and, therefore, the whole economic life directly depends on the available water supply. It is, therefore, of vital importance not only to secure all water resources already feeding the country, but also to insure the possession of whatever can conserve and increase these water - and eventually power - resources. The main water resources of Palestine comes from the North, from the two mighty mountain masses - the Lebanon range, and the Hermon...

"The boundary of Palestine in the North and in the North East is thus dictated by the extension of the Hermon Range and its water basins. The only scientific and economic correct lines of delineation are the water-sheds."

Though the above stated views of Aaronshon were endorsed by the Zionist delegation, they did not find any reflection in the final documents of the Paris talks. Indeed, Haim Weizmann expressed his discontent in a letter written to Churchill in 1921 and stressed the following (Fromkin 1989, p. 513):

"The agreement with France cut Palestine off from the Litani, deprived her of possession of the Upper Jordan and the Yarmuk and took from her the fertile plains east of Lake Tiberias which had heretofore

been regarded as one of the most promising outlets for Jewish settlement on a large scale."

In spite of this initial distaste for the agreement, since 1949, its official date of foundation, the State of Israel has launched many initiatives, including military operations, and been successful to a great extent in getting control of the water sources mentioned above.

Regarding the use of the Jordan River, various plans had been developed starting from 1913 when Palestine was under Ottoman control. For example, a plan prepared in 1913 by George Franghia, a Christian Arab in charge of public works in Palestine, included the diversion of the Yarmuk River to Lake Tiberias, irrigation of the Jordan Valley by water channelled from this lake, and the construction of two hydroelectric power plants. However, with the defeat of the Ottoman Empire in the First World War this plan became void (Naff and Matson, 1984, p. 30). Following the war, activities for meeting the water needs of the local people shortly turned into a political debate concerning Jewish immigration.

This debate concentrated on the capacity of the land and the water resources of Palestine in terms of possible new settlers it could receive. After the official recognition of Palestine by the British as a land for Jewish settlement, it was proposed to the British Government to develop various facilities to utilize the Jordan River. Among these proposals, the request of prerogative by Pinhas Rütenberg, a Russian engineer to produce energy in the Jordan Valley was endorsed. The idea behind this was to prove, by developing water resources, that more immigrants could settle in Palestine. In 1922, in an address to the House of Commons, Churchill praised this initiative and stated the following (Fromkin, 1989, p. 523):

"I am told that the Arabs would have done it for themselves. Who is going to believe that? Left to themselves, the Arabs of Palestine would not in a thousand years have taken effective steps toward the irrigation and electrification of Palestine. They would have been quite content to dwell - a handful of philosophic people - in the wasted sun-scorched plains, letting the waters of the Jordan continue to flow unbridled and unharrassed into the Dead Sea."

During the post-war division of Ottoman territories, close cooperation was observed between Arab and Jewish leaders. For example, the younger son of Hüseyin, the Emir of Hejaz and the head of the delegation to the Paris Peace Conference said (Wolf, 1994, P. 16):

"The two main branches of the Semitic family, Arabs and Jews, understand one another, and I hope that as result of interchange of ideas at the peace conference, which will be guided by ideals of self-determination and nationality, each nation will make definite progress towards the realisation of its aspirations (cited from Esco Foundation, 1947, p. 139):

On 3 January 1919, Faisal and Weizman issued the following joint declaration which stressed their national ambitions and mutual friendship (Wolf, 1994, p. 17):

"All necessary measures shall be taken to encourage and stimulate immigration of Jews into Palestine on a large scale, as quickly as possible to settle Jewish immigrants upon the land through closer settlement and intensive cultivation of the soil. In taking such measures the Arab peasant and tenant farmers shall be protected in their rights, and shall be assisted in forwarding their economic development (Original reproduced in Weizmann letters)."

In their cooperation with the European powers both during the war and its aftermath, the Arab leaders and Jews displayed a 'green light' for Jewish immigration to Palestine.

The Zionists maintained that the territory of Palestine could carry ten times as many people as then existed, and that it was possible to settle masses of people in this region without the displacement of the existing 600,000 Arabs.

Nahum Sokolow said the following as he was opening the 12th Zionist Congress in 1921:

"Jews were not going to the Holy Land in a spirit of mastery. By industry and peace and modesty they would open up new sources of production which would be blessing to themselves and to the whole east." (Fromkin, 1989, p. 516).

In the 1920s primitive methods of agriculture were being practised on fertile soils in Palestine. According to the Zionist Plan declared by Weizmann, fertile lands belonging to the Arabs would not be enclosed but unused arid land would be made productive by the application of scientific techniques.

However, the real course of events turned out to be quite different. Jews created a lucrative market by pushing up the price of land. Then, especially richer Arabs put their fertile land up for sale. It has been stated by various sources that between 1920 and 1928, at least a quarter of the elected leaders of the Arab communities sold land to Jews at exorbitant prices though they talked against such practices (Fromkin, 1989, p. 523).

Between 1923 and 1929, following the establishment of a British mandate in Palestine, the region was relatively peaceful. These was also a fall in Jewish immigration in this period. However, parallel to the intensification of the anti-Semitic movement in Germany during the 1930s, there was again a noticeable increase in Jewish immigrants to Palestine were 4,000 in 1930, 30,000 in 1933, and 62,000 in 1935.

In 1935, the Arab authorities appealed to the British Mandate for the prevention of immigration and land sales. Following this, there were several uprisings from 1936 to 1938 against the British Administration. The reason behind this unrest was the worry that ever-increasing immigration would bring about Zionist domination in the region. A commission headed by Lord Peel, was sent to the region to examine the situation. It came up with a proposal for the abolition of the Mandate with the exclusion of Jerusalem and Haifa, division of Palestine into two states for Arabs and Jews, and the restriction of immigration to 12,000 people a year for a period of five years.

Jewish leaders did not view this proposal sympathetically since it limited immigration and restricted the boundaries of the Israeli State. Following this, the British Government proposed, in a 'white paper', the establishment of a two-nation state, formed of Arabs and Jews, and freezing the number of immigrants at a total of 75,000 for a period of five years. Though this proposal dropped off the agenda with the outbreak of the Second World War, the genocidal practices of the Nazi regime during the war fundamentally changed the conditions prevailing in the

aftermath of the war. US President Truman requested Britain that 100,000 Jews should be permitted to settle in Palestine immediately and all limitations to immigration should be abolished. A commission formed by US and British officials decided in April 1946 on the continuation of the mandate, admission of 100,000 immigrants and the disarmament of the Israeli Secret Army which was then believed to number 65,000. However, this initiative too was unsuccessful and the issue was taken by the British to the United Nations in 1947. The UN decided in November 1947 on the division of Palestine into two states, one Arab and the other Jewish, and an international status for Jerusalem. (Figure 1 shows the UN plan)

In 1947, there were about 1,269,000 Arabs and 678,000 Jews living in Palestine (Mansfield, 1991, p. 235). The decision of the UN was not accepted by the Arabs but received well by the Jews. Despite the fact that 55% of the land given to Jews consisted of the Negev Desert, this decision opened the doors for the establishment of an Israeli state. These developments led to skirmishes between the Arab and Jewish communities. Following the departure of the British High Commissioner and the official end of the Mandate in 14 May 1948, the foundation of the State of Israel was officially declared. The first war between the State of Israel on one side and Jordan, Syria, Iraq and Egypt on the other broke out in May 1948 and ended in January 1949.

At the end of this war, all the Negev except the Gaza strip, Lake Tiberias and the western section of Jerusalem were occupied by the Israelis, About 750,000 Palestinians living in these areas had to move out to the west bank of the Jordan River and areas along the Gaza Strip, laying the basis of the prolonged 'Palestinian problem.' Figure 2 shows the boundaries formed as a result of the first Arab-Israeli war.

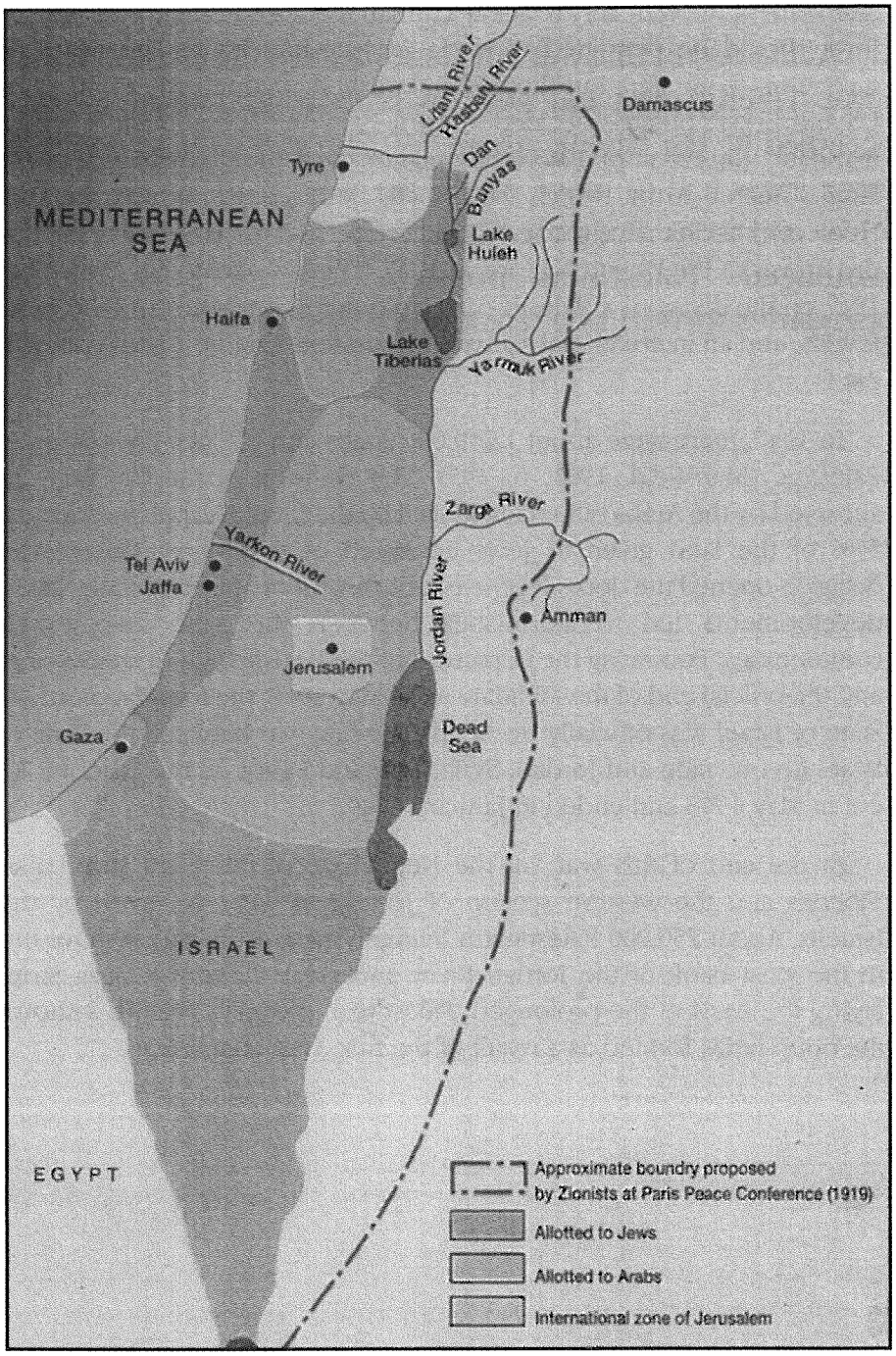

Figure 1: Zionist Proposal (1919) and UN Partition Plan (1947) Source : Wolf, A.T. (1995)

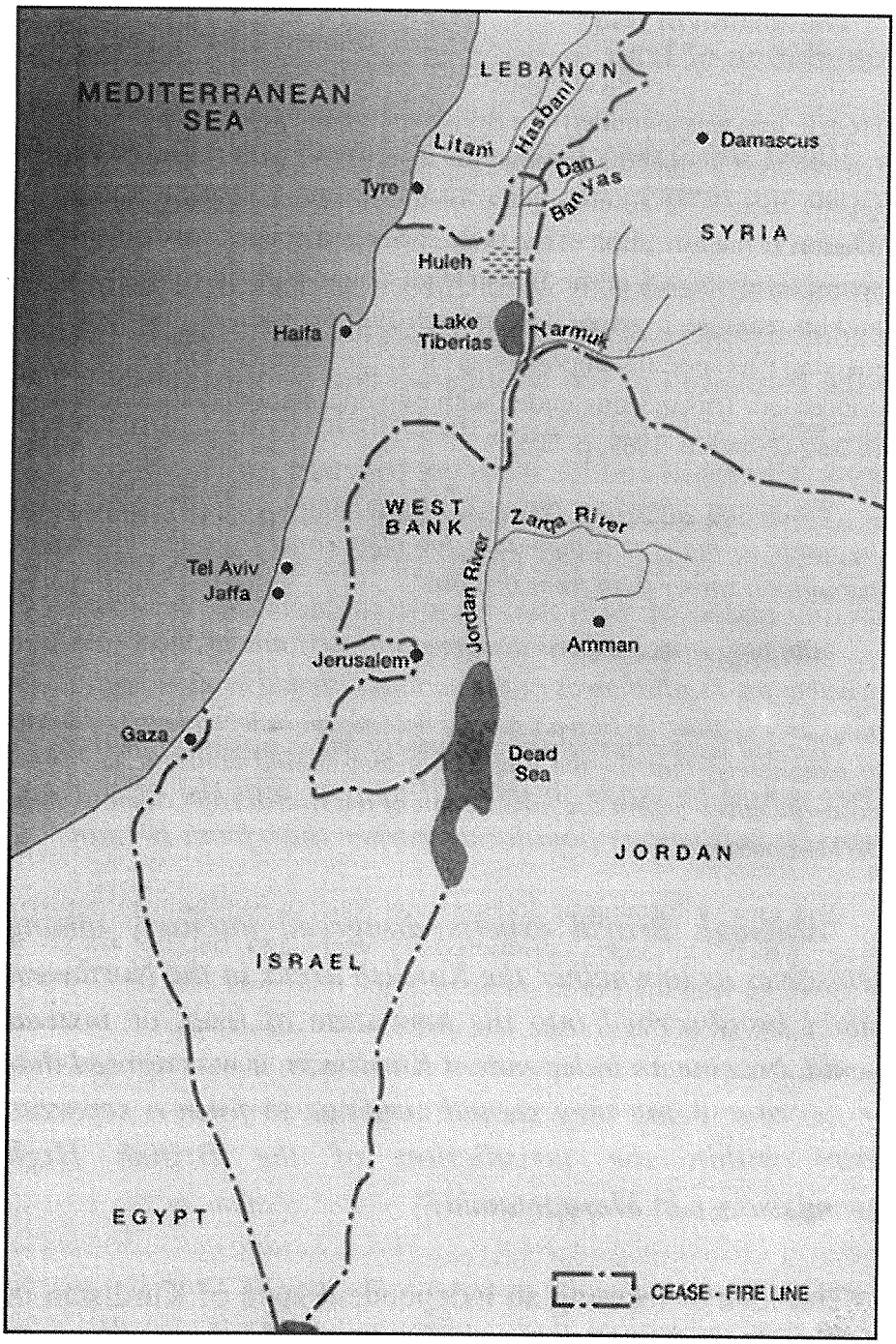

Figure 2: Borders After the First Arab-Israeli War (1949).

Foundation of Iraq

Under the Sykes-Picot Agreement of 1916 between the British and French, Iraq was identified as a British sphere of influence and the British Government assigned a commission, headed by Lord Curzon, to decide on the models of administration of the newly occupied territories. In relation to the formation of the boundaries and political structure of Iraq, senior level officials of the British High Commission in Egypt, Churchill and his team got together on 12 March 1921 for a ten-day meeting. This meeting was specially important as far as the status of Northern Iraq was concerned. This meeting ended with two important decisions in relation to Iraq (Fromkin, 1989, p. 503):

"Feisal was offered the throne of Mesopotamia, but every effort would be made to make it appear that the offer came from the indigenous population rather than from Britain."

"Although British experts disagreed intensely among themselves as to whether the Kurdish areas in the northwest should be absorbed into the new state of Iraq, or instead should become an independent Kurdistan, it was agreed that for the time being they should continue to form a separate entity within the jurisdiction of the British High Commissioner in Mesopotamia."

The idea of forming an independent state of Kurdistan in northern Iraq, which had been considered 75 years ago but not found in conformity with the British interests of the time, was later revived after the Gulf War. In this context, the unstable situation created in Northern Iraq and the water issue are both occasionally brought onto the agenda. In *'Water and Instability in Middle East'* by Natasha Beschorner it is stated that:

"Water issues occupy a relatively minor position in the regional security agenda compared to the question of Kurdish autonomy and the activities of the nationalist movements like the PKK. Turkey's principal concern is the security of its southern and eastern borders and it has guaranteed minimum Euphrates flows into Syria.

The Kurdish position on the region's water resources has not yet extended beyond general claims to sovereignty. The PKK has made actual threats against Turkey's hydraulic installations, especially the Atatürk dam. At the same time it has not proposed an alternative economic programme for the region, much less a water management strategy."

In addition to water resources, Iraq also has oil as another very important natural resource. Though it is frequently said that water has now gained more importance than oil, the latter is still a focus of attention as a strategic resource for internationally competing economic powers. Thus, it is necessary to take a look at the historical process through which this important resource has been shared by various powers.

Shortly before the First World War, the Ottoman Government granted prerogative to the Turkish Petroleum Company, half of whose shares were owned jointly by the Anglo-Persian Oil Company, Royal Dutch Shell and the German Deutsche Bank. These foreign companies committed themselves not to search for and extract oil in Ottoman territory without the participation of Turkish companies. *Still, some areas delineated on the map with red lines were excluded from the scope of this commitment, and it was found out later that these areas were especially rich in terms of their oil reserves.* Following the First World War, and with the occupation of Mosul by the British, German shares were transferred to England.

Since the Sykes-Picot Agreement defined Northern Iraq as a French sphere of influence, the British guaranteed that the French too would have prerogative in the extraction and processing of oil in Mosul. In return for this guarantee, the French acceded to the occupation of Mosul by the British. As for the United States of America, though it did not stand against the formation of spheres of influence in the Middle East by the British and French, it reacted to interventions in commercial activities, especially in the field of oil. Standard Oil of New York (Socony), an American firm, sent one of its engineers to Iraq in 1919 to search for oil. One of these engineers stated in his letter that (Fromkin, 1989, p. 534):

"the pie is so very big that whatever has to be done should be done to gain us the rights which properly belong to American Citizens."

Following the interception of this letter by the British while holding İstanbul under occupation, London instructed Arnold Wilson, the High Commissioner for Iraq to ban the activities of these engineers. The US Department of States protested to England about this action upon the request of Socony. Similar clashes of interest went on for a while, and then a multinational Iraq Petroleum Company was established, consisting of the Anglo-Persian Oil Company (to be renamed later as BP), Royal Dutch Shell, on American group formed by Standard Oil of New Jersey and Socony-Vacuum (Mobil) and Compaigne Française des Petroles, whereby each had a share of 23.75%. The remaining 5% of shares were given to Gülbenkian, a businessman of Armenian origin.

The British mandate ruled Iraq from 1922 to 1932. An agreement concluded in 1930 laid down that both countries would cooperate in foreign policy for a period of 25 years. Britain would have the use of certain air-bases in Iraq and in return would provide military aid. Following this agreement in 1932, the British mandate formally ended. Iraq became independent and joined the League of Nations under British sponsorship.

However, public opinion in Iraq was that full independence could never be realized since the oil was under the control of multinational monopolies. Nuri-al Said who had climbed to power with the support of the army enjoyed vast executive powers from 1932 to 1958 until his assasination, together with the King, as a result of a bloody coup.

Following a period of instability after the overthrow of the royal regime in 1958 by General Kasim, the Ba'ath Party assumed power in 1968. A. Hasan Al-Bekir, the strong man of the regime, nationalized the Iraq Oil Company in 1972 after reaching an accord with the partners of the company.

Consequently, Iraq's oil revenues displayed a very sharp increase, from US $ 584 million in 1972 to US $ 7.5 billion in 1974. However, first the Iran-Iraq and then the Iraq-Kuwait wars channelled this vast revenue to armaments and led to the present instability prevailing in the region.

Foundation of Syria

France had quite intimate trade relations with Christian communities living on the slopes of the Lebanon Range. This country's ambition to play an active role in the affairs of both Syria and Lebanon was guaranteed with the Sykes-Picot Agreement. The model of government envisaged for Syria was to enthrone Feisal, the son of the Emir of Hejaz, under the French Mandate. However, upon the declaration of independence in 1920 for a 'Greater Syria' covering Lebanon, Jordan and Palestine by the General Congress of Syria, France took over the Arab government in Damascus. France then divided Syria into three autonomous regions and also established autonomous local governments. Following these events, Feisal had to leave Syria, destined to rule in Iraq.

In 1930, the High Commissioner of the French Mandate declared Syria a Republic completely under the control of France in foreign affairs and security matters. A parliament was formed. Though the agreement ensuring the full independence of Syria was endorsed in 1936 by the Syrian Parliament, it was not carried out in practice because of the disapproval of the French parliament. The most important reason why the French behaved hesitantly in this matter during the Second World War was the attractiveness of the oil reserves located in northeastern Syria and its strategic location on air routes connecting this region to the Far East.

Hatay (Alexandretta) province, located along the Eastern Mediterranean Sea coast, ceded to Syria by the French, was subsequently returned to Turkey after a referendum in June 1939. The Orontes river enters the Mediterranean Sea passing through the Hatay province in Turkey and, thus Turkey is a downstream riparian. Turkey has proposed including the Orontes in its discussions with Syria on the use of other transboundary watercourses. Yet, the Syrians, because of their longstanding grievance over the 1939 referendum, refuse to recognize Turkey's legitimate and internationally recognized right of sovereignty in Hatay province. This means they also refuse to negotiate an agreement concerning the use of the River Orontes' waters.

Following the course of events briefly described above, Syria and Lebanon gained the status of independent states in 1946, just after the end of the Second World War.

Developments in the Arab-Israeli Conflict Since 1949

Israel started to build up its military and economic strength straight after its independence. Laws were passed to encourage immigration. In the initial stage, 700,000 immigrants came to Israel, mainly from Central and Eastern Europe, and then from such countries as Yemen, Iraq and Nothern Africa. Although Arab countries enforced an economic embargo against Israel, the latter was successful in overcoming its difficulties due to the aid coming from the US in grants, and the war reparations paid by Germany.

Following the formation of an independent State of Israel, we see three closely interlinked issues appearing on the agenda of the Middle East: securing a permanent peace between Israel and Arabs; Palestinian refugees; and the utilization and management of the waters of the Jordan River. After coming to power in 1949 as a result of a US-supported coup in Syria, colonel Hosni Zaim promised to bring about a solution to the Arab-Israeli conflict. He sent a letter to Israeli Prime Minister David Ben-Gurion offering a peace agreement. This proposal envisaged some modifications along the cease-fire line the settlement of 300,000 refugees in Syria, in return for half of Lake Tiberias. (Wolf, 1994). However, Israel did not accept this proposal and Hosni Zaim lost his position within less than a year in a counter military coup.

As to the utilization of the Jordan River, Arab countries and Israel started to declare their respective projects from 1951. Arab countries launched joint development work on the Banias and Hasbani tributaries of the Jordan River, and on the Yarmuk River while, Israel declared that its National Canal Project would draw water from Lake Tiberias and use it for the irrigation of coastal plains and Negev desert.

In 1953, an agreement was reached between Jordan and the UN Agency for Aid to Refugees for the construction of the Maqarin (Unity) Dam on the Yarmuk and a canal to irrigate the eastern bank of the Jordan River. The idea was to settle 100,000 Arab refugees on the land to be gained for agriculture.

Following the Israeli launch of its national canal in 1953, a dispute emerged as to the selection of the point where the Canal would draw its water. This dispute found its way up to the UN, and there were even armed clashes on the cease-fire line. Syria objected the Israeli initiative to draw water from a point called Gesher B'not Ya'akov which was located to the north of Lake Tiberias in the demilitarized zone according to the cease fire agreement. However, Syria's objection was not accepted by the UN. Still, after the Soviet veto of this UN resolution in 1954, Israel had to switch from its original choice to the northwestern shore of the lake.

In the face of such conflicts, US President Eisenhower sent a special representative to the region in 1953. Johnston, the US President's representative, came up with a proposal called the 'Johnston plan' which merged various suggestions relating to the utilization of the Jordan River in to a single scheme. In this scheme, state boundaries were assumed, for the moment, as non-existent and the basin was considered as a whole. The scheme then went on to identify the most suitable and rational solutions for water utulization and also quantified the allocations of water for each state.

The Johnston Plan was successful in mediating, to a certain extent, between the respective claims of the parties involved. For example, Israel abandoned its argument that the Litani River in Lebanon had to be considered together with the Jordan River while the Arabs gave up their objection to the Israeli initiative of transferring water from Lake Tiberias to the coastal plains and the Negev desert. After being endorsed by the technical committees of the states involved, the plan was endorsed by the Government of Israel in July 1955.

The Arabs, following a different track politically demanded that the problem of refugees should be addressed separately from issues related to water. The Johnston Plan's idea of transferring water from the Nile to the Western Sinai and settling 2 million refugees in this area was not accepted by the Nasser regime in Egypt. The Council of the Arab League finally rejected the plan in October 1955.

If one compares these events taking place 40 years ago with current discussions and conflicts over the Euphrates and Tigris, very interesting points will catch one's attention. These can be summarized as follows:

• Egypt, which occasionally claims leadership over the Arab states, does not accept the proposal of giving water to the Palestinian Arabs from the Nile. Yet, Israel and some wertern circles propose water transfer from the Atatürk Dam Lake to the Jordan River for the settlement of Arab-Israeli conflict.

• Syria, while asking for the separate handling of the problem of refugees and occupied territories from water-related discussions, also tries to solve problems related to water by playing the trump card of terrorism.

As events followed the course described above, 1956 witnessed an event which drew attention to another point. With the nationalization of the Suez Canal by the Nasser regime in Egypt, a great blow was struck against the interests of the British and French. As a reaction to this nationalization, Israel occupied the Sinai peninsula and Gaza in line with a secret agreement established between Israel, France and Britain. However, with the intervention of the Soviet Union and the US, Israel withdrew from the Sinai and Gaza after the UN declaration of a cease fire.

The project of bringing the water of Lake Tiberias to the Mediterranean coastal plains and Negev was largely completed in 1964. Worries shared by the Arab countries concerning the progress of this project led Nasser to call for an Arab Summit in January 1964. The basic agenda of the summit meeting consisted of discussions over developing a common strategy over water issues. Various alternatives concerning possible measures were discussed and finally it was decided to divert the tributaries of Hasbani and Banias in to the River Yarmuk, in Syria, instead of letting them flow into and replenish Lake Tiberias, which is the main water reservoir of Israel (Naff and Matson 1964). The idea was clear: to prevent Israel from making use of these waters. The summit also agreed that Syria and Jordan should be given financial and technical assistance towards the construction of a dam on the Yarmuk.

In order to stop construction started in line with the summit decisions, Israel organized several military operations in 1966 and 1967, and border violations increased further. Following these tensions, war broke out on 5 June 1967 between the Arabs (Jordan, Syria and Egypt) and Israel. This

'six-day war' ended on June 10th with the Israeli occupation of the Sinai Peninsula, Eastern Jerusalem, the West Bank of the Jordan River and the Golan Heights (See figure 3).

At the end of this six-days war, Israel gained the following important strategic advantages:

- The Syrian project of diverting the waters of Banias and Hasbani into the Yarmuk River was blocked.

- With the occupation of the western bank of the Jordan River (named as Judeau and Samaria by the Jews), Israel became a riparian state on the main course of the Jordan River.

- Israel established control over the ground water resources of the West Bank.

After the war, about 200,000 Palestinians moved to the eastern bank of the Jordan river and thus further aggravated the refugee problem. The UN Security Council asked Israel to withdraw from the occupied areas in resolution 242. Israel paid no heed to the UN decision and on the contrary, continued to settle its new immigrants coming from Europe in these newly occupied areas. Connection of ground waters to the national water network of Israel brought limitations in the water available to the Palestinians.

The failure of the armies of the Arab states in the six-day war led to the increased influence of the Palestine Liberation Organization (PLO) as an independent force. The PLO started to harrass Israel more intensively after this war.

The last war between the Arabs and Israel broke out on 6 November 1973 when Egypt and Syria attacked Israel. Egypt was initially successful in its Sinai campaign. However, Israel managed to pull itself together with US support and made advances in both the Sinai and Syria, coming as close as 40 kilometers to Damascus. Then, with Soviet intervention and US efforts to stop the Soviet Union coming any further into the conflict, the UN Security Council called on 22 November 1973 for a cease fire with the condition that the 1967 decision of the Council should be implemented and peace talks start immediately.

In the aftermath of the 1973 Arab-Israeli war, the PLO gained quasi-official status in various international organizations. Indeed, the UN General Assembly for the first time agreed to include the Palestine question as a separate item on its agenda in September 1974.

In 1978, the Presidents of Egypt and Israel came together at Camp David and this summit was followed by the Washington Agreement in 1979. In line with this agreement, Israel withdrew from the Sinai Peninsula and tensions were somewhat reduced along other borders.

The next series of events were regionwide in nature. The Gulf War in 1990 made possible peace talks between the Arabs and Israelis. At the opening of the Madrid Peace Conference on 30 September 1991, President Bush proposed *"multilateral talks covering a variety of issues such as arms control on a regional scale, water, economic development and Palestinian refugees."* The Madrid Conference agreed on the regional character of the above-mentioned outstanding issues and called for the establishment of working groups to address these issues, one of which would deal with water resources in the region.

The Working Group on Water Resources has met five times with representatives from more than twenty countries participating.

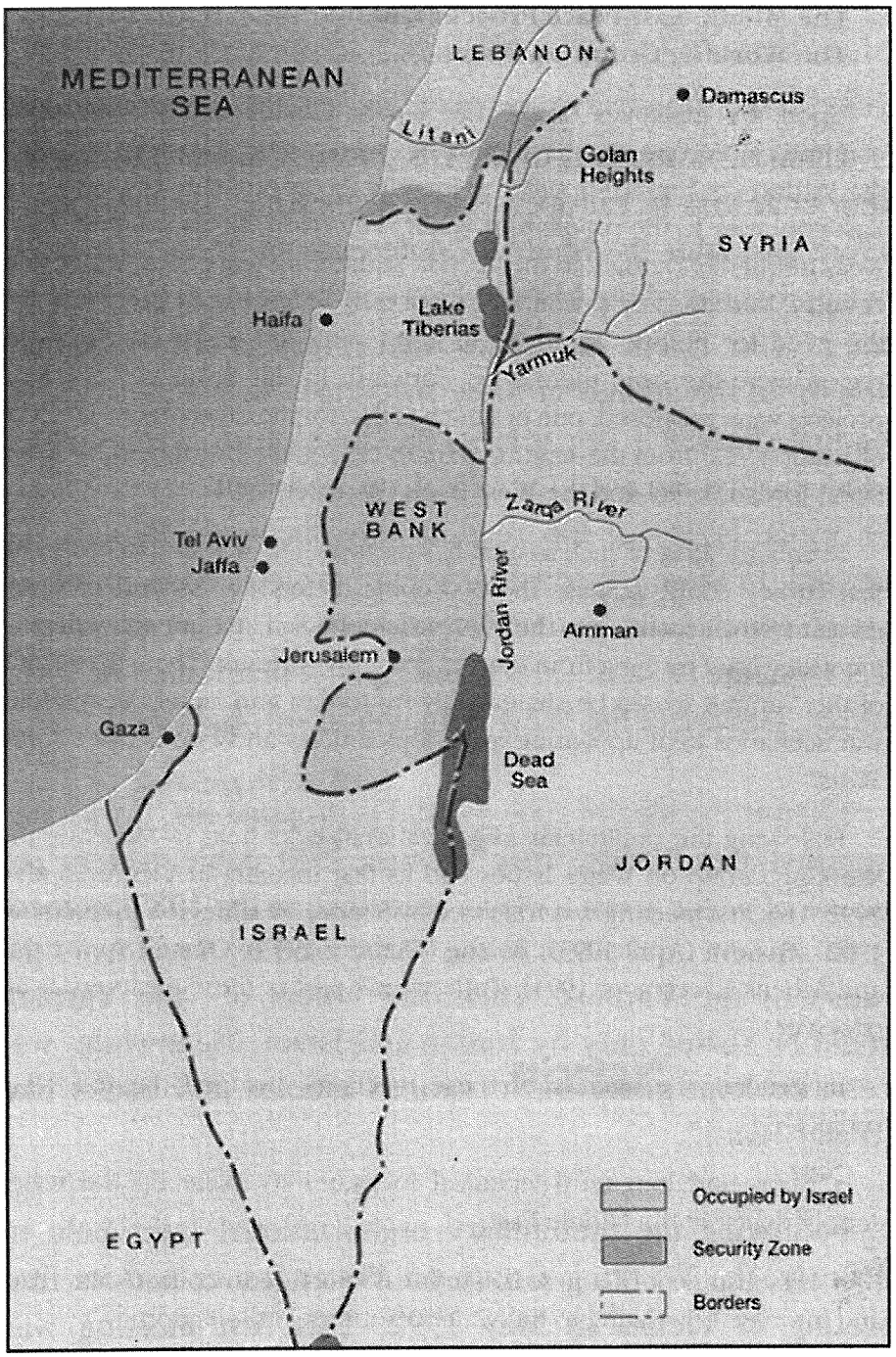

Figure 3: Territories Occupied by Israel After the 1967 War.

The Middle East Peace Process and The Working Group on Water

Upon the initiatives of the US, Japan, Canada and various other countries in Europe, technical meetings were arranged before and after the Madrid Conference in order to identify the approaches of the Middle East countries to the problem of water. The rivers Euphrates and Tigris were frequently brought to the agenda at these metings. As a 'water rich' country, Turkey's key role in the solution of water-related problems and the need for holistic approach in addressing the water issues of the region were the main themes put forward. In this framework, several projects were proposed, one of which called for the diversion of 1.1 BCM of water a year from the Atatürk Dam to be equally distributed between Syria, Jordan, Israel and the West Bank (Wachtel, 1994).

Even if the idea of such a canal has disappeared, it was also proposed that Turkey could increase the 500 cubic meters per second of water given to Syria according to the 1987 protocol by an amount equivalent to the water used by Syria from the waters of the Yarmuk. Then, the waters of the Yarmuk would be shared only by Jordan and Israel. Meanwhile, war scenarios kept appearing in various articles and books like *'Water Wars'*.

Following the preliminary organizational talks held in Moscow, the Working Group on Water Issues had its first meeting in Vienna in May 1992. This first meeting was followed by 5 more: Washington (September 1992), Geneva (April 1993), Beijing (October 1993), Oman (April 1994) and Athens (December 1994). Turkey took part in these meetings as an observer.

In general, the agenda of these meetings included the following subjects:

- Short and long-term technical measures to make up the water supply deficit in the Middle East,

- Establishment of a new institutional structure to collect/share data and information relating to the water resources in the region,

- Mechanisms for the settlement of disputes,

• Investigation of the possibilities of cooperation in the management of water resources.

The activities of the Working Group on Water Issues concentrated, in line with the multilateral talks of the peace process, more on the above stated technical subjects. However, political intentions and approaches occasionally also made themselves apparent in this process.

Fevzi el-Ibrasi, head of Egypt's delegation stressed at the first session of the meeting held in Vienna that the Nile should be considered out of the scope of the Working Group. Representing Egypt, as an Arab country in the Middle East, Ibrais pointed out (Proceedings of the Vienna Meeting):

"Nonetheless, I would like underscore that Egypt's participation since the beginning of the peace process is based on the fact that the Nile river is outside the scope and competence of this working group and multilateral peace negotiations. It is worth mentioning that such a position is also seconded by the general understanding of all parties which emanated since the start of the peace process."

While Egypt as an Arab and Middle Eastern country wanted the Nile out of the scope of the Working Group, the Foreign Minister of Greece, a country which arguably has no geographical relationship with the region, made the following proposal at the meeting held in Athens on 7-9 December 1994, two years later, (Proceedings of the Athens Meeting):

"Pressing problems need urgent solutions. I propose that a Commission of experts consisting of representatives not only of the core parties but also of any interested party, be formed. The Commission's mission would be:

a) the identification of areas and countries which have an abundance of water for export,

b) the study and planning of ways of transport of available water,

c) the study of the economic and financial parameters for water transport,

This study should make proposals for the prompt and profitable ways to transport water resources.

Greece is willing to undertake the initiative of organizing and hosting this Group, whose work should begin as soon as possible."

Hence, Greece is willing to play a role in the power game to shape the water policies of the Middle East.

In the peace process, Syria had several bilateral talks with Israel, but boycotted all multilateral talks on any other issue including water. Syria declared that it would abstain from taking part in these meetings unless a solution was found to the problem of Arab territories under occupation.

Israel, on the other hand, sought a guarantee that it could continue utilizing the water resources of the area even after its withdrawal from the occupied territories. Consequently, Israel insisted an assurance that the River Banias would not be diverted to Syria were the Golan Hights to be given back to the Syrians.

Following the Madrid Conference, an important step was taken on 13 September 1993 when the Palestinians and Israeli signed an agreement in Washington D.C. as a result of bilateral peace talks. Yet, there are important problems awaiting solution. The *"declaration of principles"* on an Autonomous Administration sets forth that Palestinians should form an Administration for Land and Water Management whose authorities and responsibilities are to be laid down by a joint committee. It was also decided that this committee should perform a supervising function over the utilization of ground water resources in the west bank of the Jordan River and in Gaza. However, Israel claimed, as a part of its supervising duty, the right to veto any initiative that could harm the water use of Israeli settlements.

Turkey took part in these multilateral talks not as a country from the region but as an observer. At these meetings Turkey stated that it would be problematic to consider the rivers Euphrates and Tigris as a resource make up for the water shortages of the countries of the region other than their natural riparians, and that it would complicate the picture further if the water resources of the region were taken as a hydrological whole.

PART II

HYDROPOLITICAL AND TECHNICAL ASSESSMENT OF THE WATERS OF THE MIDDLE EAST

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HYDROPOLITICAL AND TECHNICAL ASSESSMENT OF THE WATERS OF THE MIDDLE EAST

Waters in the Middle East and Hydropolitical Differences

The six rivers in the Middle East under examination here, namely the Euphrates, Tigris, Jordan, Nile, Litani and Orontes, have unique charecteristics in terms of hydrological properties, geopolitics and hydropolitics. There are some fundamental diferences in the problems associated with these rivers which are very country-specific.

Among these rivers, the Euphrates and the Tigris together have an average annual water potential of about 87.7 billion cubic meters (BCM) which is approximately equal to that of the Nile. The Jordan River has an average annual flow of 1.4 BCM which equals only 1.5% of the total annual discharge of the Euphrates-Tigris or Nile. The basin of this small river is shared by four states, Israel, Jordan, Syria and Lebanon, who all gained their independence in the 1940s. Now there is a fifth one coming with the establishment of an Autonomous Palestinian Administration in the West Bank and Gaza. In the Jordan Basin, bitter territorial and ideological disputes have continued for more than half an century; water conflicts have surfaced and developed many times in history and taken different forms.

The Nile Basin extends over an area of 2.9 million sq.km and transcends 9 riparian states. The 1959 Nile agreement between Egypt and Sudan did not reserve any water for upstream riparians and brought a number of reactions from the other riparian states. Ethiopia stressed its legitimate right to the waters of rivers originating from its plateau.

In contrast to the Nile and Jordan Rivers, the Euphrates and Tigris have vast potential to meet the needs of the three riparian countries of Turkey, Syria and Iraq, assuming the transfer of excess water in the Tigris to the Euphrates.

Yet, the issue is always dragged into the complex international political arena without much attention to the technical aspects of the matter. For instance, conditions relating to the Euphrates and the Tigris

tend to be equated with those of the Jordan River, whose utilization by Israel, Jordan, Palestine and Syria has always been problematic. Then, an easy analogy runs that just like there have been wars over the Jordan River, the same is possible in the case of these two.

The Orontes originates in the Bekaa Valley of Lebanon. Its waters are mostly consumed as it flows through Syria, and the river finally reaches the Mediterranean in Turkey. With an average annual water flow of 2.5 BCM, the Orontes corresponds to 8% of the water potential of the Euphrates. While using the waters of the Orontes, Syria does not consider the needs of Turkey and consequently there is a serious water-shortage in the Amik Plain of Turkey.

The Litani River originates in Lebanon and also reaches the sea in this country. Its annual water flow is 700 million cubic meters (MCM). Israel has occasionally come up with the proposal of diverting this river into the Jordan River to supplement the latter. Hence, the Litani, which carries water equivalent to 0.2% of the Euphrates and 50% of the Jordan river has frequently become a factor in the Arab-Israeli conflict.

The water problem in The Middle East has ben conceptualized as constituting a unified whole. However, such an approach would only complicate technical matters further. For example there is the idea that Turkey could give Syria 5 m^3 more water per second, which is 1% of the 500 m^3 per second presently allocated. Then Syria would not need to use the Yarmuk, a tributary of the Jordan River, and it would then be possible to allocate the Jordan river for the use of Jordan and Israel only. Yet such a plan is not possible at all in terms of both technical considerations and international law.

Any additional water corresponding to 1% of the currently supplied 500 m^3 per second would disappear in a short distance both through leakage and evaporation, leaving aside the error margin in measuring the volume of water at the border observation station. Such a proposal, which has no chance of realization, will only make problems more difficult to solve.

To conclude, it is not possible to consider the region as a whole in terms of its hydrological and hydropolitical features. Thus it is necessary to take each of the rivers, Euphrates-Tigris, Orontes, Jordan, Litani and the Nile, separately and produce solutions as such.

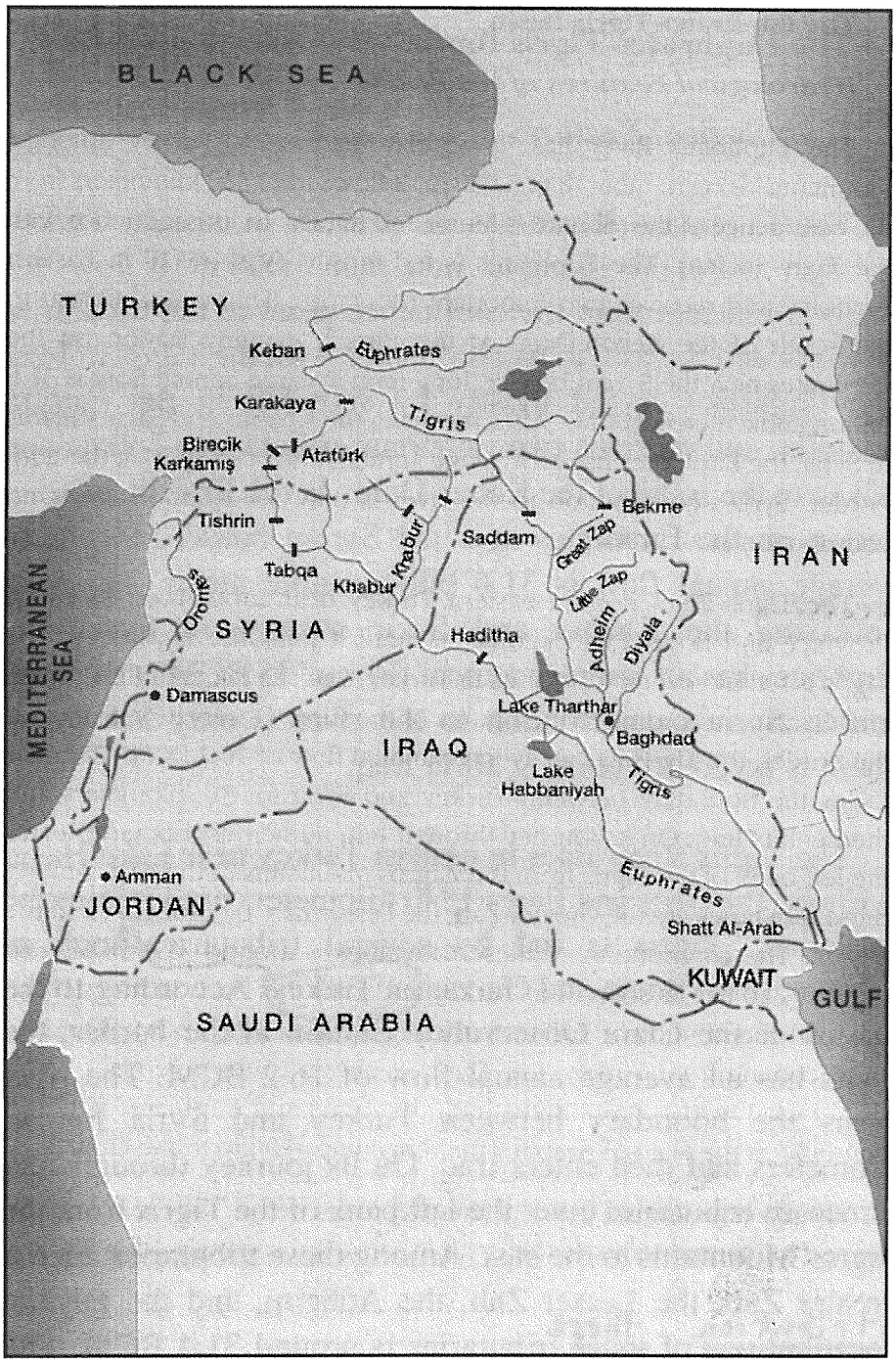

Figure 4: The Euphrates-Tigris Basin

The Euphrates-Tigris Basin

Hydrological Features of the Basin

The Euphrates River has its sources in eastern Turkey amongst mountains rising to more than 3,000 m. It flows for 2,330 kilometers from the confluence of the tributaries Murat and Karasu, to its confluence with the Tigris in Iraq. The Euphrates is fed mostly by snowfall in Eastern Anatolia, and receives two important tributaries, Tohma and Göksu to the south of the Keban Dam. At the Birecik gauging station on the Euphrates near the Syrian border, long term average annual flow is 31.6 billion cubic meters (BCM). After receiving the Khabur and Sacir streams in Syria, the Euphrates has an average annual flow of 35 BCM at the Iraqi border. Syria's contribution to the river is only 3.4 BCm. There is no contribution at all in Iraq.

The Tigris River rises in eastern Turkey near Lake Hazar in Elazıg Province and flows 1,840 kilometers until it joins the Euphrates. The Tigris is fed by several tributaries in Turkey. Such as Batman, Ilısu, Botan and Garzan. According to the figures of the Cizre Observation Station at the border, the Tigris has an average annual flow of 16.2 BCM. The river forms the boundary between Turkey and Syria for 30 kilometers and then enters Iraq. On its journey through Iraq numerous tributaries enter the left bank of the Tigris from the Zagros Mountains to the east. Among these tributaries are the Greater Zab, the Lesser Zab, the Adheim, and the Diyala. The contribution of these tributaries is around 31.4 BCM. The Greater Zab has its sources in Turkey and joins the Tigris in Iraq. Hence the total contribution of Turkey to the Tigris reaches 21.3 BCM. With 21.3 BCM coming from Turkey, the Tigris reaches a water potential of 52.7 BCM near Quarna in Southern Iraq, the Tigris and Euphrates join and continue as the Shatt al-Arab for the remaining 179 km to the Gulf.

The average annual flows of the two rivers before they join and the respective contributions of the riparian states are summarised in Table 1 (See also figure 4).

TABLE 1 : Average Annual Flows And Contributions of the Riparian States

River	Average Annual (BCM) Flow	Contribution of Countries to the Flow (BCM)		
		Turkey	Syria	Iraq
Euphrates	35	31.6 (90%)[3]	3.4 (10%)	0
Tigris	52.7[1] (49.2)[2]	21.3 (40%)[3]	0	31.4 (60%)
Total	87.7	52.9 (60%)	3.4 (4%)	31.4 (36%)

(1) Beaumont, P., Transboundary Water Problems in the Middle East, Bilkent University, 2-3 September 1991, p.12.

(2) Kolars, J., Water Resources in the Middle East, Canadian Journal of Development Studies, Special Issue, 1992, p. 108.

(3) State Hydraulic Works (DSİ).

When this table is examined, it can be seen that Turkey contributes to the Euphrates by 90%, Syria by 10% and Iraq by 0. As to the Tigris, contributions are, respectively, 40%, 0, and 60%. Even if the Euphrates and the Tigris are taken together, Syria's total contribution is only 4%.

Syria objected in principle to the quota allocations of the Jordan River proposed in the Johnston Main Plan in 1954. Since 77 percent of the water of the Jordan water system originates in Arab countries (Naff and Matson 1984, p. 40). Syria's objection to the quota allocation of the River Jordan contrasts dramatically with what it claims from the Euphrates.

What has been stated so far clearly reveals the mistake in the expression "Arab waters" frequently used both by the Arab Union and the Arab Press. When there were temparary reductions in the flow rate for one month during the filling of the Atatürk Dam Reservoir, a Turkish Envoy was sent to the various Arab countries to explain the technical reasons for this operation. In an official visit to Libya for this purpose, statements made by Kaddafi in a meeting attended also by the author of this book included interesting points revealing the general approach of the some Arab countries. Kaddafi gathers rivers which he describes as "Arab waters" into three groups:

• Waters that originate from the Arab countries, but are later somewhat usurped (i.e. the Jordan River).

• Arab waters that originate from countries displaying hostile acts towards the Arabs. Kaddafi gave, as an example, the approach of Ethiopia where the Blue Nile originates and on this occasion also made reference to dams which he claimd to have been constructed in Ethiopia with Israeli support,

• Arab waters that orginate from countries having friendly relations with Arabs,

Constructive discussions around technical issues can only be held if a basic question with respect to the water problem has been truthfully addressed. This question is: "Whose water are we talking about?". A reply to this question which is consistent with international legitimacy makes it possible to discuss technical matters meaningfully and fruitfully.

If we consider water entering rivers as similar to processed products, then precipitation, i.e. snow and rain, forms the raw material of this product. The waters of the Euphrates and the Tigris are formed mostly of melting snow. Turkey, in the basin of these two rivers, is engaged, in winter months, in an intense struggle against snow cover in order to ensure transportation between rural settlements and rural settlements and urban centres. The annual cost of maintaning communication and energy transmission lines and measures for flood prevention amounts to several billion dollars.

As will be later touched upon in elaborations relating to international law, the Association of International Law cites the respective contributions of riparian countries to the waters as one of the important factors in determining equitable and reasonable share in use of water resources. If the issue is addressed from this point of view it will immediately be clear how weak and unrelated to a technical rationale the Arab approach is.

The seasonal and annual flows of the Euphrates and the Tigris Rivers have extremely high variance. Two distinct dry cycles were recorded in the Euphrates River over the 1937-93 period. The first was in 1958-62, 1961 being the year with the most severe shortfall when the annual flow

was as low as 14.9 BMC which equates to just 47 percent of the long-term average. The second dry cycle started in 1970 and ended in 1975. The lowest flow was in 1973 with a annual flow of 18.8 BMC representing 59 percent of the average. Since the Keban Dam was then not operating, the effect of these two dry periods were felt in Syria and Iraq. However, after the Keban Dam was put into operation in 1974, water shortages were largely mitigated in the three riparian countries. **For example 1989 was also a very dry year. Were it not for the positive effect of the Keban Dam, there would have been only 20.8 BCM of natural flow into Syria instead of 25.5 BCM of regulated water.** On the other hand, recorded peaks of annual flow were 56.4 BCM and 57.7 BCM in 1969 and 1988, respectively. These represent 178 per cent and 183 percent of the long-term average. The flow rate of the Euphrates also has significant seasonal variations. In an average year, the highest flow is generally observed in April or May and the lowest in September. The fact that the monthly flow of the Euphrates fluctuates between 530 per cent and 16 percent of the monthly long-term average is sufficient evidence of the seasonal fluctuations.

Similar high seasonal and annual fluctuations are also observed in the Tigris River. According to the discharge records at Cizre gauging station on the Tigris river near Turkey's border with Syria, the annual average flow was 16.2 BCM over 1946-94 period. The Tigris annual flow variations are similar to those of the Euphrates. The 1970-75 period experienced a drastic decline in the flow rate, the lowest being in 1973 at 9.6 BCM, corresponding to 59 per cent of the average. On the other hand, 1969 was a peak year with 34.3 BCM measured at Cizre station (212 per cent of the annual average).

Variation in yearly annual flow and in mean monthy flow of the Euphrates and the Tigris are illustrated in Figure 5 and Figure 6.

Because of the extremely high seasonal and annual flow fluctuations in the Euphrates and Tigris Rivers, storage facilities are a key concern in the problem of water resources management for the riparian countries in the Euphrates-Tigris Basin. The implications of dams in Turkey will be discussed in detail in the following paragraphs.

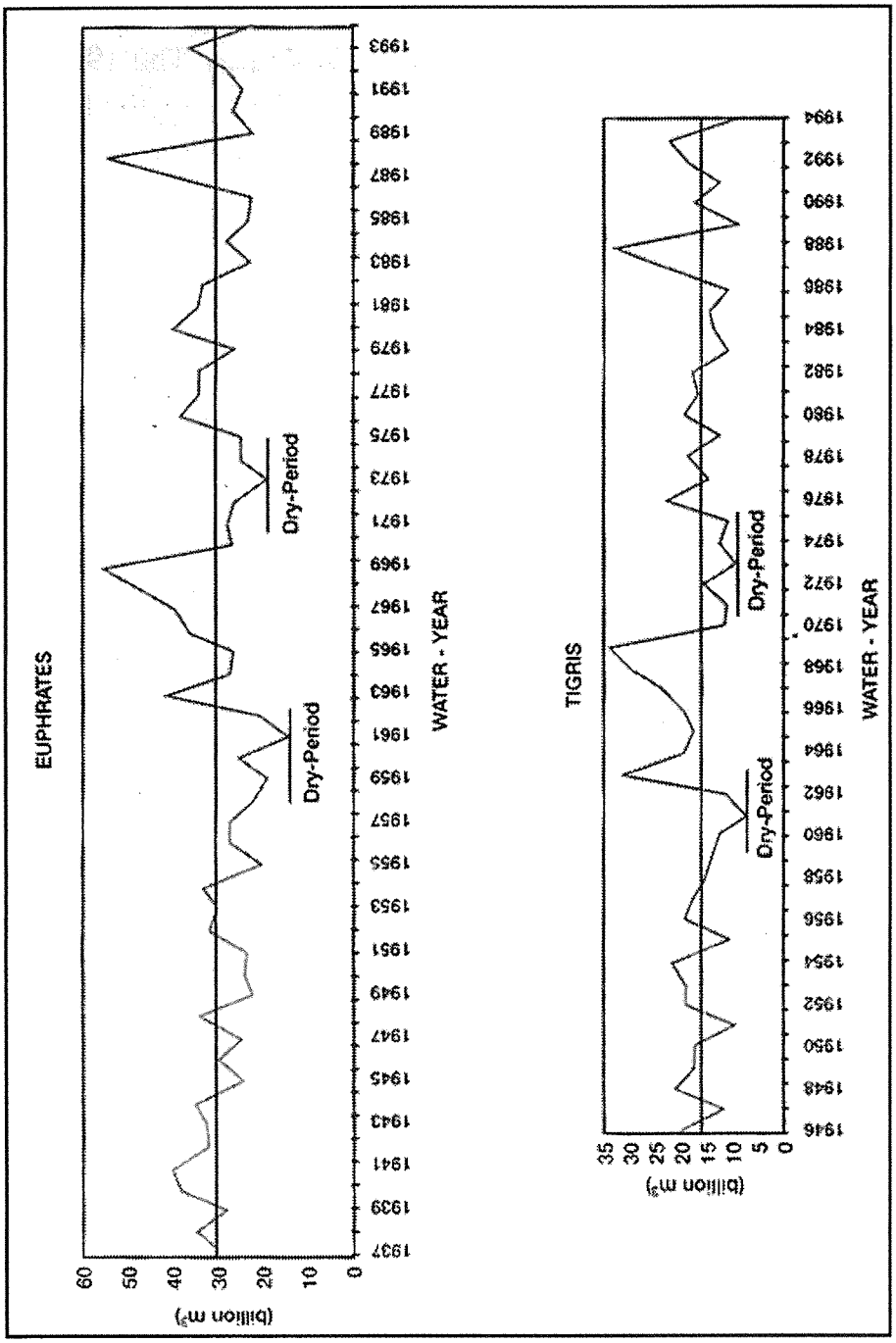

Figure 5: Variation in Yearly Flows of the Euphrates and Tigris at Birecik and Cizre respectively. Source: General Directorate of State Hydraulic Works (DSİ).

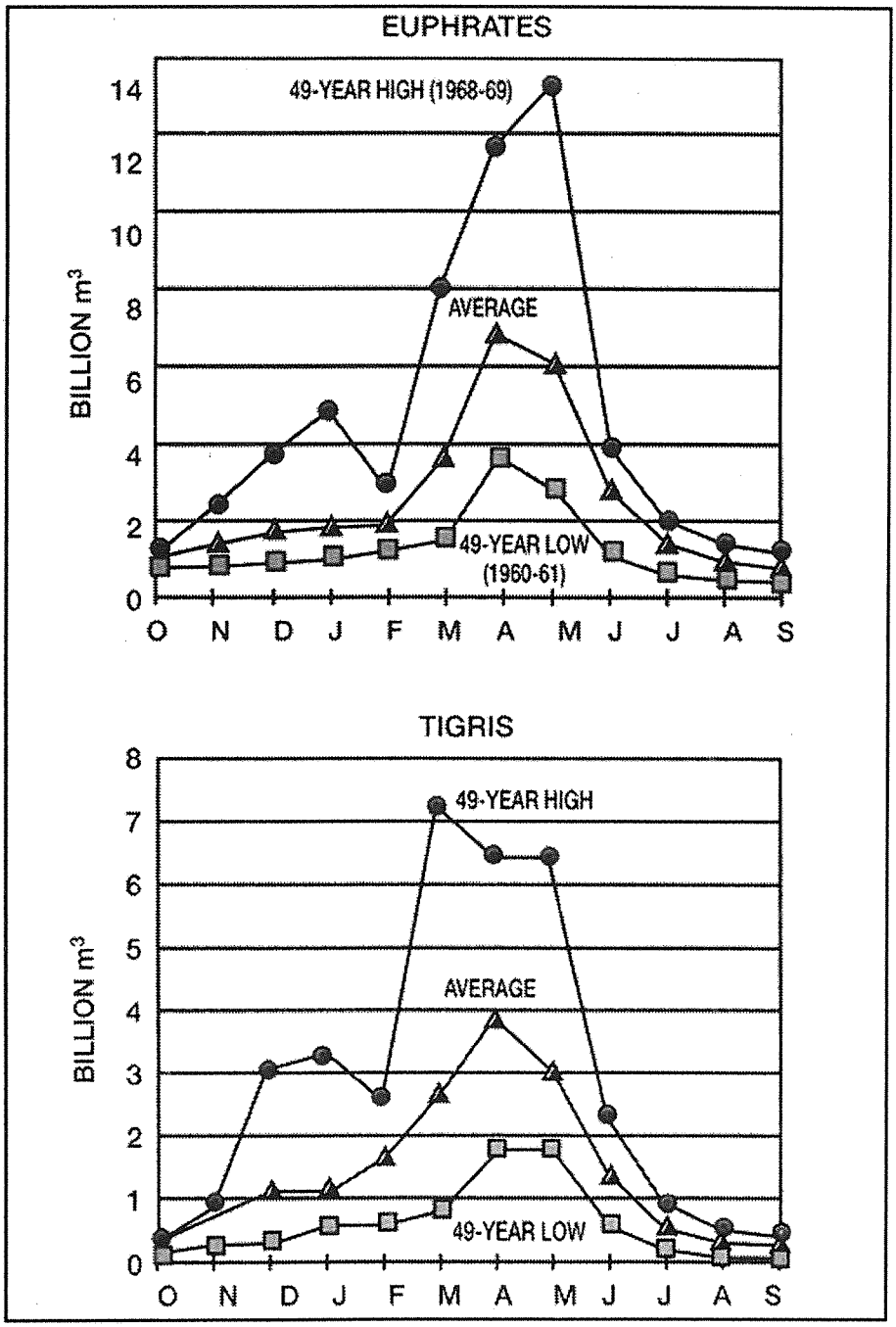

Figure 6: Variation in Mean Monthly Flows of the Euphrates and Tigris at Birecik and Cizre respectively.
Source: General Directorate of State Hydraulic Works (DSİ).

Impacts of Dams Built in Turkey

The large annual and seasonal variations observed in the run-off of the large basins make it necessary for water resources management to store water in the upper cachments in order to allow regulated flows throughout the year and over the years. The impacts of dams on the Euphrates and Tigris rivers must be viewed within the context of the management of the whole Euphrates-Tigris basin. The extreme variability of the Euphrates and Tigris Rivers flow has been a central water management problem for millenia.

The Euphrates, along its entire course in the downstream countries, does not provide ideal sites for the creation of large dams and associated reservoirs. The largest dam in Syria (Tabqa) has only 9 BCM active storage capacity, which accounts for only 28 percent of the natural flow of the Euphrates. The main storage facilities on the Euphrates River in Turkey are the Keban, Karakaya, Atatürk, Birecik and Karkamış dams, of which the largest three, the Keban, Karakaya and Atatürk dams, are currently operating. Birecik and Karkamış dams are under construction (Figure 7 page 44). Since the active storage capacity of these reservoirs is 47.6 BCM - 1.5 times the annual mean flow of 31.6 BCM - the natural flow of this river is being regulated to a great extent by utiluzing the head of 503 m from Lake Keban to the border over a distance of 468 km. Evaporation rates at the reservoirs in Turkey are much less compared to those at Tabqa, Quadisiyah and Habbaniya due to the climatic conditions and the better volume-to-surface ratios of the reservoirs in the Euphrates gorge.

On the other hand, the absence of large reservoirs in Syria and Iraq indicates that little practical use has been made of resevoirs in these countries for storing water from high-flow years to low-flow years, and flood waters will continue to flow to the sea.

The timing of the floods on the Euphrates and Tigris has never been ideal for crop production. As Garbrecht notes (qouted in Goldsmith and Hildyard, 1984, p. 304):

"First, the floods of the Tigris and Euphrates were very erratic and occurred at the 'wrong time', the period April-June being too late for the summer crops and too early for the winter crops. Secondly, the two rivers carried a much greater amount of sediment than the Nile River. And, finally, the very small incline of the alluvial plain (1:26,000) and the

fine texture of the soil easily gave way to waterlogging and salinization (lack of natural drainage)."

The low-lying plains in Syria and Iraq form a natural expansion zone for high waters. The combined area of lakes and swamps at the head of the Gulf varies from 8,288 sq. km at the end of dry season to 28,490 sq. km during the spring flood, covering the area having irrigation facilities. During the 1946 flood, the total inundated area reached 90,650 sq. km (Naff and Matson, 1984, p. 85), causing severe property damage and loss of life.

The downstream riparian countries have no over-year water storage capacities. Therefore, Syria and Iraq are unable to store water for later use, as became clear in the dry-year of 1989. For the downstream riparian countries, the potential reductions in natural flow needed to provide for Turkey's full development of the Euphrates-Tigris basin could be greatly mitigated by water savings from evaporation savings and management of the waters in the basin. A reduction in system-wide evaporation losses would mean that more water would be available for all riparian countries.

The quantity parameters of a river can be transformed by storage reservoirs; in other words, the characterics of a stream can be dramatically altered with the help of storage facilities. Such a change can be depicted in a flow-duration curve. For this purpose, a statatistical analysis of the stream flow for the Euphrates at the Turkish-Syrian was carried out with and without the Keban Dam. The annual run-off duration curves for the years 1937-90 for both cases are given in Figure 8. According to these curves, the mean annual flow rate of 968 cubic maters per second, corresponding to 33 percent of the time span, increased to 46 percent after construction of the Keban Dam.

Kolars (1993, pp.13-14) asserts the positive effects of upstream regulation and points out that:

Variation in the flow of both rivers ranges from a condition of severe drought to destructive flooding. It is on this basis that ***the Turks make one of their strongest justifications for implementing the GAP with its giant dams and reservoirs capable of smoothing out such variance and providing a dependable year-round flow downstream.*** *However, this argument has not been enough for the Syrians and Iraqis. (emphasis added)*

One of the most intensively impounded river systems in the world is the Colorado River which drains the South-Western United States and enters Mexico. A brief examination of discussions which took place between the USA and Mexico provide an interesting insight into run-off regulation within the context of the management of the entire basin.

At the time of the negotiations on the Colorado river compact between the USA and Mexico, in view of certain allegations raised by Mexico the USA's Department of State released the following statement on 30 June 1941 (Whiteman nd., 947-8).

"The water it is proposed to deliver to Mexico from the Colorado river in perpetuity is obviously worth many times a larger amount of uncontrolled normal and natural flow and hence would seem to be of no less value than the 3,600,000 acre feet of normal and natural flow of water 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 and the water to be delivered to Mexico have not involved any cost to that country under the plan herein presented; no charge would be made to Mexico for storage cost at Boulder Dam."

In the Department of State's memorandum of 11 February 1942, it was stated that:

.... the Department of State felt that it had more than met the requirements of Mexico based upon that country's past claims since the quantity suggested of controlled water would be so much more valuable than a much greater quantity of uncontrolled water. It was noted with satisfaction that Mexico recognised this to a certain extent by its counter-proposal that approximately 2,000,000 acre-feet of water would be acceptable." (Whiteman, 948-949).

These two memoranda clearly underline the importance of upstream regulation for basin-wide water resources management. It is interesting to note that, in the case of Colorado, the annual volume of Colorado River water guaranteed to Mexico under the treaty of 1944, is 1,500,000 acre-feet (1,849,568,000 cubic meters), which accounted for little more than 40 percent of the 3,600,000 acre-feet of normal and natural flow requested by Mexico in 1930.

In conclusion, Turkey's dams would provide Syria and Iraq with much needed water security. Thus, if there were no dams in Turkey, flood water would reach the Gulf without being stored and causing great harm, and there would have been serious water shortages in dry periods as used to be the case in the past.

The management of dams in Turkey has always been in conformity with principles that ensure the benefits explained above. During the drought of 1989, inflows to Keban Reservoir in the wettest months of April, May and June were only 42%, 22% and 28% of the long-term averages, respectively. While the dam receives on average 9 BCM of water in these months, the total inflows fell to only 4 BCM. Hence, were it not for the Keban Dam, only 20.8 BCM of water would have passed onto Syria. Yet, thanks to the management provided by the Keban Dam, the actual amount of water reaching Syria was 25.5 BCM. These figures are for annual totals. We can also take a look at the monthly distribution. In 1989 again, the volume of water received by Syria in July and August when the need for irrigation is the greatest would have been 160 cubic meters per second (414 MCM in a month) under natural conditions. However, the Keban-Karakaya system managed to deliver an extra 180 cubic meters per second (467 MCM in a month) which raised the total volume of water crossing the boundary in these two months to 340 cubic meters per second. This, of course, helped downstream countries to avoid the effects of an otherwise inevitable drought.

In spite of all these technical facts, every event in the Middle East tends to be judged on the basis of political arguments. For example, Beschorner (1992), in her book makes the following point: ... *"the fact that flow regulation may be hydrologically beneficial was politically irrelevant"* ... Contrary to this view, David A. Lilienthal, one of the former presidents of the Tennessee Valley Authority in the US puts forward his opinion regarding the dispute between India and Pakistan over the Indus River as follows (Biswas, 1992):

"The problem of development and use of the Indus basin water reserves should be solved on a functional and not a political plane, without relation to past negotiations and past claims and independently of political issues."

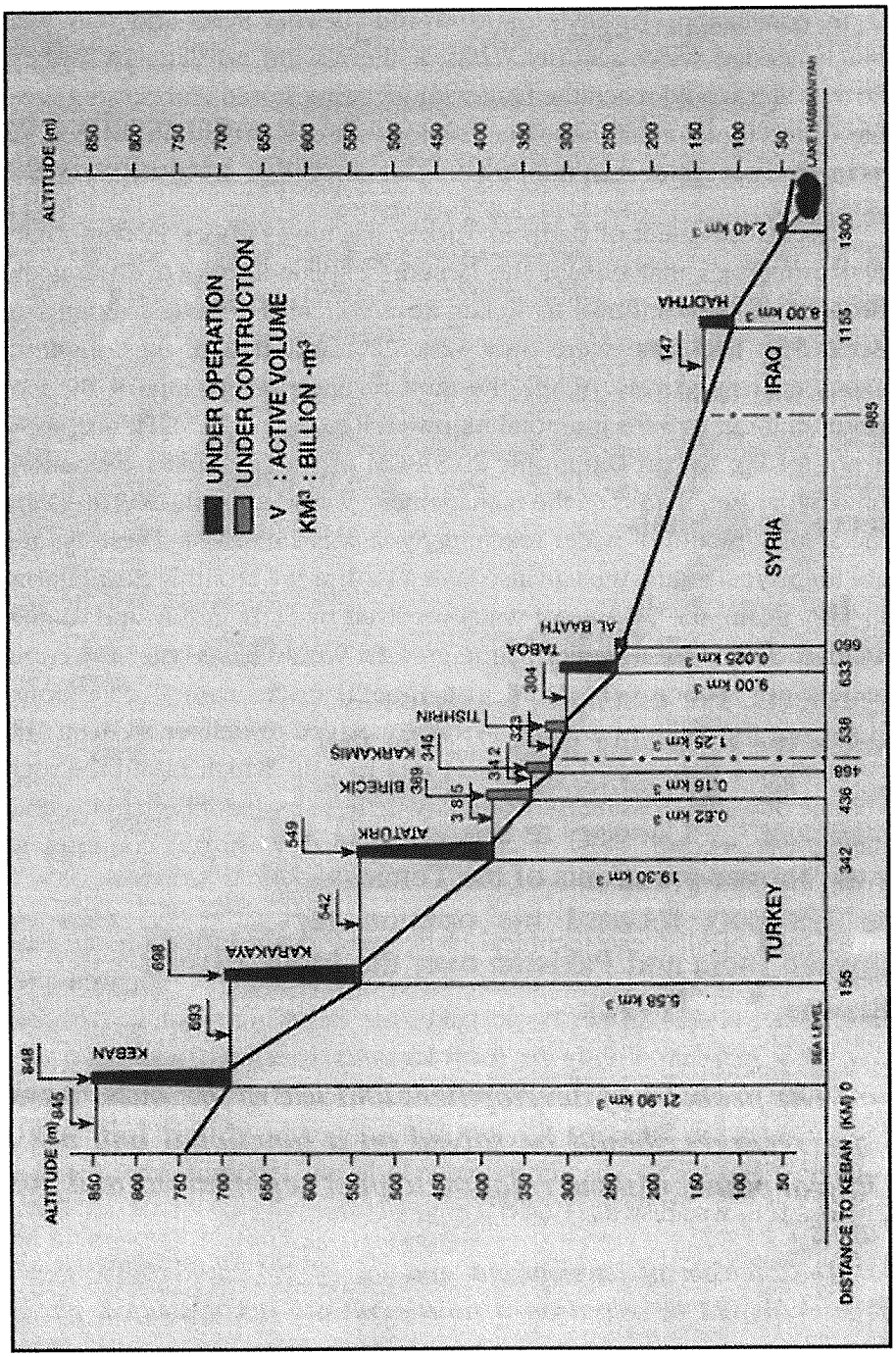

Figure 7: Dams on the Euphrates

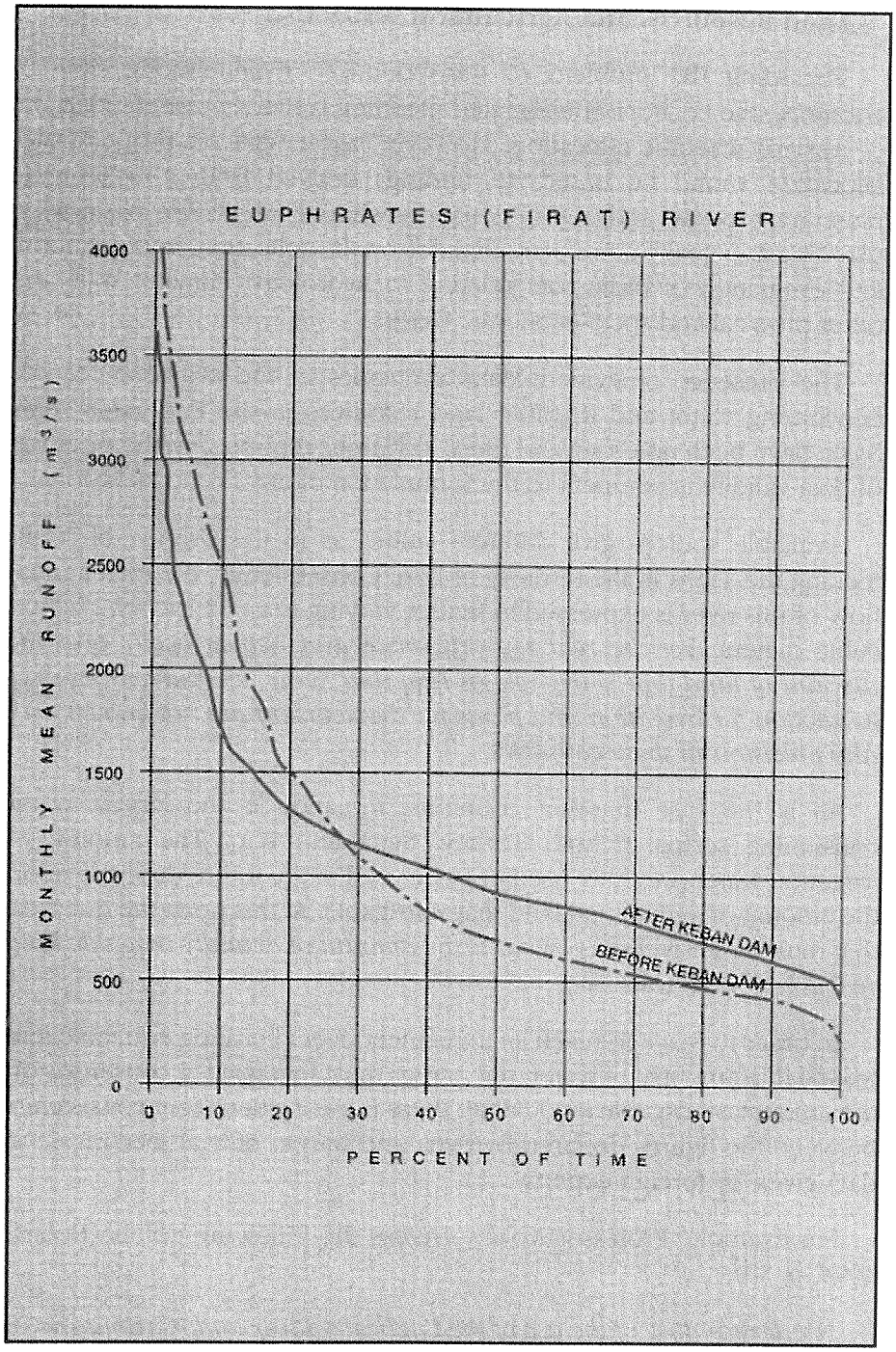

Figure 8: Run-Off Duration Curve of the Euphrates River at the Border

Land Resources and Agricultural Water Use

Regarding the problem of transboundary rivers among riparian countries, the concept of integrated planning is merely presented in the context of resource allocation. However, agreement on proper water allocation shoud be based on findings derived from a basin-wide planning process, and any negotiations should emphazise basin-wide planning as a goal. Such a plan depends on the collection, interpretation, and evaluation of basic data relating to hydrology, climate, soils and other physical and socio-economic factors.

The presence of evident data anomalies in the available records concerning water and irrigable land resources in the Euphrates-Tigris basin have been noted several times in various reports, and the question of data validity is pertinent to the formulation of any firm conclusions.

Available sources give different values as to the volume of water feeding the Tigris in the territory of Iraq, Consequently, the total annual flow of this river is expressed in figures varying from 52.7 to 49.2 billion cubic meters. *Yet the real big difference and debate occur over the amount of land that is irrgable in Iraq and Syria. The current levels of extraction for irrigation and plans for development are not known with any precision in these countries.*

As is the case in other countries, irrigation is the largest water consuming sector in both Turkey, Syria and Iraq. The amount of irrigation water presently used or to be used in the future depends upon the amount of agricultural land that is irrigable. At this point the question that must be answered is: *What is the amount of actually irrigable land in Turkey, Syria and Iraq?*

In order to reach to reach an agreement over allocating equitable and reasonable amounts of water, the parties must first reach a consensus on the amount of irrigable land. Here, there is a considerable inconsistency between the figures declared by Syria and Iraq in official meetings and data given by foreign experts.

For example, Professor Kolars stresses the following points (Kolars, 1994, p. 50):

"Understanding of the use of the Euphrates River and its tributares in Syria for irrigation is obscured by lack of data and conflicting reports...

much of the 640,000 ha originally scheduled for irrigation has had to be abandoned because of gypsiferous soils.

Early schemes to develop as many as 650,000 hectares along the Euphrates by building the ath-Thawrah Dam were reduced by 1983 to 345,000 ha and subsequently to 40,000 ha. Inaccurate soil surveys conducted by German firms failed to warn the Syrians about the effect of gypsiferous soils both on canals and on field applications of water. The Rasafah project originally estimated by the Russians to encompass 150,000 ha was actually abandoned and no more than 208,000 ha (12,000 ha government projects, 196,000 ha private lands) were under irrigation in the Euphrates valley in 1985-1986.

Moreover, large tracts of fertile valley land have been lost beneath the waters of Lake Assad and to poor drainage and salinization. Revisions in Syrian agricultural plans now place greater emphasis on dry farming and ancillary projects on the Khabur."

Naff and Matson (1984 p. 97) noted that: ... *unexpectedly high reclamation costs of between US $4,000 and US $10,000 per hectare had already led Syrian agricultural officials to admit privately that Tabqa's ultimate goal of 650,000 ha would probably never be reached..'*

According to the USAID report quoted by Kolars (1991, p.8), less than half of the original 640,000 ha is reasonably good land for irrigation purposes.

According to Beaumont (1992, p.180), the actual irrigation coverage which is planned by Syria remains controversial, and figures have ranged from as low as 400,000 to values in excess of 1 million hectares. Beaumont also adds: *".. recent estimates suggest that the final total will be between 400,000 and 800,000 hectares. Iraq, too, has ambitious plans for irrigation expansion in the Tigris-Euphrates basin. Figures in excess of two million hectares are quoted, but details are not available and it is not certain just how much of this proposed irrigation is to be located within the Euphrates catchment..."*

Based on the above quoted figures, Table 2 reveals data discrepancies on the existing and proposed irrigation project areas fed by the Euphrates River in Syria and Iraq.

TABLE 2 : Conflicting Data On The Total Irrigation Project Areas Fed By The Euphrates (hectares)

Country Source	Syria	Iraq
Official (1)	773,000	1,952,000
Kolars	375,000 397,000	1,294,000 1,550,000
USAID Report	320,000	
Anderson	200,000 - 500,000	
Beaumont	400,000 - 800,000	

Source : Bilen, Ö., 1994, 83
(1) Figures given to the Joint Technical Committee in 1982 and 1983.

Referring to the table, foreign experts argue that conflicting figures concerning availability of irrigable land in each riparian country and lack of consensus on irrigable land potential are important issues. Such inconsistent figures can mislead analysts. For example, if irrigable land in Syria is taken as 400,000 ha and it is assumed that surface irrigation methods will consume 12,000 m^3 of water per hectare annually, the total water consumption becomes 4.8 BCM. The irrigation water requirement of the 773,000 ha which Syria claims to be irrigable, is much higher than 4.8 BCM at 9.3 BCM.

In conclusion, it can be seen that the consistency and reliability of data on the land to be irrigated is a major concern for all parties and much work needs to be done to clarify the existing situation. Considereng soil quality, soils are classified in six categories ranging from excellent (class 1) through poor (class 4) to uncultivable (class 6). Among these categories, class 4 presents particularly severe limitations for crop production. High-textured soils, together with salinity and alkalinity, will cause serious difficulties in the process of reclamation, making it uneconomical. It is therefore not worthwhile to drain and reclaim such soils. Even after drainage and reclamation, the productivity of these soils will be very low compared to lighter-textured and better structured soils. Low productive soils, on which low yields are likely to

be obtained despite enormous water use, must be removed from irrigation in all riparian countries. If only a small percentage of the land which is least suited for irrigation is left unequipped with irrigation facilities, the resulting water savings will be considerable.

Agricultural withdrawals from the Ephrates and Tigris, which correspond to 80 percent of total consumption, are differently calculated by the parties because of the soil data inconsistency mentioned above. National guidelines being practiced by each country for data collection, evaluation and processing are based on different criteria and are not readily applicable to transboundary water courses. Data collection and surveys of water and land resources need to be jointly performed by the riparian countries so as to acquire a basis for water allocation questions.

From the preceding discussion, a work plan could be designed which proceeds in three stages:

(**i**) Inventory studies of water resources would be made covering data compilation, exchange of flow and meteorological data from agreed upon gauging stations (See Table 3), correlation of flow data, and extension of short term records to generate longer period of records with an acceptable level of data reliability.

TABLE 3 : Key Gauging Stations

Key Stations	Turkey	Syria	Iraq
On the Euphrates	Belkiskoy	Kadhya Abu-Kamal	Husabia (Hit) Nasiria Fishkhabur
On the Tigris	Cizre	-	Mosul Kut

(**ii**) Inventory studies of land resources would include: unifying classification of land resources and determining irrigation water requirement for projects in operation, under construction and planned by applying the rules of **Rapid Survey Techniques** to the jointly selected project areas in the riparian countries.

(**iii**) The two major stages very briefly described above, concerning water and land resources inventory studies, would be integrated in a master plan, which combines the riparian countries resource management plans and water transfer projects from the Tigris to Euphrates. Based on this plan, a simulation study could be carried out to develop water budget and allocation models among the riparian countries.

The complexity of the relationship between the principle of the equitable utulization of tranboundary waters and the principle of not causing harm to the beneficiaries could be addressed by means of well-mediated technical approaches. Producing a definition of the reasonable and appropriate amount of water that each country needs from the Tigris and the Euphrates, depends upon the availability of complete and accurate information on the land and water resources of both rivers.

Transfer of Water From the Tigris to the Euphrates

The total quantity of water flow in the Euphrates River regulated by large upstream reservoirs is likely to be adequate for domestic water supply, industrial growth and agricultural development in the foreseeable future; but there might still be a problem in matching supply to demand at certain places and times (e.g. during severe drought periods) and the supporting potential of the Euphrates and the Tigris should be considered. It is misleading to focus on the River Euphrates or the River Tigris in isolation from each other. These two rivers form one single basin having an annual potintial of 87.2 BCM and should be taken as parts of the same system. There is no natural barrier between these two rivers and they come very close to each other in Iraqi territory. It is even very difficult to demarcate the watershed boundaries in Iraq near the confluence point. For this reason, the relevant literature gives the water-shed of the both rivers jointly as 884,000 km^2. The list of river basins published by the UN also cites this figure.

Unlike the Euphrates, The Tigris River has several major tributaries in Iraq which join the Tigris at the left bank from the Zagros mountains to the east. Among these tributaries are the Greater Zab, the Lesser Zab, the Adhaim and the Diyala. The average main stream flow at Mosul is 21.3 BCM and the tributaries supply 31.4 BCM. The total water resources of

the Tigris basin, therefore, amount to 52.7 BCM, 1.5 times as much as the annual mean flow of 31.6 BCM in the Euphrates river.

A comparison can be made also with respect to the land resources of these rivers. In Turkey, there is 1,654,000 ha of land that can be irrigated by the Euphrates. The exaggerated figures declared by Syria and Iraq are 773,000 and 1,952,00 ha, respectively. If these official figures are accepted, the total land that is foreseen to be irrigated by the Euphrates turns out as 4,379,000 ha. The land that is to be irrigated by the Tigris is 602,000 ha in Turkey, 200,000 ha in Syria, and 3,819,000 ha in Iraq, giving a total of 4,621,000 ha. While the water potential of the Tigris is 1.5 times as much as that of the Euphrates, the areas that are to be irrigated respectively by these two rivers are very similar in extent to each other, demonstrating that there is surplus water in the Tigris.

In fact, according to the balance sheet of water resources versus water uses from the Tigris River prepared by Kolars (1992, p. 108), the amount of surplus water in the Tigris River is 11.9 BCM/year. In his balance sheet, Kolars accepts the natural flow as 49.2 BCM/year which is less than the figure of 52.7 BCM/year given by Beaumont. Based on Beaumont's figure, surplus water amounts to 15.4 BCM/year, of which 50 percent could be transferred.

The point presented above forms the most important technical feature of the Euphrates-Tigris system. By utilizing this technical feature, it is possible to connect these two rivers at various points and to transfer the surplus water of the Tigris to the Euphrates. Thus, while discussing the use of these rivers, it is necessary to take into account the aggregate water potential of 87.7 BCM and make evaluations in this holistic manner.

Are these points made only by the Turkish experts? To answer this question, it will be useful to look at the following quotations from several sources on Middle East water issues.

"Fortunately for Iraq, however, there is little suitable land in these two countries which could be irrigated by using the waters of the Tigris. As a result it seems unlikely that serious international problems will be generated concerning the use of its waters, and Iraq will be able to make the fullest use of them for its own needs. This explains why Iraq is able

to divert a significant proportion of the flow of the Tigris through the Tharthar basin to augment the water resources of the Euphrates" (Beaumont, 1978, . 42).

"Iraq could well make greater use of the discharge of the Tigris. In fact, the Tharthar canal project which at the moment diverts Tigris Water into the Tharthar depression, thereby controlling floods, is planned to be extended to be Euphrates, facilitating therefore the transfer of flow from one river to the other." (Anderson, 1986, p. 19).

The Iraqis are also planning to transfer water from the Tigris to the Euphrates. The Tharthar canal project presently diverts water into the Thartar depression, controlling the flood flow of the Tigris. The next stage of the plan is a canal from the Tharthar into the Euphrates, and outlet canals back into the Tigris and the Euphrates to channel water as needed into agricultural projects. (Naff, 1984, p. 92).

Kolars (1993, p.49) makes a different recommendation concerning the route of a transfer canal, viz.:

... a canal might be built from the Mosul reservoir (or a smaller retaining or diversion facility farther upstream) in order to bring the supplementary supply of water to the Euphrates River. Such a canal could run almost straight south following the 500 m contour to the Euphrates below the Haditha dam. This, in combination with water stored in reservoirs on the eastern tributaries of the Tigris, might alleviate Iraq's predicted water problems. The expenditure on such ventures should be considered as an international, regional item to be shared by all the riparians. Such an idea raises the possibilities of potential basin-wide regional cooperation.

Another recommendation made by Beamount (1991) is as follows :

On the Tigris the picture is clearer as much less development has occured, or indeed little is planned outside Iraq. In Turkey some water use takes place in the Diyarbakır basin, but as yet no major water structure will be built in the near future. Leaving Turkey, the river flows into Iraq, though for a short distance the boundary between Syria and Turkey is marked by the Tigris River itself. In this area the head waters of the Khabour, the major Tributary of the Euphrates, are close by, and

it would not be too diffucult from an engineering point of view to divert some of the waters of the Tigris into the Khabour at this point.

Among the above-cited project proposals, the one which links the Tigris to the Euphrates through Tharthar lake has already been realized and in operation since 1988 (Dhanoun, 1988, See figure 9).

From time to time, it is argued that salinity in the Thartar depression precludes the transfer of water except in extreme cases (Kolars, 1993, p. 13). However, a by-pass canal built north of the Thartar depression could transfer the fresh Tigris water directly into the Euphrates, by making use of the existing canal between the Thartar depression and the Euphrates, avoiding the rather saline soil formation in the Lake Thartar bed. (Figure 9)

While discussing the possibility of linkage between the Tigris and Euphrates Rivers, it is interesting to note that the original idea dates back to pre-christian times. It was then thought to link the two rivers by the Shatt el Hai canal (McDonald and Kay 1988, p. 1-2)

This issue can be better put as follows:

Suppose two transboundary rivers enter into a lower riparian State. One of these rivers receives a large portion of its water from tributaries which run exclusively within national boundaries while the other river is highly susceptible to the demands of upper riparian countries like Turkey and Syria. How ethical would it be for the lower riparian state to insist on maintaining all its existing and potential water rights on the latter river (which is very much needed and susceptible to depletions by other states) while reserving the surplus water of the former river only for itself?

In the face of all this technical data, why do Syria and Iraq insist that these two rivers should be taken separately and water allocations made respectively?

The irrigation water requirement from the River Tigris is rather limited in Turkey and Syria. That is why Iraq is able to make the fullest use of the Tigris and tries to get as much as possible from the waters of the Euphrates. Syria, since it will have surplus water flow through its hydropower plants, supports the position of Iraq and considers that the

interests of Iraq over the Euphrates are compaitible with its own interests over the same river.

The same concept of water transfer among rivers was also adopted in the solution of the dispute between India and Pakistan over the Indus River in 1960.

The Indus River originates from the plateau of Tibet and is one of the largest rivers of the world with an average annual water capacity of 208 BCM. This is 2.2 times greater than the combined water capacity of the Euphrates and the Tigris. Formed by five tributaries (Jhelum, Chenab, Ravi, Beas an Sutlej) each of which has the features of a big river, the Indus provides irrigation water for the Punjab (meaning 5 waters) Plain and lands in the Indus valley.

Following the independence of India and Pakistan in 1947, new national boundaries created serious problems by partitioning irrigation canals and waters in the Punjab Plain and making India an upstream riparian state. At the outset, Pakistan insisted that existing irrigation schemes should have the same water sources as they had before.

After examination of the dispute, upon the appeal of India and Pakistan, experts from the World Bank concluded as follows (FAO, 1970, p. 13):

"An essential part of the Pakistani concept is that existing uses of water must be continued from existing sources. Moreover, 'existing uses' in the Pakistan plan, include not only the amount of water that have actually been put to use in the past, but also allocations of water which have been sanctioned prior to partition even though the necessary supplies have not been available for use... The corresponding concept of the Indian plan, on the other hand, is that although existing uses (here defined to include only the actual historic withdrawals) must be continued, they need not necessarily be continued from existing sources... The Bank proposal embodies the principle that the historic withdrawals of water must be continued, but not necessarily from existing sources... A requirement that existing uses must be supplied from existing sources would unduly limit the flexibility of operation needed for the efficient use of waters. In fact, no fair and adequate comprehensive plan could, in the opinion of the Bank Representative, be devised under such a requirement"

In 1954, the Word Bank put forward a proposal for the equitable distribution of water resources available to India and Pakistan. The proposal had three important features :

(i) The waters of the western rivers were to be allocated to Pakistan and the waters of the eastern rivers to India. Irrigation schemes in Pakistan which were fed by the eastern rivers, would in future be fed by waters to be transferred from the western rivers by means of a system of link canals. It was estimated that 17.3 BCM/year of water would be required, ultimately to replace the water designed for use by India.

(ii) India would make a contribution to the cost of replacement works,

(iii) During the construction phase, India would limit her withdrawals from the eastern rivers to proportions which would match Pakistan's capacity to replace them.

The Bank's proposal differed from Pakistan's (which provided for existing uses to be supplied from existing sources), but it did recognize Pakistan's right to water in providing that India should pay the cost of building the replacement link canals. The gain to India would be that the waters of the eastern rivers would then be available for the expansion of irrigation in undeveloped Indian land.

In fact, the Bank's proposal protected existing irrigation uses from disturbance, and allocated surplus supplies to areas already developed or to be developed through water transfers among rivers. This was a technical solution which involved no judgement upon the legal contentions put forward by the concerned parties.

This experience illustrates that existing and future agricultural water requirements in Iraq need not all continue to be met from the Euphrates. Some areas fed by the Euphrates could be more efficiently commanded by waters to be transferred from the Tigris River. A system of link canals can easily serve to augment the Euphrates-fed irrigation. This possibility constitutes the most promising technical solution to help match supply with demand in the Euphrates-Tigris Basin.

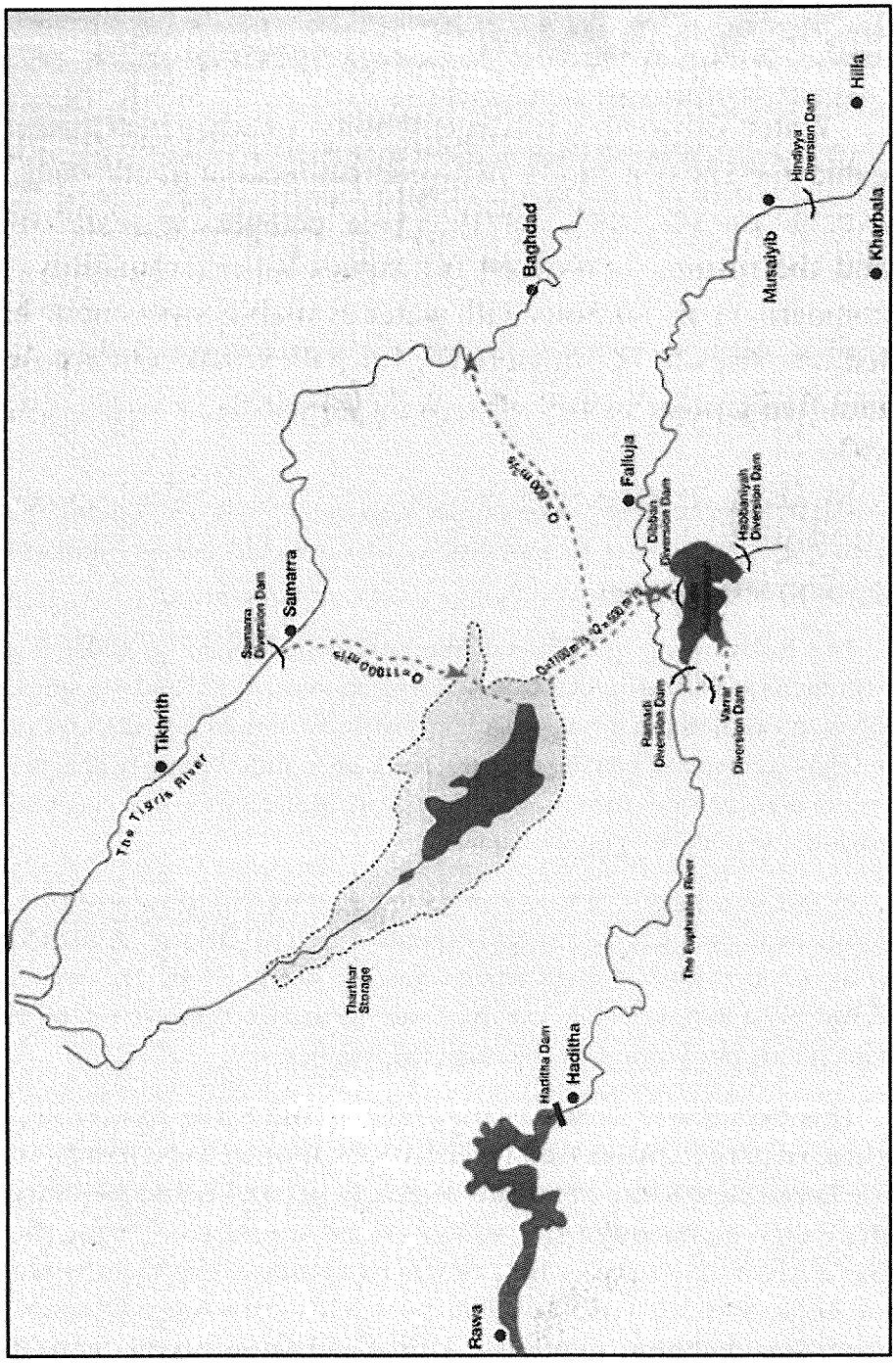

Figure 9: Tharthar Project : Diversion of Water from the Tigris to the Euphrates

Per Capita Water Availability in Turkey, Syria and Iraq

Water use and water availability can be expressed in cubic meters per capita per year per person. Total annual average run-off in a country is divided by population and the result is called per capita water availability. A comparison of countries with water availability per capita has led countries to be categorized, for policy making purposes, into five groups, as follows: (Wolf, 1995)

- Above 10,000 m3 per person : have limited management problems;
- 10,000-1,600 m3 per person : have general management problems;
- 1600-1000 m3 per person : have water stress;
- 1000-500 m3 per person : have chronic scarcity;
- Less than 500 m3 per person : beyond the 'water barrier' of managable capability;

However, the above defined index representing a whole country is a rather approximate figure open to interpretation, and misleads analysts in some cases. In a country like Turkey, which covers a large area and much of whose water supply is widely scattered, not easily stored or diverted, high per capita water availability based on total water potential or total runoff does not necessarily reflect the real situation in the country and masks extreme local variability. Extremely irregular precipitation and flow conditions are the factors which limit the utilization of water resources economically. These conditions require dams of large volume. This particular factor which further exacerbates economic and geological problems may also altogether block the realization of a project in some cases and thus largely limit the utilization of the resource in question. *In countries where rivers flow under irregular conditions, the gap between the total and usable water potential is very large.* Hence, there may be a great difference between per capita total water potential and usable water potential. For example, The European part of Turkey, Central Anatolia and some regions in Western Anatolia face serious water shortages with regard to irrigaton and domestic water supply. Water availability per capita in those areas is very low. Calculation of per capita water availability based on total water supplies, instead of exploitable resources, without taking into account local variability does not make much sense.

However, the difference between per capita water availability based on total and exploitable potential is marginal for the countries of small size where diversity in climate across the country is less significant.

Water Resources of Turkey

Numerous reviews and studies have appeared over the past decade addressing the water resources issues in the Middle East region. In most of these documents, Turkey is cited as a water-rich country. However contrary to what has been thought, Turkey is not a water-rich country, and furthermore the temporal and geographic distribution of water resources potential of the contry does not provide appropriate conditions to easily meet present and anticipated needs. Average annual rainfall is 643 mm but it is not evenly distributed over time and space. Precipitation varies from 250 mm in Central Anatolia to 2,500 mm on the Eastern Black Sea. Though the average surface flow in the 26 river basins, is 186 billion m^3, utilizable surface flows are much less, due to the fact that much of the water flows during flood and there are limitations on creating storage to accommodate all this quantity. Hence, utilizable surface flows are calculated as 95 billion m^3. Furthermore, exploitable ground water is about 12 billion m^3. Thus, the total exploitable water resources of the country reaches 107 billion m^3. On the other hand, Turkey releases annually 16 billion m^3 of regulated water from billion m^3 its storage facilities to the Euphrates and after deduction of this 16 billion m^3, available water for consumption is 91 billion m^3. The above mentioned points can be summarized as follows:

Average Annual Precipitation	643 mm
Total Precipitation over Turkey	501 km^3
Total Run-off	186 km^3
Safe-Yield of Groundwater (plus)	+12 km^3
Water Allocated to Syria and Iraq (minus)	-16 km^3
TOTAL WATER POTENTIAL (1)	182 km^3

Usable Surface Run-off	95 km^3
Safe-Yield of Groundwater (plus)	+12 km^3
Water Allocated to Syria and Iraq (minus)	-16 km^3
TOTAL USABLE (exploitable) POTENTIAL (2)	91 km^3

The contribution of the Euphrates-Tigris Basin to the water resources of Turkey is very significant. The Euphrates-Tigris Basin potential accounts for 28% (53 BCM) of the total run-off in Turkey (186 BCM) and 1/5 of total irrigable land out of 8.5 million hectares is situated in this basin.

Water Resources of Syria

Under a protocol signed with Syria in 1987, Turkey allocated 500 m^3/second of water to Syria and Iraq (this makes 15.768 BCM or, 16 BCM, if we round the figure up, of water in a year). Thereafter, Syria and Iraq agreed in a protocol to share this water where Syria gets 42% and Iraq gets 58%. Hence the amount of water received by Syria and Iraq is 6.72 and 9.28 BCM, respectively.

Syria's water resources, including national and transboundary waters are shown in Table 4 below:

TABLE 4 : Water Resources of Syria (MCM/Year)

Basin	Surface Flows and Surface	Ground Water	Total
Khabur	1695	500	2195
Orontes	2509	356	2865
Coastal areas	2386	236	2622
Damascus	833	193	1026
Aleppo	497	303	800
Upper Jordan	530	50	580
Desert	125	100	225
Euphrates (1)	6720	300	7020
Tigris (2)	2500	-	2500
Total	17795	2038	19833

Source: M.Wakil, IWRA, Vol, 18, No. 1, 1993
(1) Though the amount of water drawn by Syria from the Euphrates is given as 13 BCM in the table prepared by Wakil, the author uses the figure 6.72 BCM according to the 1987 protocol.
(2) The Tigris is included in the table by the author. In this estimate, 200,000 hectares of land for which Syria considers drawing water from the Tigris and the conditions of natural flow along the Turkish-Syrian border have been taken as a base.

Considering the natural flow along the Tigris River where the river forms the boundary, it is estimated that Syria could use about 2.5 BCM of water. What is more, Syria declared plans to irrigate 200,000 hectares of land using the waters of the Tigris. For these reasons, figures showing the water potential of Syria should also include the Tigris River.

Water Resources of Iraq

As stated before, 31.4 BCM of water joins the Tigris in Iraqi territory. Together with the main stem of the Tigris after Turkey's and Syria's uses, the annual amount of water that Iraq can use from the Tigris totals 35.1 BCM. The figure rises to 44.4 BCM with the 9.3 BCM of water allocated from the Euphrates. Since there are no figures on the ground water resources of Iraq, ground water potential has not been considered in the overall totals.

Population Projections of the Riparian Countries

The next step in estimating per capita water availability over a certain period is to project the population for each riparian country. *Water in the Sand: A Survey of Middle East Water Issues* published by the US Army Corps of Engineers has been used for population projections for Syria and Iraq. In this source, the average annual rates of population increase are given as 3.8%, 3.9% and 2.1%, for Syria, Iraq and Turkey. The global average for the world is 1.8% and both Syria respectively and Iraq are significantly above this average.

In the 7th Five Year Development Plan (1996-2000), the population of Turkey is projected to reach 67,332,000 in the year 2000 and the annual rate of population growth is expected to drop to 1.5% in the 2000s. According to these data, projections for the years 2010 and 2020 have been made by the author and results are summarized in Table 5.

TABLE 5 : Population Projections

	1990	2000	2010	2020
Turkey	56,473,000	67,332,000	78,229,000	90,889,000
Syria	12,116,000	16,857,000	22,533,000	26,094,000
Iraq	18,880,000	24,023,000	30,932,000	41,808,000

Based on the foregoing analysis per capita water availability for each country is given in the Table 6

TABLE 6 : Average Annual Water Per Capita (m^3)

	1990	2000	2010	2020
Turkey	3223 (1611)	2703 (1351)	2326 (1163)	2002 (1000)
Syria	1636	1177	880	760
Iraq	2352	1848	1435	1062

Figures in parenthesis are calculated according to the 91 BCM of water which is the usable water potential in Turkey. If one considers that the Euphrates is regulated fully and the Tigris partly, and that the topographic conditions of both Iraq and Syria allow the allocation of these waters to irrigation, it can be accepted that the usable water potential of Syria and Iraq is equal to the total water potential. It is generally accepted that countries where per capita water is around 1000 m^3 or less face serious water problems. *Thus it can be said that these three countries will, by 2020, face more or less the same conditions in terms of water supply.*

Environmental Problems

From time to time, the cause of mass fish deaths in the Gulf is attributed to the water recycled in the Euphrates by Turkey after having been used for various purposes. However, Turkey's use from both rivers is presently very limited and corresponds to only 1% of the total water potential of the Euphrates and Tigris of 87.7 BCM. Moreover, there is no pollution in Turkey in the basin of these two rivers that can be attributed to industrial waste. It would be more plausible, when inquiring into the causes of such deaths, to consider the dumping of highly toxic trace metals and other forms of waste into the coastal and offshore waters from oil refineries, the water recycled after the irrigation of the extremely saline soils of Syria and Iraq, or the pollution from the facilities ruined

during the Iraq-Kuwait war. Since the Gulf countries have not yet reached an agreement on comprehensive marine management, we can anticipate even more troublesome environmental consequences in the future. With or without irrigation development the Gulf area has been under serious attack by industrial and oil pollution, and agricultural pollution remains a trivial externality. Efforts to seek causes in a 3,000 km distant country constitute a clear indicator of how issues are distorted and mispresented. The conclusion is that if one were to cite water resources development as the major cause of pollution in the Gulf, **one would be missing the forest for a single tree.**

It is a well recognized fact that the major parts of the arable lands in Sria and Iraq, including most of the area under irrigation, is seriously affected by salinization and large areas have fallen out of production over the years. The high salt content inherent in the soil itself is recycled into the Euphrates and Tigris after irrigation. According to Tariq Harran (1973), the Director General of Soils and Reclamation, in 90 percent of the arable land of central and southern Iraq, levels of salinity are so high that the average crop productivity per unit area in this region is below that in the majority of Middle East countries. Indeed, Erik Eckholm described vast areas of the South Iraq as ***glistening like fields of freshly fallen snow*** (quoted by Goldsmith and Hilyard, 1984, p.140) As for Syria, Gabaly (quoted by Goldsmith and Hilyard, 1984, p.140) noted that:

'... due to the aridity of climate, with evaporation exceeding precipitation in many locations, it is estimated that 70 percent of the soils put under irrigation are potentially saline'

We can conclude that all of the above cited problems emerge from the nature of the soil and poor drainage conditions in Syria and Iraq. On the other hand, the head-waters of the Euphrates and Tigris are of high quality and return flow from irrigation will be only moderately mineralized, containing about 700 ppm (ppm indicates the quantity of salt as miligrams per liter) dissolved solids, and of satisfactory quality for irrigation supply. In this context, we should note that under the terms of a joint treaty signed between the USA and the Mexico, the USA agreed to reduce the salinity level of water entering Mexico to 800 ppm from an average salinity level of 2,800 ppm at the Yuma desalinization plant (Goldsmith, Hildyard, 1984, p. 147). Thus, the agreed upon salinity level

of return flow provided to Mexico is almost equal to that provided by Turkey to its neighbours.

Moreover, the return flows from irrigation schemes around the Atatürk Dam enter directly into the dam reservoir and are diluted with a large amount of fresh Euphrates water. Turkey has plans to use a part of the recycled water in its own territory, and thus to limit the irrigation withdrawals from the Atatürk Dam in order to increase energy production.

Confirming what has been said above, Prof. Kolars makes the following point (Kolars, 1993, p. 36):

"Syria may experience relatively little additional trouble regarding salination from Turkey, but its own soils are notoriously gypsiferous and saline and their proper washing and cleansing could dump oppressive loads of dissolved solids an Iraqi fields"

In both Syria and Iraq, drainage systems are extremely insufficient and many problem emerge because of this insufficiency.

To conclude, environmental problems induced by use of the Euphrates-Tigris Basin water in Turkish territory are manageable and within reach of control and mitigation.

The allegation that water use of Turkey from the Euphrates is the main cause of fish deaths in the Gulf was put forward by one of the participants of a meeting on *'Waters in Middle East'* held in Egypt in 1993, attended by the author. Not having a share of use of even 1% of the water flowing into the Gulf, Turkey can not reasonabaly be blamed for the deaths. However, the allegation itself is a vivid example of how some issues are presented to world public opinion. The author had to take the floor to reply and after making some relevant technical explanations closed his speech with an anecdote from Nasreddin Hodja, a well known historical figure with a bright sense of humor :

One day, Nasreddin Hodja's mother-in-law gets carried away by a sudden flood while she is washing laundry by the river. As soon as he is informed about the event, Hodja hastily runs to the point where she was last seen. While he sends all the people around him downstream, he starts to walk upstream to search Wondering about the reason for this rather strange choice of direction, people asked:

- How in the world can one be carried away upstream by a flood?

Hodja's reply is interesting:

- My mother-in-law was a good lady. But throughout her life she has been so puzzling and so different that there is some possibility of her being carried away upstream.

Hodja's keen humor could be a clue to see how certain events can be distorted or misrepresented.

International Law and the Euphrates-Tigris Basin

Legal rules for the non-navigational uses of transboundary waters have not yet fully matured. However, it can be observed that the topic has been receiving an ever widening interest since the beginning of the 20th century. First by professional jurists and then by individiual countries. There are two extreme views which, in the course of time, have played a role in the shaping the rules relating to the use of transboundary waters.

According to the Harmon Doctrine (which is also known as the 'absolute territorial sovereignty doctrine'):

States can make all kinds of uses of transboundary waters while they are in their own territory. They may even fully consume these waters without leaving any for downstream states.

In a dispute over the use of the Rio Grande which is a transboundary water used by the US and Mexico, Judson Harmon, an American jurist claimed that states have absolute sovereignty over waters in their territory without being subject to any limitation, and that this sovereignty formed the main principle of international law. The Harmon Doctrine dominated the treaty signed between the US and Mexico in 1906. Article 4 of the treaty states the following:

"The delivery of water as herein provided is not to be construed as recognition by the United States of any claim on the part of Mexico to the said waters."

Article 5 further states:

"The United States, in entering into this treaty does not thereby concede, expressly or by implication, any legal basis for any claims her heretofore asserted or which may be hereafter asserted by reason of any losses incurred by the owners of land in Mexico due or alleged to be due to the diversion of waters of the Rio Grande within the United States; nor does the United States in any way concede the establishment of any general principle or precedent by the concluding of this treaty."

Running contrary to the Harmon Doctrine, downstream riparian states maintained the claim that upstream riparian states could not introduce any alteration to the natural flow of transboundary waters (the 'absolute territorial integrity doctrine').

It is apparent that while the first of these claims blocks the use of transboundary waters by downstream riparians, the second, in turn, inhibits upstream riparians. Since water is an important natural resource, the will and desire of countries to live peacefully with their neighbours made them realize that both claims were extremely radical and mutually exclusive. It was then accepted that all riparian states should have the right to make use of transboundary waters. Efforts to find some reconciliation between these two approaches intensified in the 1950s and the issue was placed on the agenda of many international forums. One of these initiatives was taken by the International Law Association (ILA), an organization without any official status, and resulted in resolutions being adopted in Helsinki in 1966. However, these decisions have no officially binding character.

Also known as the Helsinki Rules, these decisions introduced the concept of "equitable and reasonable" use of water by riparian states. It stressed that both upstream and downstream states should be able to make equitable and reasonable use of transboundary waters. *What is important to note here is that the term 'equitable' use does not mean that water is to be used in absolutely equal quantities.*

According to the Helsinki Rules, a reasonable and equitable share is to be determined in the light of all the relevant factors in each particular case. These factors include, but are not limited to:

- the extent of the drainage area in the territory of each basin state,
- the contribution of water by each basin state,
- the climate affecting the basin,
- the past and existing utilization of waters,
- the economic and social needs of each basin state,
- the availability of other resources,
- the avoidance of unnecessary waste in the use of water,
- the population dependent on the waters in the basin,
- the practicability of compensation as a means of resolving conflicts among users,
- the degree to which the needs of a basin state may be satisfied, without causing substantial injury to a co-basin state

In 1970 the United Nations General Assembly recommended that the International Law Commission (ILC) of the UN should: ".... take up the study of the law of the non-navigational uses of international watercourses with a view to progressive development and codification...". Even though the ILC included this subject in its programme of work in 1971, it was not until 1997 that a draft convention was submitted to the General Assembly.

The General Assembly adopted a Convention on the Law of the Non-navigational Uses of International Watercourses on 20th May 1997 by 103 votes in favor to 3 against (Turkey, China, Burundi) with 27 abstensions. Statements made by the representatives of states who abstained or voted against the law drew attention to the obvious drawbacks in major clauses of the convention as follows

(i) The law fails to represent or reflect the general agreement of all countries. Quite a number of countries have reservations over its major clauses. It is also rare in the practice of international legislation that nine statements of understanding are attached to the draft convention and the effect of such explanatory statements in conventions is rather doubtful.

(ii) The principle of territorial sovereignty is a basic principle of international law. A watercourse state has indisputable territorial sovereignity over the part of transboundry watercourses that run through its territory. It is hard to understand and regrettable that this principle is not affirmed in the Law.

(iii) There is obviously an imbalance in the convention regarding the rights and obligations of states at the upper and lower reaches of transboundry watercourses. This will not facilitate wide aceeptance of the convention. It will also make it hard to implement the convention.

(iv) Under article 33 of the UN Charter, countries are entitled to choose their own means and procedures for the settlement of disputes. The means and procedures of compulsory fact-finding as set forth in the convention go against the provisions of the Charter. It is not appropriate for a framework convention to foresee any compulsory rules regarding the settlement of disputes, a matter which should be left to the discretion of the states concerned.

(v) Further, the 37-article Watercourses Convention and its 14-article annex deviated from the aim of being a framework agreement. As a framework convention, the text should have set forth general principles. Instead, the convention went beyond the scope of a framework and established a mechanism for planned measures. Such a practice has no basis in international law.

Based on the above-mentioned considerations, quite a number of states made reservations about several provisions of the convention and reserved the right to handle the non-navigational uses of transboundary watercourses with their neighbours in a fair and reasonable manner in accordance with relevant international practice and bilateral watercourse agreements. In many regions, such bilateral arrangements have been worked out to promote sustainable use and management of watr resources. It is imperative that this flexibility is retained. Such countries may, on the basis of mutual consent and cooperation, find common ground to undertake activities in keeping with local needs and requirements.

While the convention has been strongly opposed by several countries, two basic legal principles of 'equitable and reasonable utilization' and 'obligation not to cause significant harm' seem to be widely accepted, even though many representatives have voiced the need for clarification or adjustments.

It clearly emerged during the discussions at the United Nations that the notion of equitable utilization has to be understood in a flexible manner. The core of the notion is a balancing of interests at stake. No rigid parameters are compatible with this notion. Notions such as acquired rights or apportionment in the form of quotas are not the part of the concept. It goes without saying that equitable utilization not only means taking into account emerging social and economic needs by the riparian state concerned, but also the scope of possible repercussions on other riparian states. This is what Turkey has done, and is determined to respect in the future, by pledging release of water of the Euphrates at the rate of 500 m^3/sec as a monthly average at the Syrian border.

The obligation not to cause any significant harm to any riparian state is as valid for Syria and Iraq, as downstream states, as it is for upstream states. In this context, reference should be made to a statement by Stephen C. McCaffrey (McCaffrey, 1991), the Special Rapporteur of the ILC on the topic, according to which:

"A downstream state that was first to develop its water resources could not foreclose later development by an upstream state by demostrating that the later development would cause it harm; under the doctrine of equitable utilization, the fact that a downstream state was 'first to develop' (and thus had made prior uses that would be adversely affected by new upstream uses) would be merely one of a number of factors to be taken into consideraton in arriving at an equitable allocation of the uses and benefits of the watercourse"

As stated above, vested rights are made subject to significant limitations by international law. This element of vested or acquired rights should be considered together with many other factors. In addition to the disputability of its validity for transboundary waters, it is anyway quite difficult or even impossible to define which date is the critical one for such a claim. The point is that whatever date is chosen will determine the

amount of water the claim will be for. Is it the year 1950 or 1980, or the 19th century? In relation to demands stemming from times when irrigation was done using very primitive methods, it is impossible to pinpoint a date for the beginning of 'historical use'. It is also important to consider that ancient irrigation practices were extremely limited in terms of population and means available for such practices, rendering them irrelevent to any comparison to newly developed irrigation schemes.

It is accepted by balanced observers that in disputes emerging between upstream and downstream states the general tendency is to side with the latter, and this is contrary to the principle of equitable and reasonable utilization. For example, Professor Beaumont says (Beaumont, 1992, p.182):

"So far, internatonal jurists have been quite concerned about the rights of downstream states in the use of irrigation water while they have not been so keen about the rights of upstream states. Though 90% of the waters of the Euphrates are formed in Turkey, this point is easily overlooked."

In conclusion, Turkey acted within the limits of its sovereign rights by giving particular emphasis to the social and economic needs of the development of South-East Anatolia as a region of rapidly increasing population with almost no natural resources at its disposal. Turkey also took into consideration the legitimate interests of the two other riparian countries to be protected against harm by making a unilateral pledge to release an average of 500 m^3/s at the Syrian border.

Syria's legal position on the Euprates-Tigris Basin compared to the other basins reveals an interesting point. Syria is an upstream riparian on the both the Jordan, The Yarmuk and with respect to Turkey on the Orontes rivers, but is a lower riparian on the Euphrates and The Tigris.

As noted by Dellapena (1994), *'after equivocating for fifteen years, Syria adopted a claim of absolute sovereignty in 1964 to justify the plan then proposed to divert the headwaters of the Jordan into the Yarmuk and thereby to deprive Israel of its major source of water. This posture effectively negated any legal basis for claims against Turkey relating to the Euphrates and the Tigris.'*

Brief History of the Water Relations Among Turkey, Syria and Iraq

For centuries, the waters of the Euprates and the Tigris flowed uninterrupted through the scarcely developed southeastern part of Turkey, irrigating only the immediate vicinities of their courses. More recently, Turkey started to implement a development project in her southeastern region which is based on increased utilization of the two water courses. This project is a multi-sectoral, integrated development project and comprises not only water resources development, but also investment in all related sectors such as agriculture, energy, transportation, healthcare, education, urban and rural infrastructure in an integrated manner. The main objective is the economic development of th most underdeveloped region of the country with five million people.

Eager to maintain a good neighbourly relationship with the other two riparian countries, Turkey has kept Syria and Iraq fully informed of its plans to make use of the Euphrates and the Tigris on her own territory. However, construction activities undertaken by Turkey within the limits of its sovereign rights, aimed at the social and economic needs of the Southeastern Anatolia have aroused the objection of Syria and Iraq. This is despite the fact that these facilities are, like Keban and Karakaya, just for energy production and thus no water consumption is involved. Infact they generate significant increases in the power produced downstream.

Turkey's efforts for the economic and social development of Southeastern Anatolia have been twisted, on the initiative of Syria and Iraq, and presented to the countries of the region and of the world as Turkey's ambition to establish its hegemony over the region. Based on this, various political scenarios, including 'water wars' have been invented and it was even demanded that Turkey should construct no facilities at all on the Euphrates and the Tigris. Hence, the development of water relations within the last 50 years has been closely shaped by the construction of Keban, Karakaya and Atatürk dams. As a result of negotiations, which took place both before construction and after these facilities were put into operation, several protocols were signed. These developments are described and examined below.

Period Prior to the Construction of the Keban Dam

In 1946, Turkey and Iraq signed a Protocol for the Control of the Waters of the Tigris and the Euprates and the Tributaries. This protocol was the first document which adressed flood control measures to be untertaken jointly. According to the protocol, storage facilities for the regulation of these rivers might most properly be situated in Turkish territory and Turkey would establish several gauging stations on both rivers. During flood periods, the results of the measurements would be shared with Iraq on a daily basis.

This protocol focused mainly on the flood control works on the Euphrates and Tigris rivers and underlined the positive impacts of storage facilities to be sited in Turkish territory as follows:

"construction of flood prevention and water flow regulation facilities on the Euphrates and Tigris and their tributaries is important for Iraq to ensure its regular water use and to avoid any overflooding."

With this statement it was stressed that storage facilities to be constructed in Turkey would be to the benefit of both countries. The protocol also envisaged the exchange of hydrological and meteorological information and up to now cooperation on data exchange has been realized to a great extent. From 1946 up to the decision to start the construction of the Keban Dam, no significant development took place in relation to water issues.

Construction of the Keban and Karakaya Dams

Turkey, Syria and Iraq entered a new phase of ther relationship over water following the decision of Turkey to construct the Keban Dam on the Euphrates. The Keban Dam was designed for energy generation and it had no feature which would change the water balance of the basin. Furthermore, Keban had a very positive impact on the water storage facilities of Syria and Iraq by ensuring the regulation of approximately 70% of the waters of the Euphrates.

The feasibility studies pertaining to the Keban Dam and Hydroelectric Power Plant to be constructed on the Euphrates River, an important

project in the electrification programme of Turkey, were completed by the end of 1963. After that, The Turkish Government initiated the necessary preliminary works to start construction of the project in 1964 and informed Syria and Iraq about the project. The feasibility studies of the Keban Dam had shown the benefits accruing to the downstream projects because of large scale improvements in the regulation of water, as discussed earlier. To provide the Syrian and Iraqi officials with up-to-date information on the dam, a copy of the feasibility report of the Keban project was submitted to Syrian and Iraqi technicians by their Turkish colleagues. The first meeting was held on 22-27 June 1964 with the participitation of Turkish and Iraqi experts.

At this first meeting, the Turkish delegation declared that during the filling of the Keban Dam, Turkey would undertake all necessary measures to maintain a discharge of 350 m^3/sec immediately downstream of the dam, provided that the natural flow was adequate to supply the above discharge. Turkey also argued that the Euphrates and Tigris Rivers should be considered as one transboundry watercourse and studied together. The second meeting was held with Syria on 5-14 September 1964 in Ankara. After these bilateral meetings, in accordance with the recommendations of the technical delegations of Turkey, the first tri-partite negotations were held in Baghdad in 1965.

During this meeting, a Turkish proposal to establish and define the duties of a Joint Technical Committee (JTC) for the Euphrates-Tigris Basin was discussed. From the Minutes signed by both parties, it is interesting to note that Syria had suggested that the duties of the JTC should include investigating the possibility of making up any shortfall in water supply to the three countries from the Euphrates by diverting excess water from the Tigris, having first inventoried the irrigated and irrigable areas in Iraq. The result of such a study would be presented to the countries' governments to act on.

Iraq strongly opposed this proposal and insisted on negotiating only over the Euphrates. Syria changed its position after 1980 and returned to advocating handling both rivers separately, although both rivers form one watercourse system in the territories of the three riparian countries.

After this meeting, relations switched back to information and data exchange and the water problem again entered a dormant phase.

The Keban and the Thabka (Syria) Dams were completed almost at the same time in 1974 and the initial filling of the reservoirs of these two dams at the same time caused the emergence of serious problems. While Turkey adopted a constructive attitude, Syria adopted a very rigid policy line against Iraq. While Turkey fulfilled all its commitments, Syria, diverging from its original commitments, released much less water to Iraq from the Thabka Dam. Indeed, Iraq protested to Syria in April 1975 with a note delivered to the Arab League (Beschorner, 1993). The mutual hostility of these two Baath regimes found its repercussion also in water issues and a serious tension developed between the two countries. It went even as far as Iraq seeing Syria's attitude as *casus belli* and deciding to apply military sanctions. This action by Iraq was stopped at the last moment with the mediation of Saudi Arabia and the Soviet Union.

At the time the World Bank was approached to fund the Karakaya project in 1975, Turkey had been actively studying plans for the development of the water resources of the Euphrates River since 1962 and had formulated projects for irrigation and power. In 1974, it completed the first stage of the 1,260 MW Keban Hydropower Dam. Karakaya Dam represents the second stage in the basin development program and involves the regulation of the water released from the Keban Reservoir for hydro-power generation. The principal objective of the project was to provide additional generating capacity (1,800 MW and 7,353 GWh per year for the Turkish Power System) and to enable better use of the upstream Keban Hydropower Plant (the output of Keban would be increased by 400 GWh in an average hydrological year). This would save foreign exchange by substituting hydroelectric energy for imported oil. The Karakaya project, like Keban, does not involve irrigation, nor abstraction of water from the Euphrates river other than for initial filling of the reservoir.

The project consisted of the construction of the Karakaya Dam and Hydropower Plant with a reservoir of 5,600 billion cubic meters usable storage on the Euphrates River, located about 160 km downstream of the Keban dam, comprising a concrete arch-gravity dam 173 m high with an

overflow spillway, power intakes, steel pestocks, and a powerhouse at the toe of the dam containing six 300 MW turbine-generator units.

In order to ensure that reservoir filling would not adversely effect the lower riparians, Syria and Iraq, the filling and operating rule proposals were evaluated by the World Bank on the basis of a model developed by the bank in 1974. As a result of this evaluation, it was ascertained that if Turkey maintained an average monthly discharge of 500 cubic meter per second, as the Euphrates passes from Turkey into Syria and Iraq, this would ensure that the existing downstream requirements for power generation and irrigation and future growth could be met. Moreover, it was also confirmed through the model that the Karakaya reservoir could be filled in a reasonable span of time. This operating rule was named the **'Rule of 500'.**

After detailed discussions, an informal agreement between Turkey and the World Bank on the **'Rule of 500'** was concluded. The principles were communicated by Turkey to Syria and Iraq and Turkey offered to discuss a tripartite arrangement with these countries to monitor the application of the Rule of 500. It was only then that the bank decided to appraise the project. However, following objections received from both Syria and Iraq, Board consideration of the loan for the project was deferred. In March 1979, an official policy statement was endorsed in the Turkish Parliament that Turkey would observe the Rule of 500 during the construction, filling and operation of the Karakaya dam until such time as any large consumptive water use project on the Euphrates was implemented in any of the three riparian countries (Turkey, Iraq or Syria). The project, therefore, was reapraised in late 1979, and presented to the World Bank Board in May 1980.

Prior to approval of the bank's loan of US$ 120 million in May 1980, the Turkish Government had obtained bilateral credit from a group of Swiss banks in 1977/1978 for an amount equivalent to US $ 295 million to finance principally the supply of turbines and electrical equipment for Karakaya. Additional financing was also obtained from the European Invsetment Bank (ECU 85 million, equivalent to US $ 110 million) and from Italy (US $ 20 million). The total project cost was estimated at that time at the equivalent to US$ 1,160 million (excluding interest during construction), of which US $ 602 million would be foreign expenditure.

The stalemate in negotiations continued until the start of the construction of the Atatürk Dam.

Construction of the Urfa Tunnels and the Atatürk Dam

Parallel to Turkey's development efforts on the Euphrates and the Tigris Rivers, which constitute about one quarter of Turkey's total water potential and 27% of its energy generation capacity, the Euphrates and the Tigris became a bigger issue in Middle Eastern politics.

Construction of the Urfa Tunnels, which would irrigate 476,000 hectares of land with water drawn from The Atatürk Dam, had been started in 1977 and Turkey also initiated construction preparations for the Atatürk Dam in 1980. These developments marked a new phase in relations over water issues.

In accordance with the agreed minutes of the Turkish-Iraqi Joint Economic Committee meeting held in December 1980, a Joint Technical Committee (JTC) was established to negotiate water issues.

The mandate given to the JTC was defined as being to decide the methods and procedures which would lead to a definition of the reasonable and appropriate amount of water that each country needs from the both rivers.

The JTC helds its first and second meetings in 1982, with the participation of Turkey and Iraq. Syria did not take part in these meetings although invited by Turkey. In 1983, Syria also participated in the JTC and tri-partite meetings went on for seven years until the outbreak of war between Iraq and Kuwait in 1990.

The major discussion items on the agenda of the JTC were as follows:

- Exchange of hydrological and meteorological data and information in the Euphrates-Tigris Basin,

- Exchange of information about the progres achieved in construction of dams and irrigation schemes in the three riparian countries (several field trips were also organized),

• Discussions on the initial filling plans of the Karakaya and Atatürk Dams,

• Development of a methodology leading to definition of the reasonable and appropriate amount of water needed from the Euphrates and the Tigris Rivers,

With regard to data exchange, Turkey, as an upstream country, provided all the information including the operation rules of reservoirs in its territory for better water management in the Euphrates-Tigris Basin.

While the JTC continued to hold its sessions, a Joint Economic Committee meeting was held in 1987 with the participation of the Turkish and Syrian Prime Ministers. At this meeting, the parties agreed that *"until the final allocation of the waters of the Euphrates, Turkey would release 500 m^3 per second of water, as an annual average to the Syrian border and compensate for the deficit in the following month if any month's average falls below this specified quantity"*. Following this agreement, Syria and Iraq Signed a protocol to share the waters of the Euphrates 42% to 58%, respectively.

In the JTC, Turkey tried her best to formulate a mutually acceptable plan for the equitable utilization of the Euphrates and the Tigris Rivers. Having such an intention, Turkey in the fifth meeting of JTC on November 11, 1984 proposed a so called *"Three Staged Plan For Optimum, Equitable and Reasonable Utilization of The Transboundary Water Courses of The Euprates-Tigris Basin"*.

According to the plan, in the first stage the hydrological and meteorological data at certain gauging stations in the three countries would be exchanged, checked and verified. If needed, additional joint measures would be made. Available water quality data would also be exchanged and verified. By considering the comsumptive uses and evaporation losses from reservoirs, the natural (virgin) flow of the river at various points in the basin would be computed.

The second stage would be devoted to developing consensus on the irrigable land potential of the basin countries. As noted earlier, official figures given for irrigable land potential in Syria and Iraq, conflict with other sources and need to be clarified by joint studies.

The two stages concerning land and water resources inventory studies would be integrated into a master plan including water transfer projects from the Tigris to the Euphrates as a third stage. Based on this master plan, a simulation study could be worked out to develop water budget and allocation models.

With regard to the Turkish proposal of studying water transfer possibilities between the two rivers, Iraq and Syria argued that the Euphrates and Tigris should be evaluated separately, giving priority to the Euphrates. This approach rejects the water transfer possibility from the Tigris to the Euphrates in spite of very strong arguments in favour of such a transfer as discussed earlier.

Although, the JTC held several sessions to decide the procedure which would lead to the definition of the reasonable and appropriate amount of water that each country needs, a consensus could not be reached. Syria and Iraq also rejected the Three Staged Plan. It seems that such joint studies may disclose that certaion agricultural practices in the downstream riparians are inefficient and uneconomic and therefore their water needs can not be justified. Discontinuation of uneconomic practices for the sake of efficiency and rationality might be perceived by the concerned countries as a threat to their strategic priorities (e.g. food security) and as a violation of their sovereignty.

Undoubtedly, to develop and negotiate such a comprehensive plan for a water basin under conflict constitute a time-consuming and troublesome process. The problem was clearly outlined by Biswas (1983) *'... planning and negotiation between the United States and Canada over the Colombia River took 20 years, even though both had friendly relations and shared similar economic, political, cultural, social and religious conditions. All available evidence indicates the long gestation periods in the resolution of international river development agreements: such delays are norms rather than exceptions."* Similarly, the negotiations between the US and Mexico over the Colorado river took almost half a century starting in 1900 and ending with a treaty only in 1946. At the beginning, Mexico came to the table with a request for 3,600,000 acre feet (4,439 billion cubic meters) of water from the river.

Against this, the US as the upstream country, allocated an amount of water which corresponded only to 42% of the request made by the Mexico.

When the construction of the Atatürk Dam was completed and the time had come for initial filling of reservoir in 1990, an intensive worldwide campaign was launched. News items appearing in some media were completely baseless and far from the truth. Allegations were made that *'Turkey is Barring the Euphrates' Flows'* The most dramatic scenario was sketched in Newsweek (quoted by Tekelei, 1990):

"Officials in Syria ... do not believe the Turks will let the river return to normal flow... Shaker Bazoua, Director - general of Syrian's Al-Thawrah Dam, believes the Atatürk Dam will cut the Euphrates's flow by two-thirds ...: There is no longer a river, the Euphrates is dead ... In future the people will visit the Euphrates Valley and say, There used to be a river here."

These statements appear politically motivated and aimed at deepening the conflicts in the region and rivalries among the riparian states. Thus, the purely technical process of filling the reservoir was used as an excuse for conflict, although turkey had taken all precautions as detailed in the followng paragraphs in order not to cause any harm to Syria and Iraq.

The technical studies to fix the date of the impounding began 4 years in advance of the filling operation, taking into account of many factors such as the construction schedule, progress of construction activities, and long term river flow forecasts. All this was included on the agenda of the JTC and Syrian and Iraqi experts were fully informed about developments at every stage.

There are 3 diversion tunnels parallel to each other on the left bank of the Euphrates at the Atatürk Dam site. Two of them were closed in 1988 and 1989 respectively and these diversion tunnels were converted to bottom outlets, that is, the tunnels were equipped with gate facilities to release water downstream. In order to initiate impounding, closure of the last diversion tunnel was envisaged on the 13th of January 1990.

Closure should be performed at low-water levels for the technical reasons (e.g. to overcome uplift forces act on the stoplogs during the closure operation). On the other hand, at such low water levels the two bottom-outlets would not be operational to release water downstream unless the water head over the sill of the intake structure reached a certain level.

Filling the volume between the two water levels; the one at which closure was undertaken and the one at which bottom-outlets became operational, needed a period of 4 weeks (closure period). **During this short closure period, the amount of in-flow from the catchment area between the Atatürk Dam and the Syrian border reached 120 cubic meters per second.**

In order to minimize to the largest extent possible any adverse consequences for Syria and Iraq, Turkey decided to release a large amount of additional water, in advance, from reservoirs on the Euphrates from November 23, 1989 to January 13, 1990 (make-up period). During this make-up program, additional water delivered by Turkey was meant to be retained in the Tabqa Dam located only 70 km downstream from the border, so that this surplus water could be used in the closure period between January 13, and February 13, 1990.

The total amount of water which passed the Turkish-Syrian border was 3,468 BCM for the period of November 23, 1989 to January 13, 1990 (make-up period).

If one takes into account the make-up and closure period of 81 days starting November 23, 1989 till February 13, 1990, the average quantity of water passing the Turkish-Syrian border was 532 cubic meters per second. This is an amount higher than the usual virgin flow of the Euphrates at the border during the same period.

Moreover, the initial filling operation was undertaken during the period of minimum irrigation requirement in the riparian countries.

During the meeting of the JTC held in Damascus in November, 1989 before the impounding, the Turkish delegation gave very detailed information to Syria and Iraq about the impounding to the Atatürk Reservoir.

The main reason for going into such detail over the filling of the Atatürk Dam is that the issue is stil being abused. For example, in the book 'Water Wars' it is claimed that:

> *".....To show its ability to influence its neighbours, Turkey went out of its way to demonstrate the power conferred by ownership of water resources. The Turks did this peacefully and quite subtly, and have of course firmly denied that their action had any political overtones. Everyone else accepts that when the Turks stopped the flow of the Euphrates river for more than three weeks in January 1990, they were making a point". (Bullock and Darwish, 1993: p.30).*

Authors of this type of books set out to examine water issues but get lost in political interpretations by skipping concrete technical facts. In fact, such publications frequently fall into internal contradictions mainly because of their deep involvement in politics and their distance from hard facts. Natasha Beschorner who has a relatively sounder approach to the matter, notes in her book *'Water and Instability in Middle East'* that Syria and Iraq had found the one month closure period too long and asked for it to be shortened to 15 days. What has been shown here is that the operation was a technical not a political one, and what was disputed was only the length of the water with holding period.

After this brief history of the water relations of Turkey with Syria and Iraq, it may now be useful to take a look at Turkey's relations with its other neighbours on water issues.

Turkey's Water Relations with Non-Arab Neighbors

Professor Oral Sander states that in the moulding of a country's foreign policy, neighbors, together with the geographical loation of the country in question, play a role and there is a kind of correlation between the number of bordering countries and the attitudes and approaches towards foreign policy matters (Sander, 1993). Further, referring to the book *'The Statistics of Big Fights'* by Richardson, Sander adds that the same correlation is valid between the number of neighboring states and the possibilities of warfare that the country may face.

Turkey has borders with Greece, Bulgaria, the former Soviet Union or what is now the Commonwealth of Independent States (Azerbaijan and Armenia), Georgia, Iran, Iraq and Syria. As stated by Most and Starr (Sander, 1993):

"a nation that borders on a large number of other nations faces a particularly high risk that it may be threatened or attacked by at least some of its neighbors ... and confronts its neighbors with cuncertainty because it must protect and defend itself against many potential opponents ... Countries having many neighbors with differing compositions and orientations generally seek to reduce their insecurities by arming or making alliances."

Considering this, Turkey needs to assume an active role for the political and economic stability of the region. Looking beyond this point, Turkey has also made considerable efforts to cooperate with its neighbors in the field of transboundary and bordering waters. The following sections will give some concrete examples of these efforts.

Turkey's national boundaries with other states are formed, in many areas and regions, by rivers. In fact 22% of the total length of the boundaries of Turkey which is 2,753 kilometers are drawn by rivers. Table 7 shows Turkey's boundaries in terms of land boundaries and bordering rivers (or wet boundaries)

Since 22% of all boundaries are formed by rivers, Turkey has entered into many agreements and its success in negotiating agreements regarding the use of these rivers is noteworthy.

TABLE 7 : Land and Water Boundaries of Turkey

Neihboring Countries	Length of border with Turkey (kilometers)	Length of the river as it forms the boundary	Ratio of wet boundary to land boundary (%)
Syria	877	76	9
Former USSR (1)	610	243	40
Iran	474	20	4
Iraq	331	38	11
Bulgaria	269	50	19
Greece	212	188	89
Total	2753	615	22

Source: Bilen, Uskay; Comprehensive Water Resources Management Policies and Analysis and Turkish experience, World Bank International Workshop, 1991.
(1) Commonwealth of Independent States (CIS)

In 1927, Turkey and the Soviet Union signed a **Treaty on the Benefical Uses of Boundary Waters.** This treaty addressed the use of the Arpaçay and Aras rivers, the waters of which they agreed to utilize on a fifty-fifty basis. A Joint Water Commission was established to control the use fo waters. In 1973, the two governments signed an additional **Treaty on the Joint Construction of the Arpaçay (Ahuryan) Dam.** After extensive feasibility studies, the dam was built and since 1986 has been operated by the Joint Water Commission. Arpaçay Dam has an active storage capacity of 510 MCM. Half of the water of the dam is used by Armenia, the other half by Turkey for the irrigation of the Iğdır Plain.

The River Aras, after forming the boundary between Turkey and Armenia, flows into Iran and thus also constitutes a transboundary water. Hence, Turkey and Iran had talks over the use of the river and reached an agreement.

In a similar vein, Turkey and Greece after the Treaty of Lausanne, signed several protocols regarding the control and management of the Meriç (Maritsa) River which forms the boundary between Greek and Turkish Thrace. The River Maritsa originates in Bulgaria, enters Turkish

territory 20 kilometers to the north of Edirne and flows into the Aegean Sea near Enez after forming the boundary between Turkey and Greece for 180 kilometres. An agreement relating to the construction of flood control works on the River Maritsa was signed in Istanbul February 19, 1955. The Agreement provided for the construction of flood control works in accordance with a master plan. After this agreement, in order to determine joint measures to be taken against flooding of the river, Turkey and Greece in 1955 awarded a contract to the Harza Engineering Company to prepare the Master Plan of the Maritza Basin. According to the agreement, each Goverment would undertake construction and finance the works in its territory. The agreement also provided for a Permanent Maritsa River Committee to coordinate the program, settle disputes and make recommendations to governments. Some of the facilities envisaged by this Master Plan have been realized. However, since Bulgaria, as an upstream country had not taken part in this bilateral work, the plan did not include the part of the river in Burgaria. Projects undertaken by Bulgaria as an upstream state significantly reduces the water of the river, especially in summer. Also, pollution caused by nearby mining and industrial premises have had quite damaging effects on the quality of water.

Turkey now pumps the winter waters of the Maritsa to fill nearby dams (off-stream dams) and takes technical measures to provide water for summer months. Still, even these measures prove ineffective in very dry summers and Turkey had to buy water from Bulgaria. For example, in 1993, Turkey paid US 12 cents per cubic meter for 15,886,000 cubic meters of irrigation water.

In short, Turkey has always sought consensus with her neighbors, even with Greece and Armenia, who historically have had difficult relations with Turkey. Below, we shall deal with Turkey's efforts to cooperate with Syria and Iraq.

Turkey's Initiatives for Cooperation

Projects developed through the joint contributions of the countries concerned play an important role in the creation of an atmosphere of mutual trust and cooperation. Such projects stand out as concrete

indicators of cooperation. Hence, Turkey has so far proposed and implemented several projects with its neighbors in relation to the use of transboundary waters. The Arpaçay Dam built together with the Soviet Union during the reign of the cold war is a good example of such cooperation. Based on its experience in this field, Turkey proposed the following projects to Syria and Iraq.

The height of the Tishrin dam located to the north of the Tabqa Dam in Syria, presently under construction is limited to 20 meters. If the height is higher than 20 meters, the dam lake will extend over and beyond the Turkish border. On the Turkish side near the border, there is the Karkamış Dam. Construction of this dam had not yet started when a proposal to Syria was made. It was suggested to Syria in 1989 that instead of having two separate dams, the height of the dam to be built by Syria could well be raised to 40 meters, and that it would be more economical if the two countries shared the energy generated by this dam. However, Syria did not accept this proposal on the grounds that preparation of the feasibility studies for such an endeavour would take too much time and they would like to start right away with their own project. The Turkish side tried to convince Syria that the Joint Technical Committee could finish such studies and surveys in a rather short time and that Turkey has wide experience in the rapid completion of such projects. The efforts of Turkey proved futile and Syria insisted on continuing on its own.

After this futile attempt, Turkey came up with another proposal to build a dam jointly on the Tigris where it formed the boundary between Turkey and Syria. This proposal envisaged a project similar to the Arpaçay Dam on the Turkish-Armenian border built jointly during the cold war years. The water of the prospective dam on the Tigris would similarly be used for irrigation in the two countries.

Turkey already had experience and knowledge concerning the technical problems to be faced when handling joint projects on border waters. With its proposal to Syria, Turkey showed a wish to avoid such problems but without receiving any positive response from the Syrian side.

As has been explained in detail in the preceding sections, the Tigris has a considerable amount of surplus water even after the needs of all

parties are met. It is thus possible to divert the surplus water of the Tigris to the Euphrates. Based on this, Turkey's proposal for cooperation covered the joint design and construction of connection canals between the two rivers. This time, the party rejecting the Turkish proposal was Iraq.

Syria also opposed the Peace Pipeline Project which envisaged the transfer of water by pipes from the rivers Seyhan and Ceyhan, both of which are internal waters of Turkey, to those areas in the Middle East which suffered water shortages. Political responses to this project are addressed in the relevant sections of the book.

Thus we can summarize that Turkey's efforts at building confidence and an atmosphere of cooperation in the region have so far met no positive response.

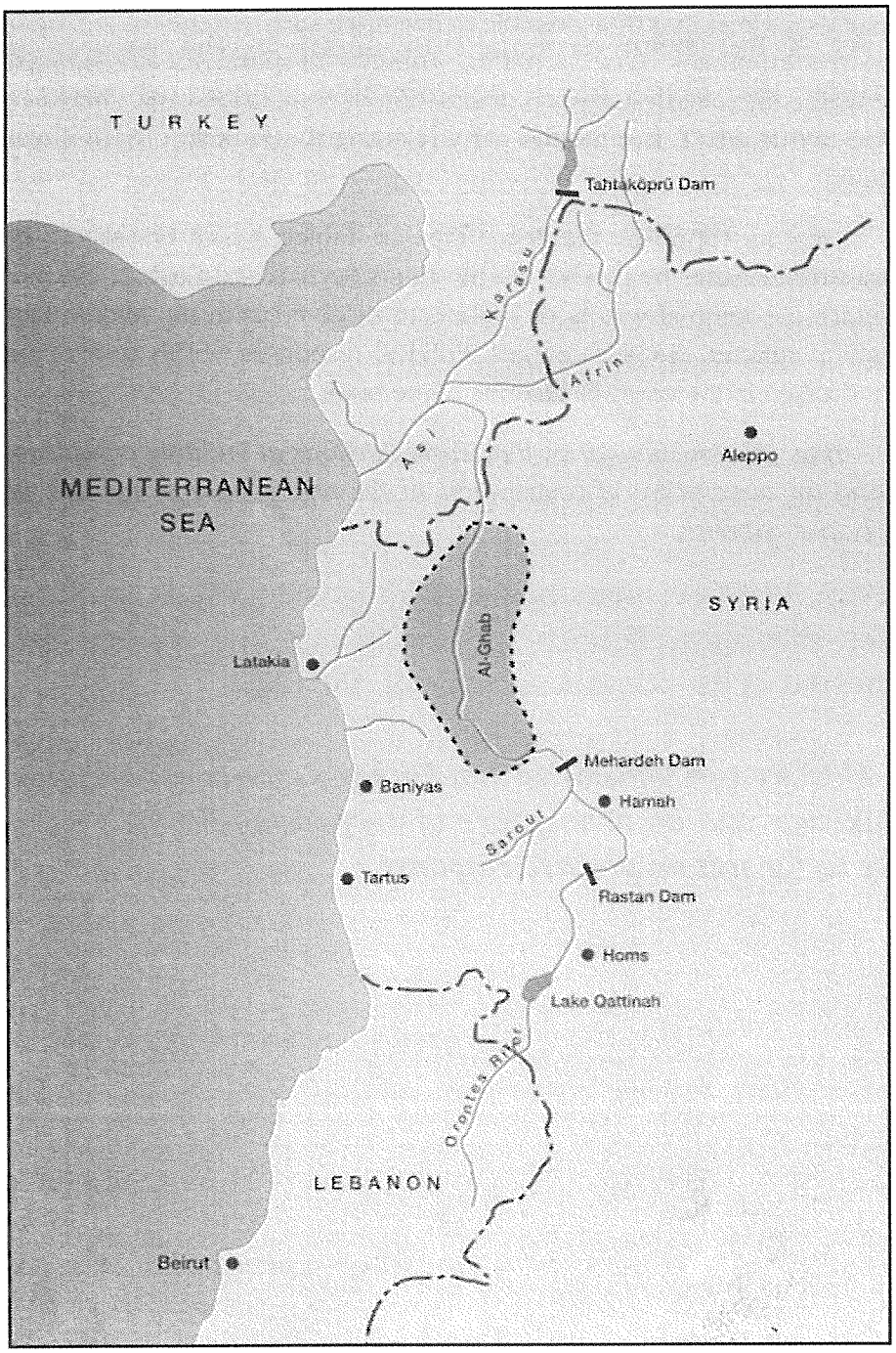

Figure 10: The Orontes River

The Orontes River

The Orontes is transboundary river that rises in the Bekaa Valley in Lebanon, under Syrian control, flows north through Syria, becomes the Turkish-Syrian frontier for about 31 km, and then swings west for about 90 km through Turkey before entering the sea. In Lebanon its length is about 40 km. In Syria, it enters Homs Lake about 16 km from the Lebanese border. The lake itself is some 16 km long. The Orontes traverses the Asharneh Plain for 24 km; then enters Ghap Valley which is over 48 km in length. From the lower end of the valley to the border is about 39 km. The river is augmented by a number of small tributaries and springs on its course through Syria. Immediately after Lake Homs is the Asharneh Irrigation Scheme covering 20,000 hectares of land (Naff, 1984, p.118). Another important irrigation facility on the Orontes is the Ghap Irrigation scheme which covers 140,000 hectares. The waters of the Orontes are regulated by Lake Homs, Rastan and Mehardeh Dams and consumed by irrigation facilities. Presently, there are initiatives to irrigate a new area of 30,000 hecares of reclaimed swamplands in the Ghap depression and new dams are under construction on the tributaries of the Orontes. In conclusion, almost all the waters of the Orontes, which has an annual capacity of 2.5 BCM, are exhausted by the aforementioned projects. The amount of water in the river drops as low as 3 m^3 per second in summer because of its use by Syria, and the river is presently facing a very serious pollution problem.

The water pollution problem in the Orontes River has also been acknowledged by Syrian expert Yahia Bakour, as follows: (Bakour, 1992).

"The environmental status of the major basins varies, ***The Orontes Basin is experiencing increased pollution hazards caused by fertilizer industries from nearby Homs Province, the Homs town sewerage system, and agricultural drainage.*** *In the Damascus Basin, The Barada River is seriously polluted during the summer when its flows are lowest. The waters of Yarmuk, Badia, and Tigris and* ***Khabour Basins and coastal area are clean,*** *and pollution is under control.* ***In the Euphrates Basin the water is clean, and***

agricultural drainage is the only source of pollution."*(emphasis added)"*

With an agreement enacted in 1994 between Lebanon and Syria, 80 MCM of the waters of the Orontes is allotted to Lebanon at the point where the river leaves Lebanon with an approximate capacity of 420 MCM. In other words, ony 19 % of the water coming from the territory of the Lebanon is allocated to the uper riparian country. In addition to this unjust allocation, various articles of the agreement include provisions stipulating the control and supervision of Syria. All these clearly reveal the political and military influence of Syria over Lebanon. This agreement aroused the reaction of the Lebanese public opinion which criticized the agreement in legal, technical and political terms, stressing that it was not enacted under free and equitable conditions (Samir, 1995, p.29). Another point which is important in terms of politics and the principles of international law is the fact that, in spite of being the third riparian to the Orontes, Turkey was never informed or asked for her opinion in regard to such an agreement. When Syria forced Lebanon into this agreement, it highlighted the urgent water needs of the cities of Hama and Homs (Samir, S., 1995). However, Turkey faces an even more serious problem in its Amik Plain.

Now, if we compare the position of Syria, totally ignoring the rules of international law and thus preventing irrigation in the Amik Plain of Turkey, to the attitude of the Turkey in relation to the Euphrates and the Tigris, the following points come to the fore:

- While Turkey leaves about half of the water of the Euphrates to downstream states in line with the 1987 protocol, Syria almost totally exhausts the waters of the Orontes without paying any heed to the needs of Turkey as a downstream state.

- Although Turkey has so far made many proposals to Syria and Iraq regarding the equitable and reasonable use of the waters of the Euphrates and the Tigris, Syria declines to enter into any negotiation with Turkey regarding the Orontes.

- Syria's ambitions include the creation of a 'Greater Syria' covering Lebanon and the Hatay Province of Turkey which is still shown as a part of Syria in maps circulating in that country.

Taking into consideration above mentioned points and, just for a moment, changing the present geography of the Middle East to locate Turkey as a downstream state in regard to the Euphrates and the Tigris, one can easily assess what kind of problems Turkey would have to confront.

Syria's stand against Turkey as an upstream riparian in the case of the Orontes is similar to its policy towards Jordan, an Arab State. In regard to the River Yarmuk which is the most important tributary of the Jordan River, Syria is an upstream state relative to Jordan and Israel as it is to Turkey on the Orontes. An examination of its approach to the use of the waters of the Yarmuk will throw some light upon the contradictory policies of Syria as both a downstream and upstream state.

The main trunk of the Yarmuk forms a boundary between Syria and Jordan for 40 km before it becomes the border between Jordan and Israel and it joints with the Jordan River 10 km below Lake Tiberias. The Yarmuk contributes 500 MCM per year to the River Jordan. After pointing out that Syria was largely consuming the waters of the Yarmuk, Elias Salameh from the University of Jordan, and Abu Taleb clearly outlined the attitude of Syria as follows: (Salameh and Taleb, 1991)

"After considering the hydrology of the river system and the socio-economic and land use factors in the three riparians of the Yarmuk River, it becomes clear that Jordan is suffering the most from the current impasse concerning further development of the river. Its food production, labor employment, and food exports depend crucially upon the river water, which constitute only 40% of its share, according to the Johnston plan. Initial development plans in the valley dating back to the fifties and sixties were planned and implemented on the basis of allocations specified by the Johnston Plan.

...At present, Syria extracts more than the share specified by the Jonhston Plan, and uses most of the water for irrigation in the highlands, which already receive an average annual precipitation exceeding 450 mm. This amount of precipitation is enough to support field crops, fruit trees and even summer crops. Also, the irrigated areas along teh Yarmuk River are very small and lie in very awkward terrain, thus depriving the necessary feasibility from teh whole activity.

Moreover, Syria is relatively rich in water resources and the Yarmuk does not represent a vital or important source for the future.

"Israel's case is similar in many ways. The country extracts some 100 MCM/year from the Yarmuk although its share of the occupied Yarmuk Triangle is only 25 MCM/year. An Additional 45 MCM of water is pumped to Lake Tiberias in the winter months to supplement the sources used for domestic and irrigation purposes outside the Jordan and Yarmuk catchments. In all, the Yarmuk contributes approximately 4% to Israel's requirements. This relative lack of dependence upon the Yarmuk as a water source is dramatized by the fact that part of Lake Tiberias' water is used to irrigate areas in the Negev Desert in the South, through the national water carrier and its regional water supply schemes"

As a country which frequently talks about solidarity among the Arabs, this policy of Syria as described by Arab experts is important in two respects:

- As it does in the case of the Euphrates, Syria pushes its water requirements up by allocating water to its unirrigable lands. This point was touched upon before when dealing with data on the land resources of the country.

- As an upstream state, Syria adopts a very deaf attitude towards the justified demands of the downstream countries.

In sum, the following saying can be used to summarize the policy adopted by Syria:

Mine is mine, but yours is negotiable.

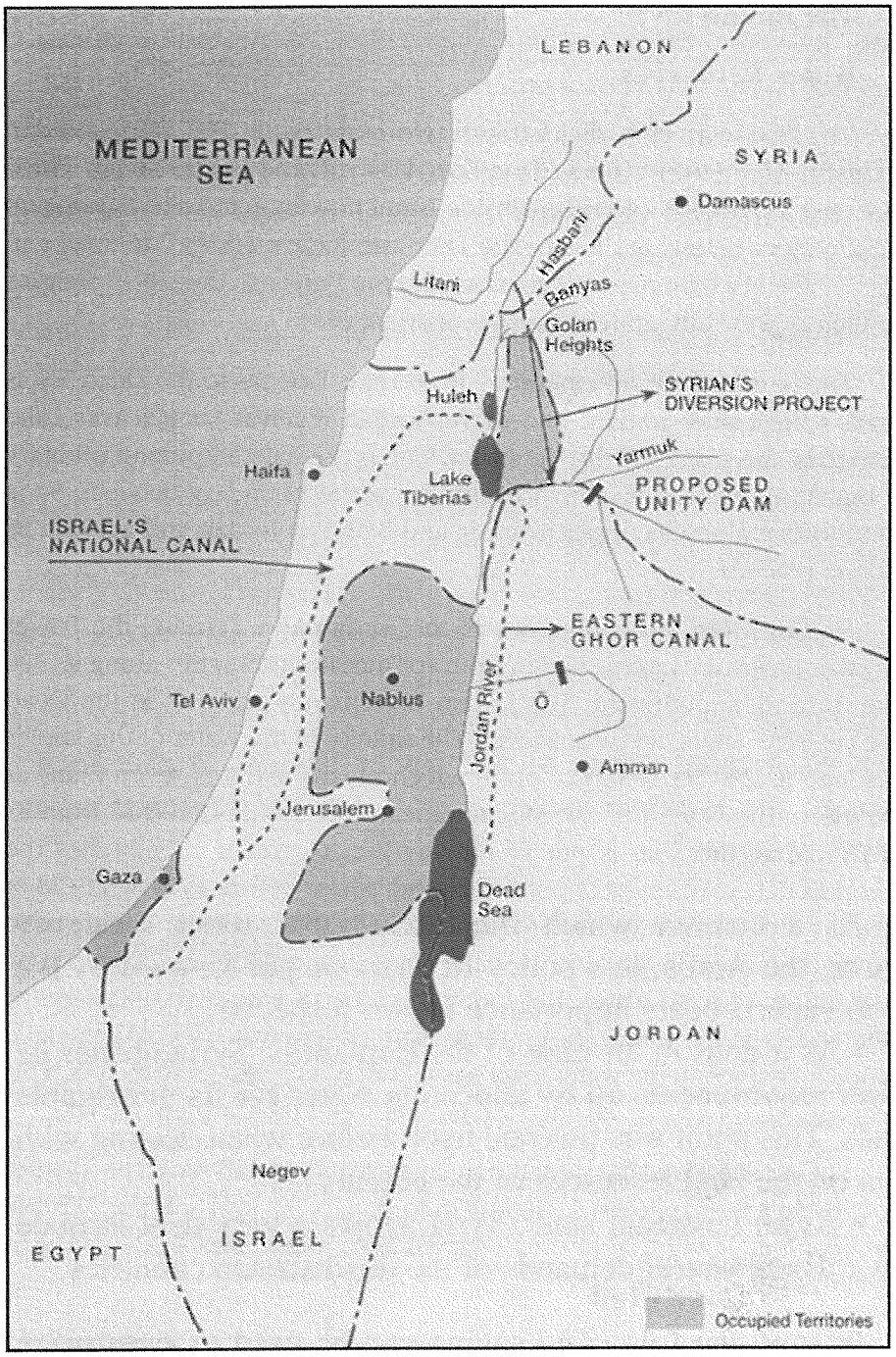

Figure 11: Water Resources Development Projects on the Jordan River.

The Jordan River

Water Resources

The Jordan river is divided into two main parts. The Upper Jordan consists of the headwaters of the Dan, Hasbani and Banias Rivers which meet at a point six kilometers inside Israel flowing into Lake Tiberias, at 210 meters below sea level. The Dan, the largest spring, originates in Israel, the Hasbani rises in Lebanon, and the Banias in the Golan Heights which is presently under Israel occupation.

The part of the river extending from Lake Tiberias to the Dead Sea is called the Lower Jordan. The Lower Jordan receives, as it leaves Lake Tiberias, the waters of the Yarmuk which is the most important tributary originating from Syria. The Yarmuk forms the boundary between Syria and Jordan along its upper reaches, and between Jordan and Israel in its lower reaches.

Starting from the confluence of the Jordan and Yarmuk, the Lower Jordan picks up waters coming from springs and tributaries along its 320 km meander southward. The Jordan River finally ends up in the Dead Sea at 395 meters below sea level. The salinity of the water of this lake is as high as 250,000-300,000 ppm, which means that it is seven times as saline as the waters of the Mediterranean. As can be depicted from its very name, the lake is not fit for any life. However it embodies the world's richest reserves of potassium and borax. Before 1950, 1.3 BCM of fresh water on average used to flow annually to the lake, and there used to be no change in the level of water since evaporation was balanced by the inflow of fresh water. But today, because of extensive utilization of the waters of the Jordan River, there is much less water feeding the lake and consequently the water level has fallen by as much as 10 meters. This change has, of course, affected the ground water table around the lake.

The Jordan River has a total drainage area of 18,140 km^2. The sharing of this area is as follows: 7,216 km^2 in Jordan, 6,445 km^2 in Syria, 712 km^2 in Lebanon, 1,842 km^2 in the occupied West Bank, and 1,925 km^2 is in Israel as it was before 1967.

The contributions of the streams mentioned above to the Jordan river are given in Table 8.

TABLE 8 : Natural Flow of the Jordan River

Stream contributing to the Jordan river	Average annual Flow (MCM)
Dan	245
Hasbani	138
Banias	121
Yarmuk	500
Intermittent Tributaries and Spring Waters	350
Total	1354

Source: Tabulated by the author using information given by Naff, T. (1984)

The Jonhston Plan and Water Allocation Among the Riparian States

The Jordan Basin is shared by Israel, the Palestinian Administration (West Bank and Gaza), Syria and Lebanon.

The River Jordan is the only surface water resource available for Jordan, Israel and Palestine and they are completely dependent on this river plus the ground water reserves existing in the west bank and the coastal area. Compared to these countries, Syria and Lebanon have large water resources.

Starting from the times when Syria, Palestine and Lebanon were in the Ottoman Empire, various plans were developed for the use of the Jordan River and its tributaries. The table 9 below lists major surveys and plans.

TABLE 9 : Plans Developed for The Use of the Jordan River

Year	Plans Proposed	States or Organizations Undertaking the Project
1913	Franghia	Ottoman Empire
1922	Mavromatis	England
1928	Hengiques	England
1939	Ionides Survey	Jordan
1944	Lowdermilk	USA
1950	Mac Donald Report	Jordan
1951	Israel Plan	Israel
1952	Bunger Plan	Jordan/USA
1953	Main Plan	USA
1953	Israeli Seven Year Plan	Israel
1954	Cotton Plan	Israel
1954	Arab Plan	Technical Committee of the Arab League
1955	Baker-Harza Plan	Jordan
1956	Israel's National Water Plan	Israel
1964	Jordan Headwaters Diversion	Arab League

Source: Naff and Matson (1984)

It is not the intention of this section to discuss all these historical hydro-development programmes for the River Jordan. For detailed information about the historical background with regard to hydro-development, the reader is advised to refer to other sources, (e.g. Naff, 1984 and Wolf, 1995).

Nevertheless, among these historical developments, an overview of the Johnston Plan which was accepted by the technical committees from both Arab and Israel, is of significance. After the frontiers of the new state had been defined in the war of 1948, each country began to develop its own water resources unilaterally. From the 1950s, water problems in the region escalated and became a priority on the agendas of various international organizations. Following these developments, The US Government then moved toward deeper involvement. In 1953, President Eisenhower appointed Eric Johnston as a special ambassador to mediate an integrated water resources development plan for the Jordan River Basin. Although the prepared document could not acquire political

status, it is interesting to have look at the bargaining issues during the negotiationg process that resulted in the plan.

The major bargaining issues pertained to (Naff, 1984):

- Water use quotas of the riparian states,
- Use of the Lake Tiberias as a water storing facility,
- Transfer of the waters of the Jordan River out of its basin.
- Use of the Litani River as a part of the system,
- Points related to international supervision and guarantees.

At different stages of the negotiations covering the period from 1953 to 1955, many plans reflecting the approaches of all parties involved were developed (See Table 9).

In the first round of the negotiations, the US State Department and Special Envoy Johnston proposed a main plan covering the disputed issues outlined above and soliciting the views of the Arabs and Israel regarding such a plan. The aim was to crystallize different views first and then to seek a consensus.

Technical work relating to the main plan was carried out by American experts under the supervision of the Tennessee Valley Authority (TVA), one of the largest water organizations of the United States. As a result, the water-use quotas of individual countries were determined and various hydro-development facilities on the Jordan River and its tributaries were studied. The US State Department and the special envoy to Eisenhower occasionally took part in technical works as observers in order to understand the political aproaches of the parties involved. Construction works included in the main plan were as follows:

- Several multi-purpose dams for irrigation and energy production on the Hasbani, Dan and Banias River, and tributaries of the Upper Jordan,
- Drainage of the Huleh swamp area,
- Canstruction of a 175 MCM capacity dam on the Yarmuk,

• Diversion structures on the River Yarmuk for the porpose of water diversion to the Lake Tiberias and the Eastern Ghor Canal,

• Using Lake Tiberias as a storage reservoir by closing its main outlet,

• Irrigation schemes on the right and left banks of the Jordan River,

• Irrigation by dams to be built on the Intermittent Tributaries of the Lower Jordan River.

On the condition that the above mentioned constructions materialized, the Main Plan allocated, as a first approach, 394 MCM of water to Israel, 774 MCM to Jordan, and 45 MCM to Syria. The Main Plan favored primary in basin use of the Jordan waters and ruled out integration of the Litani. These provisional quotas were objected to by both the Arabs and Israel.

In its objection, Isarel demanded to transfer water in Lake Tiberias to the Mediterranean Coast and the Negev, and to increase its quota to 800 MCM by considering the Litani and Jordan Rivers together.

The Litani originates in Lebanon and flows to the sea also in the same country. Thus it is a national, not a transboundary water and it is contrary to the principles of international law to connect this stream to the Jordan River without the consent of Lebanon. In spite of this, the aim was to raise the water quotas of both parties by taking the combined water potential of the two rivers.

When the Turkish proposal for considering the combined water potential of the Euphrates and the Tigris is compared to that related to the combination of the Litani and Jordan Rivers, the following points can be noted:

• Both the Euphrates and the Tigris are transboundary waters. It is possible, in terms of international law, to transfer the surplus waters of the Tigris to the Euphrates.

• The economic and technical feasibility of joining these two rivers had already been addressed.

The proposal put forward by Israel as an alternative to the Main Plan was elaborated in the 'Cotton Plan of 1954'. The Arab response to the

Main Plan was declared also in 1954. In their plan, the Arabs in principle rejected the system of quota allocation since 77 percent of all waters involved in the main plan originated in Arab countries (Naff and Matson, 1984 p. 40). The Arab alternative further insisted thet the annual allocation of 400 MCM to Israel should be reduced to 200 MCM.

As Syria presently insists on the quota allocation of the waters of the Euphrates 90% of which originate in Turkey, it is striking to observe the difference between what Syria stands for today and what it did 40 years ago.

As negotiations went on, Israel abandoned its demand to join the Litani with the Jordan River while the Arabs dropped their objection to the use of the waters of the Jordan in areas out of the river basin. However, they did not accept the storage of the waters of the Yarmuk in Lake Tiberias. Syria and Jordan argued that Lake Tiberias should be considered as a regional source and tabled a proposal for its common use. This proposal was rejected by Israel. Israel also rejected the Arab proposal entailing international supervision over water uses.

After reaching an overall consensus on technical issues, a very difficult process of negotiation started on the allocation of water. When the option of joining the Litani in Lebanon to the Jordan river was dropped, Israel withdrew its claim for a quota increase from 400 to 800 MCM.

A new plan was then formulated along the principal lines of the Main Plan. According to this plan, known as the 'Unified Johnston Plan', Israel, Jordan and Syria were allocated, respectively 400, 720 and 132 MCM of water annually. The plan was accepted on technical terms by experts of these three countries. The Israel Government endorsed this new plan, but it was not accepted by the political authorities of the Arab countries and thus could not gain the status of a political document.

Although the final plan was agreed to by Arab technical experts, it received the most vehement objection from Syria. Three years later, Ambassador Johnston summarized his frustrating experience in an article for The New York Times Magazine (Gruen, 1994):

"...After two years of discussion, the technical experts of Israel, Jordan, Lebanon and Syria agreed upon every important detail of a unified Jordan plan. But in October 1955... Syria objected to the projcet because it would benefit Israel as well as Arab countries."

Eventually, the use of the Jordan River by its riparian sates was shaped according to the *de facto* situation created by Israel through its military occupation of certain aras. The current uses are quite different from what had been envisaged by the Unified (Johnston) Plan, as given in the comparative analysis of Table 10.

TABLE 10 : Water Allocations to Riparians of the Jordan River System

	Water Allocation According to the Unified (Johnston) Plan (MCM)			Current Use Levels in 1990 (MCM)		
	Jordan	Yarmuk	Total	Jordan	Yarmuk	Total
Jordan	343	377	720	243	120	363
Syria	42	90	132	0	170	170
Israel	375	25	400	540	100	640
Lebanon	35	0	35	0	0	0
Total	795	492	1287	783	390	1173

Source: Figures of the Unified (Johnston) Plan are quoted from (Naff and Matson, 1984, p.42). Current Use Levels in 1990 are quoted from Salameh, 1991, p.38.

According to Table 8, prepared by the author based on figures given by Prof. T. Naff, the total natural flow (virgin flow) of the Jordan River which includes the upper and the lower River Jordan is 1,354 MCM. On the other hand, the total natural flow of the Jordan was assumed as 1,287 MCM by the Johnston Unified Plan. Considering the time lapse in between, this difference should be regarded as within reasonable limits.

As shown in Table 10, Israel extracts some 100 MCM/year from the Yarmuk, although its share of the occupied Yarmuk Triangle is only 25 MCM/year. According to the plan, Jordan's share from the Yarmuk was to be 377 MCM/year of which 100 MCM/year was to be stored in the Lake Tiberias. However, Jordan only uses 120 MCM/year of this flow due to the other riparians using more than the planned allocation, and because Jordan does not receive any of the 100 MCM/year potentially stored for

it in Lake Tiberias (Taleb M.; Deason J., Salameh, E., 1991). On the other hand, Israel uses 640 MCM of water from the Jordan and Yarmuk which is 240 MCM higher than envisaged in the Unified Plan.

Projects on the Jordan River

Lake Tiberias is the main surface water source for Israel and the 390 MCM of water pumped annually from this lake up 360 meters is diverted to the National Water Canal which constitutes the vital 'blood vessel' of this country. Water needs of the settlement units and arable lands along the coast are met from this Canal which has a length of 110 kilometers (Israel Water Sector Review, 1990).

Starting from the end point of this canal, water is carried to the inner parts of the Negev Desert in two pipelines each having a length of about 95 kilometers. In Israel, including the land around Lake Tiberias, the coast and the Negev, 215,000 hectars of land is irrigated. The National Water Canal system of Israel is 205 kilometers long in total starting from Lake Tiberias. The canal is also fed by ground water in cerntain areas and about one seventh of all electricity generated in Israel is used for the pumping facilities operatign along this canal. A substantial amount of the water in the upper reaches of the Jordan River is stored in Lake Tiberias and the amount of water released from the lake is very limited.

The Yarmuk has an average annual water potential of 500 MCM. Out of this 170 MCM/year is used by Syria, 100 MCM/year is diverted to Lake Tiberias by Israel and 120 MCM to the East Gor Canal by Jordan. In addition to water diverted to the Gor Canal, about 250 MCM of water flowing directly into the Lower Jordan is regulated by several dams and used for the irrigation of 31,000 hectares of land in the Jordan Valley (Salameh, 1991 p. 12).

The Magarin dam, intended to regulate the flow of the Yarmuk and thus augment the potential of usable water, has been an issue in the region since 1950. However, Syria, Jordan and Israel have so far failed to reach a tripartite agreement on the use of water to be regulated by this dam. Furthermore, Syria's extensive use of water that would feed the prospective dam without observing the rights of Jordan has, to a large extent, undermined the economic viability of such a project. We have already presented the complaints of Jordanian experts on this matter.

Ground Water Resources and Related Problems

Israel

One of the most important shortcomings of the Johston Plan was its exclusion of the existing ground water resources of the region.

Israel's total water resources amount to 1 billion 600 million cubic meters (Israel Water Sector Review, 1990). Of this total, 640 MCM is secured from the Jordan River (Table 10) and 960 MCM from ground water sources. In other words, ground and surface waters have respective shares of 60% and 40% in the total water supply of Israel. All these sources have currently been developed.

In Israel, there are two areas with considerable ground water sources and one of these aquifers extends over a strip which is 120 kilometers long and 15 kilometers wide along the Mediterranean coast including the Gaza Strip. This aquifer is also known as the 'coastal aquifer'. The other one is on the West Bank. The West Bank aquifer is divided into three, namely the mountainous aquifer, eastern aquifer and northern aquifer. One of the most important reasons behind the occupation of the West Bank by Israel is the rich ground water reserves of this area (Figure 10). (The term aquifer is used to denote underground layers containing water).

The coastal aquifer is fed by precipitation falling on the western slopes of the mountain range parallel to the coastal zone. The coastal groundwater reserves have their source in the west bank and that is why Israel has substantially limited the ground water use by Palestanians living in this area.

The distribution of ground water reserves in the region is shown below (Israel Water Sector Review, 1990):

Mediterranean Coast	**360 MCM**
Gaza Strip	60 MCM
Other Areas	300 MCM
West Bank	**600 MCM**
Mountainous Areas	300 MCM
Eastern Aquifer	140 MCM
Northern Aquifer	160 MCM
Total Ground Water Resources in Israel and Palestine	**960 MCM**

Palestinians in the Gaza Strip and the West Bank are allowed to use about 170 MCM of ground water in a year. This amount corresponds to only 18% of the total capacity which can be used safely. Meanwhile, Israel uses 790 MCM/year.

The Gaza strip is about 360 square kilometers in area and the population has been estimated to be 700,000 as of the year 1992. The population density of the Gaza area is about 2,000 persons per km^2. Thus Gaza is among the most densely populated areas of the world and there is a very serious water shortage. Although, the safe-yield of the groundwater in the Gaza strip is 60 MCM annualy, presently 100 MCM of water is drawn. This results in large drops in ground water levels, and water quality has been degraded because of sea water intrusion.

Jordan

Jordan has an annually renewable ground water potential of 385 MCM. Jordan also has in its border region with Saudi Arabia non-renewable fossil water reserves which will be exhausted after a while depending upon the volume of use. The Disi ground water is the most important fossil water reserve having a usable period of 50 years at an annual utilization of 125 MCM (Bilbeisi, 1991, p. 13).

The Disi Aquifer supplies water to the Gulf of Aqaba, and it is planned to meet partly the water need of Amman also from this aquifer.

The layer containing ground water in Disi extends into Saudi territory. At Tabuk which is 50 kilometers from the border with Jordan, Saudi Arabia has since 1983 been drawing 25 MCM of water annually for irrigation purposes. In recent years the amount of water drawn each year has been raised to 250 MCM. With this excessive rate of withdrawal, the reserve is foresen to be exhausted not in 50 but in 25 years. This is of special importance for Jordan and it also constitutes a striking example of the contradictory attitudes of the Arabs in regard to the utilization of natural resources.

Population Growth in the Region

Before examining per capita water availability projections for each country sharing the Jordan Basin, demographic changes in the region

over the next 30 years which could dramatically affect issues of water distribution and usage, should be evaluated.

At the outset of the First World War, it is estimated that 80,000 Jews and 650,000 Arabs lived in Jordan, Israel, the West Bank and in Gaza. In 1990, on the other hand, Israel had a population of 4.6 million (Wolf, 1992) and Jordan 3.3 million (Taleb, Deason and Salameh, 1991). No population census has been conducted in Palestine during the last 25 years. Therefore, population and demographic information for the regions comprising the State of Palestine are often based on official Israeli statistics. The population of Palestinian Arabs now living in the West Bank and the Gaza Strip under the Autonomous Palestine Administration is estimated approximately at 2,265,000 by Abdulhadi (1992) as of 1990.

If one takes 1990 as the base year and tries to forecast population over 30 years up to 2020, it will be immediately seen that further Jewish immigration to Israel and the policies adopted by the Israeli governments on this issue have great importance for the future of the region.

Prof. Hillel H. Shuval from the Hebrew University in Jerusalem outlines the approach adopted by Israel as its national policy as follows (Shuval, 1992, p.9):

"Palestinian calls for the ending of immigration to Israel from Russia and other countries for various reasons, such as not to increase the burden on the limited water resources of the area, is seen as unacceptable interference in Israel's national affairs. Israel views unrestricted immigration of Jewish refugees as the foundation stone and raison d'être of the country and any demand to restrict immigration is seen as inadmissible."

It is predicted that 2 million more will immigrate to Israel up to 2020 and the population of the country will reach 9.3 million. Israel has a relatively low natural population growth rate compared to its Arabian neighbours and it tries to cover this gap by immigration.

Table 11 below is based on population growth rates of 3.4% for Palestine (West Bank and Gaza), 3.5% for Jordan and 1.6% for Israel, given by A. Wolf. Population forecasts made by the US Army Corps of Engineers is used for Lebanon and Syria.

Because of wars, a part of the population of Palestine has moved to other Arab countries from the West Bank and Gaza Strip. Therefore, the 1946 population estimate for Palestine and figures given for 1990 are close to each other. Since there is no estimate of the number of Palestinians living in other Arab states, the present population of the West Bank and the Gaza Strip was taken as a basis.

TABLE 11 : Population Projections of the Riparian Countries of the Jordan Basin

	1914 (1)	1946 (1)	1990	2020
Israel	80,000	678,000	4,600,000	9,300,000
Jordan			3,300,000	9,200,000
Palestine	650,000	1,269,000	2,265,000	6,183,000
Lebanon	-	-	3,000,000	4,300,000
Syria	-	-	12,116,000	26,094,000

(1) Peter, M., "History of the Middle East", 1991, (pp. 160, 235)

Balance in Water Supply and Demand

The combined surface and ground jater potentials of Israel, Jordan and the Autonomous Palestine Administration are summarized below (Table 12).

TABLE 12 : Water Supply of Israel, Jordan and Palestine

Country	Water Supply MCM/year
Israel (1)	1600
Jordan (2)	860
Palestine (West Bank and the Gaze Strip) (3)	170
Total	2630

(1,3) Wolf, A. (1992)
(2) Salameh (1991)

Average annual per capita water is shown below in Table 13 with respect to individual countries:

TABLE 13 : Per Capita Water Supply in the Countries of the Jordan Basin

	Population		Water Resources (MCM)	Amount of water supply (m3/person/year)	
	1990	2020		1990	2020
Israel	4,600,000	9,300,000	1600	348	172
Jordan	3,300,000	9,200,000	860	261	93
Palestine	2,265,000	6,183,000	170	75	27
Syria (1)	12,116,000	26,094,000	19833	1637	760
Lebanon (2)	3,000,000	4,300,000	3200	1067	744

(1) Population and water resources in Syria are given on pages 95 and 97
(2) The water resources of Lebanon are taken from Hakim, B., (1994).

Some experts argue that the minimum water requirement per person per year to meet basic human need is 125 cubic meters. This amount of water has been found to be generally adequate for the maintenance of a reasonable hygienic level and high standard of living based on employment in the urban/industrial sector (Shuval, 1992). •

However, this figure excludes the water needs of agriculture and industry. According to Israeli experts, additional water for agriculture and/or other industrial or urban non-potable uses can be made available through the recycling and reuse of some 65% of the water allocated for domestic, urban and industrial use. In other words, for the coming years use of new water for agriculture will be substituted with water recycled after personal consumption, and high quality water currently used for irrigation will be re-allocated to meet drinking water needs.

As shown in Table 13, in 2020 per capita water supply will drop to 172 m^3 in Israel, 93 m^3 in Jordan, and to 27 m^3 in Palestine. Taking into account the minimum water requirement to meet basic human needs as 125 m^3/person/year, the drinking and service water gap can be calculated as follows (by assuming that agricultural water needs are met by recycled water or by water brought in to the region):

Water Gap of Jordan in 2020 .....294 MCM

Water Gap of Palestine in 2020 ..... 606 MCM

Thus, the total drinking and service water gap of Jordan and the Palestine State is expected to reach 900 MCM in 2020. Technical measures proposed to cover this gap are analysed below. However, before going into such an anlysis, it is useful to touch upon the role of agriculture in the economy of Israel.

Comments on the Role of Agriculture in the Economy of Israel

As an industrialized and high-tech producing country with a per capita Gross National Product (GNP) reaching US $ 14,333 in 1995, Israel employs only 4.1% of its population in agriculture (UN, 1997). The share of agriculture in GNP is less than 5%. Although Israel has rather limited water resources, practices such as keeping the price of irrigation water much lower than its real cost and the application of irrigation to an area of 215,000 hectares which is much more that it really needs can be explained only by historically deep-rooted religious and ideological factors instead of ecomonic ones. Yet it could be a great contribution to the solution of water problems that the Autonomous Palestine Administration is presently facing if Israel allocated some of its irrigation water to the Palestinians.

Economists make interesting assessments with regard to the water pricing policy followed by Israel (Wishart, 1985). For example, Stauffer maintains that the annual cost of the 600-700 MCM of water that Israel draws from the upper Jordan and the West Bank varies between US $ 1.2 to 1.8 billion. Stauffer also points that *"the fact that agriculture makes up 70% of the total water use of Israel is an indicator of the ideological value assigned to this resource."* Stauffer further thinks that the economic value of agricultural water in Israel should be taken as zero because of large subsidies channelled to this sector. He notes, *"as a result of an ideological approach aiming to tie Jewish communities to the land, there emerges a quite high opportunitiy cost in water, meaning the cost of limiting the use of water in other sectors than agriculture."* Instead of drawing 600-700 MCM of water from the Upper Jordan each year,

Stauffer estimates that the cost of obtaining the same amount of water from sea water desalinization would also vary between US $ 1.2 and 1.8 billion annually.

The generous support received by agriculture leads to conflicting views also in Israel. Water is an input which appears in different economic sectors and has a varying value in each of these sectors. David Wishart claims that a shift of the water resources used in agriculture to industry and the services sector would secure a larger GNP for this country.

As can be seen from what has been said so far, conditions prevailing in the Jordan Basin are completely different from those in the Euphrates-Tigris Basin. Examining these differences in terms of political, social and technical dimensions, the following points can be made:

• Within the last 40 years, 4 major wars have broken out in the Jordan Basin between Israel and the Arabs, and the state borders are still not finalised. Israel has preferred to look for military solutions in order to get a higher share of the water resources of the region (Hydraulic Imperative Hypothesis). In contract, the political boundaries of Turkey, Syria and Iraq became fixed first with the Lausanne Treaty in 1923 and then with the Hatay Treaty in 1939.

• To create a new state by returning back to the 'promised land'claimed to be the homeland of Israel has been an expectation transferred from generation to generation of jews. Ideological approaches to this theme led to the assignment of great importance to agriculture (Ideological Imperative Hypothesis).

• Assuming a partial shift of water now used for agriculture to the industry and drinking water sector, an increase is expected in the GNP of Israel. However, the ideological value of water as explained above makes such a shift impossible in the near future and this fact further aggravates the problems existing in the region.

In conclusion, the Arab-Israeli conflict embodies many socio-economic issues other than water which have considerably affected the hydropolitics of the Jordan Basin.

Covering the Water Supply Deficit

Parallel to the growing water shortage in the Middle East, discussions on various technical measures have intensified. However, it is obvious that physical developments only aiming to increase available fresh water supply will not suffice to solve water problems induced by population growth, rapid urbanization and environmental degradation. Hence, it is essential to have each country in the region design judicial and institutional measures and develop strategies to ensure the most efficient use of its water resources.

Since almost all renewable fresh water resources in the Jordan Basin including surface and groundwater have been utilized to the limits of sustainable yield, the region has already come to the end of the age of dependence upon natural fresh water resorces. Therefore, non-conventional water alternatives are becoming imperative. These alternatives are as follows:

- Desalination of sea and brackish water,
- Waste-water reclamation and reuse,
- Internbasin water transfers,
- Large-scale water transport systems utilizing barges and boats.

Among these, desalination and reuse of treated waste water is of great importance. Sewage treatment plants should be constructed to protect water resources from contamination and to be a main source of water recovery for the near future. Meanwhile, desalinisation projects should be initiated for the twenty-first century.

Initial investment and operation costs of the above listed facilities are often high. However, it is possible to overcome this difficulty with international cooperation and through the contribution of industrialized countries.

Below is a discussion of several projects either implemented or at the stage of planning in the region. Institutional and legal measures governing the demand side will be addressed in Part IV.

Sea Water Desalination

There is no doubt that the main source of water in the future will be desalinated sea water, but not before every drop of fresh water has been exploited for drinking purposes and every drop of reclaimed sewage has been treated to the standard for unrestricted use in agriculture. The technologies for the desalination of sea water have been widely used by the oil rich countries of the Middle East. According to 1992 data, the total capacity of the world's desalination facilities is 15.6 MCM a day (5.7 BCM on a yearly basis). The shares of individual countries in this total capacity are as follows: Saudi Arabia (24.4%), the United Arab Emirates (10.6%), Kuwait (9.1%), the USA (15.2%), Japan (4.1%), and several other countries (36.1%) (Worldwide Desalination Research and Technology Survey, 1994).

Desalination technology today falls into two categories which can be broadly defined as Thermal processes and Non-Thermal processes (e.g Reverse Osmosis-RO).

Thermal processes involve the use of energy. When water boils only the pure water turns to steam; the salt in the sea water remains behind in an increasingly saline brine.

Non-thermal processes involve pushing saline water at high pressures throigh selectively permeable membranes which are designed to remove salts. Because of the higher energy requirements of thermal processes, RO processes have become the technology of choice worldwide.

Because of the high energy consumption, desalination facilities cannot be afforded in large capacity in countries other than the oil-rich ones in the Middle East under present conditions. For example, in Israel as a wealthy and high-tech country, only 4 MCM of water could be treated annually by 33 separate units located in 2 different areas. This amount corresponds to 0.2% of the total water consumption of Israel.

There were initiatives after the 1967 war to construct nuclear energy-based water desalination facilities on the Mediterranean in Israel and Egypt, and on the Gulf of Aqaba in Jordan. However, these initiatives proved futile. At the beginning, the total annual desalination capacity of these facilities was foreseen as 1,400 MCM, and the initial plan was supplemented later with a project to build another facilitiy in the Gaza

Strip. The goal of this initiative, in which the former US President Eisenhower took an active part in the second half of the 1960s, was to open up additional land for agriculture in ordar to have about one million Palestinian immigrants settle in the reclaimed new lands of the region. The investment costs of the power plant was estimated as US $ 1 billion at 1969 prices. The project would have been supervised by the International Commission for Nuclear Energy and implemented by a specially formed international partnership.

The technical committee composed of Arab, Israeli and American experts worked on the project from 1968 to 1973. But, as a result of a political decision stemming from both economic reasons and from the uneasiness of introducing nuclear energy to the region, the project was abandoned.

The cost of treating sea water and relatively less saline groundwater in the Middle East is given in Table 14.

TABLE 14 : Unit Cost of Desalination Alternatives in the Middle East

Method of Desalination and the Source of Waterd	Cost Range ($/m3)	Mean Cost ($/m3)
MSF (1) (Sea Water)	1.07 - 3.00	1.87
MSF (brackish)	0.53 - 2.13	1.33
RO (2) (Sea Water)	1.60 - 2.67	2.13
RO (brackish)	0.27 - 1.60	0.93

Source: U.S. Army Corps of Engineers, "Water in the Sand: A Survey of Middle East Water issues", (1991)
(1) Multi Stage Flash System
(2) Reverse Osmosis

One of the factors which determine the cost of water desalination is the level of salinity. For example, the salinity of the water of the Red Sea is much higher than that of the Gulf. This fact alone makes any desalination of the Red Sea water considerably more costly.

Because of its high costs, it seems impossible for the time being to use desalinated water extensively for irrigation purposes. Yet, there are intensive efforts going on to develop cheaper technologies for desalination.

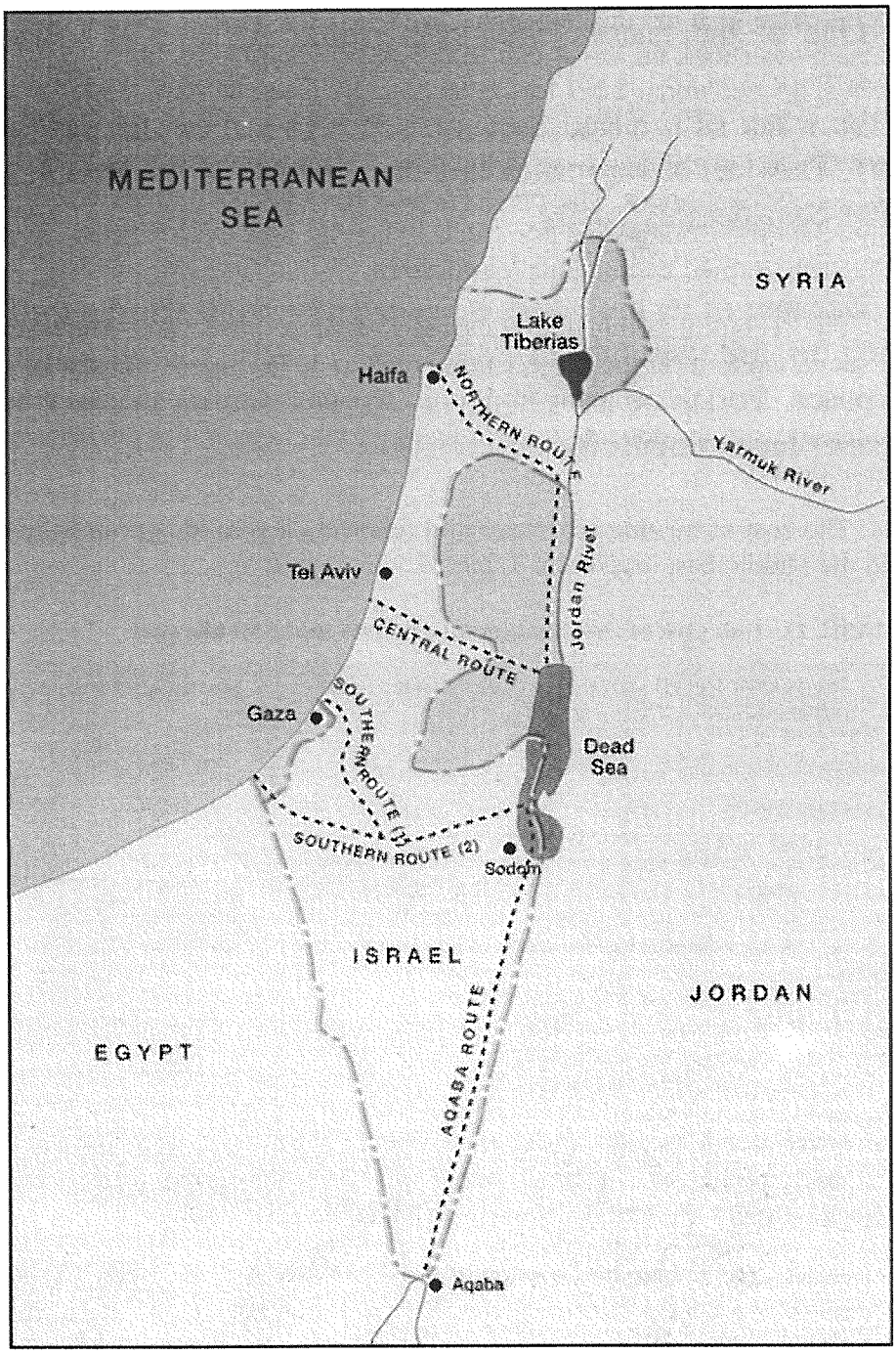

Figure 12 : Options for Connecting the Dead Sea to the Mediterranean and the Red Sea.
Soruce : Murakami, M., Musiake, K. (1994)

Connection of the Dead Sea to the Mediterranean and The Red Sea

The high energy requirement of desalination facilities led to a search for new projects to provide energy. We have already stated that initiatives to construct nuclear energy plants proved unsuccessful.

In this context, the plan to link the Dead Sea to the Mediterranean and/or Red Sea would exploit the 400 m elevation difference between them to generate hydropower. While generating energy, the salty sea water would flow by hydrostatic gravity pressure into desalination facilities located at the low point by the Dead Sea shore, operating under a reverse osmosis system. The hydrostatic gravity pressure exploited by the reverse osmosis method could save approximately 60% of the energy required by other desalination methods. Thus, the 400-meter drop into the Jordan Valley could provide not only hydropower generation, but also produce desalinated water. The project would involve water for fish ponds and recreation facilities along its route.

Studies related to the project were intensified in the late 1970's and rising oil costs encouraged Israel to investigate alternative energy sources. Later on the project became a multipurpose development scheme involving hydropower generation, production of desalinated water and recreation.

Options for Connection

Several alternative canal routes between the Mediterranean and Dead Sea (MDS) were studied, among these four alternatives were considered for further evaluation. (See Figure 12 and Table 15).

TABLE 15 : Options For Connecting The Dead Sea And the Gulf of Aquaba to the Mediterranean

Option	Entry-Exit	Length (km.)	Explanation
(a) Northern connection	Israel-West Bank	154	Unilateral plan by Israel
(b) Southern connect. (1) " " (2)	Gaza-Israel Israel-Israel	100 120	Israel-Jordan Plan Unilateral plan by Israel
(c) Central connection	Israel-West Bank	72	Unilateral plan by Israel
(d) Aqaba connection	Jordan-Jordan	175	Unilateral plan by Jordan

Source : Murakami, M., Musiake, K. (1994)

Among these four options, the central and southern connections seem to be the most appropriate ones in terms of cost and environmental impact.

The central connection has a length of 72 kilometers of which 57 kilometers consist of a tunnel with a diameter of 5 meters. 30 kilometers of this connection remain within Israeli territory while the remaining 42 kilometers pass through Israeli occupied territory (Autonomous Palestine). There is a need to construct an 80 kilometer long tunnel for the southern connection (2) which extends from the Gaza Strip to Ein-Bokek. However, since a part of this connection remains in Gaza where the Palestinians live, the Mediterranean inlet of the connection was shifted north for political reasons, to Israeli territory (Southeastern connection-1). The juncture point of all connections is the Dead Sea which is shared by Israel and Jordan.

Project Proposed by Israel

The annual energy production expected from the Southern Connection (1) which remains completely within the Israeli territory would be around 1.4-1.85 billion kWh (20% of the annual energy production of the Atatürk Dam). This project envisages the transfer of 1.23-1.67 BCM of water each year from the Mediterranean to the Dead Sea. The total cost of the project is estimated as US $ 1.9 billion in 1990 prices.

Since the water transfered from the sea would cause a rise in the level of the Dead Sea by 17 m, Jordanian and Israeli mineral processing plants would have to be moved. It is expected that the project would result in a 15% reduction in potassium production.

Project Proposed by Jordan

As an alternative to the Israeli project, Jordan proposed another one in which water would be taken from the Gulf of Aqaba, from the Red Sea, and carried to the Dead Sea with a 85 kilometer canal. The canal is designed to have several pumping and intermediate storage facilities along it, and energy production would be based upon an elevation difference of about 395 meters.

Political and Environmental Problems Related to the Project

The fact that the Israeli project of carrying water from the Mediterranean would raise the surface of the lake and thus threaten some archaelogical sites as well as potassium plants aroused the objection of other countries, Jordan being in first place. Further, Jordan's initiative to work on a similar project caused some political tensions and eventually led to the abandonment of both projects.

However, surveys conducted by the United Nations revealed that an upsurge of about 10 meters in the Dead Sea (from - 400 to - 390) would cause no harm to archaeological sites. These surveys further maintained that an enlarged water surface arising from this 10 meters upsurge would enhance evaporation and therefore make a positive impact on the environmental conditions of this desert area. With these remarks of the UN Commission, the project again found its way onto the agenda of the Middle East. Some experts believe that water can be obtained at a relatively low cost from desalination plants using energy produced by these facilities.

The unit water cost of the hydro-powered sea water and reverse osmosis desalination for an annual 100 million m^3 of water is estimated to be US $ 0.68/m^3. Nevertheless, there are still some doubts over the economic feasibility of the project when one considers such factors as the possible adverse impact of sea water on turbines and other hydro-mechanical equipment and the present technological inadequacy of the filters used in reverse osmosis system for the desalination of water which is too saline.

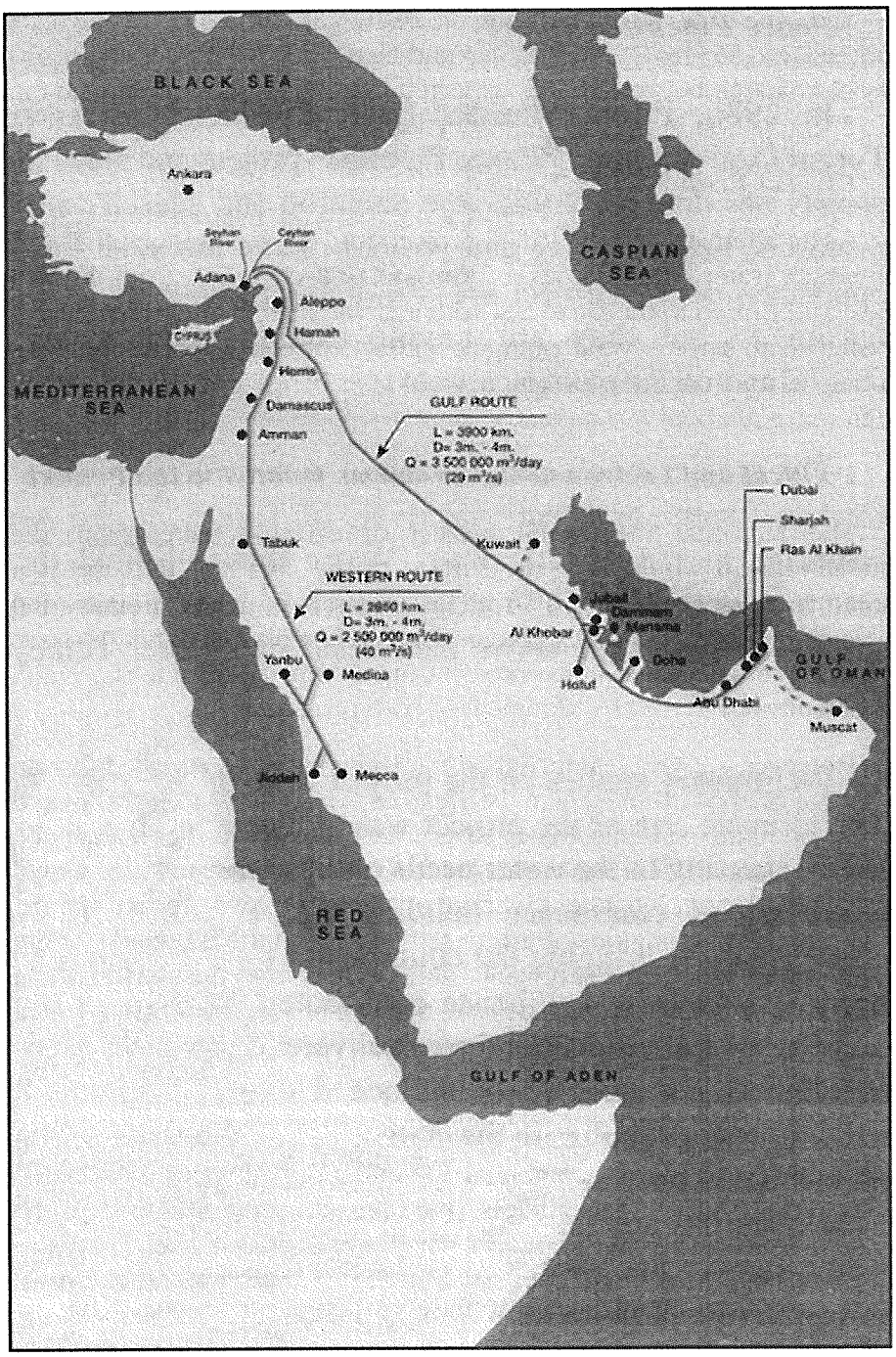

Figure 13: Peace Pipeline Project

Peace Pipeline Project

In 1986, Prime Minister (later President) of Turgut Özal proposed a 'Peace Pipeline' project and since then project has drawn considerable attention and caused various reactions, both negative and positive. Even the most vociferous opponents of the project do not argue about its technical feasibility, but they are raising doubts about political feasibility and financing.

The project involves diversion of water from the Seyhan and Ceyhan Rivers, both national rivers of Turkey, to the Arab countries in the Middle East. Water would reach these countries at a rate of 6 MCM a day, which is only a part of the surplus waters of the above mentioned rivers after Turkey's use.

Preliminary studies on the project were initiated in 1986. The ultimate aim of the project was, going much beyond the partial meeting of the water needs of these countries, to create a process of confidence building and an atmosphere of cooperation by bringing the countries of the region around a major joint endeavor, and hence contribute to the stability and security of the region. The water delivered through the Peace Pipeline is not intended to replace, but rather supplement existing water supplies in the countries served. The project has an estimated cost of US $ 20 billion. It foresees the use of local materials and labor in each country on the route of the water transfer line.

Designed so as to contribute to the water supply of Jordan, Palestine, Saudi Arabia and the countries of the Gulf, the project consists of two pipelines (Figure 13).

- The first one called the Western Line has a length of 2,650 kilometers and a daily water capacity of 3.5 MCM. After leaving Turkish territory, this line ends up in Mecca via Hama, Homus, Damascus, Amman, Yanbo and Medine. According to preliminary studies the cost of 1 cubic meter of water thus conveyed is US $ 0.84.

- The Eastern or Gulf Line extends, after Syria and Jordan, to Kuwait, Bahrain, Qatar and the United arab Emirates. It is longer than the first one with a total length of 3,900 kilometers. Its daily capacity is, again according to preliminary studies, 2.5 MCM and the cost per m^3 is US $

1.07. The total cost is US $ 8 billion for the western line and 12 billion for the eastern line.

Since the whole project has a rather high investment cost, some experts propose that instead of extending the line to Saudi Arabia and the Gulf countries, the terminal point could be Jordan where the problem of water shortage is felt most seriously and thus reduce costs by having a shorter line. The yearly water transfer capacity of this smaller pipeline projects is 2.19 BCM, which is 1.6 times greater than the average annual water capacity of the Jordan river. Hence it is certain that the project could play an important role in closing the water gap of Jordan and Palestine in particular.

The preliminary survey related to the project needs to be expanded by additional studies to be undertaken by Syria, Jordan, Saudi Arabia and the Gulf countries. However, even in this state of infancy, the Peace Water Project has drawn the attention of various academic circles in terms of its macro-economic impacts at both the construction and operation stages. The manufacture of the prestresed concrete cylinder pipes and other components would generate a significant amount of new industries and jobs in the region. It would also provide a market for indigenous resources and goods. So, not only would the quality of life be improved by an increased supply of water at reasonable cost, but the economic prosperity generated would likely lessen the political tension which is so pervasive. The situtation would be further enhanced by increased trade and capital flows among the countries in the region, thus establishing a framework of cooperation for a more peaceful regime of interaction due to the provision of economic linkages between these countries. In fact, economic studies over the project have been undertaken by the universities of Osaka, Toronto and Pennsylvania. These studies underlined the positive impacts of such a project on the countries of the Middle East.

In sum, the technical and economic feasibility of the project is accepted by many. In regard to its political feasibility, it has been generally argued that realization of this project, which needs the cooperation of Turkey, Syria, Jordan, Saudi Arabia, Kuwait, Oman, the United Emirates, Katar and Bahrain, is impossible because of the deep-rooted mistrust and political friction between many of these countries.

Political Approaches to the Peace Pipeline Project

Since its initial presentation to public opinion and the parties concerned, the project has recived many political responses. While Jordan displayed, in general, a receptive attitude, Syria and Saudi Arabia adopted a negative one.

The Jordanian Ambassador to the UN, Adnan Abu Adeh stressed the importance of receiving water from Turkey through such a project and, Dr. Jawad al Anani, the Head of the Center of Economic and Technical Studies in Amman declared his organization's support for the project (Gruen, 1993, p.17).

While Jordan and Palestine, two countries with serious water problems and facing the threat of witnessing these problems much aggravated in the near future support the project, the issue has been diverted from its original course and a campaign against Turkey has been launched before Arab public opinion through the special efforts of Syria.

To give an idea of the tone of this campaign, the following allegations are quoted from Water Wars:

"...Presently Turkey considers itself a regional power and tries to extend its influence into the Asian Republics of the former Soviet Union. Turkey also has ambitions covering the south...In fact, the Arabs believe that Turkey wants to revive the Ottoman Empire." (quoted from the Turkish edition)

The mistaken and prejudiced content of this view is already apparent. As we can recall, Turkey acceded to the UN resolution and closed the Iraqi oil pipeline during the Gulf War which started with the assault of Iraq, an Arabian country, on Kuwait, another Arabian country, and in which several Arab countries imposed almost all sanctions on Iraq including military ones. Yet, one reads in the same book that this act of Turkey "supported the preconceived idea of Arabs that Turkey is not reliable in water issues." This is just one example of the chaotic environment desired by some in the explanation of events taking place in the Middle East. Putting everything else aside, one should note that an Iraqi oil line reaching the Mediterranean through Syria has been kept closed by Syria for more than 20 years.

The water pipeline is envisaged to pass through Arab territory and the decision to give water to Israel fully depends upon the discretion of the countries concerned. Inspite of this fact, a long article entitled 'The Water Crisis: Turkey Sells the Arab's Water to Israel: 260 billion m^3 Water Shortage in the Arab Region in 2030.' published on 2 May 1993 in Al Alam Al Yom, a Cairo based magazine is another example showing how Arab public opinion is misinformed and what kind of political games are being played. We have already stated that it is completely up to the Arab countries whether to accord any water to Israel or not. The water of the project will be drawn fully from the rivers Ceyhan and Seyhan, both flowing entirely within Turkish territory. Moreover, there is one more point to be clarified for readers who are less familiar with the statistics: The 260 BCM which is given in the article as the prospective water shortage is three times greater than the combined water capacity of the Euphrates and the Tigris, which supplies water to three countries, and that of the Nile which waters 9 countries, emphasising how figures for prospective water shortage can be exaggerated and distorted.

We have already stated that sea water desalination plants are widely utilized by Saudi Arabia and the Gulf countries. These countries are dependent upon foreign technology both in the procurement of necessary equipment and in the operation of such plants. The influence and commercial interests of international companies supplying such equipment and know-how create a lobby against initiatives which seek ways of water supply other than desalination. In comparison to the m^3 cost of US $ 0.84 to 1.07 of bringing water from Turkey, it is claimed that the per unit cost of water to be obtained from desalination based upon the energy production through the Mediterranean-Dead Sea water connection is US $ 0.68 (Marukami and Musiake, 1994, p. 117). As seen here, there are strenuous efforts to show the cost of desalinated water lower then it would actually be. In fact, the desalination cost per cubic meter water is around US $ 1.5.

In conclusion, the peace pipeline project proposed in good faith to create an atmosphere of cooperation, stability and security in the region has been diverted from its real course and premises in the complex political milieu of the region. Non-implementation of this project means no loss on the part of Turkey. However, it is obvious that the Middle East, divided by many competing interests, will lose much.

Technologies for the Reuse of Waste Water

Waste water finding its way directly to any sewage system contains various saline dissolutions, organic particles and micro-organisms. Since they are harmful in terms of both human and environmental health, waste water has to be fully or partly treated before it is recycled into the natural environment or reused for any purpose.

Although treated waste water can be used in place of fresh water in agriculture and industry, very rigid standards restricts, to a large extent, the use of such water for drinking. Israel plans by 2020 to allocated all fresh water, in line with population growth, to drinking, and shift the use of recycled water completely to agriculture. In using waste water in agriculture, a distinction has to be made, according to the crop involved, between irrigation which is to be made with water of high quality and irrigation which can be made with water of lower quality.

In such crops as fresh vegetables which are consumed without any processing, it is compulsory to apply high quality purified water. On the other hand, in such industrial crops as cotton or sugar beet and in fruits that are to be canned after going through several stages of processing it is permissible to irrigate with relatively less treated water. There are quite elaborate standards observed in this field.

The cost of treated waste water varies according to the quality and quantity of the waste water, while another very important item which must be included in the costs is storage facilities. While the utilization of drinking water spreads more or less uniformly over the whole year, irrigation needs concentrate on a relatively shorter period of the year, say 2 to 5 months. It is therefore necessary to store water in periods in which there is no demand for irrigation.

In Israel out of the total waste water of 300 MCM/year, only about 100 MCM/year is treated to a high level in the Dan Region Sewage Reclamation Project and Quishon scheme. Another 100 MCM/year is treated to lower levels and the remaining 100 MCM/year is untreated. According to forecasts, waste water potential for utilization within the green line is in the immediate development stage (around 1995) about 330 MCM/year; in the final stage (around 2005) about 410 MCM/year for a population of 7 million. (Harrosh, J.H, 1993). Not in absolute quantity

but in percantege terms, Israel leads the world in the utilization of water treatment technologies.

Due to the increase in demand for water for drinking and industrial uses, it is predicted that before 2005 there will be a 50% decrease in water allocated to agriculture in Israel. It is planned to bridge the gap emerging in irrigation water with reclaimed waste water and to channel investment in the water sector mainly towards waste water treatment.

In conclusion, the reuse for treated waste water and drainage water can release freshwater for higher value use and reduce fertilizer consumption.

Maritime Conveyance of Water in Large Volumes

Water conveyance by sea is presented as a relatively small scale operation resorted to as an urgent and short term intervention in cases of drought. For example, when there was drought, water was carried by sea from the mouth of the Rhone to eastern Spain at a cost of US $ 4 per cubic meter. However, considering the prospects of major water gaps in some countries in the 21st century, several measures are presently being discussed, including the option of routine seaborne water conveyance in large volumes.

According to a project on conveying water to Saudi Arabia from Pakistan, Sudan or Egypt, the amount of water considered is equivalent to 910,000 m^3 which is the daily capacity of the Jubai desalination plant, the largest in Saudi Arabia. Among various options, the sea route connecting Karachi in Pakistan to Damman in Saudi Arabia was accepted as the most economic. In this option, tankers with a capacity of 300,000 dwt each will carry water from the mouth of the Indus river to Damman which is on the Gulf, a distance of 1,600 kilometers from the point of origin (Farouq and Al-Layla, 1987). For the daily provision of 910,000 m^3 of water which is equivalent to the daily water need of a city at the size of Ankara it is necessary to form a fleet consisting of 17 tankers. The unit price of water on board at the terminal point was calculated $ 0.79/m^3. This is the CIF cost of untreated water, excluding the costs of unloading and treatment. Yet, even if these costs are added, the unit cost will still be lower than $ 1.67/m^3, which is the cost of water purified at the Jubai plant.

There are some suggestions for reducing the costs of transport. For example, there is the idea that instead of tankers as conventional transport vessels plastic containers called 'medusa-bag's can be used. These bags have a water carriage capacity of 1 MCM when attached to haulers. However, this idea is at the stage of further research and as yet there has been no experiment even on a small scale.

In Turkey, the Manavgat Water Supply Project was launched in order to meet the increased water needs of the coastal region especially in summer when tourism is at its peak, and also to respond to demand which may come from other countries. In this project, tankers will fill with 500,000 m^3 of water daily (180 MCM yearly) at facilities to be built near the mouth of the Manavgat river. Water at a rate of 6 m^3/second (500,000 m^3 daily) in facilities 1 kilometer downstream from the Manavgat Dam will be pumped up 50 meters to the treatment facilities. Then, after treating half of the daily water capacity, treated and raw water will be conveyed to the filling station 11 kilometers away via two pipelines.

It is proposed to have the operation and management of the Manavgat facilities transferred to the private sector and have private companies engaged in selling and distributing water. As already stated, the project is both for domestic needs and exporting water. Thus, it is possible for the countries of the Middle East to obtain Manavgat water under regular market conditions.

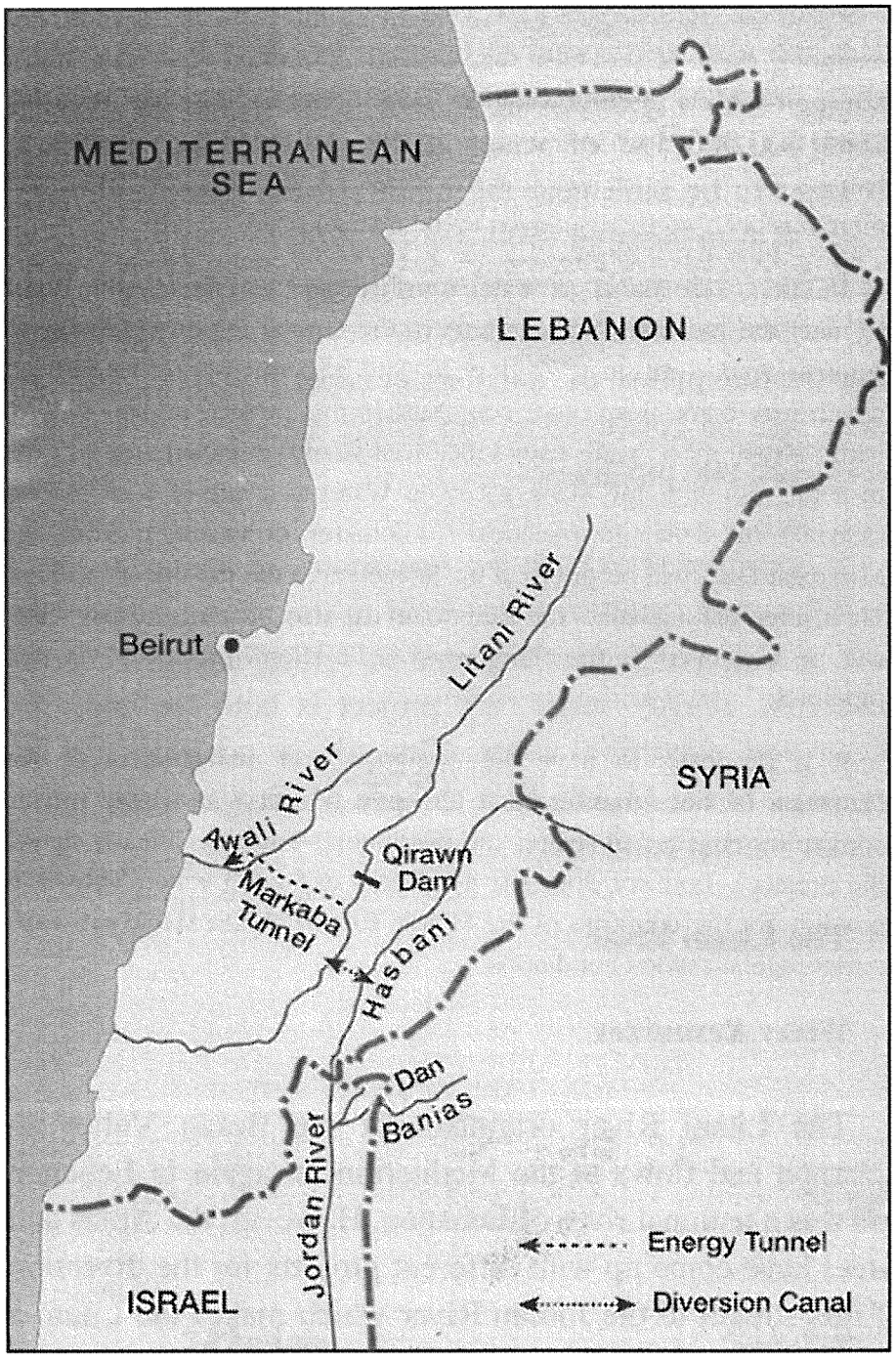

Figure 14: The Litani River Basin

The Litani River

Water Resources

The Litani River originates in the Bekaa Valley in Lebanon and flows into the Mediterranean again in Lebanon making it a national river of Lebanon. However, the Arabs and Israel have come up with different projects for the diversion of this stream to the Jordan River which makes the Litani a regular item the water debates of the region.

Following the First World War, in the Zionist proposal presented to the Paris Peace Talks, the Litani Basin was shown as part of the area for Jewish settlement (Figure 1).

Haim Weizmann, the first president of the State of Israel had long ago, in 1921, complained in his letter to Churchill that *"the Sykes-Picot Agreement between France and Britain ruled out any possibility of Jews making use of the Litani River."*

In the plan prepared in 1944 by Lowdermilk, the Litani was considered as a part of the Jordan River system and it was proposed to have 40% of the water of the Litani trasferred to the Hasbani, a tributary of the Jordan River (Figure 14).

Lebanon gave priority to energy production in the utilization of the Litani. Being one of the richest countries of the Middle East before the civil war, Lebanon had placed special emphasis on tourism, trade and light industries and launched investments to supply energy to these sectors.

With, annual water capacity of 700 MCM, the flow of the Litani is regulated by the Qirawn Dam located at the southern tip of the Bekaa Valley. Energy production takes place first at the outlet of the dam and turbined flow is then diverted into the Awali Stream via a tunnel into a second hydro electric plant. In addition 25,000 hectares of land is under irrigation in the Awali Valley. Since 82% of the waters of the Litani (574 MCM) is diverted into another stream, the remaining flow is only 126 MCM.

According to Lebanese experts, the total annual water endowment of the country is 3.28 BCM, on average, together with other streams and

ground water reserves (Hakim, 1994, p.57). However, Shuval, an Israeli expert from the Hebrew University of Jerusalem gives the figure 9 BCM as the water endowment of Lebanon (Shuval, 1994, p.295).

Such a wide divergence in figures, where one is three times greater than the other, is one of many examples indicating the confusion over data concerning water resources of the region. Why are such conflicting figures given? Israel neighbors Lebanon and it has a long-term strategy aiming to make use of the waters of this country by presenting it to public opinion as 'water rich'. When Israel occupied southern Lebanon in 1982, it prepared plans to develop the water resources of the area as well as to eliminate the influence of the Palestine Liberation Organization (PLO). Lebanon, on the other hand, tried to defend its water resources with the assertion that these resources are only sufficient to meet its own needs.

Political Problems Related to the Use of the Litani

In the south of Lebanon about 600,000 Shiite Moslems live and the region is relatively underdeveloped. The transfer of the waters of the Litani to another stream in the north of Lebanon and development of the water resources in this region enhanced the discontent towards the central government which is generally under the rule of the Christians. This led to various problems among the Shiite, Sunni, Christian, Arab and Druze communities.

Settlement of PLO members, in southern Lebanon after their expulsion from Jordan and the bombing of this area by Israel created a chaotic environment which ended in civil war. Israel entered southern Lebanon in 1982 and gained control over the downstream part of the Litani River. It has been claimed that after the occupation of the area, Israel prepared technical plans and started intensive engineering work on water resources. In order to gain full control over the Litani and have access to the 700 MCM of water in the River Litani, Israel had to extend its occupation up to the Bekaa Valley. After considering the military risks involved in such an operation, Israel decided not to go further and established a security zone of 40-45 kilometers in the Southern Lebanon.

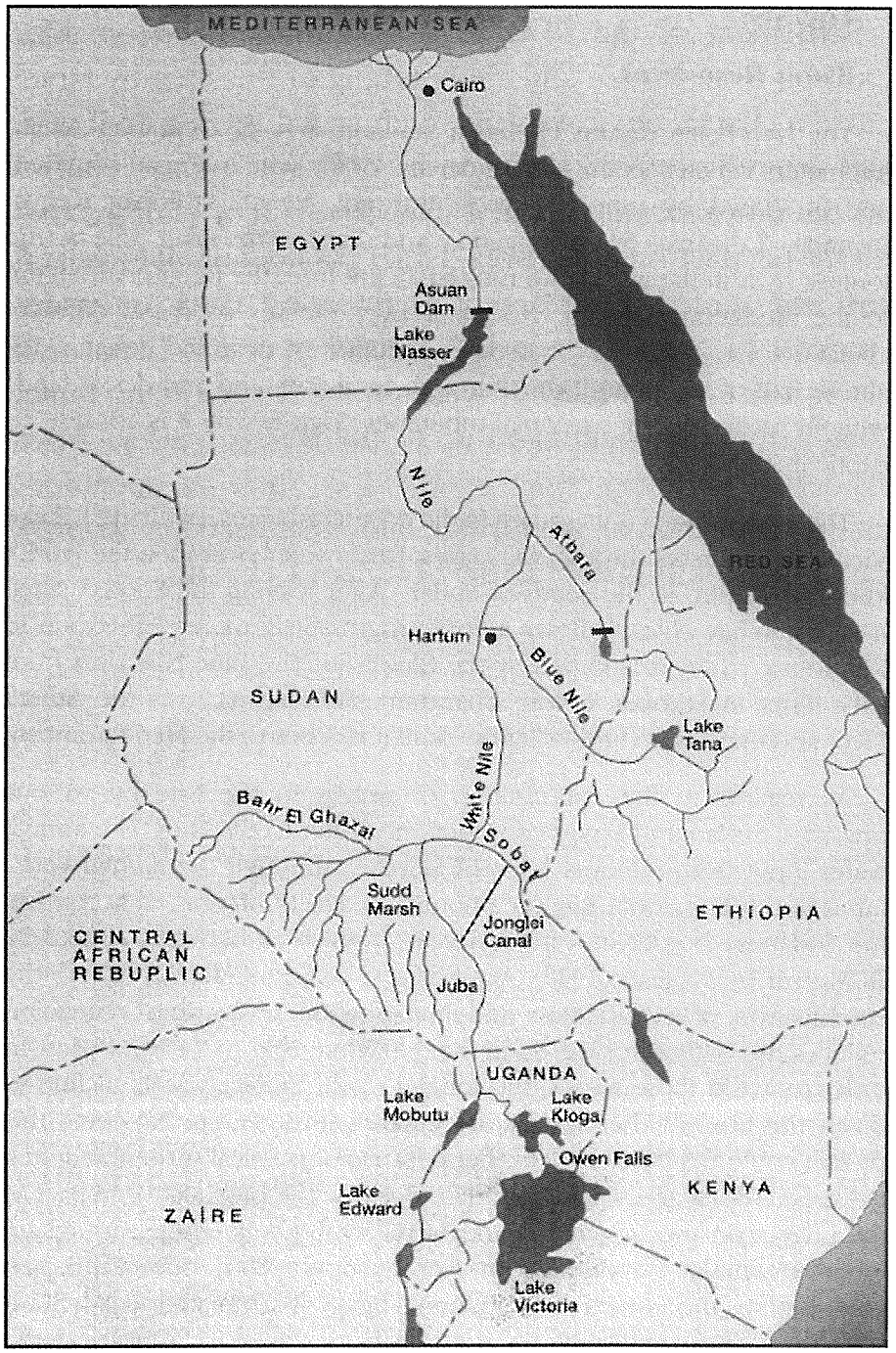

Figure 15: The Nile Basin

The Nile

Water Resources

The Nile Basin (figure 15) has a drainage area of 2.9 milion square kilometers which accounts for 10 percent of the whole African continent and is shared by nine countries: Burundi, Egypt, Ethiopia, Kenya, Rwanda, Tanzania, Sudan, Uganda and Zaire. The River Nile is the longest river in the world and runs 6,825 km from the Equatorial Region to the Mediterranean Sea. No other river crosses so many different climatic zones. Although it rises in a rainforest near the equator, for almost half of its length it runs through semi-arid, arid and desert lands without receiving any perennial tributaries. That is why it is considered exotic in character.

The Upper Nile has its source in the equatorial lakes, particularly Lake Victoria and passes through the largest fresh-water swamp in the world, known as Sudd, in the south of Sudan. After leaving the Sudd, (called here the White Nile), it flows across progressively more arid terrain to Khartoum, where it is joined by the Blue Nile. The Blue Nile rises from Lake Tana in Ethopia. Below Khartoum, the Nile receives the Atbara River and there is no further inflow until it reaches to the Mediterranean.

As regards to the contribution of waters to the Nile by various riparians, Sudan and Egypt contribute no water to the Nile. The annual water input from Ethiopia is 72 BCM/year. Although the annual water input in the Equatorial Region amounts to 400 BCM/year what reaches the Sudanese border in a normal year is given as between 20 and 22 BCM/year by Magead (1994). According to Naff and Matson (1984), the combination of evaporation and transpiration by swamp vegetation reduces the outflow of the Sudd via the White Nile to 14 BCM/year. In order to avoid these losses, the Jonglei Canal Project was launched to divert the flow of the Nile before entering this region. However this project could not be carried further because of political turmoil reigning in Central Africa and southern Sudan. Besides, the prospective impact of the project on the largest wetland of the world was enough to agitate environmentalist organizations in Europe. With the Ethiopian contribution, the annual flow entering Egypt is estimated at 84 BCM, which was also used as the figure for the mean annual discharge in the 1959 Agreement between Egypt and Sudan.

Of the 84 BCM/year natural (virgin) flow at the Sudan – Egypt border 72 BCM/year or 85 percent comes from the Ethiopian highlands and the total supply of other six upstream riparians is 12 BCM/year. There is no water supply to the river in Sudan and Egypt and evaporation losses from the reservoir of the Aswan Dam reaches 10 BCM.

The 1959 Nile Treaty and the Water Rights of the Upstream Countries

Egypt and Sudan made an agreement in 1959 on the sharing of the waters of the Nile. In this agreement, Egypt, which contributes no water to the Nile and causes a loss of 10 BCM of water by evaporation because of the Aswan Dam, gets 66% of the waters of the river's natural flow of 84 BCM. Sudan's share is 22% and the remaining water is lost by evaporation. Table 16 compares water allocations under the 1959 Nile Waters Agreement.

TABLE 16 : Allocation of the Waters of the Nile According to the 1959 Agreement

Country	Countries Contribution to Water Potential (BCM)	Water Allocation According to the 1959 Agreement (BCM)
Egypt	0	55.5
Sudan	0	18.5
Ethiopia	72	0
Other Upstream Count	12	0
Evaporation Losses	-	10
Total	84	84

Source: Whittington, D., and McClelland, E. (1991)

The 1959 Nile Waters Agreement did not reserve any water for upstream riparian countries. Because of this unfair allocation, it is likely that serious disputes will emerge in the 21st century between Egypt and upstream countries, most of which became independent in the second

half of the 20th century and are still lacking political stability. The colonial era and British and French interventions since the beginning of this century left their mark on the legal regime of the Nile. Interventions of the colonial administrations on such an important natural resource as water constitute the basic reason for the present day problems which will be further aggravated in the 21st century.

An overview of historical developments prior to the 1959 agreement will make this point clear (Krishna, 1986, p.1-28).

- According to a protocol signed in 1891 between Italy, acting on behalf of Ethiopia, and the British Colonial Administration in Egypt, Ethiopia could introduce no development on the Blue Nile which would alter the amount of water flowing to the Nile.

- Following this protocol, an agreement which delineated the boundaries of Ethiopia was made on 15 May 1902 between Ethiopia and the British Colonial Administration. Although it was an agreement related to border clarification, the Ethiopian Emperor Melenik the Second committed his country to introducing no development on the Blue Nile and Lake Tana that would alter the volume of flow passing to Egypt.

- Both with the trilateral agreement signed on 13 May 1906 by England, France and Italy, and the notes exchanged in 1925 in Rome between Italy and England, Egypt's interests on the Nile were reconfirmed without any consideration of the rights of upstream states.

- The Agreement on the Waters of the Nile in May 1929 has a special importance in the hydro-political history of the Nile. The most important article of this agreement is quoted below:

"In Sudan and in other countries under the British Administration, no irrigation or energy facility or any development can be introduced on the Nile or on the lakes which constitute the source of the former that would decrease the volume of water received by Egypt or delay this flow or lower the levels of water."

In 1935, an American firm received permission from Ethiopia to construct a dam across the outlet of Lake Tana. However, this project was stopped by the British under the provisions of the 1929 agreement.

• Following the agreement of 1929 regulating the use of the waters of the Nile, several protocols were signed and notes exchanged to support this agreement.

Finally, the agreement defining the sharing of the waters of the Nile between Egypt and Sudan was made in 1959.

With regard to this agreement, the following points are of interest:

• With the exception of annual water allotments to Egypt and Sudan, teh provisions of the 1929 agreement were adopted without much change,

• Sudan gave its consent to the construction of the Aswan Dam whose reservoir would partly occupy in Sudanese territory.

• The annual amount of water flowing into the Aswan Dam was fully shared by Egypt and Sudan with respective share of 55.5 MCM and 18.5 MCM. Egypt gave its consent to Sudan for the construction of the Roseries Dam and other facilities on condition that it would not exceed its quota.

• All upstream riparian countries, before starting any development on their waters, had to apply to the Joint Technical Committee formed by Egypt and Sudan, furnish this committee with relevant technical details and receive its approval.

• Sudan, by establishing an accord with Egypt, could introduce measures in its southern marshes and wetlands in order to reduce water losses.

The Nile Basin became the scene of great power rivalries in the cold war era after World War II. The Bureau of Reclamation, the biggest water organization of the US estimated that 33 separate irrigation and energy production facilities could be developed in Ethiopia. It is interesting to take note of the timing of the US in developing an interest in the basin. The start of the construction of the Aswan Dam in 1960 with Soviet aid and Nasser's political shift towards the Soviet Union led the US to extend technical assistance to Ethiopia for the projects concerned. The US reaction to the political position of the Egypt found its reflection this way and the issue took on an international character with the involvement of the two supperpowers In fact, US interest in Ethiopian projects diminished after Nasser's demise.

Projects prepared by the US water experts envisaged an irrigation scheme of 434,000 hectares in Ethiopia. This was 17% of the 2.6 million hectares of land then under irrigation in Egypt. The projects also included an estimated annual electricity generation of 25 billion kWh. (about three times as much as the capacities of the Atatürk and Aswan dams) from four dams to be constructed on the outlet of Lake Tana, the origin of the Blue Nile. It was calculated that after irrigation and evaporation from the dam lakes there would be a reduction of 4 BCM/year in the amount of water flowing to Egypt. In spite of the fact that Ethiopia supplies 72 BCM/year of the total water of the Nile (84 BCM at the Aswan Dam) Egypt still tries to prevent the Ethopia from using 4 BCM of water. An agreement originally made under the pressure of the British and Italian colonial administrations that usurped the rights of other upstream countries is used as a pretext for denying the legitimate rights of Ethiopia.

Moreover, the respective populations of Egypt, Sudan and Ethiopia are, according to the 1987 data, 50, 23 and 44 million. Population forecasts for the year 2025 give these figures, again in the same order, as 99, 56 and 122 million (Whittington and McCleland, 1991). Ethiopia is one of the poorest countries in the world with a per capita GNP of US $ 130 (1989) and it needs to realize the above mentioned projects. The recent political turmoil and economic problems of Ethiopia do not seem surmountable in the near future. It is obvious that barring Ethiopia from making use of the waters of the Nile, which has been declared an 'Arab Water' by Egypt, will lead to much troublesome regional strife in the future.

Concerning attempts to arrange an agreement on the allocation of the Nile Basin waters, between Sudan and Egypt, the government of Ethiopia set forth its position in 1957 as follows:

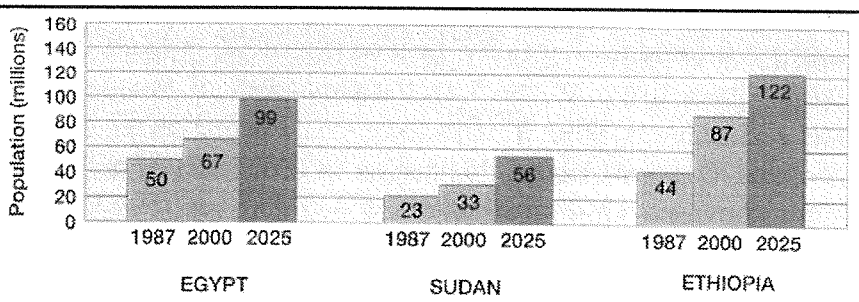

Figure : 16 - Population Projections (Egypt, Ethiopia, Sudan)

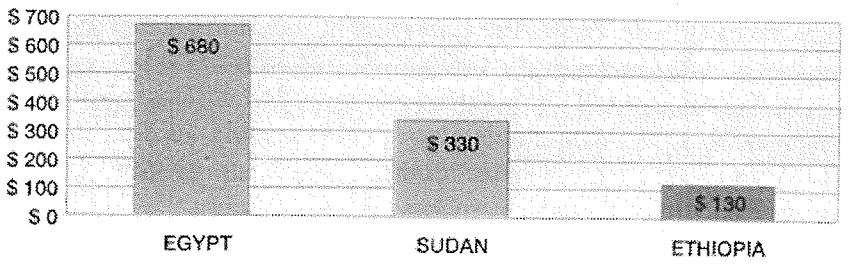

Figure 17: Per Capita Gross National Product (1989) (Egypt, Ethiopia, Sudan)

"The Imperial Ethiopian Government has ascertained the fact that certain discussions have been taking place concerning the division of the waters of the Nile. Ethiopia alone supplies 84% of those waters, as well as the immense aluvium fertilizing the lower reaches of the Nile. In view of this fact and the overwhelming importance which such waters and soils represent with respect to the total water and other resources of Ethiopia, the Imperial Ethiopian Government finds it important once again to make clear the position and rights of Ethiopia in this matter and would, in this connection, invite attention to the official communiqué published on this subject by the Ministry of Foreign Affairs on 6th February 1956. Just as in the case of all other natural resources on its territory, Ethiopia has the right and obligation to exploit the water resources of the Empire, and indeed has the responsibility to provide the fullest and most scientific measures for the development and utilization of the same for the benefit of present and future generations of its citizens."

Egypt is moving towards expanding the coverage of irrigation through the development of its desert areas. Within the framework of its master plan for land reclamation, Egypt has selected 580,000 hectares of land as a priority target to be supplied with irrigation facilities in the medium and long term. It plans to develop 340,000 hectares of this total by water coming back from irrigation within its quota of 55.5 BCM. However, Egypt needs 10 BCM more water to fulfil its original plan and the source of this additional water is as yet uncertain (Whittington and McClelland, 1991, p.10).

An Upper Nile Project has been considered to reduce water losses occurring in the Sud marshes in the south of Sudan. While about 50 BCM of water flows into these marshes, what flows out or actual water supply to the Nile is only 12 BCM. It is planned to minimize this water loss by the Jonglei I and Jonglei II canals to be opened in this region. The construction of these two canals, expected to supply an additional 3.8 BCM to Sudan and Egypt, was started in 1978 but later stopped because of the internal strife in southern Sudan.

PART III

ANALYSIS OF SELECTED TREATIES RELATING TO TRANSBOUNDARY WATERS

PART III
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Water Treaties

Worldwide, according to various sources there are currently 217 water-related agreements. These can be considered in three groups as follows:

(i) Treaties related to waters that form national boundaries,

(ii) Regional cooperation agreements not related to water allocation, and

(iii) Treaties on transboundary waters which involve water allocation among the countries of the basin concerned.

Without knowing the exact distribution of these agreements among the three categories we can nevertheless say that many of these treaties are related to waters which form international boundaries.

(i) Since streams constitute natural barriers, many waters are taken as a basis in drawing boundaries between countries. Acceptance of the established principle of law of allocation of equitable proportions of water to the riparian countries in the utilization of these waters has meant that negotiations between countries have not so far led to serious problems. Having stable boundaries along these waters has taken priority over water allocation issues.

(ii) Most regional cooperation agreements are not related to water allocation issues. They are mostly agreements of general scope which deal with such issues as exchange of data among the countries of the basin concerned, flood warnings, hydraulic power production and ensuring safe navigation on waters. Such agreements are particularly related to basins which have quantitatively adequate water flow, are fed by abundant water coming from both upstream and downstream countries, and face relatively low seasonal and annual changes in water quantity. A number of these will be introduced below.

The 'Treaty on the Sustainable Utilization and Protection of River Danube, enacted in 1994 to cover 12 countries will be discussed in later sections of this book. There will also be a detailed treatment of the as yet unresolved dispute over the Nagymaros-Gabcikova (Bös) Project. The parties of this 20 year dispute are Hungary and Slovakia (former Czechoslovakia) which took the case to the International Court in the The Hague.

The Mekong is one river which is referred to as an example of regional cooperation. The four downstream states (Cambodia, Thailand, Laos and Vietnam) signed a Treaty on 'Cooperation for the Sustainable Development of the Mekong Basin' in 1995. However, the upstream countries (China and Myanmar, formerly Burma) are not the parties to this Treaty.

As far as the Middle East is concerned, the Middle East Water Information Network (MEWIN) is a US-based non-governmental organization founded in 1994 to deal with regional cooperation issues. At present, there are efforts to move this organization to a country in the Middle East. The objective of the MEWIN is stated as:

> *".....to improve regional planning and management of water resources throughout the Middle East and to promote the peaceful and cooperative use of this vital resource....."*

Apart from MEWIN, another US based organization 'Associates for Middle Eastern Research' also has a data bank and it is possible to establish communication between these two data bases.

Considering that the water resources of Saudi Arabia and the countries of the Gulf are so limited that these countries already struggle to provide for their needs mostly through the desalination of sea water and that the Jordan-Yarmuk basin has a water potential of only 2 billion cubic meters including groundwater reserves, it becomes clear that the objective of regional planning and development of water resources in Middle East is concerned particularly with the Euphrates and the Tigris.

As the upstream riparian, Turkey holds a key position regarding the information network that is to be established by collecting data and information on the rivers of Euphrates and Tigris. Even if it is possible to

assess by satellite the snow load and depth in the Euphrates-Tigris Basin, or even to find out the water equivalent of a given snow cover, there is still a need for a network of ground stations over the whole basin to check and correct these findings. Observation stations in Turkey would therefore be of crucial importance for any such information network. It will then be possible, through studies using these complementary networks, to estimate the flow of the Euphrates and the Tigris and to formulate management policies for water storage facilities on these streams.

It is obvious that such an information exchange is of direct interest to Turkey as the upstream country and also to Syria and Iraq as the two downstream countries. However it is not always easy to perceive a technical explanation for the interest of such countries as the US, Canada, Germany, the United Kingdom, Norway or other Middle Eastern countries outside the basin. It sometimes seems like the technicians of these countries might better focus more on the streams in their respective countries and present these studies for the benefit of other countries.

When the issue concerned is the utilization of such a precious natural resource as water and the region concerned is the Middle East, any initiative for the establishment of an information network system for the purposes of 'regional cooperation' inevitably runs the risk of being misunderstood, as we have exemplified before, and being politicized in spite of the good intent of most academic researchers involved.

(iii) The number of treaties on the allocation of waters to riparian countries is relatively fewer than those in the first two groups. The ensuing sections of the book will be engaged in detailed analyses and hydro-political evaluations of the utilization of the waters of the Indus by India and Pakistan and the Colorado by Mexico and the US. These analyses and evaluations will also include comparisons with the situation in the Euphrates-Tigris Basin. Finally, there will be analyses of various articles relating to water use in the Peace Treaty signed by Israel and Jordan on 26 October 1994.

River Danube

Introduction

The basin of every transboundary river has its unique technical, socio-economic and political features. Thus, the nature of problems concerning the utilization of water by riparian states varies greatly from one basin to another. For example, the Danube flows in a climatic zone that receives adequate precipitation and the use of water for agricultural purposes is lower than the water potential of the basin. Consequently, quantitative problems regarding the utilization of water are of secondary importance in contrast to rivers flowing in arid or semi-arid zones. What comes to the fore in the case of Danube are environmental issues such as water pollution, which largely stem from the advanced industrial status of the 12 countries located in the basin.

This section begins with an overview of the Danube basin, followed by a detailed analysis of problems related to the implementation of the Nagymaros-Gabcikova Project under the 1977 agreement between Hungary and Slovakia.

In a context where water problems of the Middle East, particularly those related to the Euphrates and Tigris, are regularly a focus of some western countries, a technical and hydropolitical analysis of problems between Hungary and Slovakia concerning utilization of the waters of the Danube will enable us to pinpoint how some advanced European countries approach their own water issues compared to other parts of the world.

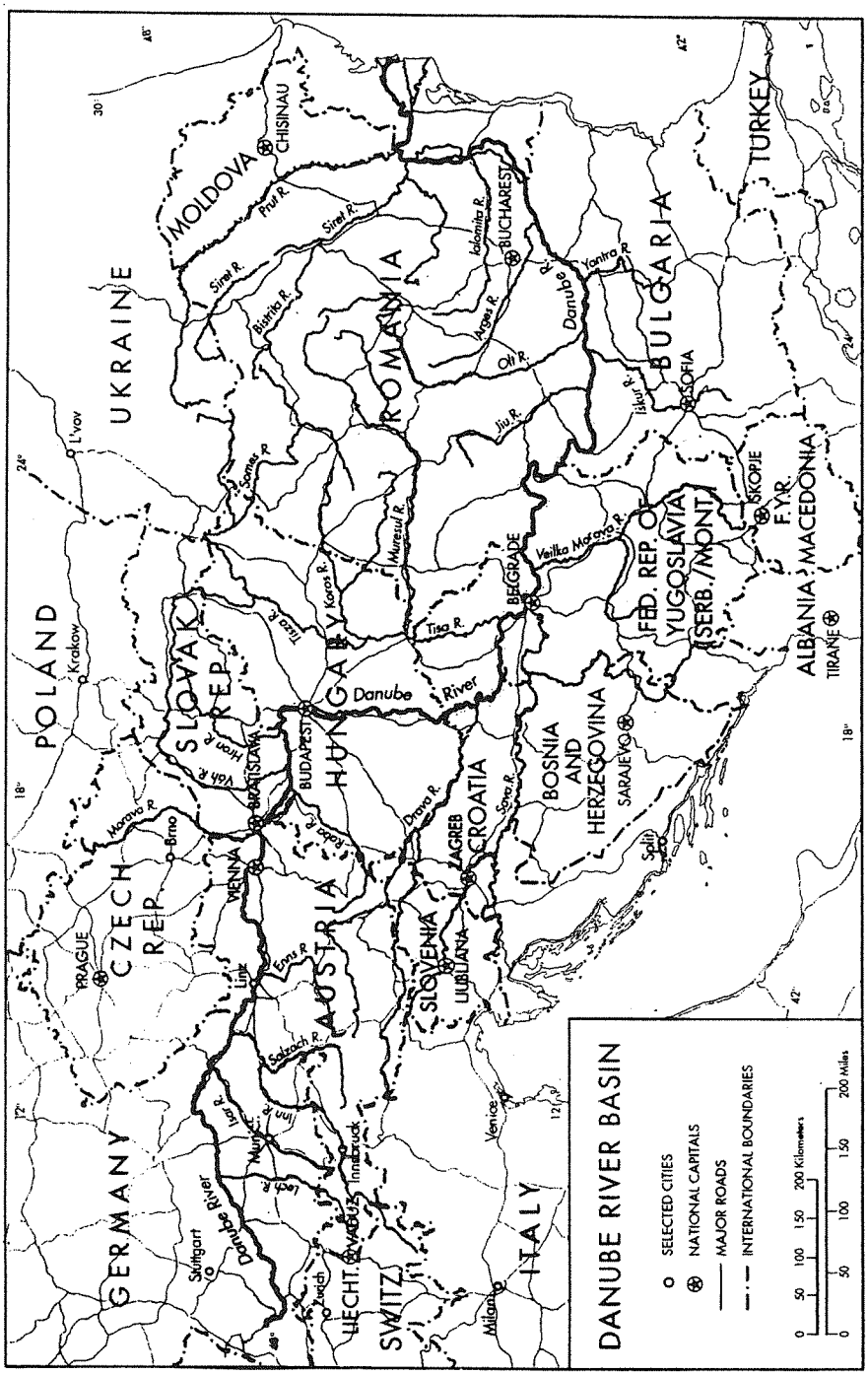

Figure 18: River Danube Basin

Hydropolitical and Socio-economic Characteristics of the Basin

The river Danube originates in Baden-Württenberg to the south of Germany and flows for 2,912 kilometers before joining the Black Sea. There are 12 states, at different levels of development, along this watercourse and its basin: Germany, Austria, the Czech Republic, Slovakia, Hungary, Bosnia and Herzegovina, Serbia (Yugoslavia), Romania, Bulgaria, Ukraine and Moldova. Some of these states emerged following the dissolution of the former Soviet Union and Yugoslavia.

The Danube Basin has a drainage area of 817,000 km^2 and supports 82 million people (Petersberg, 1998). The average annual flow of the Danube in Germany is about 300 m^3/second. This figure reaches 1,900 m^3/s in Vienna with the input of various tributaries and 6,550 m^3/s in the broad delta just before the river flows to the Black Sea (Hauck and Schmid, 1991). Precipitation in the basin can reach as high as 3,000 mm as an annual average, but is as low as 400 mm in the delta area.

Table 17 below shows the differences in the level of development of the countries located in the basin. The table uses the Human Development Index (HDI) as a more recent yardstick in addition to the traditional measure of Gross National Product (GNP). The former is a composite indicator of factors such as life expectancy, level of education (educational status of adult population; number of students enrolled to primary, secondary and higher education) and per capita income in terms of purchasing power parity.

TABLE 17 : Per Capita GNP and Human Development Indices For the Countries of the Danube Basin

Countries in the Basin	Per capita GNP (1) US $, 1995	Human Development Index HDI (2), 1996
Germany	25,179	0.924
Austria	24,823	0.932
Slovakia	2,331	0.873
Czech Republic	3,498	0.882
Hungary	4,072	0.857
Slovenia	7,206	-
Bosnia-Herzegovina	1,307	-
Yugoslavia	1,171	-
Romania	1,274	0.748
Bulgaria	1,106	0.780
Ukraine	339	0.689
Moldova	-	-

(1) United Nations, World Statistics
(2) UNDP, 1997.

Examining the countries of the basin in terms of their respective per capita gross national products (GNP), shows Germany and Austria far ahead of other countries. However, if the comparison is on the basis of Human Development Index (HDI) then the differences are not so striking. Some of these countries are already on their way towards integration into the European Union and they are thus expected to develop a much improved socio-economic status in coming years.

Activities Related to the Development of Water Resources

The varying economic structures of the basin countries and their specific climatic and topographic conditions have both affected the ways these countries utilize water along the course of the Danube. In the upstream countries, Germany and Austria, water utilization for industry, drinking water supply and hydraulic energy production has predominated while downstream countries are also engaged in using the river for irrigation purposes.

In addition to these uses, the river has for centuries been utilized for navigation. On the completion of the canal connecting The Rhine, Main and Danube at the end of the 20th century, the age-old dream came true and the North Sea was connected to the Black Sea.

There is 2,280 kilometres of navigation on the river, extending from Ulm in Germany to the Black Sea. However, since natural conditions may block navigation in some parts, water storage facilities were constructed both to ensure adequate water depth and also to produce electricity. The most important difficulty for navigation is posed on that part of the river flowing between kilometers 940 to 1,040 (measured from the Black Sea mouth) in deep valleys where the river also forms the boundary between Yugoslavia and Romania. This rocky part where water flow reaches 3-5 meters per second is known as the 'Iron Gate'. Here, where average annual flow reaches 5,520 m^3/s, the largest and smallest flows have varied, respectively, between 16,000 m^3/s and 1,400 m^3/s over an observation period of 122 years. Twenty-five percent of all hydraulic potential of the Danube is concentrated in this section of the watercourse.

In 1971, the 'Iron Gate I Project' began operation in order to solve this navigation problem and produce energy. A dam with a storage capacity of 2.4 billion cubic meters and a height of 32 meters created suitable conditions for navigation and the time length of navigation which used to be 120 hours on this part was reduced to 31 hours, together with an enhanced cargo capacity. On the Iron Gate Dam I, there are there are two hydraulic power plants with an installed capacity of 2,050 MW generating 10 billion kWh energy a year. As a result of this project, about 9,000 hectares of cultivable land and 17 settlements were completely submerged, while another 20 settlements were partly affected. New levees, 73 km long, were built along the watercourse. At the same time, it was necessary to repair over 200 km of existing levees. A network was introduced for the drainage of the cultivable land protected by levees. This initiative resulted in the resettlement of 24,000 people affected by the project and many historical structures had to be transferred elsewhere. In order to eliminate the negative downstream effects of large volumes of water released by the Iron Gate I and to produce electricity, another dam, the Iron Gate II, and a hydraulic plant with an installed capacity of 540 MW were constructed.

Apart from the projects mentioned above, there are also various other hydroelectricity facilities designed specifically for this type of river and these facilities are equipped with passages allowing for navigation. There are 8 dams on the main course flowing in Austria and another dam near Vienna (Freudenau) is presently under construction. Considering the facilities established on the main course and hydraulic power plants on the tributaries of the river, efforts to utilize the energy potential of the river vary greatly from country to country.

For example, while Austria supplies two thirds of her energy needs from hydraulic plants which are clean and environmentally friendly, such former socialist countries as the Czech Republic, Slovakia, Hungary, Romania and Bulgaria opted for a policy based on coal, liquid fuels and nuclear energy thus keeping the contribution of hydraulic energy low. Thermal plants established with standards much lower than in advanced plants cause serious water and air pollution, thus contributing to environmental problems as acid rain, which affects the whole basin.

Along the course of Danube, apart from efforts to improve navigation conditions and produce energy, there has also been an ongoing struggle against floods. After the disastrous floods which struck Austria in 1830 and 1854, intensive measures were introduced to protect the city of Vienna which was eventually deemed safe from floods of up to 14,000 m^3/s. Hungary is especially prone to the flood damage because of her flat topography. Therefore, many check dams were built along the river on the Hungarian Plain. Similar measures were also introduced in Romania and Bulgaria. In short, in the Danube Basin, management of the river has meant that damage resulting from floods following sudden rainstorms or from ice blocks floating down to the river from neighboring mountainous regions has been significantly reduced.

In the parts of basin occupied by industrially advanced countries as Germany and Austria, water pollution is generally under control. In some other sections of the river however, this pollution may assume serious dimensions. Surface waters can be divided into four categories with respect to the level of pollution: first, high quality water; second, water containing some pollution; third, polluted water; fourth, extremely polluted water. Although, since the 1990's, the waters of Danube are considered to lie in the second class, it has been observed that they are now falling into the third class, and water polution increases close to

large settlements and industrial enterprises. Therefore, countries like Germany and Austria assign great importance to waste water treatment facilities. Following the collapse of the Eastern Bloc, pressures on other countries of the basin to introduce similar measures have intensified.

International Treaties Governing the Utilization of Danube

The first comprehensive administrative and technical arrangement to prevent floods and ensure navigation on Danube was introduced in 1773 by Maria Theresa, the Empress of Austria-Hungary. On 30 March 1856, an international commission was set up under the Paris Treaty to take charge of affairs related to the administration and control of navigation on the Danube. Following this Treaty, there were various bilateral and multilateral agreements among the riparian states. Among these agreements, the 1948 Danube Treaty is particularly important since it included technical standards for navigational routes and measures needed to make the river better fit for navigation. For example, the Treaty defined such technical characteristics as the minimum water depth in the river (2.7 meters before Vienna and 3.5 meters after), necessary width for navigation, bank slopes and size of passages from hydraulic plants (Hauck and Schmid, 1991). An 'International Danube Commission' was also formed to manage international watercourse navigation.

Following the Second World War, the split into Communist Eastern and Democratic Western Blocs hindered any effective cooperation, especially in relation to measures that were needed to prevent pollution in the river. There was a saying in the 50s and 60s that *"had Johann Strauss lived up to our day, he would have changed the title of his popular waltz from 'Blue' to 'Brownish Danube'"*

With the breakup of the Soviet Union in 1990, the Cold War ended and democratization efforts started in the former Eastern Bloc countries. Inclusion of these countries in the expansion of the European Union should yield a more homogenous political, economic and social structure in Europe. In the positive atmosphere created by these expectations, the 'Treaty on the Sustainable Utilization and Protection of Danube' was signed on 29 June 1994 to take effect in June 1998. This Treaty is much more comprehensive than earlier agreements of similar nature. Article 2 states that:

".....The Contracting Parties "shall strive at achieving the goals of a sustainable and equitable water management, including the conservation, improvement and the rational use of surface waters and groundwater in the catchment area [...]. Moreover the Contracting Parties shall make all efforts to control the hazards originating from accidents involving substances hazardous to water, floods and ice-hazards [...]. Moreover they shall endeavour to contribute to reducing the pollution loads of the Black Sea from sources in the catchment area."

The International Commission set up under the terms of this Treaty has its Secretariat in Vienna and its specialist technical teams have started work on the following issues (Petersberg, 1998):

- The technical team studying particles and substances that pollute water has made an inventory of urban and industrial wastes, identified those which should be given priority attention and prepared its first progress report regarding measures to be taken.

- Another special team has in 1997 put into effect its plan of urgent intervention against pollutants released following unexpected accidents. According to this plan, each country in the basin has established its own 'primary warning station' ready to activate urgent measures against suddenly emerging pollutants carrying the risk of seriously harming the river. There are also standard measures to minimize the risk of such unexpected accidents.

- Working groups on supervision, laboratory work and data banks have established a supervisory laboratory network, identified the methods by which an exchange of information can take place in the whole basin and come up with a mechanism to supervise all action programs and measures developed to prevent pollution in the Danube Basin.

The commission established in 1991 to give effect to the Danube River Environmental Protection Program has identified 170 points in the basin which are extremely critical regarding pollution. This program has also brought together those members of the European Union not located in the basin, international finance institutions and many non-governmental organizations. In 1998, the commission delegated its full authority and responsibilities to the International Commission on the Danube.

Problems Related to the Gabcikova (Bös) and Nagymaros Project in the Danube Basin

Objectives of the Project

The River Danube flows eastward starting from Bratislava, the capital of Slovakia, marks the boundary between Hungary and Slovakia, and then enters Hungary by making a wide crescent southward (Figure 18). After Bratislava, the river flows on a much more smoother bed composed of sand and gravel. In this area, many small islands and meanders have posed serious difficulties for navigation. The International Commission on the Danube advised Hungary and Czechoslovakia to take measures to improve the conditions of navigation, and this advice was acted on in 1976 by the governments concerned and their Joint Boundary Commission.

Meanwhile, the oil crisis of 1973 had pushed many countries to adopt energy policies based on their own natural resources. Accordingly, both Hungary and Czechoslovakia had started work on projects to utilize the hydraulic potential of the Danube.

In addition, Czechoslovakia and Hungary had suffered devastating floods in 1954 and 1965, respectively. This made it urgent to build flood prevention facilities in the area where the river formed the boundary between these two countries. Consequently, it was decided to improve navigation, produce hydraulic energy and build flood prevention facilities along the course extending about 200 km between Bratislava and Budapest.

Since these two countries were both under communist regimes dominated by the Soviet Union, it was not difficult for them to agree on such a project. The national assemblies of Hungary and Czechoslovakia ratified the Treaty on the *'Construction and Operation of Facilities Under Gabcikova-Nagymaros Project'* on 16 September 1977.

The preamble of the Treaty defines the objectives of the project as follows: "Utilization of the waters of the Danube in its flow from Bratislava to Budapest for navigation, energy production and agricultural irrigation purposes so as to contribute to the economies of the both countries." The project accordingly envisages hydraulic energy

production, improvement of the conditions of navigation and protection of both banks of the river from floods. It was also stressed in the articles of the Treaty that ensuing practices and the operation of the system should protect the natural environment and prevent any pollution in the river.

Important Elements of the Project

The project included the following facilities as shown schematically in Figure 19 (page 165).

- The natural bed of the Danube was to be changed and an artificial canal of 25.2 km constructed on Czechoslovakian territory. This canal would then flow along the natural course of the river. A diversion facility (Dunakiliti Dam), to divert the water of the river into the canal, was to be built in the territory of Hungary. This diversion facility and check dams to be constructed on both sides of the river would be able to store 243 million m^3 of water.

- Gabcikova Hydrolectric Power Plant (HEPP) with an installed capacity of 720 MW, and capable of producing 2.7 billion kWh energy a year, would be constructed at the 17^{th} kilometer of the canal together with channels to allow navigation.

- Starting from the point where the artificial canal joins the river, the 20 km of river bed would be deepened by dredging.

- Nagymaros Hydrolectric Power Plant (HEPP) with an installed capacity of 158 MW, and capable of generating 1 billion kWh energy a year, would be built in Hungarian territory to regulate the waters released by the Gabcikova Dam and produce energy. Navigation channels would be included in this facility.

As described here, the system as a whole constitutes a single and indivisible project whose components are located in the territories of the two countries so as to complement each other. This point was clearly expressed in the joint agreement annexed to the Treaty of 1977. In this system, Hungary would be in charge of operating the Nagymaros HEPP with its diversion facilities whilst Czechoslovakia's responsibility was to operate the artificial canal and Gabcikova HEPP.

It was further agreed by the parties that the diversion facility, artificial canal and the HEPPs of Gabcikova and Nagymaros would be under the joint proprietorship of the two countries, and all costs and energy to be produced would be allocated equally.

Article 22 of the 1977 Treaty stated that borders would not be changed and the line connecting the shallowest points along the main course of the river would form the boundary between the two countries.

Actual construction works were started in 1978 under these provisions. According to the original schedule, the first turbine unit of the Gabcikova HEPP would be in operation in July 1986 and the whole system would be in operation at the end of 1990.

Objections to the Project from Hungarian Public Opinion

Shortly after the start of the project, the Hungarian public raised objections that the project would harm the environment. A number of protest rallies followed. Objections further intensified with the support of the 'international environment lobby'. The Hungarian Academy of Sciences also gave support to these objections and protests. The academy based its objections on the following grounds:

- The diversion of a substantial part of the flow of the Danube into the artificial canal would prevent water withdrawal from the main bed, groundwater level would fall, wetlands around the level would dry out and natural flora and fauna would be damaged as a result;
- An asphalt lined diversion canal would harm water quality; water containing cancerous materials would pose a threat to public health;
- The artificial lake to be created by the diversion canal would cause the pollution of ground water reserves;
- The dam to be built in Nagymaros in Hungary would submerge some land and harm the natural environment; it would also disturb the natural landscape to the north of Budapest.

The Government of Hungary responded in an undecided and contradictory manner in the face of all these objections. At Hungary's request, a protocol was signed with the Czechoslovakian side on 10 October 1983 to slow down ongoing construction and delay the phasing in of hydroelectric power plants. In 1984, Hungarian and Austrian firms signed a contract for the financing and construction of the project. In 1988, a report prepared by the Hungarian government defending the implementation of the project was adopted by the Hungarian Parliament. Following this approval, another protocol was signed with Czechoslovakia on 6 February 1989 to accelerate the process of construction. However, on 27 September 1989, the Government of Hungary once more changed its mind, gave up the whole idea of constructing Nagymaros Dam, and decided to keep the Dunakiliti Dam (diversion facility) as it was without any further progress.

The Slovak side replied that the project had already included all possible measures to minimize any adverse environmental impact and that the Hungarian side was driven not by environmental but political concerns. To cite an example, Miroslav B. Lista, a Slovak water resources specialist put forward the following opinion after the collapse of the communist regime:

> *".....The background of these events was of a political character, as reports of Hungarian authors (Kozák, Mosonyi e.a.) revealed. Protests against the communist regime in the form of political demonstrations would be severely suppressed, but environmental protests were tolerated. Nagymaros, as one of the largest investments, about which the people were insufficiently informed, was pinpointed as the cause of all difficulties of the country, especially as an environmental danger and a burden on the state budget. People did not realize that Austrian firms had taken over not only the construction of two main structures -the Dunakiliti weir and the Nagymaros river- step but also their financing, with the perspective of repayment through a part (about 60%) of the Hungarian share of electric energy produced.*
>
> *In addition, Nagymaros was said to "spoil the view on the Danube bend at Visegrad", considered to be a "national heritage". Austrians were accused of eco-exploitation of neighboring*

countries and Slovaks of an attempt "to separate Hungarians living along the Danube and to concretize the borders", i.e. to fix the border definitely in the Danube bed, according to the decision of the Trianon peace treaty of 1920. This is by many Hungarians still considered as forced upon their country, reducing Hungary significantly in size and significance, after the fall of the Austro-Hungarian Empire.

The borderline in a region of mixed population was drawn so that about an equal number of 400 thousand Slovaks remained in Hungary and Hungarians in Slovakia. After a half-century, during which the Hungarian army occupied the south of Slovakia there times, the number of Slovaks in Hungary fell to about 10 thousand, while the number of Hungarians in Slovakia grew to over 560 thousand. However, illogically, the Slovaks were accused of an attempt to assimilate the Hungarians. As the 1977 Treaty contains a voluntarily signed confirmation of the Trianon border line, some groups of Hungarians (not large but loud) are striving to abrogate it by all possible means, cost what cost.

In an attempt to preserve good neighbourly relations, CSFR used every opportunity to negotiate, with the aim of discovering and clearing the arguments for the unilateral abandonment of work. It reviewed all the potential environmental impacts of the G/N Project. Although no imminent danger of an environmental catastrophe was found (what was confirmed also by two independent expertises of Bechtel Environmental Inc. and Hydro Quebec International), possibilities of mitigation of the environmental impacts by appropriate measures were studied and proposed. The economic damage resulting from the total abandonment of the G/N Project would reach a sum of over 100 bill. Crowns, which represented about 80% of a yearly budget of the Slovak Republic and in purchase value about 10 bill. US $. Such impact on the weakened state economy would be disastrous, with unforseeable consequences."

As clearly seen in the quotation above, the issue also provoked and highlighted the problem of ethnic discrimination

The Proposal of the Czechoslovakian Side Against the Suspension of the Project

Towards the end of 1989 at the time Hungary suspended the construction of Dunakiliti Dam, the artificial canal to divert the waters of Danube, the Gabcikova Dam on the canal, and navigation channels, which were all in Czech territory, were to a large extent completed. All that remained to be done to make the system operable was to complete the Dunakiliti Dam to divert the stream. Faced with the decision of the Hungarian side, Czechoslovakia started to seek other ways to make the project operational while at the same time launching diplomatic efforts to persuade the Hungarians to complete the dam.

Given the position of the Hungarian Government, two alternatives were identified. Option A was the original project - which seemed unrealistic at that time. Option B, avoided construction of the Nagymaros Dam and HEPP in Hungary but stuck to the construction of the Dunakiliti diversion scheme.

However, Option B also contained uncertainties since the Hungarian side had stopped the construction of Dunakiliti and no clear idea then existed as to the future behavior of the Hungarian Government. Thus the Czechoslovakian side proposed Option C, or the *'temporary solution'*, to reap the benefits of the already completed parts of the project.

This last alternative, envisaged changing the location of the diversion scheme and moving it to Cunova in the Czech territory. The Czech side would construct another diversion facility on its own territory. In addition, they proposed to reduce the water storage capacity on the Danube to prevent any risk of flood in Hungarian territory (Figure 20, page 165). Through this change in the project it would be possible to divert water into the artificial canal and to the HEPP sited on this canal.

Because the project to build the Nagymaros dam in Hungary had been abandoned, the operation of Gabcikova HEPP was also modified. Instead of releasing large volumes of water occasionally via the turbines (termed 'operation at peak'), it was necessary to keep the plant operating by releasing the same total volume of water but over a longer period of time and in more limited flows.

Hungary's Failed Attempt to Block the 'Temporary Solution'

The temporary solution outlined above was rejected by Hungary. Nevertheless, the Czechoslovakian government authorized the construction of the Cunova diversion scheme on its own territory in November 1991.

Hungary launched intensive diplomatic efforts against these developments to prevent the diversion of the Danube into an artificial canal in Czechoslovakia. These efforts of Hungary included the following:

- Contacts with the Federal Republic of Czechoslovakian authorities under the neutral auspices of the European Union (EU);
- Calls for a meeting of the senior officials of the European Conference for Security and Cooperation (ECSC) using its emergency mechanisms;
- Attempts to take the issue to the International Court of Justice in The Hague;
- Application to the International Commission on the Danube to halt the construction;
- Declaring that Hungary would unilaterally annul then suspended Treaty of 1977 should Czechoslovakia continue its construction activities.

In these attempts, Hungary maintained that the implementation of this temporary solution by Czechoslovakia would cause the alteration of her border with that country. For example, a high-level Hungarian official stated that despite some problems, the Paris Treaty of 1947 on borders had not been violated even under the hegemony of the Soviet Union, and that this new situation was therefore an "extremely bad example". During these attempts, Hungary raised no claim over the land remaining between the former bed of the Danube and the canal into which the flow was to be diverted. Therefore, this behavior could be construed as merely a political tactic to attract the attention of the international community to this specific issue.

The Czechoslovakian authorities declared, for their part, that the implementation of the project would be no violation of the principle of *unchanging borders.*

After Vaclav Havel, an internationally renowned writer, became president of Czechoslovakia, his declaration that the project had to be maintained caused great disappointment on the Hungarian side and accelerated its steps to nullify the 1977 Treaty.

Hungary Nullifies the Treaty

Having failed to block the 'temporary solution', the Hungarian Parliament declared the nullification of the 1977 Treaty which it had earlier suspended. This decision also included a provision that there would be no further discussions with Czechoslovakia beyond those related to nullification. The parliament did not only resolve to cancel the Hungarian part of the project, but also stated its opinion that those facilities remaining on the Czechoslovakian side should not be put into operation. This opinion was officially communicated to Czechoslovakia on 19 May 1992.

This unilateral annulment of the project imposed heavy costs on the Hungarian economy. The Antall-led government of Hungary had tried unsuccessfully to justify its actions legally on the grounds that the Treaty of 1977 was signed under the Communist regime and thus its consequences should be binding on that regime only. However, Hungary was forced to pay compensation to contracting Austrian firms amounting to more than US$ 260 million, quite apart from the burden of a US$ 560 million loan extended by Austria for the project.

In annulling the Treaty of 1977, Hungary acted on the mistaken assumption that the other side would also stop the project. But this disregarded the fact that the Czechoslovakian side had already made much progress in the project. A high level Hungarian official admitted this error by saying that "nobody in Hungary had ever thought that the Czechoslovakians would attempt to divert the Danube onto their territory."

Despite Hungary's actions, all political parties in Czechoslovakia (excepting those representing the Hungarian minority) agreed that the

Gabcikova dam should be completed and thus doomed Hungary's protests to failure. On 20 October 1992, Czechoslovakia declared that technical preparations to divert the river to its new course were completed and navigation on the river would therefore be stopped for two weeks. The Danube was diverted into its new course on 1 November 1992 and Gabcikova HEPP was phased into operation.

On 1 January 1993, Czechoslovakia split into the Czech and Slovak Republics and the direct partner of Hungary after this division became the Republic of Slovakia.

Initiatives by the European Union

Concurrent with Hungary's nullification of the 1977 Treaty in 1992 and attempts by Czechoslovakia to develop a temporary solution, the European Union was intensifying its efforts to bring about a solution to the problem. In April 1992 it proposed to act as a mediator between the parties.

The EU stressed that it was ready to appoint specialists to, and preside over, a trilateral commission to assess the legal aspects and environmental implications of the project. The Union asked the parties to agree to the following:

- The governments of Hungary and Czechoslovakia would apply separately to the European Union;
- Both governments would agree to abide by the decisions of the tripartite commission;
- Both governments would abstain from any step that would block the implementation of measures in line with the report prepared by the tripartite commission.

It was decided, along these lines, to hold the first meeting of the commission in Vienna before the diversion of Danube to its new course.

The Government of Czechoslovakia informed the Commission that it could negotiate the terms of the temporary solution provided Hungary continued the construction of the Dunakiliti Dam and guaranteed water

flow into the newly constructed canal. Hungary, on the other hand, insisted that Czechoslovakia should stop all project-related activities during the process of negotiation.

Given the conflicting stances of the parties, the first meeting of the commission was unsuccessful. Subsequently, the EU's efforts could not prevent Hungary's unilateral annulment of the Treaty of 1977 and the diversion of the river to a new course by Czechoslovakia. This meant the emergence of a *de facto situation.*

In 1993, facing some new circumstances, the parties decided to take the issue to the International Court of Justice. An Arbitration Contract prepared for this purpose was submitted to the Court on 3 April 1993.

Decisions of the International Court of Justice*

The Arbitration Contract asked the International Court of Justice to resolve the following issues:

(i) Was Hungary entitled to first suspend the 1977 Treaty and then annul it?

(ii) Was the Federal Republic of Czechoslovakia entitled to introduce a 'temporary solution' in November 1991 and then to start operating facilities unilaterally in November 1992?

(iii) What judgment can be made of the legal validity and consequences of Hungary's declaration of 19 May 1992 to annul the Treaty?

The Court of Justice was also asked to assess the economic implications of the present state of affairs.

As to point (i) above, The Court voted 14 to 1 that Hungary was not legally entitled to annul the Treaty. In discussions over the issue outlined in paragraph (ii) Slovakia argued that the suspension and then annulment of the original Treaty by Hungary made it necessary for Slovakia to continue relevant activities under a project similar to the original one. Slovakia based her claim of the legal validity of the

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(*) This section is based on the Communiqué No. 97/10 issued by the Court of Justice on 25 September 1997.

'temporary solution' on the principle of approximate application. The Court did not see any point in investigating whether there was any such principle in international law and stated that even if such a principle did exist its application could be possible only within the framework of already existing treaties. In relation to the Gabcikova-Nagymaros Project, The Court also resolved, in line with Article 1 of the Treaty of 1977, that:

- the project consisted of interlinked components which could not be isolated from each other:
- the project was a single and indivisible one requiring the joint proprietorship and investments of both countries as stipulated in Articles 8 and 10 of the 1977 Treaty.

On the grounds outlined above, the Court decided that there was a substantial difference between the original project as described in the Treaty and the 'temporary solution'.

Maintaining that it had resorted to this solution in order to mitigate her losses arising from the unilateral abandonment of the original project, Slovakia insisted that *"an established principle of international law allows one party to seek ways of reducing its losses where the other party fails to fulfill its obligations."* The Court, however, argued that this principle could be a basis for assessing losses but not an excuse for any other wrongful act.

The Court had separate discussions and voting on the 'temporary solution' activities started by Czechoslovakia on her own territory in 1991, and on the unilateral decision to divert the Danube to a new course in October 1992.

On the first issue, the Court voted 9 to 6 that Czechoslovakia did not commit a wrongful act by introducing a 'temporary solution' in 1991 on the grounds that negotiations between the parties were continuing at that time and there was no definitive indication of the result of these negotiations.

However, despite the Court's support for its 'temporary solution', Czechoslovakia's unilateral decision to divert the course of the river in October 1992 was considered a wrongful act, again by 9 to 6 votes.

The third issue raised in the Arbitration Contract related to the assessment of the legal validity of Hungary's declaration to annul the Treaty. The Hungarian side put forward five points to defend its position:

- State of necessity,
- The impossibility of performance,
- Fundamental changes of the original circumstances,
- Material breach of Treaty,
- Development of new norms of international environment law.

- State of necessity

The Court of Justice ruled that even if there had been a state of necessity this would not be a sound basis for the annulment of an agreement and a state of necessity could be a valid defense only in those cases where there was failure in the implementation of an agreement.

- The impossibility of performance

The International Court observed that Articles 15, 19, and 20 of the 1977 Treaty allowed for the reconsideration of emerging economic and ecological circumstances by the parties involved and therefore the introduction of new arrangements.

- Fundamental changes of the original circumstances

The Court ruled that it was possible to foresee the developments in international norms on the environment, and additionally, that Articles 15, 19, and 20 were framed in such a way as to be adapted to new norms. On these grounds, the Court decided that the points raised by Hungary could not remove the obligations of the agreement.

- Material breach of Treaty

The most important argument of Hungary that the agreement had been materially breached was the actual construction of facilities under the 'temporary solution'. The Court accepted that the diversion of the Danube to a bypass canal by Czechoslovakia in October 1992 was a wrongful act. However, the Court maintained nevertheless that the declaration of Hungary on 19 May 1992 to annul the agreement could not

be valid since the act of diversion had not taken place by that date. Consequently, since there had been no act of diversion by 19 May 1992 and no possibility of negotiating disputed issues, the Court rejected the Hungarian claim that the Treaty was breached in May 1992.

- *Development of new norms of international environment law*

The International Court of Justice stated that newly emerging environmental laws could be incorporated into the original agreement by mutual consent and within the framework of Articles 15, 19 and 20. According to the Court, these articles made it possible to address and discuss new environmental norms in the context of a common plan. In any case, the very reason for including these articles in the Treaty had been to respond to needs which might emerge in the course of time.

In sum, the Treaty was not a static one but a structure able to adapt to new norms defined by international laws. Environmental concerns had grown rapidly in the years following the signing of the Treaty, clearly proving the validity of Articles 15, 19 and 20.

The Court observed that the parties had both respected environmental considerations but had not been able to agree on the scope and content of measures to be taken under the project. The Court further decided that initiatives by a third party would contribute to the settlement of the dispute in case there was no adequate softening in the original stands of the parties.

Upon these considerations, the Court declared that both Hungary and Czechoslovakia did not fulfill their obligations imposed by the Treaty of 1977; that wrongful acts of both parties had not legally led to the expiration of the Treaty; and that there was no justification for the annulment of the agreement.

In conclusion, the International Court of Justice voted by 11 to 4 against that the declaration of annulment dated 19 May 1992 did not legally end the Treaty of 1977.

The Court took this decision by examining whether the acts of the parties in the period 1989-1992 were in accordance with international norms. The decisions of the Court as to the future acts of the parties under this evaluation are summarized below.

Legal Consequences of Court Judgements

The Court of Justice accepted that the Treaty of 1977 was still in effect as a document governing relations between the parties. Although these relations are also governed by other conventions involving these two countries and by the provisions of international law as well, the Treaty of 1977 had predominance over them. Nevertheless, the Court observed that a de facto situation had emerged as a result of non-compliance with this Treaty and this situation could not be overlooked in legal terms regarding the future actions of the two countries. The de facto situation existing since 1989 is still valid and shaping the relationship of the two countries. It is essential to take this fact in consideration while assessing the circumstances that emerged as a result of the non-fulfillment of the obligations in the Treaty.

The joint investment project is not restricted to energy production but also includes other objectives. These are related to the improvement of navigation on the Danube, flood prevention, frost control and protection of the environment. The parties agreed to fulfill their obligations, implement and conclude those parts of the project relating to these objectives.

Based on the points presented above, the Court voiced the opinion that the parties were under a legal obligation to realize all objectives of the project from the Treaty of 1977.

The Court also observed that the environmental impact and effects of the project were of great importance and stressed that it was necessary to bear in mind existing standards in environmental risk assessments. Although Articles 15 and 19 of the Treaty included obligations for the protection of the natural environment, some new norms and standards have emerged within the last two decades. According to the Court, international norms and standards apply not only to newly launched investments but also for those already in operation. The Court was of the opinion that the parties should develop a new approach to the environmental impacts of the operation of Gabcikova HEPP. In particular, there was urgent need to solve problems related to the volume of water to be released into the former course of the Danube.

According to Article 26 of the 1969 Vienna Convention on International Agreements, "any agreement in effect binds the parties and requires their consistent action in good faith." According to the opinion of the Court, the principle of "action in good faith" refers, in the context of the case under examination, to the objectives of the Treaty and the intentions of the parties to conclude the Treaty. As such, this principle has a meaning beyond the execution of the Treaty in its narrow sense. In other words, the principle of action in good faith imposes an obligation to realize the main objectives of the Treaty according to a reasonable consensus.

The Treaty of 1977 not only covers the issue of joint investment but also represents a legal arrangement. According to the agreement, the 'boat passage system' to ensure navigation fell under the joint proprietorship of the parties and the operation of this integrated system required coordination. In addition, the returns from the project were to be allocated equitably by the parties. Since the Treaty was still in effect, the International Court deemed the joint legal arrangement as the main element and stressed the need to re-impose it.

According to the Court, which examined the situation in its wider context, since the construction of Dunakiliti Dam in Hungarian territory had been abandoned, the Cunova Dam in the territory of Czechoslovakia had the same status with Dunakiliti Dam. This dam too would have to be operated in compliance with the agreed rules. The International Court stated that the re-institution of the joint regime would be in conformity with the principle of optimal utilization of water resources and conducive to the realization of the objectives stated in the Treaty.

There was no application to the Court to assess the losses incurred by either party as a result of implementing the project in a manner different than that originally envisaged. However, the parties asked the Court to lay down the principles by which any request for compensation could be put forward.

The Court decided that the parties had to compensate for each other's losses on the grounds that both Hungary and Czechoslovakia had been involved in wrongful acts. However, the Court suggested avoiding such

an action on the grounds that the wrongful acts had been overlapping and uncompleted. Hence the parties could mutually give up their claims.

As to the costs incurred in joint construction, it was decided to consider such costs separately from compensation and have them liquidated according to the relevant articles of the Treaty of 1977. The Court further ruled that Hungary could share the benefits of facilities constructed in Czechoslovakia by sharing the investment and operating costs of these facilities.

Establishment of a Temporary Operation Regime on the Disputed Part of the Danube

Following the diversion of the Danube to its new course by Slovakia, the parties conducted negotiations in 1993 and 1994 for the establishment of a 'temporary operation regime' on the disputed part of the watercourse.

The Treaty of 1977 had stated that the former course of the river would be given 50 m^3/s water in winter months and up to 200 m^3 /s during the growing season for vegetation and crops. Based on these quantities, it was planned to produce energy in Gabcikova HEPP by diverting 81 percent of the annual flow of the Danube into its new course.

Slovakia proposed, as a fair compromise, to temporarily (until the decision of the court would be reached) increase the sanitary flow several times, to a level of 100 to 500 m^3/s. As a consequence, the amount of water to flow through Gabcikova HEPP was reduced to 65 percent of the average annual flow.

During negotiations, Hungary demanded that water to be released to the former course should be raised to two thirds of the average annual flow in order to maintain the ecological balance. However, this demand was not accepted by Slovakia since it would substantially reduce energy production. In addition, Slovakia claimed that the re-direction of 70 percent of the waters of the Danube to its former course would lead to eutrophication in the waters of the diversion canal and further deteriorate ecological conditions by accelerating the process of erosion along the former course.

As a result of this two-year negotiating process, a consensus was reached in April 1995 on a 'temporary water management regime'. Following this agreement, the long disputed Dunakiliti dam was reconsidered with some project revisions and the dam was finally constructed. With this facility, the old course is supplied with varying rates of water flow that may rise to 500 m^3/s.

There is as yet no clarity as to when a definitive and final agreement might be reached.

Conclusion

Prior to the 90s, there were in Europe the Eastern Bloc countries governed by communist regimes and the countries of the Western Bloc having multi-party democratic systems. This basic divergence in political structures had stymied any fully-fledged agreement on the non-navigational use of the Danube by its riparian states. It was only in the new context following the dissolution of the Eastern Bloc and the process of democratization that the 'Agreement on Cooperation for the Sustainable Utilization and Protection of the Danube' could be reached in 1998.

Turning to the Euphrates-Tigris Basin, we can observe that both Syria and Iraq are governed by single party authoritarian regimes while Turkey's system is democratic. As with the Danube, this discrepancy has blocked any fruitful agreement between the parties in the Euphrates-Tigris Basin too.

Regarding the water dispute between Hungary and Czechoslovakia in Central Europe, we observe that a 25 km stretch of the original watercourse of the Danube was modified in spite of all the objections of Hungary.

It is interesting to note that while many specialists from Europe, mainly from Germany and the United Kingdom, and from the US have exhibited a keen interest in the water issues of the Middle East and that many international meetings have been organized around these issues, there has been less interest in the Nagymaros-Gabcikova dispute, although it creates a risk of serious ecological disaster. The literature on

this dispute is surprisingly limited with the exception of the official opinions of the parties and the somewhat ambiguous rulings of the International Court.

Some in the West have made determined efforts to present Turkey's temporary and very short period of water withholding to impound the Atatürk Dam as a deliberately ill-intentioned act. Yet, the same actors were far less critical when Czechoslovakia stopped navigation on Danube and diverted the flow onto her own territory. They were willing to go along with the emerging de facto situation.

It is beyond the competence of this author to consider these issues from the angle of international law. Therefore, the decisions of the International Court dated 27 September 1997 and its implications have been touched on by presenting related press releases, without further legal evaluations.

Considering the issue in very broad terms, Hungary undersigned, on 16 September 1977, an agreement on the Gabcikova-Nagymaros Project and then stopped it by a unilateral decision. The main factor driving Hungary to take such a decision was the serious environmental problems that the project was expected to generate in Hungarian territory. First Czechoslovakia, and then the Republic of Slovakia, after the split of the country, insisted that the project should be continued and actually started operating the diversion canal and Gabcikova HEPP.

European Greens, who are presently engaged in various lobbying activities to prevent the construction of the Ilısu Dam within the Southeastern Anatolia Project (GAP) in Turkey, were impotent against the Nagymaros-Gabcikova project on the Danube.

At the meeting on 'Global Water Policies and Cooperation in the Management of Transboundary Waters' in Petersberg, Bonn on 3-5 March 1998, the main theme of the communique from the meeting was an advocacy of regional solutions to water issues and disputes. This approach found reflection in the Petersberg Resolution under such paragraph headings as 'Broad Based Partnership', 'Focus on Cooperation at the Regional Level' and 'Support for an International River Basin Commission'. The final document also stressed that non-riparian

countries which are not directly involved in the issue and international organizations could intervene in related discussions.

This is a clear indication that economically powerful actors do want to get involved in water-related issues. The motivation behind this has less to do with contributing to any solution than their economic and political interests. Unfortunately, initiatives driven by these interests may overlook some basic facts.

Some of those who assert that water issues in the Middle East must be handled at a regional level regard the dispute between Hungary and Slovakia as a purely bilateral problem. For example, when Germany was asked its opinion regarding the attitude of the parties in the Gabcikova-Nagymaros Project who had both breached international legal norms, the German authorities stated that the issue was of interest only for Hungary and Slovakia.

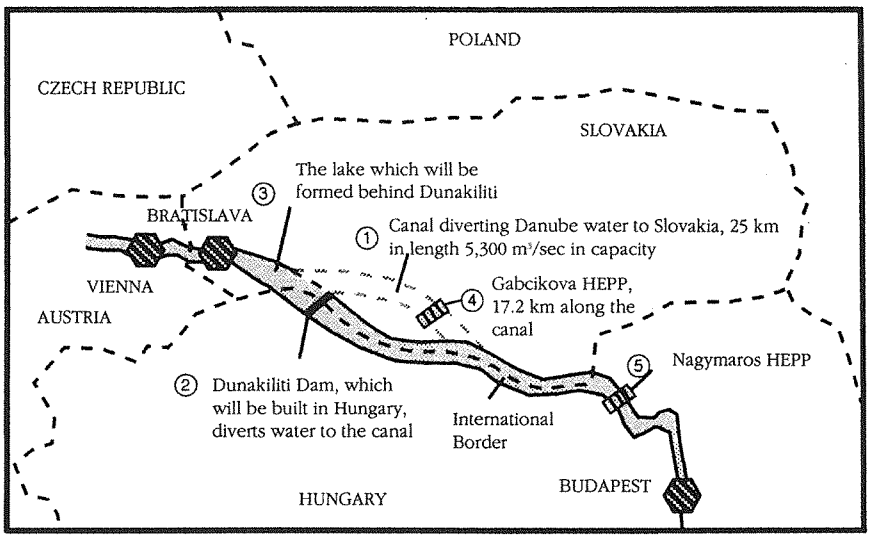

Figure 19: A Schematic Plan of the Nagymaros-Gabcikova (Bös) Project

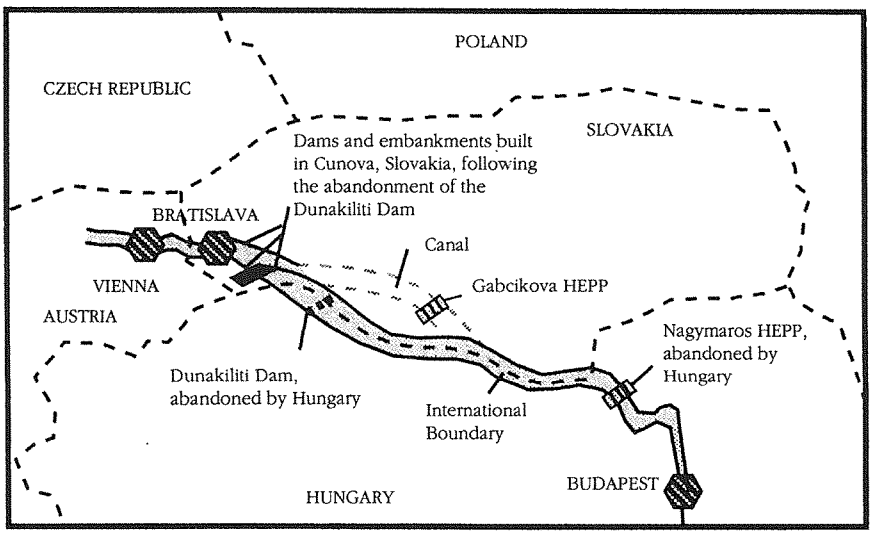

Figure 20: A Schematic Plan of the Alternative Project Developed by Slovakia (Temporary Solution-Option C)

Colorado River

Introduction

The 2,330 km long Colorado River in the southeastern United States of America has a drainage area of 632,000 square kilometers (1/12 of the total surface area of the country). After flowing through seven states of the US, Colorado River enters Mexican territory and joins the Gulf of California in the Pacific via a large delta (Figure 21).

The rivers carries 18.5 billion cubic meters of water (586 m^3/s) as an annual average at the point where it joins the Gulf. Around the Keban Dam, the Euphrates has a drainage area of 64,000 square kilometers and its average flow is 640 m^3/s. Despite the fact that Colorado River has a drainage area ten times as large as the Euphrates at the Keban point, the Colorado River receives less water than the Euphrates at the Keban point on a per kilometer squared basis.

The Colorado River is fed by the snow of high plateaus and 4,000-5,000 meter high Rockies, extending north to south towards the center of the US. After Colorado, Utah, Wyoming and New Mexico, the river enters the states of Nevada and Arizona which have desert characteristics similar to those in Egypt and Sudan. As such, the Colorado River is regarded as the 'Nile of America' (Anık, 1991).

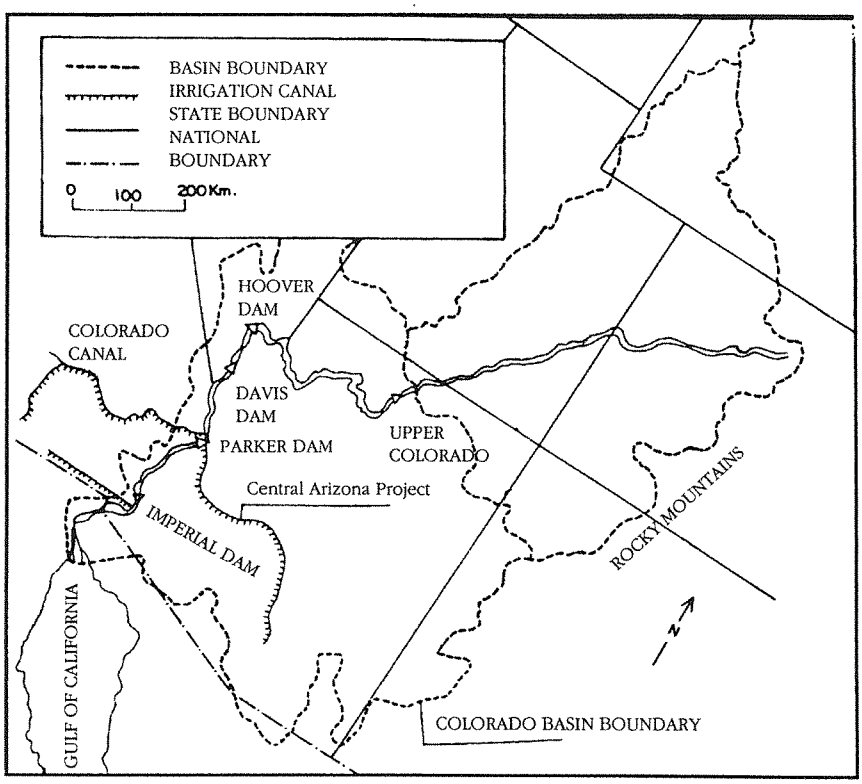

Figure 21: Colorado River Basin

Water Allocation to States and the Agreement of 1922

With the discovery of gold in the Rockies and some regions in the west of the US, there was a mass population movement to the west known as the 'Gold Rush'. However, many of these striving and ambitious people hoping to find gold and get rich in a short time had to engage in agriculture after their hopes faded. They soon found out that the summers were too dry for crop farming in the State of Colorado. They then organized under the leadership of Horace Greely, the founder of the city of Greely, built the first water diversion facility on a tributary of the Colorado River in 1870, and subsequently started irrigated farming on an area of about 3,000 hectares (Bekişoğlu, 1992). Following this first success, farmers organized in small groups and started to introduce irrigation to ever wider areas.

Railroad construction which had begun before irrigation started its crucial role in the development of the region, allowed the marketing of farm products and especially the development of the cattle trade.

In the 1870s, cultivable land was divided into parcels of 64 hectares and distributed to farmers. Legislative measures were introduced to prevent the division of farm plots through sales or inheritance, which also contributed to efficient and productive farming.

However, these efforts for responding to ever increasing farming needs by water transfer from one tributary to another placed farmers in different river basins in opposition to each other, and also to miners who needed vast volumes of water to sift gold out of other material. In 1882, the Denver State Court had to rule over the dispute. This court ruling laid the basis of legislation related to water issues in the US as well as in the State of Colorado. The Denver Court Ruling included two fundamental points to safeguard the right to use water (Bekişoğlu, 1992).

(i) Transfer of water from one basin to another is a lawful act and there is nothing unjust in transferring the surplus water of one basin to a water needy area.

(ii) Farmers can organize themselves and take priority in utilizing the water resources of the State of Colorado on condition that such utilization is for public benefit and not to the detriment of any prior entitlement to water use.

These diversion and irrigation schemes, however, did not include large storage facilities. Consequently, the long droughts which happened from time to time affected the farming population and even forced them to seek settlement elsewhere. In 1902, a Federal Water Administration based in Denver was established to find solutions to the water problems of 17 states including the 7 in the Colorado River Basin. The main purpose was to bring dispersed water diversion facilities existing at different points along the course of streams in conformity with the principles of overall water resources planning. In addition, large-scale projects were launched under the control of the Water Administration and with the financial support of the Federal Government.

Since the flow in Colorado River varies with respect to both seasons and years, there was a need to regulate the waters of the river by a number of large dams as is the case with the Euphrates. It was of course impossible to build such large facilities with the financial means of farmer organizations and individual states, so the Federal Government had to intervene.

Imperial Valley in the State of California near the Mexican border had quite fertile soil and a project was prepared in 1919 by the Federal Government for the irrigation of this plain. This project, however, gave rise to serious concerns in the upstream states and Arizona. These upstream states therefore launched initiatives before the Congress over their concerns that the water entitlements to be established by the State of California would bring serious limitations to theirs. Congress then passed a law on 14 August 1921 foreseeing negotiation among the states involved for an equitable allocation and use of the water resources of the region.

Representatives of the 7 states met together and divided the Colorado Basin into two parts, the 'upper' and 'lower' basins, in an agreement enacted in 1922. The demarcation line between the two basins was Lee Ferry located at the outflow of Glen Canyon Dam.

According to Article III (a) of this Agreement, each basin was allocated 9.25 billion cubic meters of water a year. The upper basin included the states of Utah, Wyoming, Colorado and New Mexico, while the states of the lower basin were Arizona, Nevada and Southern California. Article III (b) of the agreement gave priority to the lower basin states by specifying that the states of this basin could increase their beneficial uses of the Colorado Basin by 1.2 billion cubic meters.

A point of interest in this Agreement was the fact that the water rights of Mexico as a downstream country were referred to only in very broad terms and that the complete average annual flow of the river (18.5 billion cubic meters) at the point where it reaches the sea was allocated to the 7 states of the US without any concern for the water needs of Mexico.

Article III (c) of this Agreement refers to the water rights of Mexico as:

".....future Mexican water rights recognized by the United States shall be supplied first out of surplus over and above aggregate of the quantities specified in (a) and (b), and if this surplus is not enough the deficiency shall be borne equally by the two basins..." (Whiteman, nd).

Here the principle is to provide for the water use of Mexico as a downstream country through the quotas of the seven states as accepted by the US. As far as water use by upstream countries are concerned, this arrangement was similar to that in the Nile Agreement signed by Egypt and Sudan in 1959. In fact, according to the Nile Agreement, the allocation of water at the Aswan Dam was 55.5 billion m^3 for Egypt and 18.5 billion m^3 for Sudan (Table 16) and it was further stated that the future water uses of other countries, Ethiopia primarily, would be deducted from the above stated quotas with the approval of Egypt and Sudan.

With the inter-state Agreement of 1922, the US had already introduced a limitation on water use by Mexico long before any final agreement on water allocation.

Water Disputes Between the US and Mexico

Regarding the US and Mexico, there are two transboundary waters of interest: the Colorado and the Rio Grande. In 1924, the US Congress empowered the President to conduct negotiations in relation to the use and allocation of the waters of these two rivers. Under this law, a joint commission composed of the representatives of the US and Mexico was formed.

In this commission, Mexico demanded 4.44 billion m^3 (3.6 million acre-feet) water use from the Colorado River but the US side stated that it could allocate only 0.92 billion m^3 (750,000 acre-feet) of water, amounting to 21 percent of the original demand of Mexico. The US side said, in addition to this 0.92 billion m^3 of water, Mexico could also use post-irrigation water returning back to the main course of the Colorado River and water in the drainage canals along the boundary (Whiteman, nd.). This wide gap between the positions made negotiations unsuccessful and bilateral talks consequently ended in the 1930s.

In the years which followed, a commission formed by the states in the Colorado Basin and officials from the US State Department started a long term project. The Federal Government was searching new tactics and positions in this process. In this work, the US side launched many projects for the further development of water potential in the basin while also determining how much water use could be possible as a result of these projects and how much water could then be allocated to Mexico. Although it was difficult to make such calculations in exact terms, it was estimated that Mexico could use 1.85 billion m^3 of water after the US realized all of its projected water use (Whiteman, nd.).

While the Federal Government had the figure of 1.85 billion m^3 as the maximum volume of water that could be allocated to Mexico, the diplomatic note submitted to Mexico on 30 June 1941 stated this figure as 1.10 billion m^3 (900,000 acre-feet). The State Department stressed the following points in this note:

> *".....Mexico would be assured in perpetuity 900,000 acre feet (1.1 billion m^3) of stored water of the Colorado River, delivered according to a schedule most convenient to the requirements of Mexico.*
>
> *.....The water it is proposed to deliver to Mexico from the 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 (4.4 billion m^3) 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 the Boulder Dam prevented serious shortages, even greater than those which would otherwise have occured 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 here in presented, no charge would be made to Mexico for storage costs at Boulder Dam."*
>
> Memorandum, June 30, 1941, handed to the Mexican Ambassador at Washington (Castilo Nawera) at the Department of State, file 711.12155/1915).

These points clearly express the positive effects expected on downstream countries as a result of dams existing in upstream countries. A memorandum in reply from the Mexican Ambassador, dated July 22, 1941, with which was enclosed a draft treaty, stated, in part:

> *".....the Mexican draft asks, approximately, 2,000,000 acre feet, or 2,500,000,000 Cu.M, which constitutes about 55 percent of the request formulated by Mexico in 1929. This reduction is the result of prolonged and detailed studies with the object of determining the minimum quantity which our country really needs to develop its possibilities in the Lower Colorado. On the other hand, the volume determined (2 million acre feet) will normally constitute a surplus from the American uses; this affirmation is based on the studies of our technicians and can be corroborated by those made by American experts."*
>
> The Mexican Ambassador at Washington (Castillo Nawera) to the Department of State, memorandum, July 22, 1941, MS. Department of State, file 711.12155/1927).

As can be clearly seen, Mexico took a step back from her original demand of 4.4 billion m^3 to 2.5 billion m^3 but this was still a higher figure than the US offer of 1.1 billion m^3. The US note dated 11 February 1942 once more stressed the importance of benefits to be reaped by dam regulated water flow and added a further 300 million m^3 to her envisaged water allocation:

> *".....In suggesting the assurance in perpetuity of 900,000 acre feet (1.1. billion m^3) of stored water of the Colorado River to Mexico, delivered according to a monthly schedule most convenint to the requirements of Mexico consistent with releases and uses on the American side, the Department of State felt that it had more than met the requirements of Mexico based upon that country's past claims since the quantity suggested of controlled water would be so much more valuable than a much greater quantity of uncontrolled water. It was noted with satisfaction that Mexico recognized this to a certain extend by its counter proposal that approximately 2,000,000 acre feet (2.5 billion m^3) of water would be acceptable.*

"While it will be difficult to make arrangements therefor, the Department of State, being desirous of obtaining the most satisfactory arrangements practicable from the point of view of the two countries, suggests for the consideration of the Mexican Government that, because of the great value of controlled water and the very heavy expenditures made by the United States in the erection of Boulder Dam and other storage facilities, provision for the assured delivery to Mexico in perpetuity according to a fixed monthly schedule of 1,150,000 acre feet (1.42 billion m³) (*) *of regulated and controlled water from the Colorado River Basin would afford satisfactory adjustment of this aspect of the problem. It would be understood that this quantity would represent the total assured deliveries to Mexico* ***from any source*** *what so ever of the Colorado River Basin and its tributaries in the United Sates. It would also be understood that any surplus would not establish any additional rights on the part of Mexico."*

Memorandum, Feb. 11, 1942 handed to the Mexican Ambassador at Washington (Castillo Nawera) on the some day, MS. Department of State, file 711.1216M/1199: 1942 Per.Ref. vol. VI. p.147-149).

The expression *"from any source"* in the last paragraph of the note implicitly refers to waters returning back to the system after being used.

In response to the new US offer of 1.42 billion m³, Mexico insisted on 2.5 billion m³ in her Note dated March 19, 1942. Stating that 2.5 billion m³ is the minimum volume of water needed to irrigate 200,000 out of 300,000 hectares of land in the Colorado delta, Mexico added that further areas could be irrigated by pumping if there is more water. Besides, Mexico emphasized that even in case where the US as the country of origin realizes all her projects there will still remain 3 billion m³ of surplus water in the Colorado (US Secretary of State Archives, no. 711.1216 M/2036).

In response to the demands of Mexico as outlined above, the US side stated in its note of 4 December 1942 that the figures under discussion were average values and the states in the Colorado Basin would have great water shortages especially in dry years if 2.5 billion m³ of water was

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(*) Converted to metric system and added by the author.

allocated as demanded by Mexico. It was further stated that 2.5 billion m^3 of water could be allocated in years with high precipitation but this amount would drop to 1.2 billion m^3 in dry years. The US side also insisted that the Mexican side should take into account the positive effects of dams built in the US territory and evaporation losses to be suffered by the US.

The US side maintained that in the 10 years prior to the phasing in of the Hoover Dam in 1935, the area irrigated by Colorado River in Mexico was 61,538 hectares. Thus, on the assumption that 13,580 m^3 of water is used per hectare, the total annual water need would be 836 million m^3. The US note given by the Department of State in November 1942 stressed that Mexico had been able to use more water for irrigation since 1935 thanks to the regulatory function of the Hoover Dam. The drought which had struck farming hard in the period 1920-35 had had a lesser effect than it might have thanks to the existence of dams in the US territory (US State Department Archives, no. 7111216 M/2036).

Following this exchange of notes, bilateral talks which had ceased in 1930 were re-started in September-December 1943 by delegations composed of the representatives of the respective countries and members of the International Boundary Commission. Following the consensus reached in these talks, an agreement on the use of the waters of Colorado River was signed in Washington D.C. on 3 February 1944.

1944 Colorado Agreement

According to Article 10 of the Agreement reached by the US and Mexico, the US allocated 1.85 billion m^3 (1.5 million acre-feet) water annually from any and all sources in the Colorado River. It was decided that this allocation would take place at the start of each irrigation season and according to a monthly water distribution schedule to be prepared by Mexico. When the US side observed that there was too much water in the river, it could add a further 250 million m^3 of water (200,000 acre-feet) annually and thus bring the agreement figure up to 2.10 billion m^3 (1.7 million acre-feet). However, in dry years or where there was some defect in the irrigation schemes, any limitation introduced on water use in the US territory would also be applicable in Mexico at the same level.

Lawson, the President of the US Border Commission, noted in his speeches and reports to the Foreign Relations Committee, that the Agreement was a success for the US side since almost half of the total volume of water to be used by Mexico would consist of irrigation surplus, drainage and other used water originating in the US and only 5 percent of the natural flow of the river would thus go to Mexico.

The allotment of Colorado River waters finally agreed upon in article 10 of the Treaty of 1944 was described and commented upon in the following manner in a statement by the United States Boundary Commissioner before the United States Senate Committee on Foreign Relations:

> *"....In the case of the present treaty the amount allotted to Mexico, far from permitting any expansion in that country, is insufficient to cover even her present uses. On the other hand the water available to the United States, which is estimated as being in excess of 16,000,000 acre-feet (19.7 billion m³), permits of the development of practically all the uses presently contemplated for decades to come, if not forever....*
>
> *.... (c) It is estimated that, under ultimate conditions of development in the United States, more than half of the Mexico's allocation will consist of return and drainage flow and other waste waters originating in the United States. Thus, Mexico isnot assured under the treaty of as much primary water as she had actually used under natural conditions; that is, prior to the concentration of Boulder Dam (estimated as being in access of 900,000 acre-feet (1.1 billion m³), and much less than she could probably have put to beneficial use under natural conditions of stream flow.*
>
> *(d) The offer of the United States Section of the Water Commission in 1929 was 750,000 acre-feet (0.9 billion m³) a year, to be delivered according to schedule and there was proposed to be added an additional amount to compensate for loses in the main canal. It was pointed out that in addition Mexico would receive certain return drainage and other excess flow from the United States. As pointed out above, after full development in the*

lower basin in the United States more than half of Mexico's allocation under the proposed treaty or in excess of 750,000 acre-feet (0.9 billion m³) per year, will probably then be comprised of return flow. Thus, the United State will receive credit for over half of the Mexico's allocation without any use of primary waters. The balance remaining represents less than 5 percent of the average annual run-off of the Colorado River basin. The amount of 1,500,000 acre-feet (1.85 billion m³) allotted to Mexico under the proposed treaty probably will require the use of less primary waters than 1929 offer, and perhaps even less in total quantity of water passing to Mexico than was involved under the 1929 offer."

Development of Water Resources in the Colorado River

Since the late 20s, the United States of America has been building large water facilities on the Colorado River which are much envied in the world. These facilities include the Hoover, Davis, Parker, Headgate, Rock, Palo Verde, Imperial, Laguna and Morales Dams and the All American Canal System. The same facilities provided safe drinking and use water for a population of some 21 million living in the basin. Per capita use of water in Southern California is around 840 liters per day, which is a figure four times larger than the per capita water supply for urban dwellers in developing countries.

Dams and recreational facilities have contributed much to regional tourism. For example, the Glenn Canyon Dam Lake (the longest man-made lake in the US) can host more than 3 million tourists annually (Anık, 1991).

The Colorado basin has numerous dams, power plants and modern irrigation-drinking water supply facilities and this makes it necessary to have a supervisory mechanism ensuring that all these facilities are operated and managed in a manner compatible with technical and economic norms and that water is allocated according to the 1944 Colorado River Agreement. This need is met by the Colorado River Decision Support System (CRDDS), which can be reached at the address http://condo.dwr.co.gov/overview/bigoverview/crdscow.html.

In the data bank which is part of the Support System, one can access information on various points including the volume of water released

daily by dams, energy generation, or irrigation areas with respect to parcels and regions.

Problems of Pollution in the Colorado River

Saline water coming back from irrigation over a 800,000 hectare irrigation area and salination which arises from the contact of dam waters with calcareous layers (which brings the level of salination up to 1,400 ppm at the border) started to create disputes between the two countries in the 60s. Mexico suffered large losses in crop yields because of salination, which drove Mexican farmers to raise claims for compensation.

The 1944 Agreement had not included any arrangement regarding the control of water quality. Only in August 1973, 29 years later, could the US and Mexico sign an agreement to control water salinity.

This agreement stipulates that the level of salinity of water to be released at the border by the US could be only 115 ppm higher than the average level of salinity in the waters of the Imperial Dam close to the border. The range of tolerance is 30 ppm. This produced an arrangement for checking the salinity of water between the Imperial Dam and the border. It therefore seems a serious shortcoming that there is no arrangement for monitoring the salinity of waters upstream of this dam.

Evaluation of the 1944 Agreement

According to the 1944 agreement, the US controlled 95 percent of the water potential of the river and left only 5 percent for Mexico. Prior to and during negotiations with the Mexican side, the US delegation had two important technical arguments in relation to matters of water allocation:

(i) Water that is controlled by dams in the upstream and regularly transferred to the downstream is far preferable than a natural flow which may from time to time cause both droughts and floods.

(ii) Water that is released back to the natural flow or to drainage canals located near national boundaries after having been used by upstream countries can still be utilized by downstream countries provided that the former have introduced reasonable pollution control

measures. As far as water allocation to the parties is concerned, these 'returning waters' should be considered additional to the 'primary water' as defined in the Colorado Agreement.

The two arguments stated above are in conformity with the relevant engineering principles concerning the distribution of transboundary waters and they can thus be taken as conventional rules. On view, it is not possible to accord any technical basis to the demands of Syria and Iraq for an equal allocation of the natural flows of the Euphrates/Tigris Basin.

In conclusion, just as the Colorado River is important for the US having developed its resources to the benefit of her people, so the Euphrates and Tigris have a similar importance for Turkey. Nevertheless, Turkey is allocating a significantly larger proportion to her neighbors than the US provided for Mexico.

Indus River

Introduction

The British Empire had once been referred to as a domain over which "the sun never sets". The basic economic policy of the empire was to transfer raw materials from its colonies in Asia and Africa to an ever-expanding home industry thanks to the industrial revolution. One of the consequences of this policy was to grow cotton and other industrial crops in the fertile Indus Basin to be processed in the homeland and marketed to the world.

Until 1947 when the republics of India and Pakistan were founded, 10.5 million hectares out of a total of 26.3 million hectares of irrigable land in the Indus Basin (Sharma, 1990) was cultivated using an inadequate system of drainage and earth canals.

Ilinformed irrigation practices and excessive exploitation of the soil driven by British industry's need for raw materials led to a rising water table and salination. Instead of adopting appropriate measures to stop this harmful trend, the colonial administration opened further areas to irrigated farming with the same primitive methods simply in order to maintain the level of agricultural output.

Starting from the early years of their independence, the republics of India and Pakistan were both engaged in efforts to rehabilitate millions of hectares of irrigated crop fields, in addition to other projects. These efforts naturally involved a high cost burden for these young countries. In addition to the agricultural problems of the Indus basin, there was also some unrest relating to the boundaries of these states. The boundaries drawn in 1947 had not clarified the status of Kashmir and it was decided to clarify this status by a referendum. Following the occupation of this Muslim-majority state by Pakistani tribes, India intervened at the request of the Indian Administration of Kashmir and bloody fighting ensued. A ceasefire was secured on 1 January 1949 through the initiative of the UN. Though the ceasefire line divided Kashmir into two parts, this line was not recognized by Pakistan and the issue remains a matter of dispute. Furthermore, the boundary between the two countries bisects irrigation canals on 10.5 million hectares of land mainly in the Pakistani State of Punjab. Important water sources thereby remained in India, which thus became an upstream country.

The chaos created by the British in their hurry to leave the Indian peninsula under pressure of Indian and Pakistani independence movements generated hostilities which have survived to present times, just as in the case in the Middle East.

In the following sections, the specific case of the use of Indus River will be addressed in the period up to 1960 when the Indus Agreement was enacted.

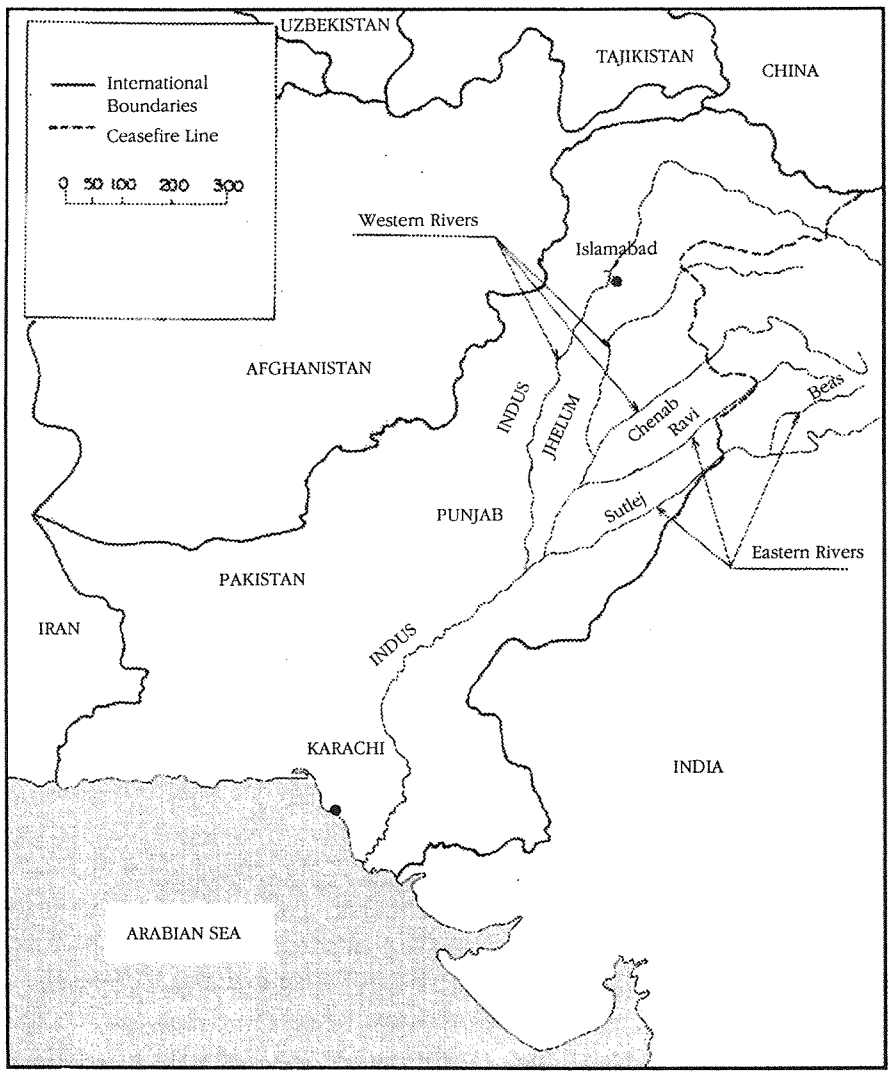

Figure 22: Indus River Basin

Water and Land Resources in the Indus Basin

The Indus, known as 'Abbasin' or 'Father of All Rivers' by local communities, is one of the biggest rivers of the world. It is a transboundary water course involving India and Pakistan. Its drainage area reaches 964,261 km^2 which is larger than the total territory of Turkey (WAPDA). This total area is also shared by China and Tibet (10 percent), Afghanistan (8 percent), leaving 82 percent of the basin to India and Pakistan (Figure 21).

The basin of the Indus, which also extends into some parts of the Himalayas, contains the largest glaciers of the world excepting those at the poles and 40 of the highest 100 peaks in the world. Studies of the Baltora glacier in Shyok Valley indicate that it could contain 120 billion cubic meters of water. Including other glaciers and ice cover in the region, this water capacity reaches 1,200 billion cubic meters (Kirmani, 1993). The Indus originates at a height of 5,500 meters in mountain ranges in Tibet and after a course of about 2,900 km it flows into the Arabian sea near Karachi.

During this long course, many tributaries join it and thus form a large system. According to the definition existing in the 'Indus Water Use Agreement' signed by India and Pakistan in 1960, which we will discuss in detail later, the system is divided into two parts: the 'Western Rivers' and the 'Eastern Rivers'.

The western part consists of the main flow of Indus, Jhelum and Chenab while the streams Ravi, Sutlej and Bean constitute the eastern part of the basin. Under the Indus Agreement the western rivers are allocated to the use of Pakistan and the eastern rivers to India.

Average annual flows in these rivers are shown in Table 18 below referring to measurements conducted over a long period by Flow Observation Stations (FOS) in both India and Pakistan (Ministry of Irrigation, India, 1981):

TABLE 18 : Water Potential of the Indus River System

	Average Annual Flow	
	Billion cubic meters	**Billion acre-feet (maf)***
Indus (Kalabagh FOS)	110.32	89.47
Jhelum (Mangala FOS)	27.93	22.65
Chenab (Marala FOS)	28.98	23.50
Total Potential in Western Rivers	**167.23**	**135.62**
Ravi (Madhopur FOS)	7.93	6.43
Beas (Mandi FOS)	15.83	12.84
Sutlej (Rupar FOS)	16.71	13.55
Total Potential in Eastern Rivers	**40.47**	**32.82**
The Indus System	207.7	168.4

• According to the British measurement system used in India and Pakistan 811 acre feet equals 1 million m^3

Although the average annual flow in the Indus system is 208 billion m^3, there are large seasonal and yearly variations. Therefore, it was agreed that the quantity of water to be taken as a basis for allocation after regulation of flow by water storage facilities should be 147 billion m^3 (119 maf). This is equivalent to 81 percent of the average annual flow.

The Indus system is affected in its upper flows by the thaw taking place at the slopes of the Himalayas in March, April and May and in its lower flows by the Monsoon rains in the period June-September. Water flow in the main course of Indus and its tributaries diminishes and falls below annual averages between November and February. Water flow then rises with the thaw starting in March. Further fed by Monsoon rains starting in June, these rivers reach their peak values in July and August contrary to what we observe in the rivers of Turkey.

Because of the 10:1 ratio between the lowest and highest average monthly flows, it was necessary to build storage facilities along the Indus and its tributaries. Consequently there are many dams in the Indus system engaged in seasonal adjustments of saving water for dry years. One outstanding example of these facilities is the 153 million m^3 rock and

earth fill Tarbela Dam in Pakistan, on the Upper Indus. The Atatürk Dam ranks 6th in the world with a fill of 85 million m^3. The Tarbela Dam annually releases about 9 billion m^3 of water for irrigation and produces energy at an installed capacity of 3478 MW (WAPDA, 1990).

In the same dam, the total usable water reaches 12 billion m^3 within a total volume of 14.3 billion m^3. These are values smaller than those of the Keban and Atatürk dams. The construction of the Tarbela Dam started in 1968 and was completed in 1976. The total investment cost was US$ 1.3 billion. Since the Indus is known as a highly sedimented river while the 'dead volume' reserved in the Tarbela dam for siltation is rather small, it is expected that the dam will go out of operation within the coming 15-20 years because of siltation. There have been long discussions since 1952 about a project to construct another dam, Kalabagh, just below the Tarbela dam mainly for energy production purposes. The dam would have an installed capacity of 2,400 MW (equal to that of the Atatürk Dam). There was no actual implementation, however, since the projected dam lake would have covered 160,000 hectares of farming land and about 250,000 people would have had to be re-settled.

Beneath the wide plains of the Indus Basin, there lies a rich alluvial groundwater layer (aquifer) down to a depth of 300 meters. Fed by Monsoon rains, the total annual water capacity of this aquifer reaches 56 billion m^3, 45 billion m^3 of which is considered usable. Although this source is already utilized, a further 10 billion m^3 could be drawn without violating reserve security (Kirmani, 1993).

In both India and Pakistan, large-scale irrigation projects have been developed by jointly using surface and groundwater resources. In India, irrigation covers an area of 57 million hectares using the waters of the Indus, Ganges and Brahmaputra rivers. India ranks first worldwide in terms of land area under irrigation. India is followed by China with 52 million hectares and by the US with 21.4 million hectares. Pakistan is fourth in the list with 17.6 million hectares of irrigated land (FAO, 1997).

Until 1947 when India and Pakistan gained independence, the state of Punjab accounted for most of the 10.5 million hectares of irrigated land in the Indus Basin. During that time, the operation of the irrigation system was under the centralized technical and administrative control of

the British Colonial Administration. Upon the split of Punjab in 1947, India gained the status of an upstream country and this situation gave rise to some problems, to be discussed below.

Problems Related to the Use of the Indus River

Following the foundation of the independent states of India and Pakistan, Sir Cyril Radcliff, Head of the Punjab Border Commission, proposed to the leaders of both nations, Nehru and Jinnah the joint operation of the management and maintenance services of the irrigation scheme which covered 10.5 million hectares of land.

While Jinnah maintained that they could not leave the irrigation of the fertile land of Pakistan to the conscience of India, Nehru stated that India would decide on the use of waters that belonged to India and the proposal was thus rejected. Nehru further considered the proposal as a new political game which would generate new problems (Biswas, 1992).

Following rejection of Radcliff's proposal, a consensus was reached on 10 December 1947 to introduce an operating plan having effect until 31 March 1948. According to this decision taken by the technical staff of the governments of Eastern and Western Punjab, a new negotiation process would be started after 31 March 1948. However, the Indian Government of Eastern Punjab stopped releasing water to Pakistan on 1 April 1948. Muhammad Ali Chaudhri who would later become the Prime Minister in Pakistan made the following statement concerning this action (Chaudhri, 1967):

> *".....On the side of East Punjab there was Machiavellian duplicity. On the part of West Punjab there was neglect of duty, complacency, and lack of common prudence - which had disastrous consequences on Pakistan".*

According to some commentators, the economic and political motives which drove India to take this action could be summarized as follows (Michel, 1967):

i) To force the Moslem population of Kashmir to migrate by bringing pressure on Pakistan,

ii) To push the Pakistani economy into a difficult position to demonstrate that it can not be successful on its own and thus needed to cooperate with India,

iii) To retaliate to the tax levied by Pakistan on raw jute originating from East Bengal for processing in enterprises located in West Bengal.

After April 1, 1948 negotiations between these two countries on the use of the waters of Indus started again and on 30 April 1948 Indian Prime Minister Nehru ordered the Government of the State of Eastern Punjab to release water to irrigation canals in Pakistan.

Following these developments, an agreement of general scope was signed by the parties in Delhi on 5 May 1948. However, this agreement did not include any detailed arrangements as to the quantity of water to be allocated to the parties.

The Delhi Agreement accepted the principle that irrigation systems remaining in Pakistan would receive water from facilities to be constructed in that country. India, for her part, committed not to cut water during the period necessary for Pakistan to build her new canals and water transfer facilities. Pakistan also accepted that India could expand her irrigation area by withdrawing water from the Indus.

During negotiations, the Indian side referred to an earlier (1947) agreement between the states of Eastern and Western Punjab and stressed that Pakistan had in fact accepted that the waters belonged to India by adopting the practice of paying specific amounts of money to India in return for water. Pakistan, on the other hand, stressed that this payment was not for water but for financing the operation and maintenance of those facilities transferring water to Pakistan but now in India. In other words, Pakistan had her vested rights in these facilities, which left no basis to the assertion that Pakistan was 'buying water' from India. The Delhi Agreement brought no solution to this problem. Nevertheless, the Pakistani State Government of Punjab accepted that an amount to be specified by the Indian Prime Minister would be deposited in the Central Bank of India as an allowance for the operating and maintenance costs of these facilities.

The Delhi Agreement introduced a temporary solution to the urgent water problems in the disturbed environment caused by drawing the boundaries of the newly emerging states. This temporary solution, however, was not to the satisfaction of Pakistan. This discontent was expressed in such phrases as "...the existing consensus brings a heavy burden for Pakistan and is not satisfactory" as in the note given to India by Pakistan on 16 June 1949. This note also included a proposal for convening a new conference to "share waters". Should there be no consensus at this conference, the issue would be taken to the International Court of Justice. The Indian Prime Minister Nehru, on the other hand, proposed to his Pakistani counterpart, Prime Minister Ali Han, the establishment of an international commission composed of senior level judges from both countries.

Nehru's proposal included the following points (Biswas, 1992):

> *".....It is true that there is always a possibility of a lack of agreement between the members of the Commission, but if they are judges of the highest standing, they will consider the issues before them in a judicial spirit and are highly likely to come to a unanimous or majority decision. Even if they fail to agree, the area of difference will have been narrowed down by the measure of agreement reached and only the outstanding point or points of difference will remain to be dealt with. The two Governments could then consider the matter afresh, including the question of reference to a third party. To think, ab initio, of a third party will lessen the sense of responsibility of the judges and will also be a confession of our continued dependence on others. That would hardly be becoming for proud and self-respecting independent nations".*

All these developments yielded the following picture towards the end of 1950:

i) Pakistan stated that she had signed the agreement dated 5 May 1948 under some duress and thus did not accept it.

ii) While Pakistan intended to take the case to the International Court of Justice, India preferred a bilateral commission composed by an equal number of senior level judges from both countries to review the dispute.

iii) There was no solution to problems relating to the assessment and payment of operation and maintenance costs to be covered by Pakistan for those irrigation canals of Pakistan whose extensions remained in India.

While India continued to release adequate water, according to the provisions of the Delhi Agreement, for the functioning of irrigation schemes in Pakistan, she also launched new projects in Eastern Punjab. For example, the Bhakra-Nangal project was put into operation on 8 July 1954. While Nehru described the project as a "giant success for India", the Pakistani Prime Minister considered this a step which would "threaten peace between the two countries."

Towards the Indus Agreement of 1960

While these problems related to the implementation of the Delhi Agreement were continuing, David E. Lilienthal, former President of the Tennessee Valley Authority (TVA) paid a visit to India in 1951.

The Tennessee Valley Authority (TVA) was founded in 1933 as an Act of the US Congress. Its aim was to introduce integrated and planned development efforts in the seven states of the Tennessee River Basin which were then the least developed states of the US. The success of the TVA in these efforts brought it a worldwide reputation. Following these developments closely, Nehru personally invited Lilienthal to India to help establish a similar scheme in the Indus Basin. Lilienthal was also closely interested in the water disputes between India and Pakistan and expressed his opinion as follows when he returned home (Lilienthal, 1951):

> *".....The starting point should be, then, to set to rest Pakistan's fears of deprivation and a return to desert. Her present use of water should be confirmed by India, provided she works together with India (as I believe she would) in a joint use of this truly international river basin on an engineering basis that would also (as the facts make clear it can) assure India's future use as well.*
>
> *The urgent problem is how to store up now wasted waters, so they can be fed down and distributed by engineering works and*

canals, and used by both countries, rather than permitted to flow to the sea unused. This is not a religious or political problem, but a feasible engineering and business problem for which there is plenty of precedent and relevant experience.

This objective, however, cannot be achieved by the countries working separately; the river pays no attention to partition - the Indus, she 'just keeps rollin along' through Kashmir and India and Pakistan. The whole Indus system must be develop as a unit - designed, built and operated as a unit, as is the seven-state TVA system back in the U.S.

Jointly financed (perhaps with World Bank help) an Indus Engineering Corporation, with representation by technical men in India, Pakistan and the World Bank, can readily work out an operating scheme for storing water wherever dams can best store it, and for diverting and distributing water."

If the approach of Lilienthal is evaluated, it will be seen that his proposals also relate to some basic principles of water engineering in addition to the specific circumstances existing in the Indus Basin.

The Indus Basin had been under the British Administration until 1947 and the Hindu and Pakistani people had lived together during this period. Technical details relating to irrigation facilities and amount of water used were gathered at a center and these data were then transferred to Indian and Pakistani specialists. Therefore, in contrast to other transboundary water cases, there is a chance to assess correctly the start of vested rights and relevant water quantities. This is unique to the Indus Basin. Lilienthal also pointed out that apart from existing water uses, new projects to be developed by India would have the same priority. From an engineering point of view, assessment of the water resources in a basin as a whole and deciding on water allocations according to this assessment is a principle valid for all river basins. This was the point stressed by Lilienthal in his suggestions.

Carefully considering Lilienthal's report, World Bank President Eugene K. Black sent a letter to Nehru and Liyakat Ali Han, Prime Ministers of India and Pakistan, respectively, in September 1951 saying

that the Bank could act as a mediator in the dispute. Both prime ministers received this proposal well.

In the same year, after the assassination of Liyakat Ali Hand, Black sent another letter to his successor Nizamettin and Nehru to outline the approach of the bank as follows (Biswas, 1992):

> *".....The Indus basin water resources are sufficient to continue all existing uses and to meet the further needs of both countries for water from that source. The water resources of the Indus basin should be cooperatively developed and used in such a manner as most effectively to promote the economic development of the Indus basin viewed as a unit.*
>
> *The problem of development and use of the Indus basin water resources should be solved on a functional and not a political plane, without relation to past negotiations and past claims and independently of political issues".*

The method suggested by Black following this general explanation was that:

> *".....India and Pakistan would each designate a qualified engineer of high standing to prepare, jointly with the designer of the other, a comprehensive long-range plan for the most effective utilisation of the water resources of the Indus basin in the development of the region. Each designer would be instructed to govern himself by the principles stated above...*
>
> *An engineer selected by the Bank would be continuously available during the planning stage to work with the designers of the two countries. He would keep himself informed of the planning in view of the Banks' previously expressed readiness to consider financing proposals and would participate in the working party as an impartial adviser, free to express his views on any aspect of the matter... He could thus assist in solving problems without being in the position of an arbitrator...*
>
> *The working party would hold an initial meeting for the purpose of determining the procedure to be followed in working*

out the plan, the steps needed to be taken, the order and mannerin which those steps would be undertaken, and the persons by whom they would be undertaken, and would set target dates for completion of the various steps. On reaching agreement on these matters, the working party would promptly, without the need of any further authorization, put the agreed procedure into effect and begin work on the plan..."

The working group had its first session in Washington D.C. in September 1951 with the participation of representatives of the parties and the World Bank. Following three weeks of long hard discussions a consensus emerged around the following program:

i) There would be an assessment of the total water potential of the Indus Basin and the water needs of the irrigable land in both countries, to include relevant measurements and studies needed for the preparation of a comprehensive plan.

ii) The working group would gather all data and check their accuracy in engineering terms. There would also be projections as to the period of time needed for data collection, and an estimate of relevant costs.

After conducting interviews with Nehru and Nizamüddin, Black made a statement on 13 March 1952 that the parties had reached an understanding and a consensus to avoid imposing any limitation on existing water uses while the technical assessment work continued. This programme illustrates the importance of having reliable data for basin-wide water resources planning and water allocation. These principles are applicable to all transboundary waters and were also incorporated in the Turkish Plan put before Syria and Iraq in 1984.

Following the Washington meeting, no result could be obtained in negotiations held in Karachi and Delhi in 1952 and 1953. Consequently, the World Bank proposed that the parties prepare their water allocation plans separately. The Bank received their proposals on 6 October 1953 and summarized them as shown in Table 19 (Biswas, 1992):

TABLE 19 : Water Allocation Plans of India and Pakistan

Water Allocation Plans Proposed	Water Quota of India (billion m^3)	Water Quota of Pakistan (billion m^3)	Total Usable Potential
Indian Plan	36	111	147
Pakistani Plan	19	126	145

Though both countries gave similar figures for total usable water potential, there is a significant difference of 15 to 17 billion cubic meters between the figures for the water to be used by each country.

Black had the following comment at this stage of negotiations:

> *"..... An essential part of the Pakistan concept is that existing uses of water must be continued from existing sources. Moreover, 'existing uses' in the Pakistan plan, include not only the amount of water that have actually been put to use in the past, but also allocations of water which have been sanctioned prior to partition even though the necessary supplies have not been available for use...The corresponding concept of the Indian plan, on the other hand, is that although existing uses (here defined to include only the actual historic withdrawals) must be continued, they need not necessarily be continued from existing sources... The bank proposal embodies the principle that the historic withdrawals of water must be continued, but not necessarily from existing sources... A requirement that existing uses must be supplied from existing sources would unduly limit the flexibility of operation needed for the efficient use of water. In fact, no fair and adequate comprehensive plan could, in the opinion of the Bank Representative, be devised under such a requirement."*

This remark pointing out the essence of the issue is further elaborated in the coming paragraphs.

In 1947, when India and Pakistan became independent states, irrigation water was secured by diverting water from the main course of

the river in canals. In other words, at that time there were no large storage facilities regulating flows, which varied greatly. Consequently irrigation water needs could barely be met in the dry season from October to April by drawing water from all the main tributaries of Indus including the Jhelum, Chenab, Ravi, Sutlej and Beas. Since she had not enough water storage capacity, Pakistan wanted to make use of all the streams and insisted on the validity of the water supply as it existed before the foundation of the republics of India and Pakistan.

The World Bank, on the other hand, deemed this insistence not valid, as shown by the remark cited above, and proposed that the main course of the Indus as well as the streams of Jhelum and Chenab be allocated to Pakistan and any resultant water shortage be compensated for by water storage facilities to be built along these streams. The Bank further took the position that the other three streams (Ravi, Sutlej and Beas), being part of the Indus system, should be allocated exclusively for India's use.

To implement this proposal of the World Bank, it was necessary to construct additional connecting canals as well as new dams. Since the waters of the rivers allocated to the use of India would largely disappear in dry seasons and since there would be a change from the way in which irrigation facilities used to be fed by these streams, there was also a need to transfer water by new canals to the existing system from dams to be built on rivers allocated to the use of Pakistan. The Bank further proposed that in the period needed to construct storage facilities and additional canals, India should give water to Pakistan from rivers allocated to her and should also contribute financially (Figure 23).

At this point, it is useful to compare these proposals with the Turkish Plan, which envisages the feeding of the Euphrates by the Tigris through a connecting canal.

While examining various problems concerning the use of the waters of the Euphrates and the Tigris, it was stressed that Turkey and Syria would have much less use of the Tigris compared to the Euphrates, and that the water potential of the Tigris was beyond the current irrigation needs of Iraq. It was also put forward in detail that the surplus water of the Tigris could be released to the Euphrates to offset the increasing demand for water from this river. This suggestion constituted one of the basic elements of the Turkish Plan.

Considering that the rivers Euphrates and Tigris are the two important streams of the Şattülarab (the union of these two rivers in Iraq before they join the Gulf), allocation of the surplus waters of the Tigris to irrigation in Iraq via the Euphrates is a proposal similar to that for the Indus Basin. Returning to the process of negotiations between India and Pakistan and to the plan suggested by Black, India took a positive approach to this plan while Pakistani Prime Minister Muhammad Ali expressed his reservations as follows in 1954 (Biswas, 1992):

> *"..... The Bank plan confronted Pakistan with an intolerable situation. Vigorous representations were made to the Bank that the flow supply of the western rivers was totally inadequate to replace Pakistan's existing uses of the water from the eastern rivers. The construction of storage dams that would be necessary to make up for the shortage would be a costly and lengthy affair; and the Bank plan made no provision for them. Even with such a provision, Pakistan's limited storage capacity would be used merely to maintain her existing position and could not be utilized for the developing needs of her growing population. Like Alice in Wonderland, Pakistan would have to run as hard as she could in order to remain where she was."*

Evaluating this stated objection of Pakistan, the Bank accepted that there was a need to construct new storage facilities to implement its plan, that is, the allocation of the eastern streams to India and the western streams to Pakistan. The Bank then, on 21 May 1956, made public its new proposal, which included principles relating to the financial contributions of India.

Following this statement, which modified the original proposal of the Bank, Pakistan accepted the proposal in principle.

India held the view that any water gap arising from the allocation of the eastern rivers to India could be bridged with the construction of the Mangla Dam on the Jhelum River, and rejected the idea of making a financial contribution to the construction of any other dam. Pakistan, on the other hand, insisted that in addition to the Mangla Dam, another dam was needed, the Tarbela, on the main course of the Indus. Consequently, the Pakistani side declared the total investment cost as US$ 1.12 billion at a meeting held in London in 1958. India, for her part, insisted on her own

plan which she considered as more "economical" and requiring a much shorter time to realize.

In the face of these developments, there was a need to establish the following in order to reach a consensus:

(i) If the eastern rivers were allocated to India, her contribution to the cost of technical measures to be taken in order to supply enough water to Pakistan should be an amount affordable by India.

(ii) There should first be an agreement on projects for technical measures and then sources of finance should be sought.

World Bank President Black visited India and Pakistan in May 1959. In his talk with Nehru, Black proposed that India's financial contribution should be a fixed amount and this contribution should be assessed independently from the overall cost of technical measures to be introduced over a long period of time. Black further added that the Bank would help finance the construction of the Beas Dam in India. . In response, Nehru agreed to supply water to Pakistan from the eastern rivers for a transition period of 10 years. Eyüp Han, President of Pakistan stated that his country would take a positive attitude to a plan envisaging the construction of Mangla and Tarbela dams in Pakistan.

When it seemed that a final agreement was in sight, Black made the following press statement in 1959:

> *".....I think I can now say that we have succeeded in establishing certain general principles acceptable to both governments, that afford a firm basis for negotiating a final settlement. I am now returning to firm up with the Friendly Governments the amount of financial aid they will be prepared to extend; and I am hopeful that within the next two months it will be possible for the Bank to invite representatives of Inda and Pakistan to meet with the Bank for the purpose of working out Heads of Agreement for an International Water Treaty."*

After these initiatives of the Bank, a consortium including the US, Canada, the United Kingdom, Germany and New Zealand got together to approve what was called the 'Indus Basin Development Plan'. According to the financing plan approved in September 1960, the total cost of investments to be made in Pakistan would reach US$893.5

million. A US$541 million portion of this total would a grant to Pakistan by the Consortium. The contribution of India was fixed at US$ 174 million, and Pakistan was extended a further loan of US$150 million.

In this context, the Indus Agreement was signed by Nehru and Mohammed Eyüp Han in Karachi on 19 September 1960, to be considered as having taken effect starting from 1 April 1960 (Biswas, 1992).

The Indus Agreement

The Indus Agreement consists of 20 Articles in 79 paragraphs. It also has three appendices covering 102 pages.

The agreement entitles India to use the waters of the Sutlej, Beas and Ravi rivers without any restriction. However, according to a detailed technical arrangement appearing in the appendices of the agreement, India had to keep providing water to Pakistan from these rivers for a transition period of ten years starting from 1 April 1960 until 31 March 1970. Pakistan, to be fed for ten years by waters diverted from these rivers, had to construct new connection canals and move the sources of her irrigation systems into her territory (Figure 23). According to the agreement, India would make a fixed contribution of US$60 million to the construction of these canals and this amount would be paid in ten equal installments within a period of ten years.

Pakistan, for her part, had the right to use the waters of the main course of the rivers Indus, the Shelum and Chenab without any restriction. As an upstream country, India nevertheless reserved the right to maintain her irrigation systems originating from the waters of these rivers including the right to water for an additional 284,000 hectares (701,000 acres) in new irrigation projects.

Articles VI and VII of the Agreement deal, respectively, with the need to regularly exchange data on rivers and canals, and the principles of future cooperation. Article VIII is the basis for the establishment of a permanent Indus River Commission composed of engineers specialized in hydrology. This Commission would meet every year at least once in India or Pakistan on a rotational basis. The following are the duties and functions of this Commission:

i) to ensure the implementation of the Agreement,

ii) to promote cooperation between the parties in the use of waters in the Indus system,

iii) to consider and resolve disputes which may arise as to the implementation and interpretation of the Agreement,

iv) to issue annual progress reports in June.

Article IX deals with methods for resolving disputes. According to this Article, should the Commission reach no accord as to the settlement of any dispute, an impartial specialist agency would be brought in. Should this agency too fail to bring any solution, the issue would be transferred to a Council of Arbitrators.

Conclusion

An analysis of the negotiation process preceding the Indus Agreement clearly reveals that adopting a technical approach contributed a great deal in this case to the solution of problems relating to transboundary waters.

The underlying principles which made the Indus Agreement possible can be summarized as follows:

i) River basins must be taken as a whole; water potential and needs must be based on sound data.

ii) There may be more than one river posing problems for riparian countries and there may be differing water demands from these rivers. In such cases, it is not possible to respond to needs by taking each stream separately from the others. Instead, the system must be assessed as a single whole. In the Indus Basin, Pakistan as a downstream country is allocated less water from some tributaries and more from others. It became clear after studies made in the basin that it was not possible to grant the parties the right to equal use from each and every stream. Where differing water allocations are made from streams which are topographically close to each other, it may not be possible to sustain given uses from the same water resource. Such problems may be overcome by transferring water to insufficiently supplied irrigation schemes from other rivers. Of course new canals and facilities are needed for such a solution. The cost of investment in such facilities may be shared reasonably by the riparian countries. When the Indus case is

analyzed carefully, it becomes clear that the dispute between India and Pakistan could be settled only by addressing the issue on technical grounds.

In the Middle East, however, technical data and methods have been paid insufficient attention and technical problems have instead become mixed up with the rather complex political context of the region. Regarding the Euphrates and Tigris Rivers, Turkey had proposed that the Basin should be considered as a whole using a technical approach based on sound data, as was the case in the Indus dispute. However, though not in explicit terms, Syria put forward an alternative proposal demanding the equal use of the waters of the Euphrates, while Iraq made proposals including the allocation of waters only after deducting her needs assessed as a vested right. However, unlike Turkey's proposal, neither of these plans were based on a technical inventory of the resources of the two rivers. In addition, there are still some other Middle Eastern countries, such as Israel, claiming that these two rivers should contribute to the solution of their domestic and regional water disputes. Finally, some economic powers from outside the region have chosen to involve themselves in the issue, but their involvement has not made a positive contribution to resolving water resource issues. As a result of these factors, the technical approach of the Turkish Plan has been bluntly overlooked.

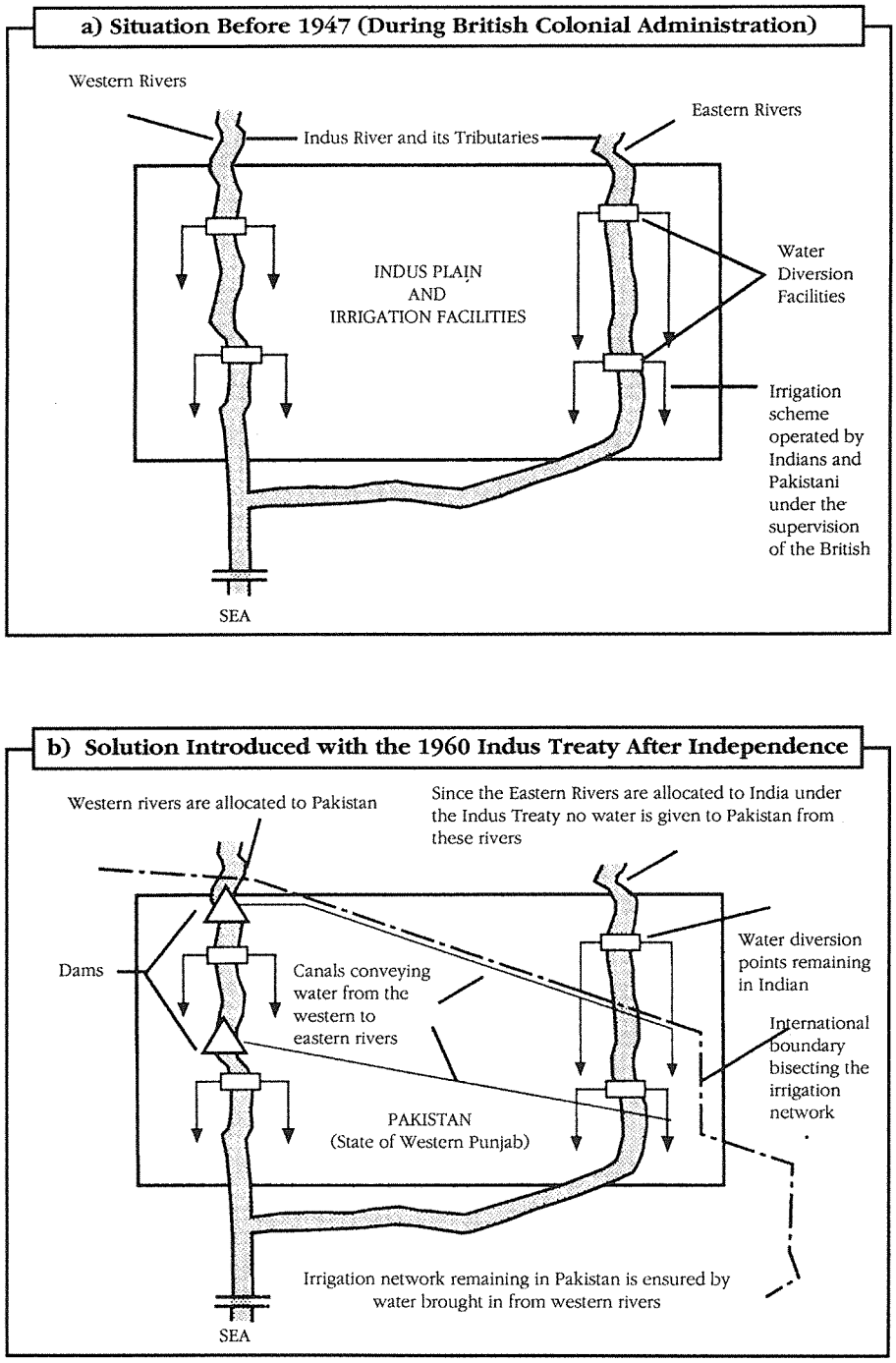

Figure 23: Schematic Diagram of the Water Allocation Plan Under the Indus Treaty

Israel-Jordan Water Agreement

Introduction

The river of Jordan and the Yarmuk, which joins it at the outlet of the Lake Tiberias, have a central place in problems relating to water in the Middle East (Figure 10).

The basin has a drainage area of about 18,000 km² shared by Israel, Jordan, Syria, Lebanon and Palestine. Considering that Lebanon both has a lesser need from and makes a lesser contribution to the waters of the basin, and that Israel and Syria are upstream countries, Jordan and Palestine are the two states facing the most difficult situation in hydropolitical terms.

Although it was decided to include the Gaza Strip as a part of the projected State of Palestine, there is yet no certainty as to what parts of the territory to the west bank of Jordan River, presently under Israeli occupation, are to be given to the State of Palestine and negotiations on this issue are still going on. Consequently, there is as yet no agreement as to the allocation of ground water reserves in the west bank to Israel and Palestine. Again, in drawing new boundaries, there is still no clarity as to who will get ground water rich areas and to what extent the present limitations over the use of these waters by the Palestinians will be eased.

Peace talks between Syria and Israel ceased in 1996 because of uncertainty of the future status of the Golan Heights and some other problems. Though talks resumed in December 1999 following a US initiative, it is yet too early to say when they will be finalized and with what kind of results.

In relation to Lebanon and Syria, Jordan and Israel are also downstream countries. This created security problems that forced Jordan and Israel to an agreement and a peace treaty was signed on 26 October 1994. Besides some other issues, this treaty also includes various arrangements regarding the use of the rivers Jordan and Yarmuk as well as Araba/Arava ground water reserves.

What follows is a detailed analysis of the Agreement, which includes provisions favorable to Israel (Beaumont, 1997) in water allocation issues.

Agreement on the Use of Jordan and Yarmuk Rivers and Araba/Arava Ground Water Reserves

Article 6 of the Agreement signed by Jordan and Israel on 26 October 1994, headed 'Water', includes six paragraphs. Paragraph 6.1 of this Article is given below:

> *".....(1) The Parties agree mutually to recognize the rightful allocations of both of them in Jordan River and Yarmouk River water and Araba/Arava groundwater in accordance with the agreed acceptable principles, quantities and quality as set out in Annex II, whicih shall be fully respected and complied with...."*

In Annex II, which is related to this Article specifically, the technical principles were described relating to water allocation from the rivers of Jordan and Yarmuk and ground water reserves.

Yarmuk River

The Article stated that in the period defined as summer (15 May to 15 October) Israel could take 12 million m^3 water from Yarmuk and leave the rest for Jordan's use. In this agreement, while Israel was guaranteed her summer water allocation, the water available to Jordan largely depended on climatic conditions and the amount of water released by Syria. These two factors pose a serious risk to Jordan.

According to the Agreement, Israel could use 13 million m^3 from the Yarmuk from 16 October to 14 May, the period considered winter, while the remainder was allocated to Jordan. Additionally, Jordan would allow Israel to pump 20 million m^3 extra water on condition that this volume of water was returned to Jordan in summer. Though not explicitly stated in the Agreement, this water would be stored in Lake Tiberias (The Sea of Galilee / Lake Kineret). A similar proposal envisaging the transfer of water from the Yarmuk to the lake had also been made in the Johnston Plan of 1955 as we saw earlier. Consequently, Israel could obtain a

guaranteed quantity of water for both summer and winter. However, considering that the Yarmuk would normally have more water in winter than in summer, this does not constitute much risk for Jordan.

In the last article of the Agreement concerning the Yarmuk, it was stated that if there was any surplus water below the water diversion points in both Israel and Jordan, this water could be freely used by the parties. However, there was no specification of the volume of this surplus water.

Jordan River

According to the Agreement, the 20 million m^3 of water drawn from Yarmuk in winter would be released to the River Jordan for the use of Jordan. The existing canal system would be used for this purpose, with Jordan sharing the operation and maintenance costs of the system. However, Jordan would cover all costs related to the construction of a new scheme which would return to the River Jordan the water drawn from the Yarmuk by Israel. These points were also set out in a detailed protocol (Article 1.2-a).

In winter, Jordan was to have on average 20 million m^3 of water, to be stored in a facility to be constructed at a point off the riverbed and south of the confluence of the Yarmuk and Jordan. Both parties could make use of any water above this volume (Article 1.2-b). However, there was no specification in the Agreement as to how this surplus water would be allocated to Jordan and Israel.

Israel would maintain its present water uses in the area up to Wadi Yabis/Tırat Zvi, where the River Jordan forms the boundary between the two countries. In this area, Jordan would use water equal to that drawn by Israel. However, this water use by Jordan would not be permitted to affect the water taken by Israel negatively in terms of quantity and quality. The Joint Water Committee would assess the existing water use and arrange relevant documents (II.2-c). Under this article there was no quantitative stipulation for water use, leaving this issue to the joint Water Committee.

Saline spring water in Israeli territory, with a potential of 20 million m^3, is presently discharged to the River Jordan. The agreement

introduced a new arrangement on this issue, whereby Israel would undertake work to desalinize this 20 million m^3 of water and transfer 10 million m^3 of it to Jordan.

As a result of this agreement, Jordan was entitled to use 30 million m^3 of water from the River Jordan and, additionally, an unspecified volume of water in the area extending from the confluence of the Yarmuk and Jordan rivers up to Wadi Yabis/Tırat Zvi.

In Israeli territory, the total water capacity of the Dan, Hasbani and Banyas rivers, which feed Lake Tiberias, the origin of the River Jordan, is 500 million m^3 (Table 1). The Agreement made no provision as to the allocation of these waters. While Israel allows no allocation for Jordan from streams which originate in her territory, she received a quota of 25 million m^3 from the Yarmuk as a downstream country.

In sum, in the time from the foundation of the State of Israel up to the Agreement of 1994, Jordan abandoned all her claims regarding the waters mentioned above.

Additional Waters

Article 1.3 of Appendix II to the Agreement stated that "Jordan and Israel shall cooperate to supply Jordan an additional 50 million m^3 of potable water". The same Article also stipulated that within one year following the Agreement's taking effect, the Joint Water Committee would develop a plan for this purpose and present this plan for the consideration of the parties. However, there was no binding provision as to the period of time within which this 50 million m^3 of water has to be supplied to Jordan.

Ground Water Reserves

Appendix II of the Agreement referred only in a narrow sense to ground water reserves. According to this, Israel would continue to use water from those wells she opened in Jordanian territory.

In 1948, the Israeli and the Arab states of the area were involved in an armed conflict which resulted from the foundation of the State of Israel. Also as a result of this war, the area Emek Ha'arava/Wadi Arab to the east of the River Jordan was annexed by Israel. This area has now been

returned to Jordan, but Jordan, according to the Agreement, accepts the right of Israel to use up to 10 million m^3 of water annually from the ground water reserves of this area. The Agreement also specified that if these wells are renewed, relevant licenses will be arranged in accordance with the laws of Jordan and Israel will supply Jordan with technical information regarding the same wells (Article IV.2).

Conclusion

The water agreement between Jordan and Israel represented a clear defeat for radical Arab nationalism, so accustomed to term the streams of the Middle East 'Arabian waters'. With this Agreement, Jordan agreed to allocate Israel more water than had been envisaged by the US-initiated Johnston Plan of 1955 (Table 9).

Regarding the 1994 Agreement, which is considered by some experts on Middle Eastern affairs as a diplomatic success for Israel, Prof. Beaumont makes the following comment (Beaumont, 1997):

> *".....There can be little doubt that as far as Israel is concerned the Peace Treaty with Jordan fulfills all its ambition from the water point of view. In effect Israel has compromised on very little and been able to keep all the water resources it has appropriated since the June War of 1967. The idea of 'equitable' distribution of water resources as put forward by the Johnston Plan has been ignored. In itself this is quite interesting as over the years many Israeli academics have quoted the importance of international law, rules and regulations in settling water disputes.*

This discussion of the Agreement between Jordan and Israel completes our analysis of disputes related to transboundary waters. The following general conclusions may be drawn from this analysis.

i) It was clarified on the basis of official documents that the US as the upstream country only allocated 5 percent of the waters of the Colorado Basin to Mexico. Similarly, the Agreement between Jordan and Israel entitles Israel to use all the water potential of the upper stream of the Jordan River.

   Meanwhile Syria, an upstream country on the Yarmuk River, allows Jordan the use of remaining waters below an elevation of

250 meters under an agreement she signed with Jordan in 1987 (Beaumont, 1987). Yet, the waters of the Yarmuk mostly originate above this elevation and are thereby monopolized by Syria.

Thus, considering the fact that 90 percent of the waters of the Euphrates originate in Turkish territory, demands for Turkey to allocate the river's waters equally with Syria and Iraq finds no precedent in any of these similar cases. Nevertheless, Turkey has offered to allocate 50% to them.

ii) A careful analysis of the Indus Agreement indicates that the settlement of water disputes between Pakistan and India was possible because the issue was approached in technical terms. In the Middle East, however, relevant technical aspects and possibilities have largely been given insufficient attention compared to the enthusiasm to link water issues to the complex political situation of the region. Turkey, on the other hand, has proposed that the Euphrates-Tigris Basin should be considered as a whole technically and on the basis of sound data as was the case with the Indus Agreement.

PART IV

WATER AND THE ENVIRONMENTAL AGENDA OF THE 21ST CENTURY

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Introduction

Efforts to develop water resources for the benefit of humanity can be traced back thousands of centuries. Parallel with technological progress, these efforts have gained intensity up to the present time. To exemplify, the International Commission on Large Dams notes that while there were 420 dams in the world towards the end of the 19th century, this number reached 36,237 by the turn of the last century. Parallel to this increase in the number of dams, the total area under irrigation rose from 74 million hectares in the 1950's to 274 million hectares, according to the International Commission on Irrigation and Drainage.

However, it was discovered that measures to increase water use through dams and irrigation facilities had to face almost insurmountable problems regarding the financing of these facilities, responding to the needs of an increasing world population, and preventing pollution in waters. This stressed the need to establish a balance between water supply and demand. Consequently, besides physical structures, the importance of demand side factors came to the fore. These factors, which in their turn require new policies, include economic, social and institutional measures to regulate demand; public participation in water management; sectoral allocation of water resources; and the preservation of the quality of available water resources. Since the 1970's there has been a consequent change in concepts relating to the development and management of water resources.

Part IV, therefore, attempts to make a general evaluation of the process of change in water resources management during the 20th century, and of various issues addressed in many international meetings held since the early 70's. Here, there will be a critical approach to some of the recommendations and resolutions appearing in the concluding documents of meetings sponsored by developed northern nations. These countries enjoy both the benefits of the information society and

their location in temperate climate zones, so these resolutions and recommendations may be in contrast to the reality of many developing countries located in arid and semi-arid zones. There will also be an examination of the stand of the more radical environmental groups that have mostly originated in northern countries comparatively free from water problems. By 'radical environmental groups' is meant here those who, for example, dogmatically argue for the introduction of worldwide zero-growth and are against any exploitation of the South's natural resources, or who ignore the critical importance of development projects for the countries of the South. Finally in this section, there will be a review of policies and strategies aimed at efficient water utilization which must be addressed together with physical structures. All these issues make up the water agenda of the 21st century.

Process of Change in Water Resources Management

The concepts and practices relating to the development and management of water resources have undergone a process of change involving various stages.

Prior to the Concept of Planning at the Basin Scale

At this stage, we can mostly observe single purpose projects which generally involved use of the closest water resource in a basin to respond to a particular need. These type of projects resulted in facilities scattered across a water basin, each having a single purpose such as irrigation, drinking water supply or generating energy for a nearby enterprise. However, as these practices expanded, serious difficulties were seen in responding to newly emerging needs. Furthermore, it also became clear that unplanned and disorganized utilization of a stream could well prevent or restrict the development of more rational projects either downstream or upstream, and that problems of entitlement to water use were mounting.

Technical and Economic Planning of Water Resources in a Basin

Thus the need emerged to consider river basins as a whole and, before any implementation, to develop an overall plan to respond in the most appropriate way to the needs of the basin concerned.

This led to the expansion of observation networks to cover whole basins and assess the water potential of the basin concerned (also by making use of past observations). Parallel to this was the creation of inventories of land fit for irrigated farming accompanied by land use plans which delineated land to be irrigated, assessed water needs for drinking-use and industry, and finally determined the energy potential of the basin. Based on this basic information and other engineering data, the technical, economic and financial feasibility of various alternative combinations of dams and other water structures could be compared. Finally, as a result of this process, **'Water Basin Development Plans'**, which also set priorities for implementation, emerged.

During this process, there have been considerable advances in construction technologies to allow for large water storage facilities (dams). This process can thus be termed the 'period of large dams'. Individual countries have undergone this process at different times depending upon their level of technology and the needs of their population.

- *First Practices in the US*

We can see two significant examples of this 'whole basin' approach in the US in the early 30s. The US first aimed at irrigating 450,000 hectares of land and generating energy with the construction of the Grand Coulee Dam on the Colombia River on northwestern USA. The dam was to have an installed capacity of 6,494 MW (about 5.5 times greater than that of the Atatürk Dam). The facility was put into operation in 1941.

The Grand Coulee Dam played an important role in meeting the enormous demand for energy at the time when the country was engaged in arms manufacturing and development of the atomic bomb during the Second World War. Revitalizing the construction sector through large-scale projects was one of various measures adopted to combat unemployment caused by the great economic depression of the late 20's and this was one of the factors encouraging the launch of this dam project (Bureau of Reclamation, 1978).

The second example of the whole basin approach was the establishment of the Tennessee Valley Authority (TVA) in 1933, again during the presidency of Roosevelt, to develop the 7 states located in the

basin of Tennessee River. G. Pinchot, an engineer advising President Roosevelt, pioneered the establishment of this administration with his assertion that "a river constitutes a whole from its source down to the point where it reaches the sea, and can be used for all purposes and needs." The TVA first had the goal of ensuring navigation in that 1,050 km long part of the river starting from the point where it joins the Mississippi, producing energy and constructing facilities for flood prevention. The 7 states in the basin were, at that time, the least developed ones in the US. While average farmer income was US$ 1,835 in other states, 60 percent of the farmers in these states had an average income below US$ 500. There was even 20 percent living on an average income below US$ 250 a year (Bekişoğlu, 1992).

The TVA was established in 1993 under a special Act as an administration attached to the Federal Government. Within a period of 8 years, the administration completed 7 large dams for energy production and flood prevention purposes. The Kentucky Dam alone protected 2.7 million hectares of land from flooding. In addition, the Tennessee River was rehabilitated and river navigation became possible as it was in Mississippi. It was then possible for a boat to start from the Atlantic Ocean and navigate to the inner parts of the continent via the Mississippi, Ohio and Tennessee rivers.

As energy needs mounted, the TVA was authorized to establish coal-fired thermal plants using coal.

Starting out from the basic objective of developing water resources, the Tennessee Project also turned to such broader objectives as erosion control and improvement of social infrastructure and thus became a project for integrated regional development. Meanwhile, farmers were trained in such topics as erosion control, use of modern farming techniques, farming of crops bringing in higher income; and storage, processing and marketing of farm products.

By the early 60s, the TVA had been able to bring about a considerable improvement in the living standards of the people of the basin. This success of the TVA was also noticed by the leaders of other countries, as

exemplified by Nehru's invitation of TVA President Lilienthal to India to examine the possibilities of implementing a similar model for the Indus Valley Basin.

- *Adoption of a Water Basin Planning Approach by Turkey and Other Countries*

The concept of water basin planning and implementation which started in the US in the early 30's was introduced to Turkey with the formation of water basin planning units within the State Hydraulic Works that had been established in 1954. It then started planning work for the development of water resources in large basins. The basins considered in this context included the rivers Menderes, Gediz, Seyhan, Ceyhan, Kızılırmak, Yeşilırmak, Sakarya, Konya Closed Basin and the Euphrates-Tigris Basin.

Regarding the Euphrates-Tigris Basin, sites for key water storage facilities, areas to be irrigated by these facilities and hydraulic plants to be constructed were all identified and, as a result such large scale dams as Keban, Karakaya and Atatürk, and the Urfa Tunnel, the longest irrigation tunnel in the world, were constructed.

There were also other countries in the world concentrating on the development of their water resources to meet their food and energy needs. These included Egypt, India and Pakistan, having gained their independence after long years of colonial administration.

In Pakistan, for example, the construction of the Tarbela Dam was realized in the period 1968-1974. It has an earthfill volume of 158 million m^3, making it the world's largest all earth-filled dam. The Tarbela plays an important role in the irrigation of large tracts of land in the Punjab Plain and in meeting the energy needs of the country.

The Aswan on the Nile in Egypt, put into operation in July 1970, is the world's largest dam in terms of water storage capacity at 162 million m^3. The dam, as the key facility of the Egyptian economy, made it possible to irrigate an additional 1 million hectares of land in the Nile Valley and generate, as annual average, 10 billion kWh of energy.

The Concept of Integrated Water Resources Development and Management

In the concept of Basin Management, of the various practices briefly discussed here, most weight has been put on physical measures to increase the quantity of usable water. However, especially since the start of the 70's, it was realized that measures geared to increase the quantity of water exclusively through physical facilities failed to respond to such phenomena as increasing population, rapid urbanization and rising costs of water provision. Consequently, discussions at international forums began to include such new topics as the prevention of water pollution, environmental problems in general, public participation in water management, training, measures to regulate the demand side, consideration of economic efficiency in the sectoral allocation of water, possibilities of privatization in the water sector, and the introduction of legal and institutional measures to make all these possible.

The development of water policies at national level incorporating the issues listed above, together with the technical and economic planning of water resources at basin level, can be termed the *'Comprehensive Development and Management of Water Resources'*. In other words, the concept of basin level water resources development and management was enlarged and given a more dynamic character by combining it with all other socio-economic factors.

Before moving on to discuss 'Water Policies' it may be useful to touch upon a selection of the international meetings that have addressed these issues since the 70s.

The most important dimension coming to the fore in these meetings was the relationship between *'development and the environment'*.

At these meetings sponsored and determined by the industrialized countries of the North, such concepts as 'sustainable development', which is said to have more than 100 definitions (Biswas, 1993), were introduced and, after these meetings, volumes of concluding documents including more than 2,500 recommendations were published. Although some of these conclusions do include materials which can be used as the basis for new water policies, others usually reflected the efforts of the industrialized countries to transfer some responsibility onto others in

mitigating global environmental problems mainly caused by themselves. The following section discusses some important examples among these meetings taking place in a period that can be called the *'period of international meetings'*.

United Nations Conference on the Human Environment (Stockholm, 5 June 1972)

The relationship between the environment and development became an international issue with the UN Conference on the Human Environment, convened in Stockholm on 5 June 1972. This meeting was important in the sense that it set the stage for the first evaluation of the issue at a global scale. The conference was attended by 113 countries including Turkey, and it became the basic starting point of all UN activities on the environment. The Stockholm Declaration which followed the Conference referred to the protection and development of the environment as the fundamental condition for the welfare and economic development of all humanity. The Declaration accordingly assigned specific duties to all governments and emphasized the importance of international cooperation and solidarity.

The Conference led to the establishment of the United Nations Environment Program (UNEP), and it recorded an important commitment to accelerate efforts to establish international norms regarding the protection of the environment. Finally, it was decided that June 5th would be celebrated annually as 'World Environment Day'.

United Nations Water Conference (Mar del Plata, 14-25 March 1977)

The *'Mar del Plata World Water Conference'* held in Argentina in 1977 came up with an action plan after discussing such issues as environmental problems generated by rapid population increase, water quality, global climate change, water users' participation in water management and water as an economic and social asset. Under this plan, the period 1981-1990 was declared 'International Drinking Water and Sanitation Decade' with the intention that governments should intensify their efforts towards safe water provision, and that programs to this end should be supported by international technical and financial institutions.

The Brundtland Report and Critique

Ms. Gro Harlem Brundtland, former Prime Minister of Norway, was elected Chairperson of the 'World Environment Commission', established by the UN in 1983. In December 1987, Brundtland published a report entitled 'Our Common Future'.

The report introduced the concept of 'sustainable development' and proposed the organization of a Conference on Environment and Development (UNCED) or Earth Summit, to be attended by all member states of the UN. In the three years following the publication of the Brundtland Report, there were about 600 international symposia and conferences discussing the concept of 'sustainable development' and other issues relating to the relationship between the environment and development.

The Brundtland Report received serious criticism on the grounds that it did not pay attention to the importance of water for the development of the countries of the South, and for approaching the issue of development from a northern perspective. In the 6th and 7th Water Conferences organized by the International Water Resources Association the approach of the report was termed 'Water Blindness' (IWRA, 1991).

While issues such as biological diversity, depletion of the ozone layer and protection of wildlife headed the agenda in many international meetings organized by the North, the same concern was lacking for problems created by lack of water or floods. Yet, millions of people have so far lost their lives from such water-related causes as drought, flood or unsafe drinking water and the same threat is still there for the 21st century.

Most of those countries which have completed their industrial revolution and are now enjoying the age of electronics and information society are located in temperate climate zones. These countries mostly face only minor problems of water shortage and their attempts to develop further are not fundamentally challenged by access to or management of water resources. Natural precipitation mostly provides for their food security and there is mostly no need to construct large water storage facilities for purposes of irrigation.

The developing nations of the South, some of which are below the poverty line, are mostly located in arid or semi-arid zones. Water shortages, drought and occasional floods have regularly created serious problems for these countries. The rapidly increasing population of these countries, especially in the second half of the 20th century, has made the development of water resources a top development priority in these countries. Accordingly, large scale projects have been launched.

Large facilities such as the Keban, Karakaya and Atatürk dams on the Euphrates in Turkey, the Aswan Dam in Egypt, the Tarbela Dam in Pakistan, and others on the Amazon have also been constructed to generate energy. The 'Three-Gorges Dam Project' on the Yangtze is presently in progress in China to construct the largest hydraulic power plant of the world. The project will result in the production of 100 billion kWh energy a year (approximately equal to the total energy that can be economically produced in Turkey).

Because the Brundtland Report was drafted by a group composed of a limited number of experts mostly from the North, almost inevitably the vital benefits of water resource projects developed by the South were neglected and environmental issues, which in fact could be dealt with through various methods, became the focus instead.

The effect of the report was to accelerate environmentalist criticism of large-scale projects and new campaigns were launched against large dams. Examples of this can be seen in the writings of commentators such as Claire Sterling, and Goldsmith and Hilyard. Commenting from the North, from countries that have already developed their hydraulic potential and have little need for irrigation water, these radical environmentalists want to impose their inappropriate Northern perspective on the very different situation existing in the South.

There were worldwide campaigns against large scale projects even if such projects were intended to supply safe drinking water to millions of people, raise the income level of farmers by bringing large tracts of land under irrigation and providing enough energy for developing countries.

Meanwhile, the Green Movement flourishing in those western countries which had completed their development process by exploiting other countries during the colonial period launched rather uninformed campaigns against water resources development projects.

Regarding the many definitions of the 'sustainable development' concept introduced by the Brundtland Report, the document 'International Action Plan for Water and Sustainable Development' published by the FAO, concludes that there is as yet no widely agreed definition. According to the World Commission on Environment and Development, sustainable development is:

> *".....Development which meets the needs of the present without compromising the ability of future generations to meet their own needs..."*

Projects can earn the soubriquet 'sustainable' if all structural and institutional precautions are taken to eliminate or minimize their adverse consequences. For example, an irrigation project accompanied by technically proper drainage facilities, integrated with training of farmers, and enjoying timely operation and maintenance services will provide its basic functions for many years. A system without these characteristics will rapidly lose its 'sustainable' character and the land will soon become arid.

The Dublin Conference of the International Water and Environment Commission (26-31 January 1992)

The International Water and Environment Commission is one of the commissions set up to conduct preparatory work for the UN Conference on Environment and Development. The Commission gathered in Dublin from 26 to 31 January 1992 and made its concluding document, the 'Dublin Declaration' public. The Declaration, which was later adopted without any modification at the Earth Summit, laid down four basic principles (FAO, 1994):

i) Fresh water is a finite and vulnerable resource, essential to sustain life, development and the environment

ii) Water development and management should be based on a participatory approach, involving users, planners and policy-makers at all levels

iii) Women play a central part in the provision, management and safeguarding of water

iv) Water has an economic value in all its competing uses and should be recognized as an economic good.

The participants to the Conference broadly agreed on the first three principles. However, on the fourth principle, there was no consensus between the position that water is an economic commodity to be paid for and the position maintaining that it was a fundamental human right for survival to have access to water free or in return for a nominal fee.

Advocates of the first position argued if water is allocated to users at prices much lower than the depreciation cost of investment plus operation and maintenance expenses there would be bottlenecks in financing new water projects which would eventually deprive millions of people of water. It was also emphasized that insufficient water charges encourage wasteful use. Nevertheless, in the end, some participants added a note of objection to the fourth principle.

United Nations Conference on Environment and Development (Earth Summit-Rio Conference) and Agenda 21

As a result of previous decisions, the UN Conference on Environment and Development convened in Rio de Janeiro from 3 to 14 June 1992 with the participation of 172 countries. 108 of these countries were represented at the summit by the heads of State or Government.

The Conference produced various concluding documents. The most important among them was 'Agenda 21' laying down the items of the world agenda for the 21st century. Two global conventions were presented for signing, on climatic change and biologic diversity, and discussions were begun on another convention on combating desertification.

The Agenda 21 is an action plan describing activities to be carried out in all spheres affecting the environment and economy by governments, development organizations and UN agencies. As such, the document includes more than 2,500 recommendations.

The agenda touches upon the following topics under 4 main headings:

i) *Social and economic dimensions*

- Demographic dynamics and sustainability
- Protecting and promoting human health
- Promoting sustainable human settlements development
- Integrating environment and development in decision-making

ii) *Conservation and management of resources*

- Protection of the atmosphere
- Integrated approach to the planning and management of land resources
- Combating deforestation
- Managing fragile ecosystems: Combating desertification and drought
- Managing fragile ecosystems: Sustainable mountain development
- Promoting sustainable agriculture and rural development
- Conservation of biological diversity
- Environmentally sound management of biotechnology
- Protection of the oceans, all kinds of seas, including enclosed and semi-enclosed seas, and coastal areas and the protection, rational use and development of their living resources
- Protection of the quality and supply of freshwater resources : application of integrated approaches to the development, management and use of water resources
- Environmentally sound management of toxic chemicals, including prevention of illegal international traffic in toxic and dangerous products
- Environmentally sound management of solid wastes and sewage-related issues

iii) Strengthening the role of major groups

- Global action for women towards sustainable and equitable development
- Strengthening the role of farmers

iv) Means of implementation

- Science for sustainable development
- Promoting education, public awareness and training
- International institutional arrangements
- Information for decision-making

A 'Sustainable Development Commission' was set up under the UN to examine global, regional and national implementation related to the above stated spheres of activity and the General Assembly of UN was designated as the policy making and approving body.

The General Assembly periodically reviews the implementation of the Agenda and held a special session called 'Agenda 21 + 5' in 1997 to make a general evaluation of the progress made in its implementation.

An overall assessment covering both the Agenda 21 and other concluding documents reveals that there are many recommendations that differ in their relevance, priority and importance with respect to developing and industrialized countries.

Considering the wide gap between the levels of development in the countries of the world and the unique character of problems faced by individual countries, it becomes apparent that most of the resolutions of the Conference cannot be realized in the medium or even long term.

There are economic factors determining problems at global and national scales. Implementation of the decisions taken at the conference require, for example, the reduction of CO_2 emitted to the atmosphere and important modifications in the technologies applied to thermal plants, existing or planned. However, in the face of existing shortages in financing, it seems quite difficult to embark upon such high cost measures or modifications.

In Agenda 21, it is stated that funds necessary for its implementation will be secured from both the public and private sectors and industrialized countries will help the others in this respect. However, the industrialized countries have not yet fulfilled their commitments on the allocation of new and additional resources although such commitments are stated in chapter 33 of the Agenda 21.

Here, there are two important points to consider:

i) At the same time as not fulfilling their financial commitments according to the Agenda commitments, industrialized countries are engaged in marketing their highly expensive technologies to those countries striving to survive deep in poverty.

ii) After heavily polluting the atmosphere, the industrialized countries are able to phase in complex and expensive technologies thanks to their high level of development and rich financial resources and to modify technical specifications accordingly. Whenever this is not sufficient, they can buy 'pollution rights' from other countries. It is anticipated that trade in the environment will further grow in the 21st century. While some in the environmental movement demand the full installation of newly developed technologies or the closure of thermal plants, they do not sufficiently criticize the ethical and human dimensions of the development of environmental trading.

Atmospheric Changes and the Kyoto Protocol (December 1997)

During the last two decades, two major atmospheric issues in particular have become the focus of international attention: depletion of stratospheric ozone and global warming. These issues have been addressed at a number of international meetings, starting with the Vienna Conference of 1985 and the Montreal meeting of 1987.

The UN Conference on Environment and Development took up the issue of global warming in more detail and resolved to bring down the levels of greenhouse gas emissions. Industrialized countries agreed to reduce their atmospheric emissions to 1990 levels by 2000, although this agreement had no binding character.

To discuss the long-term details and implementation of this resolution, a further meeting was convened in Kyoto, Japan, in December 1997 on *'Global Climate Change'*. According to the resulting protocol, the industrialized countries would, as a first step for the period 2008-2012, reduce their greenhouse gas emissions by an average 5.2 percent below 1990 levels. This is an average figure varying with respect to countries and regions. For example, the target value is 8 percent for the countries of the European Union and some Eastern European countries, 7 percent for the US, and 6 percent for Japan, Canada, Hungary and Poland (Bals and Treber, 1998). Time will show to what extent these industrialized countries, to-date the heaviest polluters of the upper atmosphere, can meet these targets.

The Kyoto Protocol also allows for the trading of emission rights among countries. Some scientists consider this a significant loophole in the protocol (Bals and Treber, 1998). Various lobbies in those countries whose industries heavily depend on coal and oil (for example the US) have exerted pressure on governments to prevent ratification of the protocol.

Relationship Between Water Resources Development and the Environment

We have so far discussed the relationship between development and the environment in general. This section will attempt a more detailed analysis of the environmental impacts of projects for the development of water resources.

Generally speaking, the environment can be defined as a system or integrity formed by physical, chemical, biological, cultural, social and economic resources and assets. The elements of the environment including air, water, land, sea and all flora and fauna are in a process of interaction.

Looking at the relationships between the development of water resources and the environment in terms of this general definition, we can say that when a dam is constructed to provide drinking water, energy or irrigation water to a specific area, this activity will inevitably have some effects on the natural environment as well as on the economic and social make up of the area concerned.

In providing drinking water, energy and irrigation water through such projects as dams, it is necessary to introduce measures which will either eliminate or minimize the negative effects of these projects on the environment. For example, farmers who have to move elsewhere as a result of a dam construction should be accorded better opportunities in their new settlements and others who will not farm again should be trained and given new skills. Especially in recent years, the joint work of engineers, sociologists and social anthropologists in this field have contributed much to the overcoming of problems related to social planning.

One inspiring example of the salvation of historical and cultural sites which would otherwise be submerged under a dam lake was the transporting of the temple of Abou-Simbel in Egypt to another place prior to the formation of the Aswan Dam Lake.

Turkey also attaches great importance to this issue. For example, archeologists from the universities of İstanbul and Chicago worked together to save the historical and cultural assets of the area during the construction of Keban Dam. As a result of this joint work, 38 tumuli were discovered in Altınova to the east of Elazığ. In May 1968, a team from the German and British Archeology Institutes and others from Michigan University joined the first group. Excavations unearthed historical pieces in tumuli and two historic mosques were transferred out of the prospective lake area (Akarun, 1999). These activities were highly appreciated internationally and recognized by UNESCO (Akkaya, 1999).

Similar work is presently in progress in relation to the Ilısu Dam on the Tigris whose construction is about to start. A protocol was signed by the General Directorate of State Hydraulic Works and the METU Center of Research for Historical and Environmental Assets (TAÇDAM) to launch activities to preserve the archeological and cultural heritage of the area. Other than these institutions, some universities from the US and the German Archeology Institute are also joining these activities. A Geographical Information System (GIS) database has been started covering the areas to be affected by Ilısu and Karkamış dams (Akkaya, 1999).

Rivers in many parts of the world, especially those in northwestern continental Europe, England, Scotland, Iceland and the mountainous areas of the US host various species of fish. Yet, these countries did not hesitate to harness these streams for their high hydraulic energy potential. These countries have so far carried out many projects for energy production together with measures to protect fish population. These projects, however, were not realized by people taking up dogmatic positions 'for' and 'against'. Rather, success came as a result of consensus between the parties as to the rules to be observed at various stages of construction and operation.

The most important measure to be taken to protect fish stock in rivers is to let fish have access to the sites where they lay their eggs. For this purpose, structures constructed on rivers to divert water to generating facilities are also equipped with 'fish passes.' For example, 370 hydraulic energy facilities existing in England and Scotland as of 1994 have such passes. 270 of these passes were designed specifically for sea trout and salmon, and 10 for brown trout. The rest are for larger fish, eel and mixed species (Wallingford, 1994). Some fish passes have also been introduced to higher dams. For example, in Orrin County, Northern Scotland, one dam has a special fish pass which carries the stream 41 meters higher than its normal flow elevation. Similar measures have also been adopted in Iceland where people mainly live from fishing. Ardnacrusha and Leixlip dams in this country have their fish passes.

These measures preserve natural fish life on one hand, and contribute to the development of sport and commercial fishing by encouraging fish stocks in dam lakes on the other. In Turkey, dam lakes yield 8,346 tons of fish a year (5,350 tons from commercial fishing in 105 dam lakes, 2,496 tons from 16 fish farming projects in 6 dam lakes and 500 tons from sport fishing in all dam lakes) (Şafak et al., 1999). According to the book 'Reservoir Fishing in Turkey' provided relevant measures have been adopted, the fish yield of these dam lakes can be soon be raised to 55,000 tons per year. This amount would correspond to 15 percent of the current total fish yield of the seas surrounding Turkey.

Riverbed gullies are a regular downstream feature of large dams. The factor causing these gullies is the upstream suspended and drifting materials accumulating in the dam lake rather than being carried further

downstream. The cleaner water released from the dam is more active in causing gullies. It is therefore necessary to built check dams and introduce other measures to prevent gullies forming in river courses below dams. There is also a need to reforest the surroundings of dam lakes and the basin in general to prevent silting and extend the economic life of dams.

It was once claimed that natural floods would enhance the fertility of soils by spreading silt in valleys and construction of dams would therefore affect soil fertility adversely by withholding silt in artificial lakes. However, actual cases in some rivers, the Nile for example, have disproved this claim. In fact, following the construction of the Aswan Dam, irrigation and proper fertilizer use has allowed the maintenance of high yields even in dry seasons. Furthermore, the great losses that used to be incurred as a result of major floods were also avoided (Shenouda, 1999).

Another thesis frequently put forward is that irrigation will eventually lead to arid lands. It is true that land will be affected negatively by irrigation if there is no training of farmers and if the irrigation system concerned is not accompanied by appropriate drainage facilities. It is therefore crucial to meet all technical requirements strictly. Thus there are technical measures to eliminate or minimize the adverse impacts of water resources development projects. Below are some examples indicating that the cost of these measures (or environmental costs) can be balanced by various benefits and positive impacts.

In the US, 66 dams having a total water storage capacity of about 49 billion cubic meters were constructed in the upper Mississippi Basin to reduce flood damages. This means that an area extending over 956,000 km^2, larger than the total territory of Turkey, was brought under control. In the flood of 1993, called the 'Great Midwest', damage of US$ 19.1 billion was avoided thanks to dams, check dams and flood prevention walls. It was calculated that water storage facilities accounted for a US$ 7.4 billion share of this avoided damage (Berga, 1999).

Japan has 500 dams constructed for flood prevention purposes and plans are ready for the construction of 400 more (Berga, 1999). In China, the Yellow River and Yangtze rivers have caused many major floods

causing great losses. The Three-Gorges Dam presently under construction on Yangtze is intended to prevent these floods. Apart from flood prevention functions, this dam will also generate 100 billion kWh of energy a year with an installed capacity of 18,200 MW which is two times greater than the installed hydraulic power capacity of Turkey.

Artificial dam lakes create a very conducive habitat for various water birds. For example, nine dam lakes in England are protected under the Ramsar Convention as hosts of endemic water birds (Ramsar Convention Bureau, 1999).

Birds arriving in the Abberton Dam Lake in autumn overwinter there for molting. These birds include mute swan, gadwall, shoveller, pachard, tufted duck, goldeneye, goosander and coot (Briddle et al., 1999)

The Rutland Water Dam, the largest artificial lake in England, built between 1970 and 1976 is another example. The dam was constructed and operated by a private firm to provide drinking water to the area. Dame Sylvia Crowe, a well-known landscape architect said the following in rejecting claims that the dam was harming the natural environment (Crowe, 1982).

> *".....Provided all the necessary steps were taken to ensure that the reservoir and its related works were designed in full sympathy with the surrounding landscape. I believed that the water would even prove an enhancement to its surroundings."*

The dam is equipped with all necessary facilities to support Crowe's view. For example water-resistant vegetation was planted around the dam to prevent the erosion that could happen as a result of changes in the water levels in the dam lake. Furthermore, there are many small shallow ponds for birds where the banks slope steeply. There are 17 special birdwatch stations for about 20,000 immigrating birds of various species. The area, protected under the Ramsar Convention, is visited by 50,000 tourists a year. Another 32,000 come to the area for trout fishing (Briddle et al., 1999).

There are specially equipped classes around the dam lake to inculcate children with a love of nature and inform them about practices of environmental protection.

In Turkey too, there have been considerable increases in bird population on dam lakes. For example the Yedikır Dam in Amasya, supplied by the River Tersakan, was constructed in an arid area yet has now become a bird habitat (Akkaya, 1999).

As seen in examples given above, artificial lakes are in fact 'wetlands', which all environmentalists appear to approve of, and can serve as recreation areas for millions of people longing for water.

Producing the same amount of energy provided by hydraulic power with thermal plants would cause considerable emissions of CO_2.

The results of a study of CO_2 emissions using data from the 1990 Energy Report of the Austrian Government were made public in a document entitled 'The State of Hydraulic Energy in Austria and Expectations' (Shiller and Drexter, 1991). According to this document, the share of hydraulic energy in the total energy production of Austria varies from 65 to 72 percent. Were hydraulic energy to be substituted with thermal energy, it is calculated that annual CO_2 emissions would rise from 10.8 million tons to 40.8 million tones, an increase of 30 million tons. If these figures are translated to percentages, thermal plants' share of Austria's total CO_2 emissions is 19.1 percent and, in the absence of hydraulic energy, this share would more than double to reach 47.1 percent.

At a time when the greenhouse effect is being seriously discussed and limits put on emissions of greenhouse gases, clean and renewable hydraulic energy deserves much more emphasis. In Norway, a country where environmental awareness is quite high, hydraulic energy makes up 99.7 percent of the total electrical energy production of the country (Flatby and Konow, 1999).

One can give many other examples based on quantified data demonstrating that projects for the development of water resources have important functions in preventing floods, providing safe drinking and use water, producing clean energy, establishing food security and especially in generating employment in rural areas. However, public perceptions were shaped by rumour and speculation and there was a relatively widespread rejection of technical findings (or a refusal to believe the facts).

Why are the European Greens Against the Ilısu Dam?

Radical environmentalists living in welfare societies which have already developed their resources fully and are enjoying the benefits of wealth have launched campaigns, through their domestic and international lobbies against water resources development projects undertaken in other countries.

These campaigns have lately found a new target, the Ilısu Dam in Turkey. What the greens in Europe are standing against is a dam project on the Tigris which will irrigate 120,000 hectares of land, raise the living standards of farmers in the area and generate 3.9 billion kWh of energy per year.

Despite a serious lack of knowledge of the context in Turkey, some radical critics of the Ilısu Dam Project have nevertheless been confident enough to claim that the primary purpose of the plan is to selectively displace people of Kurdish origin from their homes. This claim is untrue. People of Turkish origin will also be affected, and all those affected, of whatever origin, will be resettled within the region in order that they can benefit from the prosperity that the project will provide, which is of course the true purpose of the project. Perhaps it would be more useful, and certainly better received, if these critics could concentrate on extending financial and technical support to efforts initiated to protect the archeological and historical heritage of the area to be affected by dam construction.

In resettling farmers whose land and original settlements are to be submerged under dam lakes, efforts to provide better living conditions to these resettled people are continuing in this area, as well as others. According to data for 1999, there are 193 completed dams in Turkey and 103 more are presently under construction. Many people, not only in south eastern Anatolia but in other parts of the country as well have been or are being affected by dam constructions. On the other side of the picture however, millions of people can now benefit from irrigation and an area of 2.2 million hectares with modern irrigation facilities has ceased adding population to urban areas. In addition, these facilities are providing safe drinking water and generate 37 billion kWh of energy.

Distortions and baseless assertions designed to mislead the world public opinion without taking these facts into account constitute a part of the external campaign waged against the Southeastern Anatolia Project.

Critiques of projects like the Southeast Anatolian Project which overlook the importance of water resource projects in the social and economic development of countries, have more to do with international power politics, and this fact is strikingly manifest especially in cases which relate to the use of transboundary waters.

Efforts of upstream countries to develop their water resources to the benefit of their people frequently generate reactions in downstream countries. The latter, who want to make these reactions known worldwide, are more than happy to benefit from the campaigns of internationally well-organized radical environmentalists in order to unjustifiably prevent projects on transboundary waters, as exemplified by the case of Ilısu Dam on the Tigris.

'The State of the World' report, published annually by the Worldwatch Institute, which exemplifies various ideas on environmental problems, frequently criticizes upstream countries. The following comment, which is devoid of technical data and hard evidence, is taken from the report of 1996 (Brown et al., 1996):

> *"...Turkey is undertaking a huge hydropower and irrigation scheme known as the GAP (after the Turkish acronym), which could reduce the Euphrates flow into Syria by 35 percent in normal years and substantially more in dry ones, besides polluting the river with irrigation drainage. Iraq, third in line for Euphrates water, would see a drop as well, and has the added worry that Syria will also take more Euphrates water.*
>
> *Turkay and Syria signed a protocol in 1987 that guarantees the latter nation a minimum flow of 500 cubic meters per second, about half of the Euphrates' volume at the border, but Syria wants more-a requests Turkey so far has denied. In 1992, Turkish Prime Minister Süleyman Demirel reportedly remarked about Syrian requests for more Euphrates water: "We do not say we should share their oil resources. They cannot say they should share our water resources." Although the government may have a more compromising position than this rhetoric would suggest, bilateral talks have not yet produced a water-sharing agreement..."*

European Greens, who failed to stop the diversion of a 25 km course of the Danube in Slovakia and had to watch major environmental damage take place, are now trying to be more influential in developing countries. In their discourse on the protection of wildlife and wetlands, some radical environmentalists seem to have forgotten all about the human factor, which constitutes the most important component of the environment. This attitude of the radical environmentalist movement occasionally receives severe criticism. For example, the South Sudanese Minister Abel Alier did not hesitate to express his grievance to the European Greens who have campaigned against the construction of the Jonglei Canal to reduce evaporation losses in the Sud Swamp Area (Waterbury, 1979):

> *".....The people (in the South) cannot even have one full meal a day, and children of school age cannot go to school because of our underdevelopment, backwardness and poverty. Yet we are asked to accept all this ..... and remain in a sort of human zoo for anthropologists, tourists, environmentalists, and adventurers from developed countries of Europe to study us, our origin, our plights, the sizes of our skulls and the shape and length of our customary scars....."*

Some environmentalists, disturbed by these kinds of reactions to radical environmentalist approaches, felt the need for some self-criticism. It is interesting to note the following in the 'State of the World' (Brown et al., 1996):

> *".....Some environmentalists have certainly deserved their reputation for neglecting the human element of conservation. Several badly planned ecological preservation projects have come at the expense of local peoples' basic human rights. And such mismanagement, in turn, often jeopardizes the integrity of the supposedly protected areas. This pattern has been especially devastating in the developing world. In many protected areas of India, for instance, local peoples have found themselves suddenly deprived of traditional land rights and access to natural resources because of new conservation regulations. And they have responded, understandably, with increasing hostility. In one case, the creation of the Kutru Tiger and Buffalo Reserve in Madhaya*

Pradesh displaced 52 villages of Mariatribals, many of whom have since joined an insurgent movement that occasionally conducts poaching mission and harasses park guards.

Because of such failures, and because so many developing-world preservation schemes originate with industrial-world environmental organizations, northern environmentalist have had to fend off constant accusations that they care more about the South's trees and birds than about its people."

The adoption of radical environmentalist approaches to the protection of wetlands and wildlife by some local environmentalist groups has now started to disturb more moderate environmentalists.

Do Wind and Solar Energy Constitute an Alternative to Other Energy Sources?

The radical environmentalist approach is stubbornly and in a sense ideologically determined to reject the use of water as a clean and renewable energy source by capitalizing on various adverse impacts which can actually be eliminated or minimized through appropriate measures.

The same groups demand the closure of thermal plants on the ground that they pollute the atmosphere and the closure of nuclear plants because of the extreme dangers which they may pose. They want a move to wind and solar energy, switching away from thermal, hydraulic and nuclear sources (Brown et al, 1996). To assess whether such a switch is possible, there is a need to look at the level of technologies for wind and solar energy.

In 1996, world electric energy production reached 13,654 billion kWh (13,653TWh), a 15 percent increase over the 1990 figure. 8,275 billion kWh of this total (60.6 percent) is generated by the OECD countries. The European Union's share is 17.6 percent (2,400 billion kWh) and Turkey's is 0.7 percent (96 billion kWh).

As to the sources of this energy, thermal plants account for 63.42 percent, followed by hydraulic (18.67 percent), geothermal (0.31

percent) and wind (0.06 percent). In the thermal generation of electric energy, the contributions of natural gas, and coke/lignite are, respectively, 15.11 and 36.68 percent (TÜSİAD, 1998).

As can be seen in data given above, the share of wind energy in the world's total energy production is only 0.06 percent at the end of the 20th century. The installed capacity of solar energy facilities is as yet only 580 MW (TÜSİAD, 1998). This corresponds to 0.002 of the total World installed capacity of 2,846,732 MW (National Energy Committee, 1994).

Presently wind plants are in the form of wind fields containing more than one turbine. Assuming a maximum wind turbine power of 2 MW, there is need for a wind field of 1,200 turbines to generate an energy equivalent to, for example, the 2,400 MW capacity of the Atatürk Dam. Realistically, wind turbines can be used only to meet the energy needs of very small settlements. In the 21st century world, where urban centers in the South continue to expand and already that contain 60 percent of world population, there is a need for mass production of energy. So, to meet the energy needs of the urban population plus industry, some parts of the territory of countries have to be reserved as wind fields. Moreover, there are now some environmentalists rejecting wind plants on the ground that they generate serious noise pollution and cause the death of birds.

Research into wind and solar energy for electricity are still going on. Yet, it is not possible, at least for the coming 50 years or so, to have these sources meet the energy and capacity needs which reach hundreds of billions of kilowatt hours and hundreds of thousands of megawatts.

According to the reports of the International Nuclear Energy Commission, there are, as of the end of 1997, 437 reactor units with a total installed capacity of 351,795 MW. This is 17 times greater than the total installed energy generating capacity of Turkey. There are 35 more units under construction. The share of nuclear energy in total energy production is currently 78.2 percent in France, 60.1 in Belgium, 30.6 in Germany, 36.1 in Japan and 21 percent in the US (TÜSİAD, 1998). Hajime Furuya, deputy director for nuclear energy at Japan's Ministry of

International Trade and Industry, says : "nuclear power will continue to play a role in Japan's overall energy policy." A big role : four new plants are now under construction, and an additional nine will be built by 2010 (Newsweek, 2000).

The industrialized countries, with high per capita energy consumption, low rates of population growth and declining rates of industrial growth have reached a saturation point in terms of energy use. In these countries, the share of nuclear energy in total energy production varies from 20 to 80 percent and there is no need to construct new nuclear power plants. However, it would be a mistake to construe this as signaling the abandonment of this source of energy.

In the developing countries on the other hand, which still remain far below world averages in energy consumption, there is need to phase in much more energy and power than the industrialized countries to meet the needs of rapidly increasing populations. It is not possible to respond with solar and wind energy to energy needs which increase at an annual rate of 8 to 10 percent.

In 1999, per capita net electricity consumption in the world was 2 500 kWh. This average is higher than the per capita energy consumption of Turkey, currently 1 900 kWh, thus pointing to the need to raise this figure with new projects.

In conclusion, the radical environmentalists of the industrialized countries which take an 80 percent share of global energy consumption should, instead of launching campaigns against projects in other countries, focus more on getting their own nuclear and thermal plants closed down and changing consumption patterns in their own countries.

Environmental Impact Assessment (EIA) Reports

Since the 80's, it has been required for countries to prepare what are called 'Environmental Impact Assessment Reports' (EIA) to assess the impacts on the environment of facilities and infrastructure designed to develop water and other natural resources. These EIA reports were originally supposed to evaluate the social and economic benefits of investments and deal with measures to be introduced in order to

eliminate or minimize the adverse environmental impacts of such investments. However, these reports have been diverted from their original purpose and turned into documents emphasizing only adverse impacts and environmental costs. Looking at the matter in terms of the relationship between water and the environment, the few new projects that would actually be rejected in the industrialized countries did not have any priority, anyway, in terms of social and economic development. Consequently, adverse impacts are emphasized in the administrative and technical methods and principles set down by the Ministries of Environment of these countries concerning the processes of environmental impact assessment.

In the countries of the south however, many located in arid or semi-arid climate zones and having so far developed only a small part of their water resources, circumstances are radically different from those in the north. Here, millions of people are in urgent need of drinking and irrigation water and energy while trying to cope up with flood disasters. By focusing on negative impacts as prioritized by the methods of an EIA relevant for the industrialized countries and thus overlooking social and economic development benefits, the EIA reports drafted for the developing countries, and the long process involved in these evaluations, cause serious delays in the implementation of some important projects.

The EIA reports are planning tools intended to assess the cost of measures to be adopted in order to eliminate or minimize adverse environmental impacts of projects and investments. In other words, they are not decision-making tools per se. What needs to be done is to combine such environmental costs with the economic and financial costs of the project concerned and to reach multi-purpose decisions by giving equal weight to the benefits.

Water Policies and Strategies

While technical, economic and financial problems constrain water supply, increasing population and needs continuously boost demand. To maintain a steady balance between water supply and demand, there is need to identify targets in water management and to launch an action plan (strategy) to attain these targets.

Since water, different from other natural resources, constitutes the main element of life, it has a social character accompanying its economic value. This fact also poses various difficulties in the development and implementation of water policies. For example, an attempt to raise water fees for irrigation stemming from financial needs immediately causes a reaction by farmers. Decision makers prefer to increase water supply through costly investments instead of controlling demand by reducing economic subsidies in water use and introducing water saving.

Considering that usable water resources are fixed against an increasing population, water policies have to observe the following targets in addition to investments in dams and new irrigation facilities:

- Increasing efficiency in the sectoral allocation of water,
- Ensuring participatory water management,
- Ensuring food security,
- Maintaining water quality, and
- Investigating other alternatives in water supply.

Although measures that can be adopted for these targets vary with respect to individual countries, the need for reforming existing water policies is accepted by all.

Sectoral Allocation of Water

Water is an important input for various sectors. For example, it is used for irrigation in agriculture, domestic water in service sector and as a processing and cooling medium in industry. It is also the main input for hydraulic energy production.

With respect to different uses, water, just like other economic resources, must be valued in terms of its opportunity cost. In other words, in deciding on the amount of water to be used in, for example, irrigation, as drinking water or industrial purposes, its respective value in these sectors must be considered. In a perfectly operating market economy, the price of water would be equal to the marginal cost of obtaining it and as such it also reflects an opportunity cost. Contrary to this view, there is the assertion that each society has the basic right of

access to water free or at very low prices. This second approach has social, cultural and religious elements in it. It is apparent that each of these extreme positions faces difficulties in practical implementation and the solution lies somewhere in between. While in the urban drinking water supply sector the price of water comes close to its real value, there may be a need for state subsidies to keep the price low in rural drinking and irrigation water supply. Yet, this support should be provided not in operation and maintenance services but in covering the cost of initial investment. Taking a look at the practice in the Middle Eastern countries, it is obvious that state support is at very high level, especially in the irrigation sector.

Jordan and Israel irrigate, respectively, 60,000 and 215,000 hectares of land and the populations of these two countries are almost equal. Yet the contribution of Israeli agriculture to the country's GNP is only 4.1 percent. One expert defined the Israeli export of citrus fruits as "selling abroad water whose price is supported by the State". It was noted that had the Israeli farmer paid the real price of water, it would have been cheaper to import citrus fruits rather then growing them domestically (Zarour and Isaac, 1993). Considering the higher level of development Israel enjoys compared to her Arab neighbors, water used in the subsidised sector of agriculture can be shifted to the sectors of industry and services. However, the desire of Israel to put her land, including deserts, under cultivation and the ideology shaping this desire prevents such a transfer of water from one to another sector. Consequently, there are problems in providing drinking water and meeting water needs on economically sound grounds.

In countries where larger part of population live in urban centers and intensive industrialization have either been completed or are still ongoing, there is an emerging need to reconsider the sectoral allocation and use of water. There are legal arrangements in industrialized countries to allow the marketing of water saved from irrigation to farmers' unions, municipalities or industrial enterprises. In order to introduce similar arrangements in other countries, there is need for legal arrangements to make the transfer of water rights possible.

This type of water transfer from one sector to another is seen in the US in the use of the waters of Colorado and Rio Grande rivers 85% of which are used for irrigation.

According to California State Law, water saved can be marketed or leased. In Texas, there is no need for official authorization for the transfer of surface waters within the agricultural sector. However, where this transfer involves different sector, for example a transfer of water from agriculture to drinking water supply systems, there is a need to secure official authorization from the Texas Commission for the Protection of Natural Resources (Jonish and Wiseman, nd.).

According to an agreement between the Metropolitan Water District of Southern California (MWD) and the Imperial Irrigation District (IID), the IDD agreed to provide 131 m_3 water annually to the former for a period of 35 years in return for US$ 222 million US.

This agreement provides that the MWD is to transfer funds to the IID for the introduction of relevant water saving measures and to receive what is saved as water. However, it has been noted that some problems exist in the transfer of these funds to farmers (Rosen, 1992).

In the border states of Arizona, California, New Mexico and Texas there were 48 registered transfers of water rights in 1991. Of these agreements, 30 involved municipalities either buying or leasing water rights. Table 20 below summarizes the situation by individual states:

TABLE 20 : Transfer of Water Rights

State	Number of Transfer Agreements	Amount of Water (million m^3)	Price as Weighted Average (cent/ m^3)
Arizona	4	1270	4.2
California	25	924	11.2
New Mexico	5	2	22.4
Texas	14	42	5.3

Source: '1991 Annual Transaction Review: Water Comes to the Town', Water Strategist, Claremont, CA: Stratecon, Inc.

The wide range in water prices as given in Table 20 stem from the fact that some transfers involve longer periods of time while others are only short term agreements. Prices are also affected by local conditions.

Another interesting practice developed in Mexico. An industrial complex in this country financed the conversion of a nearby irrigation system into a drip system in order to get the water it needed (1 m^3 per second) and made an agreement with the farmers of the area to use this water for a period of 50 years. This conversion made it possible to save 40% of the water used, and to avoid the difficulty of bringing water in from long distances.

To make such practices more common, there is a need to have farmers organized in irrigation unions and introduce legal arrangements to allow for inter-sectoral water transfers. Since it would be too difficult for municipalities and industrial enterprises to discuss the transfer of water rights and other relevant issues with so many farmers, contacts and negotiations with the managers of irrigation unions would save much time in this process.

The following section considers the utility of irrigation unions and adopting participatory water management approaches.

Participatory Water Management

Both the Dublin Declaration and Agenda 21 stressed the importance of adopting a new approach to water management by stating that *"Water development and management should be based on a participatory approach, involving users, planners and policy makers at all levels."*

The process of participation must start with the original idea for a project, and then cover the stages of planning, implementation and operation. In this process, the beneficiaries of the project must be informed and their opinions must be reflected in the project after relevant technical and economic assessments.

This point is especially important in irrigation projects. Switching from dry to irrigated farming in a relatively short period of time and attaining projected yield increases can be achieved only by training farmers and having them adopt the project.

Since as a result of inheritance rights farmlands tend to have become divided into small parcels and thus display geometrically irregular shapes, the initial investment costs of irrigation facilities are raised and this also blocks efficient irrigation. Therefore, before introducing irrigation facilities to an area, there is a need to consolidate otherwise scattered parcels of farmland and form regular geometrical plots. In this operation known as 'land consolidation' farmers must be convinced and the operation must be completed prior to the phasing in of any irrigation network. Farmers, farmers' associations, chambers of agriculture and governmental organizations which have developed the project must come together in a participatory way to overcome this problem.

Just as urban development plans are important for healthy urban settlements without squatter settlements, land consolidation must be regarded as the 'development plan' of rural farming areas and accorded relevant legal and institutional arrangements.

Irrigation unions or districts have an important role in ensuring farmers' effective participation to water management issues. The target must be the transfer of the operation and maintenance of irrigation facilities to irrigation unions and gradual withdrawal of the State from these services.

There is a contradiction between state support of irrigation in the form of keeping the fees low and the general policy designed to reduce the wastage of water as much as possible. To ease this contradiction to a certain extent, one method may be to lower prices when actual water use is less than a specified quota and raise them when the reverse happens. Such a solution can be introduced effectively only by organizing farmers in democratic unions, establishing 'irrigation districts' and transferring facilities to these districts.

It is also possible to save considerable amounts of water by introducing legal arrangements allowing the marketing of surplus water to other sectors or districts.

Irrigation unions or districts are displaying satisfactory progress in Turkey. Farmers have started to devise interesting methods of charging water prices in areas facing water shortage. For example, such methods

as charging different prices for various water use requests and charging on an hourly basis for the use of pumped water regardless of the plant to be watered are widely used by irrigation unions. These practices make it possible to save considerable quantities of water in irrigation. Recent successes in the participation of farmers in the operation and maintenance of irrigation facilities have also been noted by World Bank experts to the extent that Turkey is referred to as a country of 'best practice' in this regard.

Food Security and the Concept of 'Virtual Water'

Though only 20 percent of the total cultivable land in the world is under irrigation, 40 percent of the total crop output is obtained from irrigated farming (Biswas, 1990). These figures clearly indicate the important role played by irrigation in ensuring food security.

Nevertheless, the arid and semi-arid countries of the South are still facing problems in food security especially in cases of consecutive years of drought and because of their growing population and shortage of water resources. In the utilization of these limited water resources, the sectors of drinking water supply, agriculture, industry and the environment are engaged in intensive competition. Since irrigation consumes so much water, there is a limitation on irrigation in order to meet the needs of other sectors.

In this case, the gap in the production of basic foodstuffs has to be closed by imports. Assuming that 1,500 m^3 water is needed to grow one ton of wheat and 1 million tons of wheat is imported, the water equivalent of this imported wheat will be 1.5 billion m^3. Water defined in this example is termed 'Virtual Water' by some experts (Allen, 1996).

Standing opposite countries of the South who have to import 'virtual water' are the industrialized countries of the North. Having a surplus of foodstuffs, these countries are globally influential in setting prices.

In the 80's, the competition between European countries and the US, both having surplus cereals, led to the depreciation of prices in the global market to as low as US$100 /ton. This led to a parallel fall in the price of virtual water, thereby creating a favorable situation for any country importing wheat. However, there was a steep rise in prices in

1995 reaching US$250/ton. Under the rules set by the General Agreement on Tariffs and Trade (GATT) and World Trade Organization (WTO) it does not seem possible to push prices back down to their levels in the 80's (Allan, 1997).

Some experts stress that rules being applied to international trade may lead to important problems regarding food security. For example, Sharma expresses these worries by saying "..... *It doos not serve any useful purpose to make wild claims in support of free trade. What is important is how it will affect us (India) as a nation.....*" (Sharma, 1995).

For the widely disputed concept 'virtual water' to be useful for economic planning, it is important to be able to predict the prices of basic foodstuffs in the 21st century.

The possibility that India and China, where 45 percent of the world population live, will enter the world market as two giant consumers has the potential to upset the balance between supply and demand and thus create serious problems for poor countries located in arid zones. Yet, it is possible for some countries, for example oil rich Saudi Arabia and the countries of the Gulf to attain food security through virtual water. In this context, there is no logical explanation to the practice of wheat irrigation using (non-renewable) groundwater resources from the Disi Aquifer in the north of Saudi Arabia. Instead of using this water for irrigation purposes, it would be much more rational to import wheat and allocate this water to some other uses.

Iraq is a country well endowed with water resources as well as oil. Yet prior to the Gulf War it was trying to bring large tracts of land into irrigated farming use by employing agricultural workers from Egypt and Jordan. If these resource-rich countries adopt distorted food security policies that create ecological pressures and engage in irrigation, based on an imported labor force they will create problems in the use of transboundary waters as we see in the Middle East.

Turkey, on the other hand, is heavily dependent on imports of energy sources such as oil and natural gas and she is engaged in irrigation in Southeastern Anatolia using her domestic labor force. Enjoying very favorable ecological conditions for agriculture, this region will contribute much to the food security of the region.

Privatization in the Water Sector

Water resources are under state ownership and control in many countries. It has been among the important duties of the state to develop water resources for domestic water uses, for providing water to irrigation facilities and generating energy, and these activities have long been known as 'public services'. In law, public services are defined as "*activities carried out to continuously and regularly respond to a general or collective need emerging at a specific time and space.*" (Polatkan, 1997). In conformity with this definition water supply activities are still undertaken by governmental organizations in many countries. However, ever increasing problems in finance have led to serious bottlenecks in the provision of these services and forced governments to seek new approaches. The result of this quest has been models developed to secure the contribution of the private sector in the fields of investment and operation.

Since water is the basic input of many sectors of the economy, such as agriculture and energy, discussion goes on as to the ways of recruiting the private sector to this area.

Considering the sector of agriculture, it is very difficult for developing countries to persuade the private sector finance, construct and operate irrigation facilities to maintain these facilities, and to recover investment costs and costs of other services by charging water users. This is so since farmers are generally along the low-income status groups of any society and are not capable of paying high water fees to cover, within a period of 10 to 15 years; the initial capital layout, interest and dividends of facilities constructed by the private sector. Instead, the operation and maintenance services of irrigation facilities discussed earlier under the heading 'Participatory Water Management' can be transferred to irrigation unions to enable the state to phase out of this sphere. Then, funds which would otherwise be used for the operation and maintenance of irrigation systems covering millions of hectares of land can be channelled by the state into the further development of irrigation techniques and farmer training.

What has been suggested above can be construed as partial privatization of the irrigation sector. Experiments of this kind both in

Turkey and other countries have yielded quite successful results, including farmers' commitment and care for systems developed by the State. In some countries, a kind of a water market emerged in the transfer of water saved by farmers. The emergence of such markets has led farmers to use irrigation water in a more careful manner.

Under conditions prevailing in the developing countries, privatization of energy production and distribution can be realized relatively easily. Thus, priority has been given to the private sector in hydraulic energy production and the 'Build-Operate-Transfer' model (BOT) has been developed as a method of financing.

In this model, a private firm is paid back its original investment, operation and maintenance expenses, interest on credit and other financing costs through the franchise of selling energy output at prices determined for a period of time depending on the terms of financing and the capacity of the facility. A reasonable margin of profit over capital outlay is ensured. At the end of this operation period, the facility is transferred to the relevant public authority free of all debt. In this system, the state guarantees only the purchase of energy generated and all risks related to credit use are borne by the private enterprise.

Since the economic life of hydraulic power plants is about 50 years, if a BOT model of 20 years duration is used then the relevant public authority has the opportunity to run the facility for 30 years or having it operated again by a private firm.

The process of privatization is significant also in the sector of drinking water supply. In this sector, there are several examples, ranging from the leasing method whereby the private sector takes over the operation and maintenance services of a water supply or treatment system to BOT.

In leasing, the private sector takes over operation and maintenance services and, in some cases, collection of water fees while the proprietorship of the facility concerned remains with the relevant state enterprise. Leasing contracts for periods of 10 years are common, especially in Europe. Water fees charged are under the scrutiny of the state. Additional funds generated by efficient conduct of operation and maintenance services as well as prevention of leaks and illicit use are shared jointly by the relevant authority, customers and the private sector.

Preserving Water Quality

In recent years, while such issues as the preservation of wildlife and wetlands, damage caused by large dams and the depletion of the ozone layer have been emphasized there has been less concern for water pollution.

Some in the Green Movement, though closely interested in the habitat of birds and wild animals, and having launched campaigns against projects for the development of water resources have yet not succeeded in creating any serious public pressure on such issues as the existence of urban settlements and industrial enterprises discharging their waste water into rivers and natural or artificial lakes without treatment.

Unless effective measures are taken to prevent the pollution of rivers, natural lakes, dam lakes and ground water reserves, the opportunity to use these resources will be completely lost in the 21st century, or else there will emerge a need for treatment facilities too expensive to be afforded by developing countries.

It is necessary for the World Bank and other international finance institutions to provide funds and contribute more to countries in financial difficulties to establish wastewater collection and disposal facilities. At present, about half the world population lacks such facilities. Governments need to attach as much importance to this issue as they do to their water resource development projects. It is crucial that these activities, often left to municipal authorities, enjoy the support of central governments.

The task of preventing water pollution is given to various agencies and organizations through various legislative acts, but there is no effective coordination of the activities of these institutitons. There is a need to reduce the number of authorized central institutions and introduce organizations at the basin level. There are two basic methods in the assessment of water pollution:

(i) In the first method, waste water is treated so as to bring its harmful substance content down to a standard minimum and it is then discharged to an aquatic receiving environment. In this case, the assessment and implementation of the 'quality standards of waste water' is important and

no attention is paid to the natural purification capacity of streams, whether these receiving environments are large rivers or small brooks. Another important point is that it is virtually imposible using conventional technologies to reduce, the harmful content of some substances existing in industrial waste to a specific value. It is of course possible to apply high technology to limit these substances to some thereshold value, yet practical application is barred by the high costs involved. Changing production techniques may be more plausible in such cases.

(ii) In the second method, standards are developed that consider the purpose of usage of the receiving environment. Applying the same standards, more pollution may be discharged to water which has a high natural purification capacity. To give an example of a receiving environment standard adopted by industrialized countries, it is required that dissolved oxygen (DO) in all sections of a water stream should be at a minimum of 4 milligrams per liter (Than, 1990).

In this method based on standards referenced to receiving environments, it will not be sufficient to assess only the content of waste and the capacity of the water source where it is discharged. The effects of this discharge on life in the receiving environment must also be assessed.

The phrase 'standards for water streams and receiving environments' is more meaningful for decision makers. For example, while the existence of four milligrams of oxygen in one litre of water is considered safe, a zero value for oxygen indicates a water of black color and foul odor.

Whichever assessment method is adopted in controlling pollution, some points need to be carefully observed in setting standards:

- Water quality standards may change with respect to countries as well as within a specific country in terms of local conditions and purposes for which water is used.

- In setting and implementing standards, there must be a balance between long-term environmental impacts and the economic, technological and institutional context of individual countries. Also

approaches that slow down the process of industrialization must be avoided.

- Standards must be viable and strictly observed.

The pollution of rivers as a result of agricultural activities takes place at many points along the course. It is therefore more difficult to control such pollution than that of industrial waste which takes place at specific points. The following are some measures which can be taken this end:

- As a priority, training and voluntary initiatives. It is important to inform farmers through various media about appropriate ways of using fertilizers and chemicals. There is a need to launch awareness raising programs in primary schools and expand them over the country.

- It is very difficult, even impossible over a wide irrigation area to check the quality of water coming back from irrigation and to determine the causes of pollution in waters remaining below a specific quality standard. It is much more feasible instead to limit the use of chemicals and fertilizers to a level that would not adversely affect output. Some countries have this practice reflected pricing mechanisms whereby farmers who exceed previously set limits pay more while other pay less for fertilizers and chemicals. These factors must be borne in mind in determining state support for the prices of agricultural inputs.

Alternatives in Water Supply

When per capita water allocation in a country is less than 1,000 cubic meters, this is considered as an important factor constraining economic development. It is estimated that in the early 21st century 20 countries, mostly in North Africa and the Middle East, will fall below this threshold. Countries where per capita water allocation ranges from 1,000 to 2,000 cubic meters face serious water problems in dry years, and this constitutes a potential threat to their development. Due to rapid population growth, there were already 40 countries in this category even before the start of the new century (FAO, 1993). In conclusion, as well as long-used surface and ground water resources, desalination of sea water

and re-use of treated waste water will be important as alternatives for water supply in arid and semi-arid zones.

Desalination facilities constitute an important opportunity especially for those countries where the majority of the population is concentrated on coastlines. Two or three decades ago, the cost of water obtained from desalination was US $ 4/ cubic meter. It is now down to US $ 1 or US $ 1.5 / cubic meter as a result of technological advances. For example, Malta, which has recently raised its per capita GNP to US $ 6,000 by creating an economy based on tourism and services provides 70 percent of its water need, from desalination facilities. In other words, 85,000 cubic meters of the total daily water need of 120,000 cubic meters are provided through desalinization and the price charged is US $ 1.20/cubic meter (World Bank, 1995).

The re-use of treated water coming back from irrigation or water supply schemes is also gaining importance in meeting the needs of the agricultural sector. At present, the cost of treating waste water for irrigation purposes is 45 US cents/cubic meter. Tunisia presently uses 18 million m^3 of treated wastewater to irrigate 3,000 hectares of land and plans to increase the amount of such water ten times in the early 2000s. In Egypt, 3.4 billion m^3 of drainage water is used for irrigation. Yet the quality of treated water is quite important for certain crops and it also requires strict control for public health reasons.

As for brackish water, which is less saline than sea water, the cost of desalination varies from 45 to 70 cents per cubic meter. The cost of water obtained from such conservation methods as the covering of canals in water distribution schemes and reducing leakage varies from 5 to 50 cents per cubic meter.

Table 21 below outlines what has been said so far:

TABLE 21: Alternatives In The Development of Water Resources

Alternatives	Estimated cost (US cents/m^3)
Re-use of waste water in irrigation	30-60
Desalination of brackish water	45-70
Desalination of sea water	100-150
Prevention of illicit uses and leakage, introduction of water saving devices in homes and entreprises	5-50

Source: World Bank Estimates (World Bank, 1995)

Mankind's age old struggle for safe and sufficient water will continue in the coming centuries. It is certain that the technologies briefly touched upon above will contribute much to this struggle. However, water problems cannot be resolved just by increasing the quantity of available water. It is also essential to control water quality strictly and to integrate efforts to improve water supply with economic, social, legal and institutional measures, to control demand.

EPILOGUE

Evaluating the history of mankind in terms of hydropolitics, one notices that amazing records were set in the second half of the 20th century in developing water resources and putting them at the service of populations. For example, 90 percent of all 37,000 large dams of the 20th century were constructed after 1950. Parallel to this, total area irrigated rose from 74 million hectares in 1950 to 274 million hectares at the end of the 20th century, the 'Blue Revolution'. This revolution played a crucial role in providing food security to an ever-growing world population which reached 6 billion at the end of the century.

However, this rapid development also brought along some problems related to the environment as well as those concerning the use of transboundary waters. These two issues made up the agenda of numerous international water meetings gathered under the leadership of the countries of the North starting from the early 1970's.

In their assesment of the relationship between the environment and water resources, the countries of the North, which had already developed many of their available water resources, displayed an unbalanced attitude which overlooked the importance of water resource projects for the countries of the south and focused on particular adverse impacts which can in fact be eliminated through various technical, economic and institutional measures.

In addressing problems related to transboundary waters, international power centers have usually been involved in inconsistent and contradictory policies which differ according to the specific region where the problem has emerged and which also overlook technical data and reality. This approach has made it especially difficult to solve water problems in the Middle East.

In a region with about 20 percent of the world is population and where various political problems, including that of Kashmir prevail, India and Pakistan nevertheless reached an agreement in 1960 regarding the use of the Indus River. This solution was facilitated mainly by the adoption of a technical approach based on sound data.

Looking at the problems between Israel and the Arab states over the use of the rivers Jordan and Yarmuk, one can see easily that most unrest in the region is somewhat related to water. Having rejected on political grounds the technical approach of the Johnston Plan in the 1950's, the Arabs had to enter into water agreements in the 90's which were more unfavorable to them than the earlier plan.

The focus on the River Jordan has in the course of time expanded so as to cover the Euphrates and the Tigris. There have been contradictory attitudes such as suggesting the transfer of water from these rivers to water needy areas on the one hand, and asserting that the water potential of the Euphrates-Tigris basin would not suffice for the future water uses of Turkey, Syria and Iraq on the other.

There was frequent reference in the 90's to the words of Boutros Ghali, the former Secretary General of the UN, who prophesied that the next war in the Middle East would break out, not over oil, but over water and war scenarios followed. Yet, in the same period Jordan and Palestine enacted peace agreements with Israel which also included water issues, and Syria started peace talks with Israel in the last month of the 20th century.

People prefer more to less. When this is generalized to cover societies and countries, we see that same natural responses lie at the root of problems related to the use of water as a resource having economic and social value. Technical and economic cooperation involving different countries will help eliminate or ease such responses. Such an approach may pave the way for a consensus bringing along neither 'more' nor 'less' but what is reasonable in the light of sound data.

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