MANAGING WATER RESOURCES IN THE TIGRIS AND EUPHRATES DRAINAGE BASIN: AN INQUIRY INTO THE POLICY PROCESS

DISSERTATION

Presented to the Graduate Council of the North Texas State University in Partial Fulfillment of the Requirements For the Degree of

DOCTOR OF PHILOSOPHY

By

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The Tigris and Euphrates are international rivers vital to the four countries through which they flow: Turkey, Syria, Iraq, and Iran. The population in the region has more than doubled in less than thirty years, and irrigated agriculture, hydroelectric power generation, industrialization, and urbanization have increased. All of these developments require more water, and the dependence of the riparian nations on the waters of the Tigris and Euphrates Rivers has become apparent, as has the need for comprehensive, basin-wide management of water resources.

At present the riparians have shown some concern about the management of water in the two rivers, although no consensus exists as to the precise nature of the problem or what should be done to resolve it. This policy-oriented dissertation attempts to help frame the policy issues of managing the waters of the Tigris and Euphrates basin. It also seeks to provide an understanding of the policy process and to meet the intelligence needs of policy-makers
with regard to the future management of these international waterways. Finally, it provides strategies for developing and implementing a cooperative water policy for this international basin.

The dissertation is divided into four parts. Part One comprises the introduction, a review of the literature pertaining to the waters of international drainage basins, and a consideration of the research approaches applicable to policy-oriented studies. Part Two deals with the environmental factors influencing the use and management of the Tigris-Euphrates drainage basin. Part Three examines the causes of increasing competition and conflict over the waters in the basin and the factors of interdependence which tend to mitigate conflict over water resources. Experiences in other countries in dealing with international drainage basins are also considered. Part Four attempts to apply these concepts and strategies to the riparian nations in the Tigris and Euphrates valley.
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Summary
Possible Strategies for Bringing the Riparians of the Tigris and Euphrates Basin into International Cooperative Action

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CHAPTER I

INTRODUCTION

Water is the most important resource to the economy of any country because of its wide ramifications for other resources and industries. It sustains life; it makes agricultural, commercial, and industrial activities possible; it is a source of energy; and it serves as a medium of transportation. Thus, water is the prerequisite for growth in all countries. But water can also be a destructive force; unless it is controlled, it erodes soil, destroys life and property through floods, and impairs the utility of land if it is polluted or when it serves as a breeding place for disease-carrying insects. Thus, water has a major impact upon productive activity, food supply, income, the degree to which rural-urban migration is accelerated or retarded, and the improvement of social welfare. Management of water resources, therefore, is an essential element in the developmental process of all countries. In the arid sections of the world this is particularly true since water is in such short supply.¹

According to a United Nations report,

There is no actual physical global shortage of water, but rather the water supply is distributed unevenly over the face of the earth. Out of the total volume of water on earth more than 95 per cent is in the oceans. Of the remaining fresh water, about 77 per cent is stored in ice caps and glaciers; 22 per cent is in groundwater and soil moisture, 0.35 per cent is in lakes and marshes, 0.4 per cent remains in the atmosphere. This leaves the scant proportion of 0.01 per cent in streams. Of this annual runoff in streams, more than half is found on the Asian and South American continents, and less than 40 per cent flows in Africa, Europe, and North America. Of the groundwater supplies, about two-thirds lies deeper than 750 meters below the surface and, thus, only a relatively small part of the groundwater in reserve, roughly one-tenth of one per cent, participates in the hydrologic cycle in an average year.²

A large number of the rivers of the world flow through or serve as boundaries of more than one country,³ and approximately 40 per cent of the world's population lives in international drainage basins (see Tables I and II). These international streams complicate the process of managing scarce and vital water resources.⁴ In addition, groundwater

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### TABLE I

**INTERNATIONAL RIVERS DISTRIBUTED IN TERMS OF NUMBER OF COUNTRIES SHARING THE SAME RIVER BASIN***

<table>
<thead>
<tr>
<th>Rivers</th>
<th>Number of Co-Riparian Countries</th>
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<tr>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Total number of rivers</td>
<td>155</td>
</tr>
<tr>
<td>Names of rivers shared by five or more countries</td>
<td></td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Continent</th>
<th>Estimated Population (Millions)</th>
<th>Total Number of International River Basins</th>
<th>River Basins Shared by Four or More Countries</th>
<th>Number of Treaties (1972)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Africa</td>
<td>270</td>
<td>56</td>
<td>12</td>
<td>34</td>
</tr>
<tr>
<td>North and Central America</td>
<td>90</td>
<td>34</td>
<td>0</td>
<td>38</td>
</tr>
<tr>
<td>South America</td>
<td>100</td>
<td>36</td>
<td>2</td>
<td>31</td>
</tr>
<tr>
<td>Asia</td>
<td>600 (ca)</td>
<td>40</td>
<td>5</td>
<td>31</td>
</tr>
<tr>
<td>Europe</td>
<td>330</td>
<td>48</td>
<td>4</td>
<td>175</td>
</tr>
<tr>
<td>Total</td>
<td>1,390 (ca)</td>
<td>214</td>
<td>23</td>
<td>309</td>
</tr>
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Aquifers do not conform to political boundaries, and this further magnifies the complexity of the water resource management function. International rivers and drainage basins are categorized as follows:

International rivers are of two general categories: those that flow between the land territories...
of two or more states (contiguous or boundary rivers) and those that flow from the territory of one state (successive rivers). A broader concept is that of an international river system which includes the international river itself, its tributary streams and rivers, and lakes and canals constituting a part of the system. And thus . . . [an] international drainage basin is a geographical area extending over the territory of two or more states and is bounded by watershed extremities of the system of waters, including surface and underground waters, all of which flow into a common terminus.\textsuperscript{6}

The problem of managing water resources, particularly international drainage basins, has become increasingly acute as a result of rapid increases in world population and industrial expansion. According to recent studies of world population, by the year 2000 the population of the world will double, and, as a result of future industrial expansion, the world's needs for water will more than double in the next decade. Therefore, the water issue emerges as a problem that could generate great controversy among nations, especially those that share international drainage basins.\textsuperscript{7}

Since World War II, disputes over the utilization of the waters of international rivers have become increasingly important to world peace. Such conflicts as those between India and Pakistan over the rivers in the Indus basin, the


\textsuperscript{7}Ibid., p. 5.
dispute between the Arabs and the Israelis over the Jordan River, and, recently, the dispute between Iraq and Iran, arising in part over the Shatt Al-Arab waterway, have threatened world peace and at the same time have hindered the development of a large portion of the world.

In developing countries, particularly in the arid regions of the world, the conflict over water resources is intense because of competing developmental strategies that depend upon adequate water resources. Thus, management of international drainage basins becomes one of the most important political issues in these regions because of the competing and conflicting interests of riparian states that share the waters of these basins. The focus of this dissertation is the management of water resources of the Tigris and Euphrates drainage basin, which traverses five developing states—Turkey, Syria, Iraq, Iran, and Saudi Arabia—in the arid Middle East.

The Tigris and Euphrates are international rivers. They flow through and are important to differing degrees to the development of Turkey, Syria, Iran, and Iraq.

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Technically, Saudi Arabia is a part of the drainage basin but has no access to the Tigris and Euphrates Rivers (see Figure 1). The interdependence of the four riparian states on the waters of the Tigris and Euphrates is readily apparent, and the development of the water resources of this international drainage basin is important to all of them, particularly to Iraq.\textsuperscript{10}

Water is and always has been an important factor in the progress of Mesopotamia. Since the dawn of the ancient civilizations of Sumer, Akkad, Babylon, and Assyria, the Tigris and Euphrates Rivers have been the region's most essential resource. Their waters made the desert bloom and permitted civilizations to flourish in an otherwise inhospitable land,\textsuperscript{11} and today they remain the key to the growth and development of this area. All four of the riparian countries are experiencing population growth and economic development. National plans in all of these states call for continued expansion, and all intend to use additional waters from the rivers. Iraq, however, is more dependent on the Tigris and Euphrates Rivers than are


Fig. 1--The Tigris-Euphrates drainage basin.*

the other riparian nations since other drainage basins are located in Turkey, Syria, and Iran upon which those nations may rely for additional water.¹²

Statement of the Problem

The management of water resources of international drainage basins comprises legal, political-international, economic, and administrative aspects. The rising demands for the utilization of these scarce water resources are affected not only by such factors as population growth, economic development, the foreign policy objectives of the riparian states, and the availability of water within the basin countries but also by technological improvements for damming and pumping water. The water of international rivers can be used in a variety of ways, and each type of use may raise serious conflicts among riparian nations.¹³

Navigation is one of the oldest uses of rivers, and the right to freely navigate rivers has long been a problem between countries. Assertions of the inclusive right to navigate international rivers can be traced to ancient times. By the Middle Ages claims for free navigation had been suppressed, and levies were made on all boats traversing


¹³Glos, pp. 20-42.
rivers through each local jurisdiction. By the end of the eighteenth century the principle of free navigation on international rivers such as the Rhine, Scheldt, Danube, St. Lawrence, Amazon, Rio de la Plata, and others became a more significant issue, and a number of treaties began to be adopted which internationalized those rivers.\textsuperscript{14}

In the formulation of these agreements a number of questions were raised such as whether free navigation on international rivers was to extend to all nations or be limited only to the riparians. Limitations on the use of navigable rivers created serious tensions, and ultimately the major rivers in the European community were opened to free navigation through treaties and conventions laying down rules and principles for navigation. Although these principles of free navigation may serve as models for other nations, they do not apply to international rivers in other parts of the world unless treaties are established that incorporate them.

A second question raised concerned responsibility for determining and maintaining the technical aspects of navigation such as the depth, width, and navigational devices and markings on the rivers. These management functions require continuing cooperation between riparian nations,\textsuperscript{14}

and some institutionalized means have usually been created to carry them out.\textsuperscript{15}

The Tigris and Euphrates Rivers generally are not useful for navigation purposes because of their flow and the topography of the surrounding land. In the lower part of the basin, however, where the two rivers run together and form the Shatt Al-Arab waterway, both Iraq and Iran--especially the former--depend upon this waterway for navigation. The Shatt Al-Arab is Iraq's only outlet to the sea, and, following the 1975 treaty between Iraq and Iran, it served as a boundary river between these two countries. In 1980, however, fighting broke out between Iraq and Iran; conflict over this vital waterway was one of the causes for this flareup of hostilities.\textsuperscript{16}

Another major use of the waters of international streams is irrigation. This is especially important in arid regions, as in the case of the Tigris and Euphrates drainage basin. At the present time, many countries, particularly those in the arid areas of the world, depend heavily upon irrigation. The largest irrigation projects are in India and Pakistan, notably in the Indus river system where many dams and barrages have been built for the purpose

\textsuperscript{15}Glos, pp. 167-174.

of expanding irrigable land that is necessary to provide food for a growing population. Many countries in Africa also depend upon irrigation, including Sudan, Egypt, Algeria, Morocco, Tunisia, and others. Many of the African irrigation projects draw water from international rivers. In arid regions of the American continent, irrigation is very important for food production, and projects have been developed on international rivers such as the Columbia, Colorado, Rio Grande, and Rio de la Plata. Countries in the Middle East depend heavily upon irrigation from international rivers such as the Nile, Jordan, Helmand, and Tigris and Euphrates. Irrigation in the Tigris and Euphrates basin is vital to all four of its riparian states, especially to Iraq. Numerous water projects have been developed by Turkey, Syria, Iraq, and Iran to increase the use of water from the Tigris and Euphrates, and many others are planned for the future.

The use of water from international drainage basins for irrigation is the most consumptive purpose for which it is employed, and, therefore, this use is potentially the most conflictual, particularly when demands for water by riparian states exceed the total amount of water that is available.\textsuperscript{17} In addition, new technologies in recent times have increased the ability to control and exploit

\textsuperscript{17}Glos, pp. 181-186.
water resources. It is now possible to dam and transport water for great distances, and it is literally possible for an upper riparian state to divert the entire flow of an international stream. The possibility of such diversions, of course, increases the competition and conflict among riparian nations.\textsuperscript{18}

The use of the water of the Tigris and Euphrates Rivers at the present time has become a major concern since the demands for water have increased among all of the riparians, and, if their future developmental plans are implemented, water supplies will not be adequate. Therefore, without mutual understanding and cooperative action in optimizing the development of the rivers on the part of the four riparian states, the possibility of major conflict over water seems inevitable.\textsuperscript{19}

A third use of the water of national and international rivers is power generation. Increased demands for electricity since the last quarter of the nineteenth century have encouraged the production of hydroelectric power. From that time until the present, Europe, North America, and


other nations, in humid regions in particular, have stressed the importance of water in generating power. A few decades ago, developing countries also began to build hydroelectric facilities. Generally, the production of hydroelectric power is part of a multipurpose water development scheme in which water stored for irrigation and flood control purposes is also used to generate electric power as it is released from the storage dams.\textsuperscript{20} On the Tigris and Euphrates Rivers, at the present time Iraq, Syria, and particularly Turkey make extensive use of the waters of both rivers for generating power.

Power generation is often classified as a non-consumptive use of water and is therefore less conflictual than other uses. But, as noted above, the fact that hydroelectric plans are often a part of nationally developed multipurpose projects which are not coordinated with other developments on international streams makes them potentially as conflictual as any other type of water use. Furthermore, the diversion of water to fill a large reservoir located on the upper part of the stream may injure the interest of downstream riparians that are dependent upon the river's continuous flow. If such a diversion is undertaken without coordination between the upper and lower riparian nations, as has been the case in several instances in the

\textsuperscript{20}Glos, pp. 190-194.
Tigris and Euphrates basin, the lower riparian may be seriously affected. For instance, in the early 1970s, Syria injured the economy of Iraq by damming the entire flow of the Euphrates in order to fill a large reservoir within its borders.\textsuperscript{21}

Another difficulty associated with the development of national multipurpose projects is flooding, although at the present time flooding is not a major problem in the Tigris and Euphrates drainage basin since retaining lakes and levees largely control natural flooding. But, as more uncoordinated national multipurpose developments are constructed, flooding may become a serious concern unless a basin-wide system of water management and cooperation can be established. As upstream dams release water to make way for additional intake of rain or runoff from the mountains, the danger of flooding downstream increases unless downstream users are notified so that their dams can be prepared for an increased water flow.\textsuperscript{22} Little formal coordination of water management currently exists among the various countries in the Tigris-Euphrates drainage basin. This lack of administrative coordination creates major

\textsuperscript{21}Nyrop, pp. 156-157.

\textsuperscript{22}United Nations, Department of Economic and Social Affairs, "Guidelines for Flood Loss Prevention and Management in Developing Countries," Natural Resource/Water Series, No. 5 (New York, United Nations, 1976), pp. 1-17.
problems when either Turkey or Syria releases water without considering the effects of their action on Iraq. Unless a cooperative arrangement among the states can be made, these problems will increase the potential for conflict among them.

Another important use of the water of international rivers is use for domestic and municipal purposes. This is the most important of all uses because the availability of water is essential to life. It is therefore quite natural that all domestic requirements must be satisfied first. The amount of water consumed for domestic uses is not large compared to that employed for other purposes such as irrigation and is thus not highly conflictual. The main problem associated with domestic and municipal uses is pollution.

In pre-industrial times, there was little or no concern about the problem of pollution in international drainage basins, but near the end of the nineteenth century European countries began to realize the dangers of unrestricted discharge of municipal and industrial wastes into international rivers. In more recent years, treaties were concluded concerning pollution on a number of international rivers within the European community. The objectives in the earlier treaties were not comprehensive and were limited primarily to safeguarding fishing. The problem of
pollution in the twentieth century has been greatly magnified by rapid increases in world population and the tremendous expansion of industry. Municipal and industrial wastes and the more toxic industrial chemicals discharged into streams often poison surface and groundwater and make them unfit for human consumption. Thus, the problem of pollution becomes international when upper riparian nations pollute international surface or groundwater.\footnote{Frederick Eugene Mosely, "The United States-Canadian Great Lakes Pollution Agreement: A Study in International Water Pollution Control," unpublished doctoral dissertation, Kent State University, Kent, Ohio, 1978, pp. 11-31.}

Pollution (other than natural pollution) is not yet a major problem in the Tigris and Euphrates drainage basin. As the nations in the area become more urbanized and industrialized, however, pollution threatens to become a critical issue because of the arid condition of the region and the lack of adequate water to dilute pollutants.

In addition to surface water, groundwater is another important component of the water system in an international drainage basin. Because amounts of surface water are limited, in the future groundwater will become ever more vital to human life. At the present time many nations depend heavily upon groundwater; in Europe, for instance, more than three-fourths of the public water supply is provided by groundwater in Denmark, the Federal Republic of
Germany, and the Netherlands. A number of unresolved problems must be faced as the world increases its use of these water resources.\textsuperscript{24}

The use of international groundwater at present rarely causes conflicts among nations, but individual countries are increasingly recognizing the importance of this resource, and competing national uses are heightening the potential for conflict. Evidence of this may be seen in recent treaties and agreements. For example, a 1973 agreement between the United States and Mexico concerning surface and groundwater with regard to the Colorado River extended previous agreements between the two nations. Under the terms of this agreement productive and regulatory measures were included limiting the pumping of groundwater, and it was stipulated that either nation must consult the other in planning any additional development utilizing surface or groundwater. Some recent European treaties, such as that between Belgium and France pertaining to the Err drainage basin, have also included agreements providing for the reduction of groundwater pollution. In Africa, the conventions and statutes of 1964 between Cameroon, Chad, \textsuperscript{24}Utton, pp. 3-4.
Niger, and Nigeria concerning the Chad drainage basin also included both surface and groundwater.\textsuperscript{25}

Relatively little use is being made of groundwater in the Tigris and Euphrates drainage basin at present, but it seems certain that the utilization of groundwater will increase as the demand for water grows. Furthermore, because of the interrelatedness of surface and groundwater, basin-wide plans must consider both forms of water resources. Since groundwater aquifers do not follow national boundaries and may extend under several countries, rates of pumping these waters and the possibility of polluting groundwater must be coordinated.\textsuperscript{26}

As has been seen, complex water problems are encountered on international rivers throughout the world, but the problems of international drainage basins in arid regions, such as that of the Tigris and Euphrates Rivers, are more conflictual than those in humid regions. Whereas the presence of governmental agencies on national rivers eases competition and helps to contain conflicts over vital water resources, on international rivers such as the Tigris and Euphrates the problems of managing and allocating water are


vastly more conflictual and difficult because the countries in question do not have the political consensus or the institutional arrangements necessary to deal with the international dimensions of the problem.

This research rests upon four assumptions. First, the increased development of the Tigris and Euphrates region will lead to increased conflict over water resources. Second, the increased demand for water will increase the need for rational basin-wide management of these vital resources, and, concomitantly, the need for an institutionalized means of making decisions pertaining to water resources will grow. Third, the policy process in international drainage basins is not fully understood. Riparian nations along most of the international drainage basins in the developed sections of Europe and North America have treaties and institutional arrangements for allocating and managing water resources, but this is not the case in most of the arid developing nations, and it is certainly not true for the Tigris and Euphrates drainage basin. Fourth, international politics and power are the ultimate factors in disputes between riparian states that share an international drainage basin; therefore, legal, rational arguments and management institutions alone will not resolve those disputes.
Purpose of the Study

The purpose of this dissertation is to study the policy process in the Tigris and Euphrates drainage basin in order to assist policy-makers in the region to better understand the complexity and interrelatedness of the water problems in this international drainage basin as they attempt to advance basin-wide cooperation in the management of these resources. The policy process in the Tigris-Euphrates basin will be studied through the examination of the following topics:

1. The factors affecting water resources in the Tigris-Euphrates basin;

2. The causes of increasing competition and conflict and the factors of interdependence which tend to mitigate conflict over water resources;

3. International experiences in other parts of the world in dealing with and attempting to mitigate conflict over international drainage basins and the types of institutional arrangements adopted, in order to determine whether these experiences might be applicable or capable of being adapted to the Tigris and Euphrates region.

Research Questions

This dissertation will address the following questions in an attempt to provide an understanding of the complexity of the policy process in the Tigris-Euphrates drainage basin.
1. What are the characteristics of the Tigris-Euphrates drainage basin, and how do they influence water problems within the region?

2. How are water resources in the region presently administered, and what effect do national patterns of management have on cooperative endeavors?

3. How have international relations and international law affected policies and management of the waters of the Tigris and Euphrates Rivers?

4. What are the projected plans for water use and development by the four riparian nations, and what effect will these projects have on the future management of the water resources in the region?

5. What are the conflictual factors pertaining to water resources among the nations in the basin, and what factors might contribute to the peaceful settlement of water problems in this valley?

6. What can be learned from experiences on other international streams that may be of assistance to the nations in the Tigris-Euphrates drainage basin in dealing with conflicts over water problems?

Importance of the Study

In the developing nations, such as the four states in the Tigris-Euphrates valley, water plays a strategic role in the development process. Currently, the main uses of
water in these nations are irrigation, domestic use, navigation, and power generation. Water has a major impact upon future development and social welfare in these societies.

At the present time, the Third World nations which depend upon international rivers, such as the Nile, Indus, Jordan, Tigris and Euphrates, and others, face serious problems in relation to the use of these streams. Most of these nations are attempting to stimulate economic growth, and the water of international rivers is vital to their development. The increasing dependence of riparian nations on scarce water resources increases the competition and conflict among them. The researcher hopes that this study will advance understanding of the water problems affecting international streams and that his findings pertaining to the Tigris-Euphrates drainage basin with regard to political-international and technical pre-conditions for cooperation will provide assistance not only to policy-makers in the Tigris-Euphrates drainage basin but to policy-makers on international streams generally.

Organization of the Dissertation

This dissertation is divided into four parts (see Figure 2). Part One comprises the introduction, a review of the literature pertaining to the waters of international drainage basins, and a consideration of the research
Fig. 2--Organization of the dissertation.

methodologies applicable to such studies. Thus, Chapter II reviews the literature on water management issues pertaining to the Tigris-Euphrates valley as well as other major
international drainage basins in arid regions. The focus of this review is the policy process in international drainage basins. Chapter II also explores the usefulness of various approaches for studying the policy process with regard to international rivers.

Part Two of the dissertation—Chapters III, IV, V, and VI—deals with the environmental factors influencing the use and management of the Tigris-Euphrates drainage basin. Chapter III discusses the physical environmental conditions of the Tigris-Euphrates valley. Chapter IV surveys the cultural, economic, and political environments of the four societies through which these rivers flow, and Chapter V considers the institutional environment, i.e., the national level and administrative structures employed in managing water resources in the four nations. Specifically, it examines how the states allocate water, control pollution and flooding, and provide for development projects and how their varying legal regimes and administrative structures affect the conflict over water. Chapter VI traces the history of international relations as they pertain to water resources in the Tigris and Euphrates region and reveals how major international powers have influenced policies within the basin. The impact of international law on the Tigris-Euphrates basin is also considered in this chapter.
Part Three of the dissertation—Chapters VII and VIII—examines the causes of increasing competition and conflict over the waters of the Tigris-Euphrates basin and the factors of interdependence which tend to mitigate conflict over water resources. Chapter VII examines factors such as population increases, economic development, and the like that cause conflict between the riparian nations; Chapter VIII, on the other hand, examines factors of interdependence in international basins and particularly those factors that may mediate the conflict in the Tigris and Euphrates basin. The experience of other international drainage basins in resolving conflictual issues over water use are also examined in order to discover the kinds of interdependence and other environmental conditions which act as a catalyst to bring about cooperative agreements. In addition, Chapter VIII examines the relationships between the degree of interdependence among the riparian nations and the types of joint administrative arrangements established to manage international drainage basins.

Part Four of the dissertation (Chapter IX) attempts to apply the various concepts of conflict and interdependence to the riparian nations of the Tigris and Euphrates valley and to propose possible strategies for bringing about cooperative actions in this basin.
CHAPTER II

LITERATURE REVIEW AND APPROACHES FOR STUDYING THE POLICY PROCESS IN THE TIGRIS AND EUPHRATES VALLEY

Despite the increasing importance of international streams in today's world, little has been written pertaining to the policy process in international drainage basins. Most of the studies that have been conducted to date focus on technical, institutional, or legal aspects of the issue. In this review of the literature the author considers the literature on the Tigris-Euphrates valley and that pertaining to international rivers in arid regions, particularly the Middle East. A survey is then made of the general literature concerning the policy process for international rivers. In this section conceptual approaches of various writers are considered in order to understand how the international policy process may be studied. The second part of the chapter is concerned with the approaches that may be useful in understanding the complexity of the political process in international drainage basins, particularly how such approaches may be used in the study of the Tigris and Euphrates valley.
Literature Review

The Tigris and Euphrates Valley

A review of the available literature on the Tigris-Euphrates drainage basin includes a number of articles, books, and dissertations. Most of them deal with the technical aspects of both rivers; a few mention the possibility of potential future conflict in the area but give little attention to the nature of the conflict or to possible means of resolving it.

"The Water Budget of the Tigris and Euphrates Basin" by Wafiq Al-Khashab illustrates this type of study. This dissertation, written at the University of Chicago in 1958, surveys the quantity and distribution of the waters of both rivers, describes the physical environment of the valley, estimates the source use of the waters, and points out that in the future conflict among the four riparian states over these scarce water resources is inevitable.¹ For instance, Al-Khashab states,

Although the potential use of the Tigris and the Euphrates basin by the upstream countries is not as great and as immediate as that in Iraq, these countries may be expected to increase their use of the waters of the basin in the future. Meanwhile, the present government plan of Iraq for utilizing water resources is based on the assumption that all the waters of the Tigris and Euphrates basin will be

available in Iraq. Such discrepancy may well result, in the not too distant future, in a conflict over water rights between Iraq and the upstream countries. Conflict now seems more apt to develop at an earlier time with the United Arab Republic than either with Turkey or Iran because expansion is more obvious in Syria than in the other two countries.

Early cooperation among the countries in the Tigris and Euphrates basin may well be necessary to avoid conflict. Examples of the partial success of international cooperation in finding solutions for international water problems may be observed in the activities of the International Joint Commission of the United States and Canada under the Treaty of 1909 between the United States and Great Britain, and of the International Boundary and Water Commission set up by the United States and Mexico for regulating and utilizing the waters of the Rio Grande and Colorado Rivers. . . . Cooperation among Iraq, Turkey, the United Arab Republic, and Iran could be used to provide better understanding of the water resources of the Tigris and Euphrates basin. Together they could gather and exchange the essential, but lacking, data, such as precipitation, temperature, evaporation, streamflow, groundwater, soil moisture, topographic, geologic, vegetation, and soil information. Cooperation could also be used in a thorough assessment of needs for water by the different countries, not only for existing uses, but for possible future expansion of the present uses. Such assessments, if realized by these countries, could be used as a basis for water allocation to prevent conflicts which may result from continued uncoordinated planning of water utilization.2

The conflict over water use on the Tigris and Euphrates Rivers can be traced back to the time of ancient civilizations. According to a 1958 article written by George B. Cressey entitled "Geographical Review: The Shatt Al-Arab Basin," many of the wars between ancient Assyria (upstream) and Babylonia (downstream) resulted from

2Ibid., pp. 94-95.
disagreements over water. Cressey also stated that the conflict among the four present riparian nations in the region will inevitably grow more intense in the future. Thus, he believed that full development of the Tigris-Euphrates basin depends on long-range cooperation among the countries of the region.

The conflict between Iran and Iraq over the waters of tributaries of the Tigris was studied in 1976 in a master's thesis written by Abbas F. Al-Saadi at the University of Cairo, entitled "Lesser Zab Area in Iraq: Geographical Study of Storage and Irrigation Projects and Their Relation to Agricultural Production." Al-Saadi stated that the conflict between Iraq and Iran over the use of water from the Lesser Zab, a tributary of the Tigris River, has been a recurring problem. Iran has attempted to close off or divert the waters of this tributary on several occasions. Al-Saadi declared that an agreement between Iran and Iraq is essential in order to avoid future conflict and to fully develop the region.

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In still another geographical study entitled *Pollution Control and Water Resources of Iraq* Mehdi Al-Sahaf described the physical environment and the need for water in Iraq. He also forecasted future needs and uses of water in Iraq and predicted increased conflict among the riparian nations. He stated that an agreement among the four riparians is an essential step in controlling future conflict over the waters of both rivers, although, like other authors, Al-Sahaf did not discuss how such an agreement might be reached. 5

Another group of studies deals primarily with the policy process in the Tigris and Euphrates drainage basin. One such investigation conducted by the United Nations in 1951 was entitled *Economic Utilization and Development of the Water Resources of the Euphrates and Tigris*. According to this study the four riparian nations are undergoing rapid economic development which requires increasing amounts of water, and the demand for water will be still higher in the future. Greater conflict among the riparians is inevitable unless cooperative efforts are undertaken to better manage and optimize water use in the basin. Although the study proposed certain institutional arrangements,

it did not fully discuss the factors influencing the policy process or how that process operates.\textsuperscript{6} For example, the U.N. document stated,

The present agreements between states are unquestionably inadequate. \ldots Agreements should be multilateral for the Euphrates and bilateral for the Tigris between the two independent groups of interested states. Pending such agreement, each interested party might undertake in its territory--provided that the rights of a riparian state are not prejudiced--works which by their nature will require no more water than will be contained within the eventual share to be apportioned to the said party, and provided also that the execution of permanent works by the riparian state to compensate for water thus diverted from wasted water flowing through its territory is not unduly delayed.

Four national committees acting within their respective countries will be necessary to plan, execute, and operate the multiple-purpose development programmes when construction is over. An international advisory and liaison board should advise and coordinate the activities of the national committees within the terms of reference arrived at by international agreement. Each state should have full latitude to finance and execute the works within its territory in accordance with the broad lines of the programmes. Litigation, if any, between the interested parties should be settled by the said board.

Expenses for investigation, planning, execution, and operation would be financed by each national committee or state for works within its frontiers, from sources specifically allotted for the purpose. But for works of an international character to be undertaken in one country for the benefit of another or for mutual benefit, expenses as well as repayment from profits of the invested capital

should be apportioned in relation to the realizable benefits.  

Malik Al-Ali, a member of the Iraqi Agricultural Council, in a 1976 article entitled "Development of International Rivers," described the potential for conflict among Turkey, Syria, and Iraq over the water of the Euphrates River. According to Al-Ali, future conflict is inevitable since the national plans of the three countries call for more water than is available in the watershed. In his recommendations for solving this conflict, the author proposed that the waters of the river and its tributaries be allocated according to the number of people living in the basins and their needs. He also argued that the water issue should be separated from other issues dividing the riparian nations and that a neutral body should be created to devise a plan for the utilization of the river based on this proposed allocation. Finally, Al-Ali recommended that a joint authority be created from the riparian countries to manage the waters of this river basin. This article, however, like the others discussed here, did not consider fully the internal and external factors--

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7Ibid., p. 156.

particularly the political factors—that influence the various riparian states in approaching this issue.

One final article which recognizes the conflictual situation in the Euphrates valley, entitled "Syrian-Iraqi Dispute over the Euphrates Waters," was written in 1977 by Zhorul Bari. Bari discussed the importance of the Euphrates to Turkey, Syria, and Iraq and pointed out that both Syria and Turkey are increasing their withdrawals from the river so that eventually Iraq's irrigation system will be deprived of adequate water. Disagreements over the waters of the Euphrates River, according to Bari, involve economic, human, and political factors, and bilateral considerations are thus very important in any attempt to resolve the conflict. Yet, this writer, like the other authors surveyed here, only described the problem without fully appreciating the complexity of the international policy process.  

From the above review of literature pertaining to the Tigris and Euphrates Rivers, it is clear that, although all of these studies recognize the seriousness of the water problem in the Tigris-Euphrates basin and often suggest legal or institutional solutions for dealing with disagreements over water, they do not study the policy process.

in the comprehensive way that is necessary to understand the complex nature of the conflict among the riparian nations in order to suggest a possible strategy for containing the conflict and reaching an agreement pertaining to basin-wide management and allocation of vital water resources.

**The Policy Process in International Drainage Basins in Arid Areas**

Relatively few studies have been conducted on the policy process for important international rivers in arid regions, such as the Jordan, Indus, Nile, and Helmand. The studies that have been written on this subject may be divided into several categories. The first group focuses on the conflict over the water of a particular river. These studies usually criticize the technical approach and emphasize that the political aspects of such disagreements must be considered. Most of them, however, do not consider possible ways of resolving the conflicts. For example, a 1955 study by Don Peretz entitled "Development of the Jordan Valley Waters" stated that technical solutions are not adequate in water conflicts. Social and political realities must also be analyzed and should be combined with technical solutions in an attempt to resolve water disputes on international streams.¹⁰

A more general article considering policy on international rivers was written by Abraham Hirsch in 1958. In "From the Indus to the Jordan: Characteristics of Middle East International River Disputes," Hirsch surveyed the rivers in the Middle East and found that irrigation is the main use for water in this region. He concluded that the conflict over water in the area is serious since irrigation is the most consumptive use of water. Although discussions concerning the Jordan and Indus Rivers were taking place at the time the article was written, Hirsch predicted that no solution to any major dispute over the water of international rivers in the Middle East would be reached until the political problems were resolved. In the following passage he stressed the importance of political factors in resolving conflicts over water and attempted to show that the policy process is not fully understood.

The reliance of the various parties to many of these disputes on outside help of third parties has already been commented upon. It is symptomatic of this entire problem. There is furthermore a preponderance of technical emphasis in the proposals for the solution of these river disputes, as if the problems were of an engineering nature only; the diplomat seems to follow the hydrologist and the economist, who do the scouting for a solution to the problem. Perhaps the technician is less encumbered with political baggage and, therefore, in a better position to reach the goal of agreement with

the other side; on the other hand, engineering solutions to political problems can be at times amazingly unrealistic.\textsuperscript{12}

Another study that focused on the causes of conflicts but did not consider possible means of resolving them is a dissertation written at Indiana University by Basheer Khalil Nijim in 1969, entitled "The Indus, Nile, and Jordan: International Rivers and Factors in Conflict Potential." Nijim examined the potential conflict over utilization of the waters of these rivers; his survey included factors such as population diversity and density, boundaries, land use, relative location, climate, water supply, surface features, and internal relations within the various states as well as the relations between those states. He also studied the conflictual factors in each valley, categorizing and ranking them according to their importance in the dispute between the riparian nations. Although Nijim clarified these factors, he did not provide a conceptual framework capable of explaining the international policy process or supporting strategies for resolving such issues.\textsuperscript{13}

\textsuperscript{12}Ibid., p. 221; also see G. H. Janse, "The Problem of the Jordan River," The World Today, XX (February, 1964), 60-68.

A second group of studies on the policy process for international rivers in arid regions focuses primarily on the institutional arrangements that may be used in dealing with conflicts over water resources. For instance, in 1956, in an article entitled "Utilization of International Rivers in the Middle East," Hirsch commented upon multi-state organizational arrangements such as the joint commission created by Syria and Jordan on the Yurmok River as patterns worthy to be followed elsewhere. Hirsch recognized, however, that such joint developments are difficult, if not impossible, to achieve when agreement cannot be reached because of political conflicts, as was the case in the Indus River system. According to the author, a partition of the Indus basin with each country taking certain of the tributaries, as the World Bank had suggested, was the only possible solution because political hostility prevented any unified development of the basin.\(^1\) Again, in this study the political process of policy-making for international streams was not fully explored.

Another article using the institutional approach entitled "International Management of the Nile: Stage Three?" written in 1981 by Kingsley E. Haynes and Dale Whittington stated that the first stage in the

international management of the Nile River began in the 1920s when the upper riparians agreed to cooperate with Egypt in monitoring and collecting data. An agreement was reached in 1929 between Egypt and Sudan concerning the allocation of the waters of the Nile; the second stage was represented by another agreement in 1959 clarifying the allocation formula and establishing other arrangements pertaining to the building of dams on the rivers. The third stage of cooperation between the riparians, which has not been completely implemented, would require coordinated management of various projects in the riparian countries. Achievement of the third stage will depend upon the creation of a joint organization with the power to coordinate water projects throughout the river basin.\textsuperscript{15} Although it is useful to understand the experience of the riparians on the Nile, Haynes and Whittington did not fully discuss the process for bringing about the stages of cooperation among them.

A third group of studies on the policy process for international streams in the Middle East stresses the importance of mediation among riparians. In a 1949 article entitled "The Waters of the Jordan: A Problem of International Water Control," H. A. Smith suggested three possible

methods of mediating the conflict over the waters of this international river. The first was to employ the International Court of Justice as a mediator, the second was to establish a joint committee composed of representatives from the riparian nations, and the third was to rely upon a third-party arbitrator. Smith also recognized that, ultimately, force could be used to resolve such a dispute, but he stated that an agreement among riparians is the best solution. He pointed out that, on the Jordan River, economic considerations are dominated by political factors; therefore, he believed that the only possible alternative to the use of force is arbitration by a third party.\textsuperscript{16}

Another analysis of how Egypt and Sudan reached an agreement over the use of the waters of the Nile was presented in 1960 by Alan Gray in the article "Nile Waters Agreement." Gray attributed the success of these negotiations largely to cooperation and mutual understanding between the chief executives of both states at that time.\textsuperscript{17}

A third study regarding the allocation of the water of the Nile River between Sudan and Egypt was made in 1957 by K. M. Barbour in an article entitled "A New Approach to


\textsuperscript{17}Alan Gray, "Nile Waters Agreement," \textit{African Affairs}, LIX (January, 1960), 5-6.
the Nile Waters Problem." Barbour reviewed the issue of dividing the water resources of the Nile between upper and lower riparian states. According to his analysis, Sudan, the upper riparian state, did not need as much water as Egypt, the lower riparian. The earliest agreement between the two countries, made in 1929 when Sudan was under the control of the British mandate, recognized the different needs of the two countries, and the waters were to be divided at a ratio of 40:2, that is, 40 million cubic meters for Egypt and 2 million for Sudan. As the Aswan Dam was being planned in the 1950s, the question of water allocation again arose. Sudan argued in these negotiations that, since much of the reservoir of the new dam would be within its boundaries, it should receive a larger amount of the Nile's water. The Sudanese further stated that their needs for water had increased because of the country's population growth and the additional amounts of land that had been placed under cultivation. The solution proposed by Barbour called for a new formula for allocating the Nile's water, based upon two factors, arable land needing irrigation and population. Such an apportionment formula, Barbour stated, would be more equitable than the previous arrangement. He argued that negotiations should be based upon this new formula, which would permit Egypt to receive
15 million cubic meters of water and Sudan 17 million cubic meters.\textsuperscript{18}

International law was considered as a means of resolving conflicts on international rivers by Kathryn B. Doherty in the article "Jordan Water Conflict," written in 1965. According to Doherty, international law provides useful principles for regulating competition among riparians, but these principles lack the power to impose obligations upon those nations. Therefore, with regard to the conflict over the Jordan River, Doherty stated that the riparians should seek a solution through arbitration by an impartial third party rather than relying upon international law.\textsuperscript{19}

The importance of the superpowers as third parties in such international disputes was discussed by Georgiana G. Stevens in a study entitled Jordan River Partition, published in 1965. According to Stevens, the United States played an important role in reducing the probability of war over the water issue between Israel and Jordan and in effect created a de facto partition of the water resources from the river.\textsuperscript{20}


\textsuperscript{20}Georgiana G. Stevens, \textit{Jordan River Partition} (Stanford, California, The Hoover Institution on War, Revolution, and Peace, Stanford University, 1965), pp. 80-84.
A fourth classification of the literature pertaining to the policy process for international streams in arid regions relies upon a functional approach to interpret conflict and conflict resolution on international rivers. For instance, in 1950, F. J. Flower, in an article entitled "Some Problems of Water Distribution between East and West Punjab," pointed out that the partition boundaries between India and Pakistan cut across the unified Punjab irrigation network. An agreement made at the time of the partition provided that India would continue to supply water to Pakistan for an agreed-upon sum. Conflict over this arrangement arose almost immediately, however, and as early as 1948 India cut off West Pakistan's supply of water. According to Flower, only one solution could help Pakistan to solve this problem: the construction of new reservoirs on the upper side of the Indus basin. By this action Pakistan would avoid the longstanding political deadlock with India and would be enabled to store water that would otherwise

flow into the sea during flood periods. Under this proposal the political problem would be avoided through a functional or technical solution.22

The functionalist approach to resolving a dispute over the Helmand River between Iran and Afghanistan was explained in an article by A. H. H. Abidi in 1977. Abidi demonstrated that Iran, the lower riparian state, employed economic and technical inducements to gain cooperation from Afghanistan on the water issue. Among other commitments, Iran promised to give Afghanistan economic and technical assistance as well as the right to use Iranian port facilities in return for an agreement regarding the development and the allocation of the waters of the Helmand River. However, the author made no evaluation of the success of this approach in his discussion.23

A fifth and final group of materials advocates or criticizes the methodologies used in dealing with disputes over international streams. For instance, in a 1956 article entitled "The Jordan River Valley," Stevens examined the role of the United Nations and the United States in dealing with the dispute over the waters of the Jordan river.


Stevens argued that both the U.S. and the U.N. used a functional approach in dealing with this problem. She pointed out that the role of economic incentives in solving political issues is not clear with regard to the Jordan River dispute because economic considerations were dominated by political conflict in the region.  

The 1957 article "The Eastern Rivers Dispute between India and Pakistan" supported the mediation efforts of the World Bank in this conflict. The author believed that the deadlock between India and Pakistan could be solved only by mediation and that the promise of needed capital from the World Bank would provide the stimulus to overcome the political roadblocks to cooperative efforts.

The author of the 1958 article entitled "The Problem of the Indus and Its Tributaries: An Alternative View" took a more comprehensive look at potential solutions to disputes over international rivers. With regard to the Indus River basin, this writer stressed the need to consider political, economic, legal, and technical factors and their importance in the conflict. A purely legal,

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economic, or technical approach to the problem would be inadequate.\textsuperscript{26}

One of the most critical examinations of the functional approach to solving international water disputes was made by Ahmad Aftab in a 1965 dissertation written at George Washington University. In this study of the role of the World Bank in attempting to solve the dispute between India and Pakistan over the waters of the Indus River, Aftab stated, the World Bank initially adopted the functional approach in dealing with the dispute. When India and Pakistan prepared statements of water needs and plans, the World Bank did not try to narrow the differences between them but, rather, produced a new plan based on entirely different concepts from those of the disputing riparians. The World Bank's plan relied predominantly upon technical and economic solutions, thereby ignoring the political differences between India and Pakistan; thus, it did not succeed in solving the conflict over the Indus.

The World Bank then formulated another proposal which considered the political realities of the situation. After the Bank altered its approach from a hypothetically-based technical or economic solution and considered the political

as well as the economic differences between the opposing nations, it was successful in helping to bring them to an agreement.\textsuperscript{27}

In still another study on the Indus River dispute, in the 1973 book \textit{Indus Waters Treaty: An Exercise in International Mediation}, Niranjan D. Gulhati examined the negotiations between the riparian disputants and considered the influence of various factors that led to the ultimate settlement of the conflict. Using a historical approach, the author surveyed such elements as politics, international law, economics, and the role of the World Bank as an impartial third party. All of these, Gulhati stated, must be considered as major influences affecting the final resolution of the disagreement between India and Pakistan.\textsuperscript{28}

\textbf{General Studies on the Policy Process for International Streams}

The policy process for international streams in general has not been studied extensively. The research that has been conducted can be classified according to the approaches that have been used or advocated by the investigators. There are basically four such classifications: (1) studies relying on the legal approach, (2) institutional studies,
(3) studies that rely on the functional approach, and (4) more comprehensive studies combining conflictual and interdependent factors.

One study relying on the legal approach is William L. Griffin's article "The Use of Water of International Drainage Basins under Customary International Law," published in 1959. With regard to the use of water from international streams, Griffin pointed out that treaties are essential in dividing the waters of these rivers. In his examination of a number of such treaties, he found that many relied upon a legal principle which called for an equitable apportionment of water based upon the actual needs of the riparians rather than the doctrine of absolute territorial sovereignty. Griffin concluded, therefore, that international law and adjudication relying upon this principle could be a means of resolving international disputes.

Another legal study entitled International Rivers: A Policy-Oriented Perspective was written in 1960 by George Ernest Glos. Basically this work advocated the adoption

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of a legal solution to problems of international streams. Glos pointed out that it is essential that all aspects—physical, economic, legal, and others—be considered in any attempt to deal with conflicts over the water of international rivers. He argued that problems should be solved on a legal basis but did not discuss the various processes of bringing the riparians into cooperative arrangements.\textsuperscript{31}

The second group of general materials on the policy process in international river basins is those which advocate institutional solutions to such water disputes. For instance, in a 1960 article entitled "Development of International Water" William E. Kenworthy recommended joint development of international rivers because of the increasing importance of water resources to all riparian nations. The maximum benefit to be gained from these resources cannot be achieved without joint efforts. The best way to accomplish this task, according to Kenworthy, is through an impartial international body. He also stated that large-scale development requires an international institution capable of dealing with the complex problems of these watersheds. Such organizational arrangements may differ from basin to basin. In some instances,

\textsuperscript{31}George Ernest Glos, International Rivers: A Policy-Oriented Perspective (Singapore, G. H. Klatand, 1960), pp. 239-245.
they may be given sufficient authority to mediate disputes and make decisions; in others, they may serve only as advisory bodies to the governments of riparian nations.32

Another study in which institutional arrangements were advocated was written by Albert Lepansky in 1963 and entitled "International Development of River Resources." Lepansky's article stated that the development of international rivers in Europe and North America began in the early nineteenth and twentieth centuries, respectively, whereas such development of international rivers in Third World nations began only after 1950.33 The author noted,

Solutions of the problems raised by international river basins depend upon two basic factors: (1) geographic, that is, the pattern of hydrology which characterizes each basin, and (2) cultural, that is, the degree of political, economic, and social cohesion or collaboration which prevails or which can be established in each basin. Wars and national hostilities do not necessarily bar joint administration of common waters.34

Solving disputes over international streams requires joint institutional arrangements as a necessary step in dealing effectively with conflicts among riparians concerning


33Albert Lepansky, "International Development of River Resources," International Affairs, XXXIX (October, 1963), 533-545.

34Ibid., pp. 547-548.
water use, but Lepansky did not explain why this type of institutional pattern would effectively resolve political conflict.

The proceedings of a 1963 seminar on the development and administration of international rivers entitled The International River Basin concluded that disputes over international streams must be resolved in such a way as to meet the special circumstances of the basin in question. The establishment of an international institution was recommended either on an ad hoc or permanent basis to gather information and make proposals to resolve conflictual issues between the parties.35

An evaluation of international river organizations was presented by Northcutt Ely and Abel Wolman in an article in the anthology The Law of International Drainage Basins in 1967. This study made an inventory of existing mechanisms and their evolution and functions. According to Ely and Wolman,

There is no best organizational arrangement to accomplish planning, construction, and operation of an integrated river basin development. This follows from the fundamental fact that no two rivers are alike and that the social, economic, and political

35J. D. Chapman, editor, The International River Basin, proceedings of a seminar on the development and administration of the international river basin held under the auspices of the Regional Training Center for United Nations Fellows (Vancouver, British Columbia, Publications Centre, University of British Columbia, 1963), pp. 27-43.
environments within each river basin impose different demands on organization for development. The variation in these essential elements precludes any uniform pattern of organizational arrangements. Therefore, each group of nations studying possible courses of action should not feel limited by specific arrangements which have proved successful in other contexts. On the other hand, existing experience cannot be ignored; rather, it offers a wealth of information about alternative administrative arrangements and solutions to problems common to most river basin developments.

On rivers where no international commission is in operation, great benefits, even though they be intangible, will certainly flow from the creation of such a mechanism, no matter how limited may be its powers, and no matter how hesitant may be its first steps forward. This area, at first, may be no more than the exchange of data independently collected; next, standardization of data; then joint collection of data; then exchange of forecasts of water utilization; then exchange of plans; then common planning of projects; then agreements in one or more of the fields of equitable apportionment of consumptive use, stream pollution, machinery for settlement of disputes, etc.

Some studies combine the legal and institutional aspects. In 1954, an article written by Clyde Eagleton entitled "International Rivers" included the following statement.

The doctrine of equitable apportionment, for example, which seeks a fair balance between the rights and needs of the parties, must have technical help to determine and measure this balance. This means machinery for controlling and measuring the flow of water; it means also administrative machinery. The experience of the past—such as that with the Rhine and Danube Rivers—shows that...
administrative bodies are essential; the United States has created such bodies both with Canada and with Mexico . . .

In short, Eagleton declared, "It is to be hoped that solutions will be sought through international law and administration rather than through political strife, wasteful to the states concerned and to the entire community of nations."\(^{38}\)

In a study published for the United Nations in 1980 entitled *Water Conflict and Research Priorities: Water Supply and Management*, edited by Carl Widstrand, it was stated,

> An important aspect in water planning and water resources research is to be aware of . . . potential conflicts and to devise methods to alleviate or prevent conflicts from occurring. . . . The only way of avoiding conflicts created by . . . mutual dependence on the same water resource is, of course, by constructive cooperation between the countries concerned. There are, however, numbers of obstacles to such cooperation: differences in incentives, sovereignty considerations, unsatisfactory institutional structure, etc.

> This cooperation can be achieved through an international river basin commission that is based upon treaties and agreements. This institutional arrangement is necessary for applying on a continuous basis the principle of equitable share

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38 Ibid., p. 299.
through the persuasion process that will be conducted by these international commissions.\(^3^9\)

Another category of general literature on the policy process in international river basins advocates the use of a functional approach for overcoming conflict over the waters of international streams. The most extensive study of this subject is a comparative law dissertation written at the University of Chicago in 1969 by Nitza Shapiro-Libai, entitled "The Development of International River Basins: Regulation of Riparians' Competition." Shapiro-Libai stated that conflicts over international rivers cannot be solved by legal or institutional arrangements between the disputing parties because they do not agree on international legal principles and no strong international organizations are present to enforce decisions. Furthermore, the author did not believe that mediation is very effective in such disputes since it depends entirely upon the will of the riparians. According to Shapiro-Libai, the most effective means for resolving international basin disputes is through specialized agencies within the United Nations. These agencies can play an important role in resolving disputes because nations desire membership in them in order to strengthen their position in the international system and

because the functions performed by the agencies are very beneficial to member states. Member states in such functional organizations, therefore, are willing to delegate some of their authority to them in order to enjoy the benefits that their membership affords. Functional agencies, therefore, have leverage in solving disputes among states. Shaipro-Libai concluded that problems of developing international rivers cannot be fully overcome without the involvement of functional international organizations. Her dissertation constituted an attempt to justify the functional approach for dealing with international disputes, particularly those involving international rivers.¹⁰

The final category of general materials on the policy process includes studies on international streams which consider the factors of conflict and interdependence and their impact upon cooperation among riparian states. A major work in this category is David G. Lemarquand's book International Rivers: The Politics of Cooperation, written in 1977. Lemarquand pointed out that important factors affect the scope and intensity of conflicts as well as the willingness of riparian states to cooperate. These factors—including population density, economic growth,

the availability of water from domestic sources, cultural linkages and practices, and foreign policies of the riparians—may cause either conflict or cooperation. According to Lemarquand, economic incentives are necessary to achieve cooperation between upper and lower riparian nations since the water issue is not as salient to the upper riparians as to the lower. In addition, what Lemarquand called "international factors," such as the international image of the riparians, international law, reciprocity and sovereignty, and linkages among nations, also need to be considered in studying the policy process for international water resources because they may positively or negatively affect the willingness of riparians to cooperate. Where reciprocal benefits are to be achieved from cooperative action and interdependence is present between the two nations, agreements to cooperate can be reached and conflicts can be resolved.¹¹

With regard to the process of strengthening the factors that may lead to cooperative action, in a 1980 article entitled "International River Basin Cooperation: The Lesson from Experience" I. K. Fox and David Lemarquand stated,

> Improved management of international rivers, lakes, and aquifers is not easy to accomplish. Some countries may have an economic incentive to

ignore demands for basin-wide accords. Mistrust and suspicions between states can reinforce one country's incentive to act alone or undermine endeavors that would be mutually advantageous. Finally, some basin countries may not have the institutional and financial capability or the political interest to take advantage of opportunities for cooperative endeavors. These obstacles are difficult to overcome but progress can be made if there is, at least, the political will to cooperate. . . . River basin organizations and procedures for exchanging data and resolving technical differences can be invaluable in building a foundation of mutual trust and confidence among the riparian states. Such a foundation provides a solid basis for the political negotiations that every agreement requires. . . . When economic incentive does not exist to negotiate an efficient and equitable agreement regarding the management and use of international water resources, it is important to build a consensus on legal principles which should govern the development and use of such resources. Some general principles of global applicability could be developed based upon the experience accumulated in reaching bilateral, multilateral, and regional agreements on management of shared water resources . . .  

Approaches for Studying the Policy Process in the Tigris and Euphrates Valley

From the review of the literature it can be seen that there is no generally accepted methodological approach for studying the policy progress on international rivers. It is therefore necessary that the approach be presented that will be used in this study of the policy process in the Tigris and Euphrates valley.

This policy-oriented dissertation will examine the needs for cooperatively developing and managing the waters of two international rivers, the Tigris and the Euphrates. It will seek to provide strategies for policy-makers in the Tigris and Euphrates basin which may help to meet intelligence needs pertaining to the future management of these international waterways and to improve the understanding of the policy development process.

The structure and purpose of a policy-oriented dissertation differ from those of a typical social science dissertation. A policy-oriented study does not test hypotheses, develop theories, or even attempt to suggest further research questions. Instead, it attempts to focus intelligence on real human needs concerning which social choices must be made. Policy-oriented research provides the most appropriate framework to aid the persons who make such policy choices.\(^3\)

\(^3\)Policy-oriented studies have been a part of the study of politics at least since the time of Machiavelli. In more recent years writers such as Harold Lasswell have argued that policy research is part of every field of political science and thus should be encouraged. See Harold D. Lasswell, "The Policy Orientation," The Policy Science: Recent Developments in Scope and Method, edited by Daniel Lerner and Harold D. Lasswell (Stanford, California, Stanford University Press, 1951); Ira Sharkansky, "The Analysis of Public Policy: Recent Additions to an Ancient and Honorable Literature," Midwest Journal of Political Science, XVI (May, 1972), 324-337; Aaron Wildavsky, Speaking Truth to Power: The Art and Craft of Policy Analysis (Boston, Little, Brown and Company, 1979); George
The method of undertaking policy-oriented research also differs from the methodologies employed in more narrowly focused social science research. Given the logic of the policy orientation, such an investigation must of necessity utilize a macro approach capable of dealing with the totality of the policy. The micro political focus of most theories cannot fully explain all of the various factors influencing policy. Since there is no generally accepted approach for studying policy framework, policy research must be eclectic, drawing from and combining various approaches.

In this dissertation a systemic framework is used to formulate the research questions which are needed to understand the policy issues and to gather the kinds of intelligence that policy-makers need. This systemic framework provides an overview of the complexity of the policy process in the Tigris and Euphrates drainage basin and the interrelationships of the various parts of this international basin. It also affords a means of studying the policy process for the basin on three levels of abstraction:

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the river basin itself as a physical or hydrologic system of interrelated parts, the decision-making processes within each of the riparian states, and the international aspects of the policy process.\textsuperscript{4}\textsuperscript{4} The Eastonian model of systems offers a framework for understanding policy on the national level, and Waltz's conceptualizations provide a framework for the international arena.\textsuperscript{4}\textsuperscript{5} The systemic framework, therefore, permits an examination of the policy issues in the Tigris and Euphrates drainage basin on a holistic basis and helps to define the types of factors that influence water-related policies.

All writings on international rivers emphasize the oneness of the basin. The physical interrelatedness of the hydrologic cycle requires that the river be studied as a single unit. Since the 1950s, the Eastonian model has been proposed as a framework for studying the policy process at the national and subnational levels,\textsuperscript{4}\textsuperscript{5} but it does not seem appropriate for use on the international level because the international system is anarchical. No central


decision-making authority is present on the international level, and, thus, no "black box" exists to carry out conversion processes. Because of the lack of a "black box," the Eastonian systems approach is not applicable to the international policy process.

Recently, Kenneth Waltz attempted to explain how the international system can be understood in terms of a systemic framework. By presenting an analogy between the international system and the economic market, Waltz was able to explain the international policy process. He pointed out that the international system involves two levels, the units and the macro-system, which interact with and influence each other. The structure of the international macro-system level is anarchical and abstract, similar to the world's economic market. Although no central authority exists to set policy, policies are made through the interaction of the units and the structural level on the international level in the same way that economic policies are made in the market. As in the market, in the international system differentiation is present in the capabilities of the units even though there is no differentiation in their functions as units. Because their capabilities differ, the units' abilities to shape international policies also vary. According to Waltz's analogy, order exists in the international system based upon the individualistic
action of each unit (state), which attempts to maximize its own benefits within the limitations imposed on it by the international system.\(^7\)

Waltz's concepts facilitate a comprehension of the international policy process for international rivers. The four riparian states in the Tigris-Euphrates basin operate as separate units with differing capabilities in the region and the international system. Therefore, in order to understand how international policies are shaped, not only the capabilities of the four riparian states but also the factors affecting the macro-system—including social and political conflicts (i.e., the intensity and nature of social and political conflict),\(^8\) the superpowers (i.e., the relationships between the various states in the region and the superpowers),\(^9\) United Nations specialized agencies (i.e., the situational positions of these agencies in influencing or enforcing international law and the role of their technical assistance), and the interdependence among the various states and the superpowers (i.e., political, economic, social, and technical aspects)\(^5\)--must be considered.

\(^7\)Waltz, pp. 79-128.
\(^8\)Dougherty and Pfaltzgraff, pp. 181-290.
\(^9\)Ibid., pp. 84-127.

Answering the research questions derived from the examination of the macro environment in the basin involves a number of other approaches. Descriptive and historical approaches are used to gather information about the physical characteristics of the Tigris-Euphrates valley and the political, economic, and cultural conditions in the region. A legal approach is taken to study the implications of national and international water law on the region, and the institutional approach is used in examining the administrative structures on the international and national levels in the valley. An analysis of the conflictual and integrative factors in the international basin is carried out by relying on conflict and interdependence theory. A comparative study of other international basins is made to provide an understanding of the various environmental factors that can serve as catalysts to bring riparian nations into cooperative action. Finally, possible policy strategies attempting to anticipate future developments are examined, based upon the entire previous analysis.

CHAPTER III

THE PHYSICAL ENVIRONMENT OF THE TIGRIS AND EUPHRATES DRAINAGE BASIN

The policy process in the Tigris and Euphrates drainage basin is influenced by the physical conditions of the valley, and these factors therefore constitute an essential basis for the topics to be considered later in this dissertation. In this chapter the physical environment of the Tigris-Euphrates valley and its impact upon conflict and cooperation between the nations in the region over the use of water are discussed.

Surface Features in the Basin

The Tigris and Euphrates drainage basin is located between latitude 40°N-29°N and longitude 36°E-52°E and comprises an area of approximately 915,606 square kilometers which extends into five countries: Turkey, Syria, Iraq, Iran, and Saudi Arabia1 (see Figure 1, p. 8, and Table III). The northern part of the basin is rimmed by

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<table>
<thead>
<tr>
<th>River</th>
<th>Country</th>
<th>Total Basin Area (km²)</th>
<th>Areas Producing Water (km²)</th>
<th>Annual Rainfall (mm)</th>
<th>Highest</th>
<th>Lowest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tigris</td>
<td>Turkey</td>
<td>57,614</td>
<td>57,614</td>
<td>1,155</td>
<td>445</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Syria</td>
<td>834</td>
<td>834</td>
<td>737</td>
<td>712</td>
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</tr>
<tr>
<td></td>
<td>Iraq</td>
<td>253,000</td>
<td>83,237</td>
<td>1,196</td>
<td>127</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Iran</td>
<td>160,158</td>
<td>130,158</td>
<td>504</td>
<td>146</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>471,606</td>
<td>271,843</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Euphrates</td>
<td>Turkey</td>
<td>125,000</td>
<td>125,000</td>
<td>1,137</td>
<td>361</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Syria</td>
<td>76,000</td>
<td>76,000</td>
<td>476</td>
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<tr>
<td></td>
<td>Iraq</td>
<td>177,000</td>
<td>........</td>
<td>138</td>
<td>95</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Saudi Arabia</td>
<td>66,000</td>
<td>........</td>
<td>100</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
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<tr>
<td>Grand total</td>
<td></td>
<td>915,606</td>
<td>472,843</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

the anti-Lebanon, Tours, Pontain, Ararat, Zagrouss, and Lourish mountains of Turkey and Iran, and the elevation of the basin slopes from the north toward the south.\footnote{Knappen, Tippetts, Abett, McCarthy/Engineers, Development Plan for the Tigris and Euphrates Rivers, Iraq (Baghdad, Iraq, Development Board, 1955), pp. 7-11.}

The basin is divided into four topographic regions (see Figure 3); each of them is described below.

1. The high mountainous region in the northern and northeastern part of the basin rises to an altitude of 1,500 to 3,000 meters above sea level. Most of this region is located in Turkey and Iran, but a small segment of it lies within the boundaries of Iraq. The Tigris and Euphrates Rivers rise in this region and are fed by the snows and rains from the mountains.

2. The foothills region, located south of the mountainous region with an altitude of between 600 and 1,500 meters, is a transition zone between the mountains and the lowlands. Most of this area is located in Turkey, and in it the central drainage of the two rivers is formed. Drainage from this region in Turkey, Iran, and Iraq feeds the Tigris and Euphrates Rivers themselves and the tributaries that ultimately flow into them.

3. The lowland region, which is located south of the foothills, is divided into two parts, the Al-Jazira...
Fig. 3--Topographic regions of the Tigris-Euphrates basin.*

subregion and the Mesopotamian trough. The elevation of the lowland region decreases from north to south and varies between 600 meters to only a few meters above sea level on the Arabian Gulf.³

The Al-Jazira subregion is shared by Turkey, Syria, and Iraq. Most of it lies within the boundaries of the latter two nations, but a small portion of it is located in Turkey. In Iraq the Al-Jazira subregion lies primarily between the two rivers. To the west, it extends into Syria, and, to the north, into Turkey. The Al-Jazira subregion is comprised of undulating lowlands that hinder natural-flow irrigation, and it is mainly used for the grazing of livestock. A portion of the subregion in Turkey and Syria, however, is used for irrigated agriculture, supplied by water from the Euphrates River.⁴

The second segment of the lowland region, the Mesopotamian trough, extends from the Arabian Gulf northward to the higher area of the Al-Jazira. This subregion is a flat, delta-like plain. Most of the Mesopotamian trough is located in Iraq, but a small portion of it extends into southwestern Iran.


4. The western desert region, which is located directly to the west and southwest of the Euphrates River in Syria and Iraq, extends beyond the frontiers of Syria, Jordan, Saudi Arabia, and Kuwait. The elevation of this region increases from the east and south to the west and northwest, forming the syncline between the Arabian shield in the south and the mountainous region in the north. A large proportion of the western desert region is located in Iraq; in fact, it constitutes 60 per cent of Iraq's total land area. Much of the desert region is barren and is used at the present time only for the grazing of animals.5

As mentioned earlier, the Tigris and Euphrates drainage basin is shared by Turkey, Syria, Iraq, and Iran. Only Iraq, however, is entirely within the basin and constitutes about half of its area (see Figure 4). A portion of each of the other riparian nations lies in the Tigris and Euphrates valley. Turkey, for example, contains five geographical regions: the Aegean coastal, the Black Sea, the area bordering the Mediterranean Sea, the central plateau, and the eastern highlands (see Figure 5). Only part of the eastern highlands region lies within the Tigris and Euphrates basin; this is the area in which the headwaters of both rivers are located. The eastern

5Al-Khashab, pp. 6-7.
Fig. 4--Iraq.*

highlands region of Turkey is mountainous—its median elevation is 1,500 meters, and individual peaks rise as high as 3,000 to 5,000 meters—and is largely a wilderness area.\(^6\)

Syria, the middle riparian on the Euphrates River, is divided into two main geographical regions, the western and the eastern zones (see Figure 6). Only the extreme eastern part of the eastern zone is located within the Tigris and Euphrates valley. A large portion of this area began to be irrigated as a result of the economic development that has taken place since the 1950s, and today Syria is attempting to use the water of the Euphrates River extensively for irrigation and power generation.\(^7\)

Iran contains four geographical regions: the Zagrous, the northern highlands, the eastern uplands, and the central plateau (see Figure 7). Part of the Zagrous region lies in the Tigris and Euphrates drainage basin; it extends from the Ararat Mountains in the northwest to the Arabian Gulf in the south and consists of mountains and hills in the north and delta plains in the south. Some of

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Fig. 6--Syria.*

Fig. 7--Iran.*

the major tributaries of the Tigris River arise in these mountains. The Zagrous region and the area along the Caspian shore are very important to Iran since approximately 60 per cent of the nation's agricultural goods are produced there even though the two regions comprise less than 25 per cent of Iran's total land surface. Most of the country's population is also concentrated in these regions. As a result, Iran has attempted to increase irrigation projects in the Zagrous and Caspian areas.  

Climate and Vegetation in the Basin

The climate in the Tigris and Euphrates drainage basin varies according to the altitude of the individual areas within it. The lowest temperatures and the highest levels of humidity are found in the mountainous region (see Tables IV and V). Temperatures in the mountains frequently fall below 0°C during the winter months of December, January, and February. Summer temperatures are relatively cool, rising, on the average, no higher than 18°C during the hottest month of August. Precipitation in this region varies from 445 to 1,196 millimeters annually.


9°F = 9/5°C + 32°.
<table>
<thead>
<tr>
<th>Station</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
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<th>Nov</th>
<th>Dec</th>
<th>Annual</th>
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<td>118.8</td>
<td>106.2</td>
<td>93.5</td>
<td>67.4</td>
<td>25.4</td>
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<td>38.7</td>
<td>88.5</td>
<td>143.6</td>
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<td>87.9</td>
<td>85.6</td>
<td>73.0</td>
<td>21.5</td>
<td>4.6</td>
<td>2.5</td>
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<td>71.5</td>
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<td>Keban, Turkey</td>
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<td>68.8</td>
<td>67.2</td>
<td>26.1</td>
<td>4.5</td>
<td>2.0</td>
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<td>48.0</td>
<td>5.7</td>
<td>0.6</td>
<td>4.2</td>
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<td>215.7</td>
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<td>185.1</td>
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<td>88.7</td>
<td>18.8</td>
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<td>59.3</td>
<td>107.6</td>
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<td>42.9</td>
<td>7.1</td>
<td>0.9</td>
<td>0.6</td>
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<td>30.4</td>
<td>55.9</td>
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<td>19.2</td>
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<td>31.7</td>
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<td>Deirzor,</td>
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<td>0.6</td>
<td>0.0</td>
<td>0.0</td>
<td>0.4</td>
<td>6.8</td>
<td>11.2</td>
<td>29.3</td>
<td>164.9</td>
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<tr>
<td>Syria</td>
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<tr>
<td>Mousal,</td>
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<td>0.0</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baghdad,</td>
<td>26.2</td>
<td>25.9</td>
<td>26.6</td>
<td>22.0</td>
<td>7.9</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>3.1</td>
<td>16.0</td>
<td>24.3</td>
<td>152.0</td>
</tr>
<tr>
<td>Iraq</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Badra,</td>
<td>46.3</td>
<td>46.1</td>
<td>58.6</td>
<td>41.6</td>
<td>5.3</td>
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<td>0.0</td>
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<td>0.8</td>
<td>10.3</td>
<td>46.3</td>
<td>255.3</td>
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<tr>
<td>Iraq</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Ahwaz,</td>
<td>35.5</td>
<td>25.2</td>
<td>16.9</td>
<td>17.3</td>
<td>3.5</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.1</td>
<td>1.8</td>
<td>26.7</td>
<td>33.5</td>
<td>158.5</td>
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<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Basra,</td>
<td>25.2</td>
<td>13.9</td>
<td>19.2</td>
<td>20.5</td>
<td>7.2</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.1</td>
<td>0.8</td>
<td>20.5</td>
<td>30.9</td>
<td>138.2</td>
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<tr>
<td>Iraq</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abadan,</td>
<td>19.9</td>
<td>14.5</td>
<td>18.5</td>
<td>14.6</td>
<td>3.7</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.6</td>
<td>25.9</td>
<td>40.6</td>
<td>146.3</td>
</tr>
<tr>
<td>Iran</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

### TABLE V

**AVERAGE MONTHLY TEMPERATURES AT SELECTED STATIONS IN THE TIGRIS AND EUPHRATES DRAINAGE BASIN (IN DEGREES CENTIGRADE)**

<table>
<thead>
<tr>
<th>Station/Region</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kars, Turkey/Mountain</td>
<td>-13.0</td>
<td>-10.0</td>
<td>-5.0</td>
<td>3.8</td>
<td>10.3</td>
<td>13.6</td>
<td>17.2</td>
<td>17.9</td>
<td>13.1</td>
<td>7.5</td>
<td>0.7</td>
<td>-7.0</td>
</tr>
<tr>
<td>Urfa, Turkey/Foothill</td>
<td>5.0</td>
<td>6.1</td>
<td>11.3</td>
<td>15.2</td>
<td>21.8</td>
<td>27.1</td>
<td>31.0</td>
<td>29.9</td>
<td>26.3</td>
<td>21.2</td>
<td>14.3</td>
<td>7.4</td>
</tr>
<tr>
<td>Deirzor, Syria/Al-Jazira</td>
<td>7.0</td>
<td>9.0</td>
<td>11.0</td>
<td>19.0</td>
<td>25.0</td>
<td>29.0</td>
<td>33.0</td>
<td>32.0</td>
<td>28.0</td>
<td>22.0</td>
<td>15.0</td>
<td>9.0</td>
</tr>
<tr>
<td>Mousal/Iraq/Al-Jazira</td>
<td>5.0</td>
<td>9.0</td>
<td>13.0</td>
<td>17.0</td>
<td>24.0</td>
<td>29.0</td>
<td>35.0</td>
<td>35.0</td>
<td>28.0</td>
<td>22.0</td>
<td>15.0</td>
<td>8.0</td>
</tr>
<tr>
<td>Baghdad, Iraq/Mesopotamian</td>
<td>9.0</td>
<td>11.0</td>
<td>16.0</td>
<td>22.0</td>
<td>28.0</td>
<td>32.0</td>
<td>34.0</td>
<td>34.0</td>
<td>31.0</td>
<td>24.0</td>
<td>17.0</td>
<td>11.1</td>
</tr>
<tr>
<td>Basra, Iraq/Mesopotamian</td>
<td>11.0</td>
<td>14.0</td>
<td>18.0</td>
<td>24.0</td>
<td>30.0</td>
<td>33.0</td>
<td>35.0</td>
<td>36.0</td>
<td>32.0</td>
<td>27.0</td>
<td>20.0</td>
<td>13.0</td>
</tr>
<tr>
<td>Abadan, Iraq/Mesopotamian</td>
<td>19.0</td>
<td>21.0</td>
<td>26.0</td>
<td>32.0</td>
<td>38.0</td>
<td>43.0</td>
<td>45.0</td>
<td>45.0</td>
<td>42.0</td>
<td>36.0</td>
<td>27.0</td>
<td>19.0</td>
</tr>
</tbody>
</table>

South of the mountainous area, the foothills region is characterized by a Mediterranean-type semi-arid climate in the winter and a more continental climate in the summer. Temperatures in the winter months (December to February) in Urfa, Turkey, a site with a climate typical of the foothills region, range from 5°C to 7°C, and in the summer months (June through August) they range from 27°C to 30°C. Average rainfall in this region is less than in the mountains, ranging from 300 to 800 millimeters annually.

The remaining parts of the basin, the lowlands and the desert regions, have a desert-like climate. Average temperatures in the summer months range from 40°C to 45°C in many locations within the Mesopotamian trough and from 30°C to 35°C in the Al-Jazira subregion; the western desert is even hotter. Winter temperatures in the lowlands vary from 7°C to 19°C. Much of the lowlands, like the desert region, is arid, with an annual rainfall in some locations of less than 100 millimeters per year.¹⁰

Throughout the entire basin, the winter season (December, January, and February) is the most humid, and over half of the annual precipitation in the valley falls during these months (see Table VI). Rain in the spring season (March through May) produces from 30 to 40 per cent of the

TABLE VI
SEASONAL RAINFALL BY SEASON FOR SELECTED LOCATIONS IN THE TIGRIS AND EUPHRATES DRAINAGE BASIN (IN MILLIMETERS)*

<table>
<thead>
<tr>
<th>Station</th>
<th>Season</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Winter</td>
<td>Spring</td>
</tr>
<tr>
<td>Basra, Iraq</td>
<td>70.0</td>
<td>46.9</td>
</tr>
<tr>
<td>% of annual rainfall</td>
<td>51.0</td>
<td>34.0</td>
</tr>
<tr>
<td>Baghdad, Iraq</td>
<td>76.4</td>
<td>56.5</td>
</tr>
<tr>
<td>% of annual rainfall</td>
<td>50.0</td>
<td>38.0</td>
</tr>
<tr>
<td>Mousal, Iraq</td>
<td>196.5</td>
<td>148.2</td>
</tr>
<tr>
<td>% of annual rainfall</td>
<td>50.0</td>
<td>38.0</td>
</tr>
<tr>
<td>Aleppo, Syria</td>
<td>187.3</td>
<td>97.7</td>
</tr>
<tr>
<td>% of annual rainfall</td>
<td>56.0</td>
<td>29.0</td>
</tr>
<tr>
<td>Diyarbaker, Turkey</td>
<td>220.3</td>
<td>177.2</td>
</tr>
<tr>
<td>% of annual rainfall</td>
<td>44.0</td>
<td>36.0</td>
</tr>
<tr>
<td>Kulp, Turkey</td>
<td>572.3</td>
<td>392.0</td>
</tr>
<tr>
<td>% of annual rainfall</td>
<td>50.0</td>
<td>34.0</td>
</tr>
<tr>
<td>Mullki, Turkey</td>
<td>470.5</td>
<td>455.9</td>
</tr>
<tr>
<td>% of annual rainfall</td>
<td>39.0</td>
<td>38.0</td>
</tr>
</tbody>
</table>

basin's annual rainfall; the summer season (June through August) is very dry and brings little precipitation. Autumn (September through November) is also relatively dry, although there are occasional rains.

The distribution of vegetation in the basin is influenced by temperature and rainfall, and a close correlation exists between climate and vegetation patterns. The vegetation distribution in the Tigris-Euphrates drainage basin is also influenced to a considerable extent by the topography and the types of soil in the various subregions.

Two major vegetation regions are found in the basin. The first encompasses the mountains and the foothills, and the second the lowlands and the desert. Most of the higher mountainous regions are barren or contain alpine vegetation, mosses, lichens, and shrubs. At lower altitudes in the mountains and the foothills, forests generally prevail. In the Turkish part of the basin, irrigated agriculture is maintained on a limited scale in the valleys of this region.

In the lowlands vegetation is influenced by the availability of water. For instance, vegetation in the Al-Jazira region consists mainly of various kinds of grasses and bulbous plants. Barley and wheat are the major crops grown in this region. Irrigation is not widely practiced, and agriculture depends primarily upon
natural rainfall. In the last two decades, however, Syria and Turkey have begun to use the waters of the Euphrates River on a large scale for irrigating areas of the Al-Jazira region within their boundaries. Recently Iraq has also attempted to develop irrigated agriculture in the portion of the Al-Jazira region that lies in its territory.

The Mesopotamian subregion, which has a flat topography, the most extensive water resources, and the most fertile soil in the basin, is entirely dependent upon the water of the two rivers. Irrigated agriculture prevails, and a host of seasonal crops such as cotton, wheat, corn, vegetables, and many kinds of fruits, particularly dates, are grown in this region.\footnote{Al-Khashab, p. 11.}

\textbf{Surface Water in the Basin}

\textbf{The Tigris River}

The Tigris River, which lies in the eastern portion of Mesopotamia, is the second largest river in the Middle East; only the Nile has a larger annual flow (see Table VII). The mainstream of the Tigris is shared by Turkey and Iraq (see Figure 3, p. 67). It flows from the southeastern mountainous section of Turkey through Iraq, where it is fed by tributaries from Iran, Turkey, and Iraq.
TABLE VII
AVERAGE FLOW OF THE TIGRIS RIVER AT SELECTED STATIONS (IN CUBIC METERS PER SECOND AND CUBIC KILOMETERS)

<table>
<thead>
<tr>
<th>Tributary</th>
<th>Gauging Station</th>
<th>Years</th>
<th>Watershed Area (km²)</th>
<th>Average Flow (m³ psc)</th>
<th>Annual Flow (km³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mainstream</td>
<td>Tusun, Turkey</td>
<td>1931-1970</td>
<td>46,700</td>
<td>587</td>
<td>18.51</td>
</tr>
<tr>
<td>(Turkey)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mainstream</td>
<td>Mousal, Iraq</td>
<td>1923-1970</td>
<td>54,900</td>
<td>650</td>
<td>20.50</td>
</tr>
<tr>
<td>(Iraq)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Great Zab</td>
<td>Eskikelek, Iraq</td>
<td>1925-1970</td>
<td>20,500</td>
<td>414</td>
<td>13.06</td>
</tr>
<tr>
<td>(Iraq)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lesser Zab</td>
<td>Altun-Kupri, Iraq</td>
<td>1925-1970</td>
<td>15,600</td>
<td>227</td>
<td>7.16</td>
</tr>
<tr>
<td>(Iraq)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Al-Adiam</td>
<td>Anjana, Iraq</td>
<td>1934-1970</td>
<td>13,000</td>
<td>256</td>
<td>0.81</td>
</tr>
<tr>
<td>(Iraq)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diyala</td>
<td>Discharge site</td>
<td>1924-1970</td>
<td>29,700</td>
<td>170</td>
<td>5.36</td>
</tr>
<tr>
<td>(Iraq)</td>
<td>(Iraq)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>46.89°</td>
</tr>
</tbody>
</table>

*Source: Adapted from Mehdi Al-Sahaf, Pollution Control and Water Resources of Iraq (Baghdad, Iraq, Al-Hurria Printing House, 1976), p. 76.

°Total represents sum of the mainstream at Mousal and the four tributaries.

The most important tributaries feeding the Tigris River are the Great Zab, the Lesser Zab, the Al-Adian, and the Diyala Rivers, which also rise in the mountains of Turkey, Iran, and Iraq.
As the Tigris River flows southward in Iraq, it joins the Euphrates at Gurmet Ali, just north of the city of Basra, forming the Shatt Al-Arab waterway.\textsuperscript{12} Tables VII and VIII show the water contribution of each nation and the annual flow of the mainstream of the Tigris and its major tributaries.

The annual average flow of the Tigris River at the Iraq-Turkey boundary is 587 cubic meters per second (m\textsuperscript{3}psc), or about 18.151 cubic kilometers (km\textsuperscript{3}) per year. This average flow is increased from tributaries within Iraq to a flow of 650 m\textsuperscript{3}psc or about 20.50 km\textsuperscript{3} annually at the Mousal station in Iraq. Further to the south, after the river has been fed by the tributaries of the Great Zab, the Lesser Zab, the Al-Adiam, and the Diyala, the total flow is increased to about 26 km\textsuperscript{3} per year. As the river flows further south and water is diverted and evaporates along the way, the flow diminishes to an average of 49.6 m\textsuperscript{3}psc at Qalat Salih in the southern part of Iraq (see Table IX). The monthly and annual average runoff from the Tigris and its tributaries is shown in Table X.\textsuperscript{13}

\textsuperscript{12}Mehdi Al-Sahaf, Pollution Control and Water Resources of Iraq (Baghdad, Iraq, Al-Hurria Printing House, 1976), pp. 66-69.

\textsuperscript{13}Ibid., pp. 71-75.
TABLE VIII
WATER BUDGET OF THE TIGRIS AND EUPHRATES RIVERS: RIPARIANS' CONTRIBUTION
BY WATER FLOW (IN CUBIC KILOMETERS)*

<table>
<thead>
<tr>
<th>River/ Tributary</th>
<th>Annual Water Supply</th>
<th>Iraq</th>
<th>Turkey</th>
<th>Iran</th>
<th>Syria</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Amount</td>
<td>% of Total</td>
<td>Amount</td>
<td>% of Total</td>
<td>Amount</td>
</tr>
<tr>
<td>Euphrates</td>
<td>29.36</td>
<td>0.88</td>
<td>3.00</td>
<td>23.78</td>
<td>81.00</td>
</tr>
<tr>
<td>Tigris</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-Mainstream</td>
<td>20.50</td>
<td>1.99</td>
<td>9.99</td>
<td>18.51</td>
<td>90.10</td>
</tr>
<tr>
<td>-Great Zab</td>
<td>3.06</td>
<td>7.57</td>
<td>58.00</td>
<td>5.49</td>
<td>42.00</td>
</tr>
<tr>
<td>-Lesser Zab</td>
<td>7.16</td>
<td>4.58</td>
<td>64.00</td>
<td>....</td>
<td>....</td>
</tr>
<tr>
<td>-Al-Adiam</td>
<td>0.81</td>
<td>0.81</td>
<td>100.00</td>
<td>....</td>
<td>....</td>
</tr>
<tr>
<td>-Diyala</td>
<td>5.36</td>
<td>3.54</td>
<td>66.00</td>
<td>1.82</td>
<td>34.00</td>
</tr>
<tr>
<td>Total</td>
<td>76.25</td>
<td>19.37</td>
<td>25.00</td>
<td>47.78</td>
<td>63.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Location</th>
<th>Amount Lost or Added (m³ psc)</th>
<th>Average Flow (m³ psc)</th>
<th>Annual Average Flow (km³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow at Tusan, Turkey</td>
<td>......</td>
<td>587.0</td>
<td>18.51</td>
</tr>
<tr>
<td>Added at Mousal station, Iraq</td>
<td>+ 63.0</td>
<td>650.0</td>
<td>20.50</td>
</tr>
<tr>
<td>Added at Al-Fatha, Iraq by Great Zab, Lesser Zab, and other tributaries</td>
<td>+714.0</td>
<td>1,364.0</td>
<td>43.02</td>
</tr>
<tr>
<td>Lost at Sammara station, Iraq by diversion to Al-Tharthar depression</td>
<td>-334.0</td>
<td>1,030.0</td>
<td>32.48</td>
</tr>
<tr>
<td>Added between Sammara and Baghdad, Iraq by Al-Adian tributary, underground water from the Tigris channel, and seepage from Al-Tharthar</td>
<td>+127.0</td>
<td>1,157.0</td>
<td>36.49</td>
</tr>
<tr>
<td>Lost between Baghdad and Kut, Iraq by irrigation, evaporation, and seepage of water into the ground</td>
<td>-126.0</td>
<td>1,031.0</td>
<td>32.51</td>
</tr>
<tr>
<td>Lost at Al-Amarah station, Iraq by irrigation, evaporation, diversion, and seepage toward the ponds and lowlands</td>
<td>-879.0</td>
<td>152.0</td>
<td>4.79</td>
</tr>
</tbody>
</table>
TABLE IX--Continued

<table>
<thead>
<tr>
<th>Location</th>
<th>Amount Lost or Added (m³psc)</th>
<th>Average Flow (m³psc)</th>
<th>Annual Average Flow (km³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lost at Qalat Salih, Iraq</td>
<td>-102.4</td>
<td>49.6</td>
<td>1.56</td>
</tr>
</tbody>
</table>

*Source: Adapted from Mehdi Al-Sahaf, Pollution Control and Water Resources of Iraq (Baghdad, Iraq, Al-Hurria Printing House, 1976), p. 71.

The Euphrates River

The Euphrates River, which lies in the western portion of Mesopotamia, is the third largest river in the Middle East, following the Nile and the Tigris, with a total annual flow of 931 m³psc or 29.26 km³ per year. The Euphrates is shared by Turkey, Syria, and Iraq; it rises in the eastern Turkish mountains and flows through Syria and Iraq.

The confluence of two major rivers in Turkey, the Faratsou and the Muratsou, forms the mainstream of the Euphrates (see Figure 3, p. 67), and other minor tributaries feed the river within Turkish territory. In Syria, three main tributaries flow into the Euphrates: the Balikh, the Al-Sajur, and the Al-Khabar Rivers. There are no major Iraqi tributaries, although some ephemeral
<table>
<thead>
<tr>
<th>Station</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
<th>Annual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mainstream at Tusun, Turkey</td>
<td>746</td>
<td>700</td>
<td>1,006</td>
<td>1,489</td>
<td>1,386</td>
<td>659</td>
<td>278</td>
<td>169</td>
<td>150</td>
<td>168</td>
<td>242</td>
<td>320</td>
<td>587</td>
</tr>
<tr>
<td>Mainstream at Mosul, Iraq</td>
<td>548</td>
<td>765</td>
<td>1,144</td>
<td>1,622</td>
<td>1,497</td>
<td>729</td>
<td>311</td>
<td>178</td>
<td>145</td>
<td>176</td>
<td>271</td>
<td>420</td>
<td>650</td>
</tr>
<tr>
<td>Al-Fatha, Iraq</td>
<td>1,147</td>
<td>1,623</td>
<td>2,348</td>
<td>3,238</td>
<td>3,046</td>
<td>1,580</td>
<td>762</td>
<td>476</td>
<td>381</td>
<td>396</td>
<td>563</td>
<td>815</td>
<td>1,364</td>
</tr>
<tr>
<td>Sammara, Iraq</td>
<td>876</td>
<td>1,164</td>
<td>1,562</td>
<td>2,006</td>
<td>2,025</td>
<td>1,330</td>
<td>700</td>
<td>520</td>
<td>450</td>
<td>444</td>
<td>505</td>
<td>784</td>
<td>1,030</td>
</tr>
<tr>
<td>Baghdad, Iraq</td>
<td>928</td>
<td>1,356</td>
<td>1,969</td>
<td>3,650</td>
<td>2,598</td>
<td>1,533</td>
<td>724</td>
<td>422</td>
<td>315</td>
<td>323</td>
<td>450</td>
<td>613</td>
<td>1,157</td>
</tr>
<tr>
<td>Kut, Iraq</td>
<td>714</td>
<td>1,158</td>
<td>1,862</td>
<td>2,527</td>
<td>2,592</td>
<td>1,367</td>
<td>544</td>
<td>339</td>
<td>258</td>
<td>268</td>
<td>302</td>
<td>440</td>
<td>1,031</td>
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<tr>
<td>Al-Amarah, Iraq</td>
<td>117</td>
<td>179</td>
<td>223</td>
<td>289</td>
<td>309</td>
<td>316</td>
<td>95</td>
<td>76</td>
<td>73</td>
<td>87</td>
<td>77</td>
<td>88</td>
<td>152</td>
</tr>
<tr>
<td>Qalat Salih, Iraq</td>
<td>42</td>
<td>54</td>
<td>68</td>
<td>82</td>
<td>107</td>
<td>65</td>
<td>38</td>
<td>29</td>
<td>24</td>
<td>26</td>
<td>27</td>
<td>33</td>
<td>50</td>
</tr>
</tbody>
</table>

*Source: Adapted from Mehdi Al-Sahaf, Pollution Control and Water Resources of Iraq (Baghdad, Iraq, Al-Hurria Printing House, 1976), pp. 111-112.*
wadis flow into the river during the rainy winter season.\footnote{Adai Hardan Al-Hadithi, "Optimal Utilization of Water Resources of the Euphrates River in Iraq," unpublished doctoral dissertation, University of Arizona, Tucson, Arizona, November, 1979, pp. 45-46.} The riparians' contributions to the water of the Euphrates River are presented in Table VII (p. 85).

At the Keban station in Turkey near the confluence of the Faratsou and Muratsou Rivers, the mean annual flow of the Euphrates is about 634 m\(^3\)psc or 20.12 km\(^3\) per year (see Table XI). The flow increases between Keban and Tabqa in Syria to 913 m\(^3\)psc or 28.84 km\(^3\) per year. Further downstream at Hit, Iraq, near the Syrian border, the annual flow of the Euphrates reaches 931 m\(^3\)psc or 29.26 km\(^3\) per year. Still further to the south in Iraq at the city of Al-Nasiriyah, as a result of diversions and evaporation, the average flow of the river lessens to about 475 m\(^3\)psc or 15.0 km\(^3\) per year. Table XII shows the monthly and annual flow of the Euphrates River.\footnote{Ibid., pp. 52-53.}

The Euphrates and Tigris Rivers join at Gurmet Ali in Iraq, forming the Shatt Al-Arab waterway. The Shatt Al-Arab is approximately 110 kilometers long and 200 to 600 meters wide. A third international river from Iran, the Karun, which has an annual flow of about 15.5 km\(^3\)
TABLE XI

AVERAGE WATER FLOW OF THE EUPHRATES RIVER AT SELECTED LOCATIONS (IN CUBIC METERS PER SECOND AND CUBIC KILOMETERS)*

<table>
<thead>
<tr>
<th>Gauging Station</th>
<th>Years</th>
<th>Watershed Area (km²)</th>
<th>Average Flow (m³psc)</th>
<th>Average Flow (km³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Keban, Turkey</td>
<td></td>
<td>64,100</td>
<td>634</td>
<td>20.12</td>
</tr>
<tr>
<td>Tabqa, Syria</td>
<td></td>
<td>120,700</td>
<td>913</td>
<td>28.84</td>
</tr>
<tr>
<td>Hit, Iraq</td>
<td>1924-1970</td>
<td>264,100</td>
<td>928</td>
<td>29.36</td>
</tr>
<tr>
<td>Hindiyah, Iraq</td>
<td>1930-1971</td>
<td>274,100</td>
<td>619</td>
<td>19.50</td>
</tr>
<tr>
<td>Shinafiyah, Iraq</td>
<td>1954-1971</td>
<td>280,000</td>
<td>473</td>
<td>14.90</td>
</tr>
<tr>
<td>Al-Nasiriyah, Iraq</td>
<td>1930-1971</td>
<td>289,000</td>
<td>475</td>
<td>15.00</td>
</tr>
</tbody>
</table>


per year, feeds into the Shatt Al-Arab. This river is completely under the control of Iran.16

Groundwater Resources in the Basin

The importance of groundwater in the Tigris and Euphrates valley has been increasingly recognized by the

<table>
<thead>
<tr>
<th>Station</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
<th>Annual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Keban, Turkey</td>
<td>289</td>
<td>368</td>
<td>709</td>
<td>1,978</td>
<td>1,793</td>
<td>792</td>
<td>362</td>
<td>246</td>
<td>217</td>
<td>249</td>
<td>302</td>
<td>303</td>
<td>634</td>
</tr>
<tr>
<td>Tabya, Syria</td>
<td>642</td>
<td>770</td>
<td>1,219</td>
<td>2,540</td>
<td>2,416</td>
<td>1,062</td>
<td>476</td>
<td>310</td>
<td>278</td>
<td>318</td>
<td>398</td>
<td>350</td>
<td>913</td>
</tr>
<tr>
<td>Hit, Iraq</td>
<td>709</td>
<td>794</td>
<td>1,131</td>
<td>2,161</td>
<td>2,438</td>
<td>1,338</td>
<td>604</td>
<td>304</td>
<td>274</td>
<td>332</td>
<td>456</td>
<td>600</td>
<td>928</td>
</tr>
<tr>
<td>Hindiyah, Iraq</td>
<td>190</td>
<td>224</td>
<td>340</td>
<td>468</td>
<td>528</td>
<td>754</td>
<td>1,424</td>
<td>1,758</td>
<td>941</td>
<td>384</td>
<td>228</td>
<td>187</td>
<td>619</td>
</tr>
<tr>
<td>Shinfiyiah, Iraq</td>
<td>158</td>
<td>164</td>
<td>263</td>
<td>443</td>
<td>461</td>
<td>606</td>
<td>877</td>
<td>1,210</td>
<td>848</td>
<td>307</td>
<td>155</td>
<td>227</td>
<td>473</td>
</tr>
<tr>
<td>Nasiriyah, Iraq</td>
<td>174</td>
<td>208</td>
<td>273</td>
<td>370</td>
<td>429</td>
<td>537</td>
<td>821</td>
<td>1,178</td>
<td>1,047</td>
<td>353</td>
<td>159</td>
<td>145</td>
<td>475</td>
</tr>
</tbody>
</table>

four riparian states, but hydrological data are not sufficient to determine the amounts and locations of groundwater aquifers in the basin. Studies undertaken by the individual riparian states show only the waters in specific locations in those respective states, and even these studies are seriously inadequate for mapping the aquifers in the entire basin. In part this lack of groundwater research reflects the fact that groundwater exploration in the basin as a whole is limited.

The available studies demonstrate that the presence of groundwater varies from region to region in the basin. For instance, in the mountainous region, aquifers are recharged by the runoff from the mountains, and groundwater in this region is therefore abundant. Groundwater is also found in the foothills since their rocky soil and rivers and streams recharge groundwater sources. In the eastern part of the foothills region near the Iraqi-Iranian border groundwater resources exist in larger quantities than in the western part of the region in Turkey and Iraq because of the presence of high mountain ranges east of the Tigris River. Hydrologists assume that groundwater flows from the mountain and foothill regions in westerly and southerly directions, although at present data are insufficient to prove this assumption.
It is believed that parts of the Al-Jazira area close to the Euphrates River have groundwater of good quality which could be used if adequate management steps were taken to ensure recharge of the aquifers from the Euphrates and its tributaries. Generally, at the present time groundwater in this region is of poor quality, and groundwater use is limited.

In the Mesopotamian plain groundwater is also limited except near the major rivers since rainfall is low and the heavy delta soil is largely impregnable. In the desert region, groundwater is very limited. In both the Mesopotamian and desert regions, as might be expected, groundwater resources have not been extensively developed. In general, no attempts have been made on the international level to study and estimate groundwater resources in the Tigris and Euphrates drainage basin, even though it is well understood that groundwater must be considered when surface water developments are made in order to recharge aquifers in the valley.¹⁷

Conclusion

The Tigris and Euphrates drainage basin is affected by the physical factors of the basin since the topography

of the valley differs from region to region. The most suitable area for agriculture is the Mesopotamian trough, which is located largely in Iraq, the lower riparian state (see Figure 8). Turkey, the upper riparian and the major contributor to the waters of both rivers, is unable to use the waters other than in the generation of hydroelectric power without diverting them to other regions of the country. In recent years Turkey has begun to divert the waters of the rivers to the central region of the nation, where the topography will permit irrigated agriculture.\(^\text{18}\) Similarly, Iran, which contributes to some of the major tributaries of the Tigris River, is unable to fully use these tributaries without diversion. In recent years, however, Iran has also begun to divert water to other areas suitable for agriculture.\(^\text{19}\) Syria, the middle riparian, is increasingly using the waters of the Euphrates River for irrigation.\(^\text{20}\)

\(^{18}\)Al-Hadithi, p. 69.


The quality of the waters of the Tigris and Euphrates basin varies widely, and at times salt content is very high due to evaporation and leaching of soluble minerals. High salinity levels limit the use of these waters for irrigation unless they are diluted. This is obviously a factor that must be considered in any plan for managing the two rivers.21

The climate of the valley also varies from region to region. The lowland region, which is the most suitable part of the basin for agriculture, is an arid area and agriculture is therefore entirely dependent on irrigation from the waters of the two rivers. Iraq is the only riparian which is completely dependent upon the waters of the Tigris and the Euphrates, although more than 70 percent of those waters come from outside Iraqi territory.22

The Shatt Al-Arab waterway is the only navigable section of the Tigris and Euphrates Rivers, and it is also the only section that serves as a boundary between nations in the basin. This waterway is particularly vital to Iraq since it is that country's only outlet to the sea.23

21Rzoska, pp. 68-74.


The Tigris and Euphrates region is very heterogeneous, perhaps as heterogeneous as any area in the world. The people in this valley represent various races and cultural backgrounds and speak three different languages. The political and economic systems of the four riparian states also differ—Syria and Iraq have basically socialist economies, Turkey's economy is predominantly capitalist, and Iran is presently in a revolutionary state—and their foreign policies tend to ally them with different superpowers.

Both conflict over water resources and the possibility of cooperation among the riparian nations are affected by these cultural, political, and economic factors. A consideration of the cultural, political, and economic similarities and differences in the four societies is therefore necessary to an understanding of the policy process in the Tigris-Euphrates valley.
Cultural Differences and Similarities in the Four Riparian States

The history of the Tigris and Euphrates basin has been shaped by three major groups of people: the Arabs, a Semitic people from the Arabian peninsula; the Turks, a Ural-Altaic people originally from central Asia; and the Persians, an Indo-European people also from central Asia. Each of these groups has its own language; Arabs speak Arabic, Turks speak Turkish, and Persians, now known as Iranians, speak Farsi.¹

In addition to these major groups, several ethnic minorities also inhabit the region. The largest and most important of these is the Kurds, who live in all four of the riparian states. Like the Iranians, the Kurds are an Indo-European people and speak an Indo-Iranian language, but Kurdish is completely different from Farsi.²

The greatest concentration of the Kurdish population is located in an area where the borders of Turkey, Iraq, Syria, and Iran meet and extends northward into the Soviet Union. The Kurdish culture and religion prevail throughout


this predominantly mountainous region. Other minorities in the Tigris-Euphrates valley include Armenians, Greeks, Caucasians, Assyrians, and others, but these groups comprise only a small percentage of the population in the four riparian nations.  

All of the people in the Tigris and Euphrates basin have been influenced by Islam. When the Arabs were converted to Islam in the seventh century A.D., they conquered and created the Islamic empire, which eventually reached from Spain in the west to central Asia in the east and from the Caucasus Mountains in the north to India in the south. Islamic principles and the culture associated with it were almost universally accepted in this vast region. The Islamic empire endured until the thirteenth century, and Islam itself became the dominant religion throughout the lands under its sway.  

Islam is still predominant in the Tigris-Euphrates region today. About 90 per cent of Turkey's 40 million inhabitants are Muslim. Eighty per cent of the country's population is ethnically Turkish, and the remaining 20

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per cent is made up of persons of other ethnic backgrounds such as Kurds, Arabs, Caucasians, Greeks, and Armenians. Kurds represent Turkey's largest ethnic minority, constituting 12 to 15 per cent of the population. Small numbers of Jews, Christians, and adherents of other religions live in Turkey, but the culture of the country is predominantly Islamic.5

Most of the inhabitants of Syria are also Muslim. With a population of 9 million, Syria is the smallest of the four riparian states. Ninety per cent of this population is Arab, and the remaining minority is composed of Kurds, Armenians, and Turks.6

The majority of Iraq's 14 million inhabitants, too, are Arab and Muslim, although the country's population also includes several ethnic and religious minorities such as Kurds, Turmokans, Assyrians, Armenians, and Jews. Arabic is the country's official language, although Kurdish is also an officially recognized tongue in the Kurdish region of the nation.7


Iran is predominantly Muslim but, unlike Syria and Iraq, not predominantly Arab. Its population of approximately 40 million is 63 per cent Persian. The remaining 37 per cent is composed of ethnic minorities such as Turkomans, Baluchis, Kurds, and Arabs.⁸

The Political and Economic Development of the Four Riparian Nations

Turkey

Turkey traces its history to the Ottoman Empire, which functioned as a major political entity in the Middle East, the Mediterranean, and North Africa from the thirteenth century until World War I,⁹ but the history of modern Turkey begins with the era of Mustapha Kemal Ataturk. After the defeat of the Ottoman Empire in World War I, Allied forces occupied Turkey. Ataturk and other nationalist leaders escaped from these forces and organized an opposition movement to the puppet government that the Allies were supporting. In 1923, Ataturk and his supporters declared the establishment of a republic in Turkey. The new Turkish constitution provided for an elected

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national assembly and a president, and the latter was authorized to appoint a prime minister. Ataturk was elected as the first president of the republic by the Turkish parliament. Since Turkey's political system was dominated by a single party, Ataturk, in effect, governed and controlled that party and the national assembly from 1923 until his death in 1939.\textsuperscript{16}

Modernization was the major emphasis of Ataturk's government, and his plan was to Europeanize Turkey. Emphasis was placed on industrialization as a means of achieving rapid economic development. Industrial plants to produce textiles, paper, cement, iron and steel, and chemical products were built under Ataturk's directives. Government played a less direct role in the agricultural sector, although capital was made available to private individuals engaged in farming through agricultural banks. Relatively little was done to improve the infrastructure of agriculture in Turkey, however, and few major water resource development projects were undertaken during the years of Ataturk's presidency.

\textsuperscript{16}Max Weston Thornburg, Graham Spry, and George Soule, 
After the death of Ataturk in 1939, his Republican People's Party continued to control the Turkish government, and little change occurred in the country's policies until after World War II. The war increased the accumulation of capital in the hands of the merchant class while the masses generally became poorer, a development which led to increased public pressure for changes in the political system in the post-war period. In response to this pressure, the government authorized the establishment of opposition parties, and, as a result, Turkey's political structure changed from a one-party to a multi-party system in the 1950s.\(^1\)

The leaders of the Democratic Party, the primary group opposing the Republican People's Party, subsequently won control of the Turkish government. They stressed the importance of the private sector in national development and espoused the view that government control should be limited to such enterprises as ports, railroads, power generating facilities, mines, and the administration of water supplies and forest resources.

By the late 1950s, an increasing rate of inflation and slowdowns in production were causing growing dissatisfaction among the Turkish people. The government reacted to this general public discontent by attempting to curb the freedom of the country's opposition parties. This action led to

\(^1\)Hale, pp. 37-81.
governmental instability, strikes, and student demonstrations that set the stage for the military takeover of 1960.\textsuperscript{12}

After the coup, a new constitution was written giving the military ultimate control of the Turkish government, and since that time the government has been under the indirect authority of the military and its leadership. The political branches of government are so structured as to ensure the military a veto, if not direct control, over national policies.\textsuperscript{13}

As a result of the weakness of Turkey's civilian government, the military intervened again in 1971, replacing the current administration with another civilian government that it found acceptable. In this second coup, as in the first one, the military made itself the guardian of the state.\textsuperscript{14}

Despite these changes in the Turkish government, inflation and unemployment continued and political violence


became widespread in the late 1970s. These conditions led to a third coup d'état in 1980, in which the military assumed direct control of the government, and this administration continues in power in Turkey today.\textsuperscript{15}

Under the indirect or direct control of the military since 1960, the government has played a larger role in Turkey's economic development. A long-range planning organization was established, and a series of five-year plans was adopted and executed. Industrialization has continued to be the main thrust of these plans for development. Agriculture and water development have received relatively little attention, with the exception of power generation projects that are needed to provide energy for new industry. This emphasis on power generation has led to the development of a number of multipurpose water projects, particularly on the Euphrates River.\textsuperscript{16} It should be noted, however, that, despite Turkey's efforts in the area of industrialization, agriculture remains the most important sector of the country's economy, employing more than 50 per cent of the population and accounting for more than 50 per cent of all Turkish exports in 1979.\textsuperscript{17}

\textsuperscript{15}Berberoglu, pp. 128-130. \textsuperscript{16}Hale, pp. 128-158. \textsuperscript{17}Ibid., p. 174.
Syria

Before World War I, Syria was a part of the Ottoman Empire. The war and the changes that followed it shaped the modern history of the country. During the war the British promised Sharif Hussein, the leader of Hijaz, an area in present-day Saudi Arabia, that they would help the Arabs to establish an independent state. In turn, Hussein led a revolt against the Ottoman Empire, and in 1918 his son, Amer Faysal, entered Damascus with his troops as an Arab hero. Faysal gained control over all of Syria except the area along the coast of the Mediterranean Sea, which was seized by French forces. Syria then declared its independence in 1919, and Faysal was named king of the new state.

Syria's independence, however, was short-lived, because, pursuant to secret agreements among the Allied powers concerning the post-war disposition of lands formerly under the control of the Ottoman Empire, France was given a mandate over Syrian territory. As noted above, in the Balfour Declaration the British had promised Hussein to aid the Arabs in founding an independent state, but at the

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19Lenczkowski, pp. 58-86.
same time they had made promises to the Zionists in Palestine. Furthermore, in the clandestine Sykes-Picot Agreement, the British and their allies planned to divide the Arab world into spheres of influence. Under the terms of this agreement, Syria was to be controlled by the French and Iraq by the British. Thus, France became the ruling power in Syria after the war.\textsuperscript{20}

The Syrians attempted to overthrow the foreign mandate in 1920, but the French authorities suppressed the revolt and removed King Faysal from the Syrian government. Social uprisings continued from 1920 until 1940, when the French finally promised the Syrians independence. The French did not leave the country, however, until 1946, following a United Nations resolution calling for their evacuation. The Syrian republic was created, with an elected parliament and president, at this time.

Both before and after independence, the Syrian government played only a minor role in the nation's economic development. The income of the majority of the people was very low, and educational and social welfare programs were limited. Political instability soon developed in Syria, and as a result of the weakness of the government the military took control in 1949.\textsuperscript{21}


\textsuperscript{21}Ibid., pp. 457-460.
A series of coups d'état took place in Syria from 1949 to 1959, in which one military regime replaced another. The Socialist Arab Ba'ath Party (SABP) gained strength during this period of political instability and acquired a great deal of influence in the government by the end of 1957.

The SABP is a nationalistic party dedicated to establishing a single unified nation that will include all Arab countries. After gaining influence in the Syrian government, the SABP supported Syria's union with Egypt in 1958.²² A new constitution was written for the United Arab Republic (UAR) to be formed by these two countries, calling for a unitary cabinet and national assembly composed of 400 members at the ratio of three Egyptians to one Syrian, and Gamal Abdel Nasser was unanimously chosen as president of the new union. Egypt and Syria were recognized as two regions within the UAR, and each had its own appointed executive council.

The union of Egypt and Syria lasted only until 1961, when yet another military coup d'état led to the latter nation's secession from the UAR. Political instability and

economic stagnation continued to prevail in Syria, leading to further coups. In 1963, the SABP recaptured its leadership of the government, but in 1966 a faction that had split off from the party seized authority from it. Rivalry within this faction continued until 1970, when Hafiz Assad, the Minister of Defense, arrested some members of the group and installed himself as the president of the Syrian republic. A new constitution was written, under the provisions of which President Assad was given virtually full control over the government.\footnote{Richard F. Nyrop, *Syria: A Country Study*, 3rd ed. (Washington, The American University, 1979), pp. 30-31.}

In spite of Syria's political instability, especially between 1949 and 1956, the economy of the country experienced some expansion. The port of Lattakia on the Mediterranean Sea, which increased Syria's ability to export agricultural products from its north and northeastern regions, was completed during this period. In addition, a number of multipurpose water projects that expanded irrigation and drained marshes were undertaken; these projects improved the nation's agricultural output, particularly the production of cotton, which rose from 6,000 tons in 1939 to 100,000 in 1950 and to 404,300 by 1973.
Industrial production comprised only about 7 per cent of Syria's gross national product (GNP) after World War II. By the mid-1950s, however, this proportion had grown to 14 per cent, and it rose to 26 per cent in 1979.

In the period between 1958 and 1961, when Syria was united with Egypt, the country underwent drastic institutional changes that affected both its economic and social life. The most important of these changes were agrarian reforms, which limited the ownership of the land and introduced credit and marketing societies to aid farmers. From 1960 until the present time, a number of five-year development plans have been instituted in Syria. Many of the country's major economic institutions were nationalized, including insurance companies, banks, and large factories. The expansion of the paper, chemical, electric, extractive, and other industries continued.\(^2\)

In the last two decades a number of major water development projects have been undertaken in Syria, which increased the amount of acreage under irrigation. Perhaps the most important of these was the Euphrates Project in 1974. The purpose of this enterprise was to irrigate a total area of 600,000 hectares by 1995 and to generate a million kilowatts of electrical power. Syria's filling

of the reservoir built for this project without considering the needs of Iraq caused major difficulties between the two countries.\textsuperscript{25}

Iraq

In the past, Iraq, like Syria, was part of the Ottoman Empire, which first occupied the region in the sixteenth century. Ottoman rule continued in Iraq until World War I.\textsuperscript{26} The British invaded Iraq during this period for strategic and economic reasons; it afforded an important route to India, and it possessed oil resources that Britain needed. As mentioned in the previous discussion of Syria, under provisions of post-war treaties, Britain was given a mandate over Iraq,\textsuperscript{27} and it divided the country into several districts, each governed by a British executive officer.\textsuperscript{28} Rebellion broke out in 1920, however, forcing the British authorities to establish a provisional government


controlled by an Iraqi commissioner and a council of ministers.\textsuperscript{29}

National feeling against Britain's occupation of Iraq increased, and in 1921, in an attempt to reduce political unrest, a new political system was established, headed by the Arab monarch Faysal, who had been removed from power in Syria by the French in 1920. As a descendant of the prophet Mohammed, Faysal had great prestige among the Arabs. He was nominated in March of 1921 and confirmed by a plebescite as the first king of Iraq in July, 1921.\textsuperscript{30} Despite the creation of this monarchy, however, the British mandate remained, and Britain's influence over the government continued until 1932, when Iraq gained complete independence.\textsuperscript{31}

The national economy of Iraq before independence was very weak, and almost all of the population was employed in agriculture. After World War I, the advent of petroleum-powered irrigation pumps and other modern machinery began to change farming methods. Oil revenues grew in the 1930s, and the government of Iraq began to spend increasing sums of money on economic development. Most of these expenditures were made for the construction of water-related

\textsuperscript{29}Ibid., pp. 387-392. \textsuperscript{30}Foster, pp. 72-82. \textsuperscript{31}Ibid., pp. 284-286.
projects. By 1940, the total land area under irrigation in Iraq had increased fourfold over the amount under irrigation in 1918.

By the post-World War II period, Iraqi industries were beginning to grow. These undertakings were related primarily to the processing of local raw materials and to meeting local needs through such endeavors as providing construction materials, cotton-ginning, spinning, date processing, and weaving. The process of industrialization accelerated in the 1950s, partly as a result of rising oil revenues that helped to build the necessary infrastructure of public works, roads, and power generating facilities. Oil revenues were present as early as 1927 but remained low until the 1950s, when the Iraqi government reached an agreement with a number of international oil companies whereby the country was to receive 50 per cent of all profits from oil production within its borders. Oil revenues subsequently jumped from $19 million in 1950 to $144 in 1953 and to $224 million in 1958.\(^3\)\(^2\)

During this period, the Iraqi monarchy lacked political stability because the government was controlled to a large degree by a small oligarchy which was incapable of facilitating social, economic, and political development.

As a result of economic stagnation and growing political unrest, Iraq experienced social upheaval in the years before and after World War II in the form of strikes, demonstrations, and popular and military uprisings.\textsuperscript{33} In the face of this continuous political unrest, the Iraqi army with the support of the people led a revolution on July 14, 1958. In this revolution the king was overthrown, and Iraq became a republic.\textsuperscript{34}

The new government, too, however, was unable to achieve economic and political development. The Socialist Arab Ba'ath Party led the Ramadan Revolution on February 8, 1963, but in 1964 a coup d'état put the Ba'ath regime out of power. The new government was overthrown four years later by the Ba'ath Party in the revolution of 1968.\textsuperscript{35}

Since that year, Iraq's political system has been composed of the Revolutionary Command Council (RCC), the nation's highest legislative body; a president elected by the members of the RCC, and the regional command of the Ba'ath Party. In 1979, the present president, Saddam Hussein, \textsuperscript{36}


\textsuperscript{35}Lenczowski, pp. 299-303.
became the second president elected after the 1968 revolution. Hussein presides over the RCC, and his cabinet is responsible to him and to the RCC. A modification was made in the governmental system in 1980, when a national assembly was created whose members are elected by popular vote.\textsuperscript{36}

Major changes have occurred in Iraq's economy and social system since 1968. Agrarian reform laws were enacted, and the oil industry, among numerous other industrial and financial institutions, was nationalized. Increases in oil revenues have permitted the implementation of extensive development and social welfare programs.\textsuperscript{37}

Despite its economic growth, Iraq experienced difficulty in achieving political stability until 1968. Following the final revolution led by the Ba'ath Party, public policy became intimately related to economic and social affairs. From the beginning, the new government sought to apply the principles of socialism to Iraq's economy and abolish economic injustice.

The government adopted national planning, and industrialization and agrarian reforms, including improvements


\textsuperscript{37}Majid Khadduri, Socialist Iraq: A Study in Iraqi Politics since 1968 (Washington, The Middle East Institute, 1979), pp. 111-125.
in the irrigation system, were encouraged. The agricultural sector was given first priority until the 1970s, when industrialization also began to be emphasized. The national plans for the 1970s stressed agriculture and sought to develop a diversified economy that would reduce the nation's dependence upon oil. The plan for 1976-1980 called for expenditures of $50 billion during the five-year period, to be divided as follows: agriculture, 18.7 per cent; industry, 32 per cent; transportation and communication, 17.3 per cent; construction, 16 per cent; and other, 14 per cent.38

Iran

In the period between 1779 and 1925, Persia was ruled by the Qajar dynasty, but until World War I both Britain and Russia played a major role in Persian affairs.39 After the war, the British became the dominant world power in the region and greatly influenced Persian policy, especially after the coup d'état of 1921, which was led by Colonel Rezakhan and received British support. Iran became the


official name of the nation after Rezakhan assumed power. In 1925, the last shah of the Qajar dynasty was deposed, and Rezakhan was proclaimed as the new shah of Iran.

In 1941, as a result of pressure from Britain, Rezakhan abdicated in favor of his son, Mohammed, who succeeded him as shah. The new shah's power was severely restricted by Iran's parliament in this period. For example, in 1951, the parliament nationalized the country's oil industry over the objections of the shah, who then refused to implement the parliament's decision. As a result of this governmental crisis, the parliament pressured the shah to install Mossadeq, a legislator and well-known nationalistic leader, as prime minister to carry out its legislative mandates.

After Mossadeq assumed office, he began to enforce the laws nationalizing the oil industry. However, he also dissolved the parliament and took full authority over the government, and in 1952 he deposed the shah.

On August 19, 1953, under the leadership of General Zahedi, a supporter of the ousted Mohammed, the military arrested Mossadeq and many of his followers. The shah was returned to power and subsequently attempted to assume complete governmental control, and, as a result, a power struggle ensued for the next ten years. From 1963 until he was overthrown in 1979, the shah was all-powerful
in Iranian society, but he faced major problems in his attempts to modernize the country. In fact,

The shah's political system was subjected to serious strains that could briefly be called "the king's dilemma," namely, how to reconcile modernization in the social and economic sectors with lack of corresponding progress in the political sector. Through the twenty-five years of the shah's supremacy (since the fall of the premier Mossadeq in 1953), opposition to the system, although cowed, was never completely eliminated. Its three main components—religious leaders, the national front, and the communists—varied in strength and ultimate objectives but agreed on the immediate common goal of radically changing the political system.

Opposition to the shah's policies continued to increase in the late 1970s, and on February 11, 1979, revolutionary forces overthrew the shah's regime and proclaimed Iran to be a republic.

Under the new constitution of the Iranian republic the president was to be popularly elected and to have the power to appoint the prime minister and cabinet members. A unicameral assembly was also established, whose members were to be elected for four-year terms. The constitution stated, however, that ultimate power in the nation was to be vested in a religious leader, known as the imam.

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42 Lenczowski, p. 224.
Khomeini assumed this office in 1979, and he has final control over the government of Iran.\textsuperscript{2}

Efforts to modernize Iran began early in the nineteenth century, when western technology and skills began to be imported from Europe, but they achieved relatively little success. After World War I, economic development was accelerated as a result of the achievement of greater internal security and increased revenues from oil. Despite these advances, however, Iran remained predominantly a backward agricultural country in which manufacturing was limited to small shops and cottage industries. Hand-woven rugs were the major Iranian export; large factories were few in number and confined for the most part to consumer goods, especially foods and textiles.\textsuperscript{3}

As noted previously, the most concentrated attempts to modernize Iran occurred in the 1970s. They were initiated as a result of a tremendous increase in the nation's oil revenues, which rose from $4 billion in 1973 to $21 billion in 1974. During this period planners gave priority to industrial development, and, consequently, industry flourished. Existing factories were expanded and new ones

\textsuperscript{2}Ervand Alrahamian, Iran between Two Revolutions (Princeton, New Jersey, Princeton University Press, 1982), pp. 496-529.

\textsuperscript{3}Lenczowski, pp. 173-174.
were constructed for the production of textiles, steel, iron, tractors, petrochemicals, and the like. The agricultural sector received relatively little attention from planners, but essential water development projects began to be emphasized, particularly in the area of Iran that bordered on Iraq.

Since 1947, the government of Iran has utilized national planning as a means of promoting economic development. The Governmental Planning Organization was initially responsible for planning and executing development projects, but in the 1970s its tasks were confined to the formulation of plans and budgets and the coordination and evaluation of programs. The implementation of plans became the responsibility of other organizations. ¹⁴ From 1949 until 1978, Iran had five national development plans. The last of these plans covered the period 1973-1977 and called for total allocated expenditures of $70 billion.¹⁵

In the years since 1979, Iran has suffered from formidable problems such as mismanagement, economic stagnation, and administrative chaos. The struggle for power between the clergy and many opposition groups,


the Kurdish rebellion, and the continuing war with Iraq all have negatively influenced the Iranian economy.\(^6\)

Regional and Foreign Relations of the Four Riparian States

The regional and foreign relations of the four countries in the Tigris and Euphrates valley have long been influenced by the major powers in the area. Before World War I, those powers were Russia and Britain, and they shaped the policies of the riparian nations. After the war, Britain became the dominant foreign influence in the Tigris-Euphrates valley. Following World War II, the United States with its Truman Doctrine assumed hegemony in the region. Turkey gravitated towards the west because the Doctrine aided it in resisting pressure from the Soviet Union, and Iraq and Iran also joined the western alliance in this era;\(^7\) Syria was the only one of the four riparians that was not allied with the west in the post-war period. In 1952, Turkey became a member of the North Atlantic Treaty Organization (NATO), and in 1955 Iraq and Iran joined the Central Organization (CENTO) through the Baghdad Pact.

In more recent years, fears of Soviet intervention in Turkey have lessened because of the Soviet policy of

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\(^7\) Bullarid, pp. 19-42.
peaceful coexistence and the emergence of détente between the superpowers. In addition, economic problems in Turkey have motivated its government to seek trade agreements with neighboring nations, especially with the Soviet Union, other Arab countries, and some non-aligned states. In the 1970s, Turkey entered into a number of economic agreements with the Soviet Union. The Soviets provided Turkey with aid and loans for industrial development, and the two countries signed a treaty pledging their intention to pursue a cooperative relationship.

Relations between Turkey and its neighbors in the Tigris and Euphrates valley have, with minor exceptions, been peaceful since the days of Ataturk. In the post-World War II era, Turkey joined Iraq and Iran as well as Pakistan and Britain in a general alliance against Soviet intervention. Turkey's efforts were also extended into the economic sphere when, in 1964, it joined with Iran and Pakistan to form the Regional Cooperation for Development Organization (RCD) to promote international trade and economic relations. In the 1970s, Turkey entered into an agreement with Iraq to permit an oil pipeline to be built within Turkish borders through which oil could be transported from Iraq to the Mediterranean Sea. This mutually beneficial arrangement gave Iraq an alternative means of shipping its oil and provided Turkey with
petroleum and a source of income. Turkey has also been represented in the Islamic Conference, despite the fact that, unlike the other members of the Conference, it is a secular state. ⁸

The orientation of Syria's foreign relations has fluctuated since World War II. After gaining independence in 1947, Syria did not ally itself with either of the superpowers but instead pursued a policy of Arab nationalism which led to its confederation with Egypt in the United Arab Republic. As a result of the Arab-Israeli conflict, Syria assumed an increasingly more militant pro-Arab stance and in the late 1950s moved toward the Soviet camp. Subsequently, it entered into a treaty of friendship and cooperation with the Soviet Union, and the U.S.S.R. continues to be Syria's largest supplier of military equipment. Yet, although it has kept up its contacts with the Soviet Union, Syria has also maintained relatively good relations with the west.

In regional affairs, Syria is a member of the Arab League and the non-alignment movement, but its relations with some of its neighbors, particularly Iraq, have deteriorated in recent years. Problems between the two

countries originated in the early 1970s as a result of ideological differences and conflict over the water of the Euphrates River. Another circumstance contributing to the strain between Iraq and the government of Syria is the fact that, at the present time, the latter is supporting Iran in the Iran-Iraq war. 

Iraqi foreign policy was pro-western after the nation gained its independence in 1932. In 1955, Iraq was one of the founding members of the Baghdad Pact, an alliance against the communist bloc. Iraq's pro-western orientation changed, however, following the revolution of 1958 and as a result of the west's support for Israel in the Arab-Israeli conflict. Iraq's allegiance shifted still further toward the east after the revolution of 1968, and it entered into a number of political and economic agreements with the Soviet Union.

Although Iraq's relations with the Soviet Union are friendly, in general it has conducted its foreign policy as a non-aligned state. It is a strong supporter of the non-alignment movement, and as a member of the Arab League it advocates Arab nationalism. Iraq's interactions with its regional neighbors are amicable, with the exceptions of Syria and Iran; this conflict will be discussed in

49Banks and Overstreet, p. 468.
more detail later in this dissertation. As a major oil producer in the Middle East, Iraq is also a member of the Organization of Petroleum Exporting Countries (OPEC).  

Iranian affairs have been greatly affected by outside powers. From the eighteenth century until World War I, Britain and Russia were the major powers in the region and greatly influenced events and conditions in Persia. Following World War I, as noted previously, Britain assumed the dominant role until the post-World War II era, when the new superpowers, the United States, and the Soviet Union, emerged in the 1950s. The United States became actively involved in Iranian affairs and helped to shape the country's government and policies. In 1959, Iran and the United States signed a bilateral defense agreement in which the U.S. promised to defend Iran from outside aggression from the Soviet Union. Economic cooperation and trade between the two nations were also expanded.

Relations between Iran and the Soviet Union historically have been strained. In 1946, the Soviets unsuccessfully sought to annex the northern section of Iran, but the threat of intervention by western powers blocked this attempt. The atmosphere between Iran and the Soviet Union became still more unfriendly after Iran moved entirely into

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the western camp; this development led the Soviets to pursue a hostile policy toward the shah's government. Relations between Iran and the Soviet Union did not improve until the late 1960s, when the shah declared that Iran would not permit its territory to be used as a base for military purposes against the Soviet Union. Since that time Iran and the Soviets have entered into a number of economic and trade agreements. One of these agreements, concluded in 1970, provided that Iran would supply the Soviets with natural gas in return for economic credit. Nevertheless, the shah's government remained suspicious of the Soviet Union because of its support for the Tudeh Party, the communist party in Iran.

Despite the shah's obvious ambition to gain dominant power in the region, Iran maintained friendly relations with most of its neighbors, and during the shah's regime it was a prominent member of OPEC. Relations between Iran and Iraq, however, were strained at best during this period, largely because of the historical dispute between the two nations over the Shatt Al-Arab waterway. This dispute will be discussed fully in Chapter VI.51 Following the revolution of 1979, Iran's relations with most of its

neighbors have deteriorated because of its efforts to interfere in their internal affairs.\textsuperscript{52}

As stated at the beginning of this chapter, the Tigris-Euphrates valley is a very heterogeneous region, but, despite the differences among its nations and their peoples, the riparian states share common values stemming from their Islamic heritage. The four riparians also have different political ideologies and economic systems, but all of them are undertaking massive development plans that depend ultimately upon the availability of ample water.

For the most part, interactions among the riparian countries in the Tigris-Euphrates valley were friendly until the 1960s because of the dominance of the western powers in the region. During the last two decades, however, the rivalry of the superpowers and the establishment of divergent political ideologies in Turkey, Syria, Iraq, and Iran have caused relations between some of the states in the region to deteriorate. These problems, as will be discussed in Chapters VI and VII, have served to exacerbate conflicts over water in the Tigris-Euphrates basin.

CHAPTER V

THE INSTITUTIONAL ENVIRONMENT: THE NATIONAL, LEGAL, AND ADMINISTRATIVE STRUCTURES OF MANAGING WATER RESOURCES IN THE FOUR RIPARIAN NATIONS

The question of who has the right to water is a fundamental issue in all societies. In arid regions in particular guidelines or rules for determining who can use water and for what purposes are essential, as are the methods of resolving disputes among individuals over water. From earliest times societies have attempted to answer these basic questions about water use. In the past local customs and traditions were relied upon to determine who could use water and in what amounts, and these traditions were frequently undergirded by religious beliefs. As the sophistication of societies increased, however, the issues related to the right to water also became more complex, which led to the codification of rules and laws pertaining to water rights.

Water legislation in modern nations is shaped by the belief that all water ultimately belongs to the state as the guardian and protector of the public interest. All life depends on water; therefore, government control
over essential but scarce water resources is imperative. Individual rights to water are subservient to the community of the state; government is responsible for ensuring effective and equitable water distribution in society, and individual rights to water originate with and are limited by the state.

Improved technology, which has increased human control over water, has made water law and administration an even more important function of the state. The development of large water projects can be carried out only by government. The allocation of water, setting of priorities with regard to what use will be made of scarce water resources, and regulatory activities necessary to protect water resources from pollution encompass social, economic, and political issues, and only the state can make these types of decisions in a society. Government must also engage in planning, coordinating, and executing policies pertaining to water management. Within its constitutional and legal powers, the state must develop and manage its water resources. Water law and administration are, therefore, vital parts of the public law in every state.

Water codes or legislation based upon the assumption of the state's power over water resources provides a method for allocating or suspending rights to water for individuals; sets priorities as to what projects, areas, and
the like will receive water in times of scarcity; establishes and empowers the necessary management and financial system for planning and undertaking the development and supervision of use of water resources; and controls water pollution.¹ Since all four of the riparian nations in the Tigris and Euphrates drainage basin have their own individual water codes and administrative systems, an examination of how those codes and systems may agree or disagree is called for since those factors affect conflicts over water and the possibility of developing a basin-wide management system.

The Heritage of Water Laws in the Tigris and Euphrates Basin

In order to understand water laws and how the four states in the Tigris and Euphrates drainage basin regulate and manage their water resources, it is necessary to examine the heritage of those laws. The single most influential historical factor shaping the current legal systems in all four of the riparian states is the Islamic religion.

The riparian nations' water laws have been greatly influenced by Muslim law. According to the tenets of

Islam, law is based on divine revelation as found in the Holy Koran. This book came from Allah (God) to man through the prophet Mohammed and is the basic source of all legal principles. Other sources of Islamic law are the Sunna and the Hadith. The Sunna is a record of what Mohammed said and did as a governor. Much of the material found in the Sunna was preserved and transmitted through oral tradition and the telling of stories about Mohammed. This oral history today is called the Hadith.

Still other sources of Islamic law include the Ijama-Al-Ummah, which is considered to be the universal consensus of opinion in the Muslim community, and the Qiyas, a system of deduction by analogy based upon precedents in the Muslim community. This deductive process permits the law to deal with new issues while retaining traditional values, provided that those values are not contrary to the spiritual principles of Islam.

Water law, like all law in Muslim countries, is founded upon religion. Islam includes basic doctrines about water. For example, the prophet Mohammed said that free access to water is the right of the Muslim community; therefore, an individual cannot hold water in order to prevent others from using it. All members of the community have the right to free access to sources of water.

The Muslim world, however, is not monolithic. Islam comprises a number of religious sects, and each of them
embodies different traditions. The Sunnite sect is the largest of these groups, accounting for approximately 90 per cent of the Muslim world. The Shiites are the second largest group, representing 9 per cent of the Muslim community. A third sect, the Ibadites, located primarily in Oman, Algeria, and Tanzania, constitutes about 1 per cent of the Muslim population. Each of these groups, particularly the Sunnites and Shiites, may be further subdivided into different schools. For example, within the Sunnite doctrine one finds Hanifite, Malikite, Shafiite, and Hanbalite schools. The Jafari, Ismailite, and Zaidite are schools within the Shiite sect.²

Generally, all of the Islamic sects and schools maintain that the right to quench one's thirst may be freely exercised on large expanses of water, such as seas, rivers, lakes, mountain glaciers, and streams. The various schools differ, however, in their interpretations of laws pertaining to irrigation. With regard to the right to use water for irrigation purposes, Sunnite doctrine stresses the community's right to large bodies of water. It also recognizes the rights of riparians; on small rivers and

canals and in instances when water is scarce, Sunnite doctrine states that the upper riparian has priority in the use of water. The right to use water for irrigation is restricted to an amount that will irrigate the user's land to a level that "does not reach above a man's ankle." Also according to Sunnite doctrine, small rivers and canals are viewed as the joint property of those who use them, and their use should be based upon mutual agreement among the riparians.

Shiite doctrine, on the other hand, states that the right to use water of natural streams, wells, or lakes for irrigation purposes is dependent upon the availability of water. When water is sufficient, everyone can satisfy all of his needs. When water is scarce, however, it should be allocated in accordance with the respective size of the plots held by riparians. Upper riparians have priority in irrigating their land but are limited to their proportionate share. Water in man-made irrigation channels is also divided proportionately among the users, in this case, according to the funds invested by the riparians.

According to Islamic law generally, no one has the right of exclusive use of the water passing through his property, and the lower riparian's right must be respected by the upper riparian. Furthermore, riparians are forbidden
to alter the conditions of a water course in a way that may cause harm to other riparians. Finally, all riparians are jointly responsible for maintaining and cleaning water courses.

It can be seen from these precepts that Islamic rules stress the principle of community rights in water. Full agreement is lacking, however, as to how water is to be allocated between upper and lower riparians.\(^3\)

Muslim law was originally codified by the authorities of the Ottoman Empire between 1300 and 1922, and the codification process was decreed by various Ottoman sultans. The early Ottoman code remained basically unchanged until 1854. A large number of reforms instituted between this year and 1876 resulted in a civil code known as the Majelle Code, which was maintained until the collapse of the Ottoman Empire following World War I. The Majelle Code was influenced by and based upon Muslim principles, and its impact continues to be felt in all of the Muslim countries which were under Ottoman domination, although these states have now largely replaced the Code with their own national water laws.

According to the Majelle Code, water is defined as a non-salable commodity to which everyone has the right of free access. The right to use water to quench thirst

\(^3\)Ibid., pp. 14-23.
requires free access to both public and private sources. With regard to irrigation rights, the Majelle Code emphasized two important principles. First, everyone is entitled to use the water of public streams for the purpose of irrigation, and the construction of canals, ditches, and other installations for the purpose of irrigation is also the right of everyone, provided that such installations do not cause damage to the water rights of others. The right to water in private irrigation channels is restricted to riparian landowners along those channels. Maintaining public rivers or canals is the responsibility of the state, and the state has the right to charge fees of some kind to those who benefit from the water system. Private waterways are to be maintained by riparians who own land along those water courses.  

Part of the Tigris basin lies in the area that was formerly ancient Persia, and the water law in this region was therefore shaped by Persian tradition. Later the spread of the Muslim faith into Persia influenced water rights and water management in Iran. This heritage is examined in greater detail in the following section, which

"Ibid., pp. 36-40.

discusses water law and administration in each of the four riparian states of the Tigris-Euphrates valley.

**Water Law and Administration in the Four Riparian States**

Despite the common heritage of the four riparians, their water laws and administrative systems have developed separately to reflect each country's particular conditions and needs. In turn, these national water systems shape the development and management of water resources and the rights of individuals to water. Thus, it is necessary to examine the experience of the four nations in order to ascertain how their legal and administrative systems may influence the nature of the conflict or cooperation among the riparians over water. Water legislation and the administrative systems of the four riparian nations in the Tigris-Euphrates basin are surveyed below.

**The Legal and Administrative System for Water Resources in Turkey**

Water law is more complex in Turkey than in the other three riparian nations. Turkey's present water legislation and administrative system were influenced by the Ottoman civil code, the Turkish civil code of 1926, and the Turkish constitution of 1960. Under the Ottoman Empire, the basis for water rules was the Majelle Code, which was founded on Islamic principles, as mentioned
previously. After the creation of the secular state of Turkey in 1923 and Ataturk's rise to power, a new civil code was enacted. This code, like its predecessor, the Majelle Code, stated that water resources are for the common good and belong to the nation. Groundwater and water from springs, however, were regarded as part of the land from which they came, and the ownership of such water could therefore be transferred with the ownership of the land. According to the civil code of 1926, the landowners had full control over groundwater and water from springs and could use or retain those water resources as they saw fit. Thus, with the exception of groundwater and water from springs, under the provisions of the civil code of 1926, water was public and subject to state control.6

Turkey's constitution of 1960 changed the law pertaining to groundwater, declaring it also to be a part of the public domain. Groundwater became state property, and ownership of land no longer embodied any special right to its groundwater resources.7 The constitution of 1960

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also required that the drilling or modification of wells or any other changes that might alter the amount of groundwater to be pumped be authorized by the General Directorate of State Hydraulic Works (GDSHW)." 

In contrast to groundwater, which is regulated by the state, surface water in Turkey is largely unregulated. Consumptive use of surface water, such as for domestic purposes, or irrigation, does not require prior governmental permission. The use of water resources in non-consumptive endeavors, such as generation of hydraulic power or fishing, however, does require permission from public authorities."

Turkish law includes no general statutory provisions setting priorities among various uses in times of water shortage, but some specific priorities have been established pertaining to holders of water rights and for certain uses of water. For instance, the constitution of 1960 stated that, in times of water shortage, those holding rights which are senior in time have first priority over those with rights that are junior to theirs."

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of priorities based upon the length of time a holder has had a permit is made by the GDSHW. In addition, some priorities specify which users will be served first. The civil code provides that the GDSHW should allocate water resources in times of scarcity based upon such criteria as the basic needs of communities; the population of communities; communities where per capita water supply costs are lowest; communities that contribute spring water, money, or land; and communities that have the most cooperative attitude toward government efforts with regard to water activities. For each new water project, the GDSHW determines the amount of emphasis that is to be given to flood control, irrigation, land reclamation, power generation, and other possible uses of water.\textsuperscript{11}

Turkey has no central administrative agency responsible for all aspects of water management, but on the national level several public agencies perform important functions pertaining to water resources. The state planning organization, for example, is responsible for formulating short- and long-range plans, including plans for water resources.

The Ministry of Power and Natural Resources, which was created in 1964, has broad authority over all natural resources and energy. This ministry is subdivided into

general directorates that are in charge of various types of natural resources. The directorates pertaining to water resources are those for Turkey's hydraulic works, the power survey and the Turkish electricity organization, and water supply and sewage disposal systems for large cities. Generally, within the Ministry of Power and Natural Resources the main division for water is the GDSHW, which is responsible for planning, developing, and coordinating the nation's water resources. The GDSHW is also responsible for formulating basin-wide plans and submitting them to the state planning organization for approval. It issues permits for the development and use of groundwater resources, plans and develops water supplies for cities and villages, and constructs and maintains public irrigation works. The General Directorate for Soil Conservation and Irrigation within the Ministry of Power and Natural Resources is responsible for the inventory of small streams and springs and for controlling private irrigation networks that are fed by the public irrigation system.

A number of other ministries in Turkey have more limited responsibility for water resource activities. The Ministry of Rural Affairs and Cooperatives is responsible for maintaining the public water supply of villages, and the Ministry of Public Works carries out flood control and navigation activities. The Ministry of Food,
Agriculture, and Animal Husbandry protects fish-breeding areas in public streams and lakes. Pollution control is primarily the responsibility of the Ministry of Health and Social Assistance. Municipal health authorities, which function under the supervision of this ministry, are responsible for protecting potable water supplies in cities and villages.

Most of these Turkish administrative departments with responsibility for water resources have offices that administer programs in individual regions and in local areas. Local governing councils and the chief executives of local governments also play important roles in providing input for national plans and in coordinating the activities of the various governmental departments within their jurisdictions.12

Like water law, the financing of water resource activities and development in Turkey is more complex than in the other three riparian countries, since regional and local governments must provide funds to help pay for development projects in their jurisdictions. When the level of investment is beyond the capacity of these local and regional bodies, however, the national government finances

projects. User fees, when appropriate, also help to raise the necessary monies to develop and maintain water facilities.

No special court in Turkey is designated to hand down decisions in disputes over water rights and water use, but agencies such as the Ministry of Power and Natural Resources have established procedures for administrative appeals. Furthermore, the decisions of such agencies may under certain circumstances be appealed to the civil courts or, in some instances, to the Council of Ministries.\(^{13}\)

**The Legal and Administrative System for Water Resources in Syria**

The basis for Syrian water law during the period of Ottoman domination, the Majelle Code, continued to be used in the post-World War I era, when Syria was controlled by France. A number of legislative decrees related to water use were issued during the French mandate period, but most of them dealt with specific water problems and did not alter the nation's fundamental water law.\(^{14}\)

After Syria gained independence in 1946, its water law and administrative system remained basically unchanged.

\(^{13}\)Ibid., pp. 247-253.

until the country was unified with Egypt in 1958. Most natural resources were nationalized during this period. The constitution of 1969, for example, instituted public ownership of natural resources, including water. Public water today, therefore, is under the control of the state, and the right to use water must be granted by public authorities.\textsuperscript{15} Despite the constitutional provision nationalizing natural resources, however, private water rights still exist in Syria.\textsuperscript{16} Private water rights, whether to surface water or groundwater, may be acquired through ownership of land, but the water may not be used without governmental permission.

The use of groundwater, whether public or private, is subject to regulations imposed by the Ministry of Public Works and Water Resources. These regulations control methods of drilling, conserving, and reporting and determine the amounts of water that may be used.\textsuperscript{17}


\textsuperscript{16}Syria, Legislative Decree No. 84 of May 1949, implementing the civil code, Article 769, in Caponera, \textit{Water Laws in Moslem Countries}, Vol. II, p. 282.

Water legislation in Syria does not specify priorities among different types of water use. Despite the lack of formal priorities, however, the country's national plans assume a hierarchy of needs in directing the development of water resources, and, in this sense, Syria does set priorities as to who will be given scarce water resources and to what uses those resources will be put.¹⁸

The administrative system of water resources in Syria, to a large extent, is similar to the system of Iraq. The Ministry of Public Works and Water Resources is primarily responsible for all water planning and development. It conducts geological and hydrological surveys, plans and undertakes water development projects, and allocates water resources in each basin or area.

A number of other national ministries are also involved in some aspects of water management. For example, the Ministry of Agriculture and Agrarian Reform contains divisions that directly or indirectly affect water and irrigation activities. This ministry finances agricultural cooperatives and agricultural development and regulates fishing and the protection of aquatic life.

Control of water pollution is mainly the responsibility of the Ministry of Public Health. This ministry defines the quantity and quality of municipal and industrial discharge into water courses, and in each province a division of the ministry is responsible for administering environmental health programs and supervising waste water facilities. The Ministry of Agriculture and Agrarian Reform is also involved in the task of pollution control as it pertains to agriculture and fish and aquatic life.

In addition, a number of other agencies on the national level in Syria perform vital water resource activities. Perhaps the best known of these is the Organization for the Utilization of Ghab Lands, which has legal, administrative, and financial autonomy. This organization represents a multiple-purpose approach to the management and development of irrigation for Ghab Lands projects. Similarly, the Ministry of the Euphrates Dam is responsible for managing the Euphrates Multipurpose Project, and the High Committee of the Euphrates Project is in charge of establishing general policy for this project and coordinating its plans within the general framework of Syria's national development plan.

Local governments in Syria are responsible for water resources within their individual jurisdictions. Each provincial council must provide a water supply, electricity,
and a network of canals for local irrigation. These councils are also responsible for maintaining rivers and implementing flood control measures. City and town councils carry out all activities related to the development of their communities, including the operation of water supply and waste water facilities. Since the authority of city governments includes both urbanized areas and the rural agricultural land surrounding them, these councils are also responsible for implementing agricultural plans and for improving irrigation canals within their jurisdictions.\textsuperscript{19}

Financing irrigation activities is the responsibility of Syria's national government. Most financial contributions are made directly from central budget appropriations, but the government also collects user fees to help meet the cost of administering water programs.

Syria does not have a special court to deal with water disputes; instead conflicts over water are resolved through administrative authorities or in the regular civil courts. Rights to public and private water are protected under provisions of the civil law governing land ownership, but public authorities have the power to modify, reallocate, or cancel the water rights of those who violate

conditions in their water permits. Public authorities also have the power to cut off water supplies temporarily or to cancel permits authorizing the installation of pumps in the public irrigation system when users do not comply with the conditions laid down in those permits. In such circumstances the individual water user may appeal, first through the administrative process and, in some instances, to the civil courts.  

The Legal and Administrative System for Water Resources in Iraq

A highly advanced irrigation system was developed in Iraq thousands of years ago. The ancient civilizations of Sumer, Akkad, Babylon, and Assyria in Mesopotamia engaged in agriculture upon a level that required irrigation and water control systems. The rise of these early civilizations and the prosperity of the inhabitants of this region from earliest times depended upon the extent to which they were able to control and effectively use the waters of the Tigris and Euphrates Rivers, and water management practices and customs from these ancient peoples have continued to influence the water practices in the Tigris-Euphrates basin.

\[^{20}\text{Ibid.}, \text{pp. 296-297.}\]

During the period of the Ottoman Empire, the Majelle Code shaped public laws, including those concerned with the use of water, in Iraq, and that code continued as the basis of Iraq's water law even after the breakup of the Ottoman Empire. This was also true in the years that Iraq was under the control of Britain, even though new legislation pertaining to water was gradually developed during these years.

Independence in 1932 did not drastically change public law and the administration of water in Iraq. The law pertaining to water rights remained basically the same, although more attention was given to water development projects and flood control, especially in the 1950s.  

After the Iraqi revolution of 1968, a new constitution gave greater emphasis to water resources. The Iraqi constitution of 1970 stated that natural resources are the property of the nation and that natural water courses such as rivers, lakes, reservoirs, streams, and ground aquifers are a part of the public domain.

The right to use public water is authorized by state legislation, and administrative agencies are empowered to

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manage water resources. At the local level, each municipality has an irrigation authority which is responsible for allocating water to those who want to divert or install pumps on public waterways. These irrigation authorities determine the amount of water that can be diverted and supervise the diversion and use of water.

Private rights to water from springs and wells, however, may still be acquired through ownership of the land on which such springs or wells are located, and use of such water does not require the issuance of a license or governmental permit. Irrigation authorities nevertheless have the right to prevent waste or abuse of private water resources.\(^2\)

The availability of ample surface water from the Tigris and Euphrates Rivers in Iraq has tended to retard the full development of groundwater, and, as a result, relatively little legislation pertains to groundwater resources or their administrative development. Existing wells in Iraq are used mainly to supply water for drinking and domestic purposes, and they are regulated, for the most part, by traditional customs. Individuals may drill wells on

private property without formal or prior authorization from the state.\textsuperscript{25}

Iraq's present water legislation does not specify priorities among various uses of water—for example, municipal purposes versus irrigation. Despite this lack of formal priorities among uses, however, the Iraqi national plan for water development necessarily rests upon an assumed hierarchy of needs, and, in this respect, Iraq does set priorities as to what uses will be given priority.\textsuperscript{26}

The major responsibility for water administration in Iraq lies with the Ministry of Irrigation, which is responsible for planning and developing all water resources in the country. It is also responsible for the allocation of water rights and for supervising and coordinating the activities of all local irrigation authorities.

Other national agencies are also involved in water management. For instance, the Ministry of Agriculture and Agrarian Reform, in cooperation with local irrigation authorities, is responsible for the management of fishing and the protection of aquatic life as well as for


\textsuperscript{26}Khadduri, Socialist Iraq, pp. 134-135.
the operation and maintenance of certain drainage canals on lands managed by the ministry. The Ministry of Municipalities plans for the water needs of municipalities and villages, and one of its divisions is responsible for the development of artesian wells to provide water for cities and villages. The maintenance of municipalities' domestic water facilities and waste water treatment installations is also directed by this ministry.²⁷

Control of water pollution is primarily the responsibility of the Ministry of Health, which determines the quantity and quality of municipal and industrial discharge into water courses. Regulations require that municipal and industrial waste must be treated and that waste water must meet specified standards of purity prior to being discharged into public water courses. The Ministry of Agriculture and Agrarian Reform is also involved in pollution control as it pertains to agriculture and to fish and aquatic life.²⁸

At the local level, each municipal council in Iraq plans needed public facilities, including those for potable and waste water, and is responsible for their construction and management. Since Iraq has a unitary governmental


²⁸Ibid., p. 105.
system, each of the ministries with responsibility for water resources is represented in the city council.

A number of semi-autonomous public institutions under the Ministry of Agriculture and Agrarian Reform are also involved, to varying degrees, in the planning and management of water resources. For instance, the Agriculture Bank, which is responsible for the development and mechanization of the agricultural sector, provides loans to farmers and other agricultural institutions for the construction and improvement of agricultural projects, including water projects. Another such agency, the Cooperative Bank, provides financial aid for agriculture and water cooperatives. Other land development agencies, such as the Big Musayab Project, are responsible for managing agrarian reform lands within their project areas and are required to provide irrigation facilities in those areas. Finally, the State Organization of Excavation and Agricultural Stations has several missions pertaining to water resources. It constructs and maintains dikes, canals, and drainage facilities and aids in the development of groundwater resources.

Financing water development projects in Iraq is the responsibility of the national government, which appropriates funds for water programs directly from the central budget. The government also collects user fees
in some instances to help defray the costs of maintenance and operation.

Iraq does not have a special court to deal with water disputes; conflicts over water rights are resolved through administrative authorities or the civil courts. Failure to comply with conditions for water use established by an irrigation authority or misuse or waste of water may lead to a cancellation of the water use permit issued by the authority. Such a cancellation is carried out after an administrative proceeding in which the water user is formally charged with the violation. The irrigation authority may also charge an individual before the courts for failure to conform to governmental regulations.\textsuperscript{29}

\textbf{The Legal and Administration System for Water Resources in Iran}

The ancient Persian irrigation system was utilized for thousands of years. Since rainfall and river water were sufficient to support life and agriculture only in the regions extending from the Caspian Sea to the mountains, Persian engineers were obliged to develop a means of transporting groundwater for long distances. A number of wells on a sloping terrain were connected by trenches in a system called a ghanat so that gravity would cause the water to flow from all the wells to the desired

\textsuperscript{29}\textit{Ibid.}, pp. 108-111.
destination. Although this ancient method of irrigation is no longer generally employed in Iran, some 2,200 ghanats are still in operation. Early rules regulating canals and ghanats were shaped by the earlier civilizations that figured prominently in Persia's history, including the Chaldees, the Babylonians, and the Hittites. Muslim principles, however, later superseded much of these ancient influences.

By the beginning of the twentieth century, water legislation was enacted as a part of the Persian civil code. More recently, water rules in Iran were organized in a special water code. In 1964, the government of Iran nationalized all water resources, and in 1968 it enacted a detailed water code.\(^3\)

Under the provisions of the 1968 water code, the use of all water, except groundwater, for limited domestic, drinking, sanitary, or gardening purposes requires governmental approval. Use of groundwater in amounts exceeding 25 cubic meters per day is also subject to governmental control. The drilling of water wells is regulated by government, and persons who drill wells are responsible for installing equipment to measure water use and are

\(^3\)Caponera, Water Laws in Moslem Countries, Vol. I, p. 74. No currently available information indicates that this water code has been modified since the Iranian revolution of 1979.
required to report the quantity of water used to the Ministry of Water and Power. All allocations of surface and groundwater for irrigation purposes are made by this ministry.\textsuperscript{31}

The Nationalization Act of 1964 also prohibited the pollution of water and granted the Ministry of Water and Power the authority to control water quality. In controlling pollution, the Ministry of Water and Power coordinates and consults with other concerned public agencies in order to set standards. Under existing rules, those using water are obligated not to pollute water sources and to institute water purification and sewage control measures where needed. These water purification facilities must be approved and are supervised by the Ministry of Water and Power.\textsuperscript{32}

Water development projects have been an important component of Iran's national development plans since the 1950s. The Ministry of Water and Power, which was created in 1964, has primary responsibility for safeguarding and developing water resources throughout the country. This agency is responsible for ensuring that the water needs of


\textsuperscript{32}Iran, Water Nationalization Act, Articles 19, 55, 56, 57, and 58, in Caponera, \textit{Water Law in Moslem Countries}, Vol. I, p. 81.
various users are considered and that water development and distribution are undertaken in a manner that will meet the social needs recognized in the national plan. Electric power production and distribution are the responsibility of ministry as well.

A number of other national agencies also perform vital water management functions. The Ministry of Agriculture has some authority over the development of water resources and projects affecting the agricultural sector. Specialized agencies in various other ministries also perform data collection or planning functions. These agencies include the Meteorological Department of the Ministry of Roads, the General Department of Environmental Sanitation of the Ministry of Health, and the Department of Geology of the Ministry of Industry and Mines.\textsuperscript{33}

A number of semi-autonomous authorities in Iran, similar to river valley authorities in the United States, are responsible for planning and constructing multiple-purpose water projects. The best known of these are the Khuzistan Water and Power Authority, the Kayaj Dam Authority, the Sefid-Rud Water and Power Authority, and the Azarbjan Water Authority. The Ministry of Water and Power is responsible for coordinating the activities of these

agencies in the general framework of the national plan. National agencies such as the Ministries of Interior, Health, and Natural Resources and the Game and Fish Department also participate in a limited manner in the management of water resources, particularly in the area of pollution control.\(^3^4\)

Financing water development projects is primarily the responsibility of Iran's national government. Most of these financial contributions are made directly from central budget appropriations, but the government collects some user fees to help defray the costs of management.

On the regional and basin level, water is allocated by committees appointed by the Ministry of Water and Power. These committees are responsible for evaluating land and water resources in the region and for recommending the issuance of water use permits. An administrative appellate process is also a part of this system.

Locally, water users are organized into cooperatives for the development and management of individual irrigation canals. Under Iran's national law, such cooperatives receive financial aid. Water boards created by the Ministry of Water and Power provide technical and financial assistance to the cooperatives and are responsible for

\(^{34}\)Ibid., pp. 90-92.
supervising the use of water. These boards also attempt to resolve disputes between water users.

Persons who have water permits are obligated to maintain their waterworks and structures in order to avoid waste and non-beneficial uses. When joint users of any water course fail to implement construction recommended by the Ministry of Water and Power, an agent of the ministry will undertake the required action and charge the users the cost plus interest.\(^3\)\(^5\)

Iran has no special court for settling conflicts over water. Water disputes are adjudicated by the regular courts of law. In lawsuits related to water, reports of the officers of the Ministry of Water and Power pertaining to conflicts over water rules are received as evidence before the court. The ministry has the power to inspect the implementation of water law, and its inspection agents have many of the powers of a police force.\(^3\)\(^6\)

Similarities and Dissimilarities in the Systems of the Four Riparian Nations

The legal and administrative systems of the four riparian nations embody a number of similarities and dissimilarities that may affect those nations' willingness to agree to a basin-wide management system. One similarity is that the water systems of all four countries have been

\(^3\)\(^5\)Ibid., pp. 89-90. \(^3\)\(^6\)Ibid., p. 93.
influenced by the Islamic tradition, which stresses the right of the whole community to water resources and stipulates that upper riparians may not change the natural conditions of water flow so as to injure lower riparians. This tradition, however, has been interpreted differently by various sects of the Muslim faith, and these interpretations, in turn, have caused the laws pertaining to water use to vary somewhat in the nations of the Tigris-Euphrates valley.

Each of the riparians has a national development plan that includes, among other things, provisions for water development projects. Each of the four states also has a central national agency with primary responsibility for planning, developing, and allocating water resources. The degree of centralization in these agencies, however, varies from one country to another.

All four of the riparians have nationalized water resources, although private rights to water are still recognized in Iraq and, to some extent, in Turkey. The varying emphases of the riparians' national plans have, in effect, set different priorities for the development and use of water in the four countries. For instance, Turkey's early development plans stressed progress in the areas of industry and hydroelectric power generation,

\[37\] Ibid., p. 27.
which shaped the water policies of the nation. Iran's early plans also stressed industrial development. Iraq and Syria, on the other hand, gave greater emphasis to agriculture and the development of irrigation projects, which influenced the formulation of their water policies differently. The varying developmental strategies of the riparians may cause conflict in any future attempts to develop a basin-wide water system. \(^3^9\)

Another dissimilarity among the four states in the Tigris-Euphrates valley is that Turkey does not allocate rights to the use of surface water and in effect relies upon the riparian system to determine such rights, despite the statement in the Turkish constitution that all waters belong to the nation. Furthermore, Turkey sets priorities for water rights and use in some instances, whereas the other three countries do not. This lack of agreement on priorities for water use, coupled with the dissimilarities in the emphases of the riparians' national development plans, may complicate future negotiations regarding a basin-wide system.

Dissimilarities also appear in the four states' administrative systems with regard to the use of groundwater. Turkey, Syria, and Iran emphasize the importance of groundwater more than Iraq. In Iraq groundwater is

\(^3^9\)Askari and Cummings, pp. 432-440, 457-462.
treated as if landowners also owned the water beneath the land, despite the fact that the Iraqi constitution nationalized these resources.

As development in all four of the riparian states continues, competition among the users of water will inevitably be heightened. In conjunction with this increased demand for water, differences in the legal and administrative systems of the countries and in the emphases of each of their development plans will become obstacles to cooperative action in the Tigris-Euphrates basin.
CHAPTER VI

HISTORY OF INTERNATIONAL RELATIONS AND INTERNATIONAL LAW PERTAINING TO THE WATERS OF THE TIGRIS AND EUPHRATES VALLEY

The history of international relations and law is vital to an understanding of the conditions and problems in any international drainage basin since the history of a region may either facilitate or impede international agreements about water. This chapter on the history of international relations and law as they have affected the waters of the Tigris and Euphrates basin is composed of two sections. The first examines the history of international relations as they pertain to the waters of the Tigris and Euphrates drainage basin, and the second analyzes the role of international water law in regulating competition in water use, particularly in the Tigris and Euphrates valley.

International Relations and Water Resources in the Tigris and Euphrates Valley

History of Navigation

The current issue of navigation on the Shatt Al-Arab waterway is an aspect of the boundary dispute between Iraq and Iran with deep historical roots. As previously stated,
the Tigris and Euphrates Rivers are shared today by four countries: Turkey, Syria, Iraq, and Iran. Most of the arable land along both rivers, however, is located in Iraq. These geographical factors have made Iraq the center of many ancient civilizations, such as those of Sumer, Akkad, Assyria, and Babylon.¹ The struggle over the boundary between the areas known as Iraq and Persia affected the political history of the region for centuries, and evidence of this conflict is still apparent between the modern states of Iraq and Iran.²

By the seventh century A.D., Baghdad in present-day Iraq was the capital of the Islamic Empire that conquered the Persians and continued as a major power in the region until the rise of the Ottoman and Persian Empires in the sixteenth centuries. During that century much of the Middle East, including the lands which are now the states of Iraq and Syria, were under the control of the Ottoman Empire. The conflict between the Ottomans and the Persians focused primarily on their boundaries in the area of modern Iraq. During that period several treaties were entered into by the two rival powers. The most important


of these, the Zuhab Treaty, signed in 1639, defined the boundaries between Persia and the Ottoman Empire. By 1730, however, the empires were again at war over their shared frontier, and another treaty in 1746 reset the boundary in the same position as that stipulated under the provisions of the Zuhab Treaty. In both of these treaties the region of Arabistan, which was inhabited by the Al-Kaab Arab tribe, was designated as a part of the Ottoman Empire's territory but was recognized as semi-autonomous because the Ottomans found it difficult to control. The treaties of both 1639 and 1730 stated that the Shatt Al-Arab waterway was entirely under the jurisdiction of the Ottoman Empire (see Figure 8).

Despite these attempts to resolve their ongoing border dispute, the tension between the Persians and the Ottomans continued, and in 1821 another war between the powers broke out, which ended in 1823 with yet another treaty, the first treaty of Erzerum. Again, the boundaries that had been defined in the earlier treaties between the rival states were reaffirmed.\(^3\)

By the nineteenth century, European imperialists had entered the Tigris-Euphrates valley. Britain's trade expanded and its power grew in the Middle East, and the

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\(^3\)Tareq Y. Ismael, *Iraq and Iran: Roots of Conflict* (Syracuse, New York, Syracuse University Press, 1982), pp. 1-3.
Fig. 8—Border between the Ottoman and Persian Empires established by the treaties of 1639 and 1730.*

influence of European nations changed the balance of power and the nature of the relations between the Ottoman and Persian Empires. In addition to its involvement in trade with both the Ottomans and the Persians, Britain wished to ensure an avenue of communication with India through the region. Furthermore, the discovery of oil in both Persia and Iraq around the turn of the twentieth century enhanced Britain's attraction to the region.

Britain's objectives, however, were challenged by Russia during this period. Russia, too, was interested in the region for several reasons. Of these, trade and resources were the most obvious, but concern over defense and the possibility of gaining access to a warm-water port caused Russia to covet land in the Tigris-Euphrates valley. Between 1804 and 1813 and again between 1826 and 1828, Russia fought wars with Persia and annexed large areas of Persian territory. Russia also fought a war with the Ottoman Empire in 1828, and, as a result of these conflicts, it gained great influence in the region.

Despite their rivalry with the Ottomans and the Persians, Britain and Russia had an interest in preserving their empires as buffer states to stop the imperialist ambitions of other European countries. As a result, both Britain and Russia cooperated in controlling the affairs of the greatly weakened Ottoman and Persian governments,
and they viewed the resolution of the frontier dispute between the Ottomans and the Persians as a major goal.

In 1843, at the urging of these two European powers, a committee composed of representatives from the Ottoman and Persian Empires, Russia, and Britain was formed to seek a solution to the boundary conflict. In 1847, this committee's efforts led to the second treaty of Erzerum and the creation of a delimitation commission to establish a boundary between the Ottomans and the Persians. Under the provisions of this treaty, the boundary was reset and Persia was given a large segment of the contested territory, including most of the area known as Arabistan (see Figure 9).

Yet, subsequent to this agreement, conflict over the boundary continued. In explaining how the decisions establishing the new boundary were made, one historian argues that the Ottomans did not fully represent the interest of Iraq in the negotiations and that Persia gained greater benefit from them because Britain was seeking to gain greater influence than Russia in Persia, whereas in the Iraqi region Britain had no competition. It was therefore to Britain's advantage to induce the Ottomans to give more concessions to Persia. In spite of these pressures from Britain, the Ottomans did not compromise away their control

*Ibid., pp. 5-6.*
Fig. 9--Border between the Ottoman and Persian Empires established by the second treaty of Erzerum.*

over the Shatt Al-Arab waterway, which remained entirely under their jurisdiction, and this was to become a major point in later disputes over navigation.\(^5\) In sum, the 1847 treaty and the endeavors of Britain and Russia to resolve the frontier disputes between the Ottomans and the Persians were unsuccessful in that the border delimitation commission did not complete its mission because of political instability in both the Ottoman and Persian governments.

By the beginning of the twentieth century, Britain and Russia recognized that the Ottoman-Persian frontier conflict was continuing to be a destabilizing factor in the region, and as a result they again attempted to persuade the parties to settle their dispute. In 1911, a protocol was signed in Teheran to create another joint commission for the purpose of delimiting the frontier between the Ottoman and Persian Empires. This commission included Ottoman, Persian, British, and Russian representatives. Like its predecessor, the commission failed because of the expansionist objectives of Persia in the region of the Shatt Al-Arab waterway.\(^6\) Persia's ambitions

\(^5\)Ibid., pp. 8-9.

threatened the Ottoman Empire, which refused to relinquish its control over the eastern bank of the waterway, but, again, Britain and Russia placed pressure on the Ottoman government, and as a result, in 1913, the two empires signed the Constantinople Protocol.

Under the terms of this agreement, both Russia and Britain were given ultimate power to resolve the dispute over the boundary between the Ottomans and the Persians. The protocol respecified the boundary that had been established by the treaty of 1847 but gave some islands in the Shatt Al-Arab waterway to Persia (see Figure 10). The work of the boundary commission was completed just as World War I broke out in 1914.

It has been argued that the agreement of 1913 between the Ottomans and the Persians was influenced by two external factors, the increasing involvement of Germany in the politics of the region because of its penetration into Ottoman affairs and the oil concession of 1901, in which Britain obtained rights to exploit oil resources in Persia. These two factors motivated Britain and Russia to favor the Persians more than the Ottomans with regard to their frontier disputes.⁷

After World War I, the balance of power in the region changed entirely. The defeat of the central powers with

⁷Ismael, pp. 9-11.
Fig. 10--Border between the Ottoman and Persian Empires established by the Constantinople Protocol.*

which the Ottoman government had allied itself\(^8\) and the
Russian revolution, which reduced Russia's influence outside its borders, left the Allies, particularly Britain and France, as the dominant European powers in the Tigris-Euphrates valley. The Ottoman Empire was dissolved, and the states of Turkey, Syria, Iraq, and other nations in the Middle East were created.

In this new environment Britain attempted to increase its influence in Iran by assisting that nation's new ruler, Rezakhan, as he sought to consolidate his power. Britain also aided Rezakhan's government in achieving its ambition with regard to Arabistan, and in 1925 it supported his occupation of that region and the change of its name to Khuzistan.\(^9\)

One international historian again has argued that the real reason for Britain's support of Rezakhan was that the growing nationalism among the inhabitants of Arabistan was causing unrest in an area that was important to the security of Britain's commerce and oil enterprises. By supporting Rezakhan's control over Arabistan, Britain sought to stabilize a region that was very important to its interests.\(^10\)

\(^8\)Amen, p. 9.


In the period between the two world wars, both Iraq and Syria emerged as semi-independent states under the mandates of Britain and France, respectively. In 1932, Iraq became an independent country, and in 1946 Syria also gained its independence. Although, as previously noted, the Euphrates River flows from Turkey through Syria and Iraq, no conflict existed among the three countries over the use of water at that time. Turkey was engaged in one boundary dispute with Iraq over the Mousal province and in another with Syria over the Alexandretta province, but, despite their seriousness, after these conflicts were resolved, they did not affect the water issue.

Conflict over navigation on the Shatt Al-Arab waterway between Iraq and Iran, however, continued. In 1934, Iraq appealed to the League of Nations in protest of Iran's violations of previous treaties. No decision was made by the League, and in 1936 Iraq and Iran entered into negotiations on the frontier dispute. In the following year, they signed a treaty under whose provisions Iran again

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gained additional territory adjacent to the Shatt Al-
Arab^14 (see Figure 11). Article 2 of this treaty stated,

At the extreme point of the island of Sho-
tait . . . the frontier shall run perpendicularly
from low water mark to the thalweg of the Shatt
Al-Arab and shall follow the same as far as a
point opposite the present jetty No. 1 at Abadan.
. . . From this point it shall return to low
water mark and flow the frontier line indicated
in the 1914 minutes.\textsuperscript{15}

It has been argued that the gains of Iran under the
terms of the 1937 treaty may be ascribed to two factors.
First, during this period Iraq was weakened by political
instability resulting from a military coup d'état.
Second, the fact that the Britain-Iran oil refineries
were located close to the Shatt Al-Arab at Abadan enabled
Iran to exercise more leverage in the negotiations and
bargaining process than it would otherwise have been
able to muster.\textsuperscript{16}

After World War II, the balance of power in the
Tigris-Euphrates region changed again. The rise of the
United States and the Soviet Union as superpowers and the
emergence of opposing east-west coalitions influenced the
conflict between Iraq and Iran with regard to their fron-
tier and navigation disputes.

\textsuperscript{14}Iraq, Foreign Ministry, Consultative Committee, pp.
41-42.

\textsuperscript{15}Ismael, p. 16. \textsuperscript{16}Al-Rawie, p. 63.
Fig. 11--Border between Iraq and Iran established by the treaty of 1937.*

In the mid-1950s, Britain, Turkey, Iraq, Iran, and Pakistan signed the Baghdad Pact, forming a western alliance to act as a front against Soviet aggression. Some scholars believed that this alliance would lessen the conflict between Iraq and Iran that could otherwise be a destabilizing influence in the region.

After the Iraqi revolution of 1958, which deposed the monarchical system in that country, Iraq's boundary dispute with Iran, particularly over the Shatt Al-Arab waterway, was revived. The conflict became even more serious after the Socialist Arab Ba'ath Party came to power in Iraq in 1968, and, at the same time, Arab nationalism was growing in Arabistan. Other factors contributing to the dispute between Iraq and Iran were the Arab-Israeli conflict and the growing friendship between Iraq and the U.S.S.R. These developments led the Iranian government to abrogate the 1937 treaty unilaterally and in retaliation to give support to the insurrection of Mustafa Al-Barzani's faction of the Kurds in northern Iraq.\(^{17}\)

By 1971, three Arab islands in the Arabian Gulf had been occupied by Iran, and in effect a state of war existed between the two countries.\(^{18}\) Iraq severed its

\(^{17}\)Ismael, pp. 18-19.

\(^{18}\)Iraq, Foreign Ministry, Consultative Committee, pp. 92-93.
diplomatic relations with Iran and made formal protests to the United Nations Security Council and the Arab League.

Between 1971 and 1974, numerous clashes occurred between Iraq and Iran. In 1974, Iraq again attempted to turn the issue over to the United Nations, but before the U.N. acted OPEC leaders at a meeting in Algeria proposed that the two countries mediate their differences and that the president of Algeria meet with the vice-president of Iraq and the shah of Iran in an attempt to resolve the issue. As a result of these meetings, the disputants entered into a treaty in 1975, which stipulated that the boundary between Iraq and Iran along the Shatt Al-Arab waterway would follow the thalweg line in the waterway (see Figure 12). Under the provisions of this agreement, Iraq received some disputed territories from Iran in return for accepting the Shatt Al-Arab boundary. The treaty was not fully implemented, however, as a result of the political instability of the shah's regime, and Iraq never received these territories.¹⁹

The shah of Iran was overthrown in 1979 in a revolution that affected peace in the Tigris-Euphrates valley. The attempt by Iran's new leaders to spread unrest through their involvement in the internal affairs of other

Fig. 12--Border between Iraq and Iran established by the treaty of 1975.*

nations in the region, particularly Iraq, led to skirmishes between the Iraqi and Iranian armies. In early September of 1980, Iran closed the Shatt Al-Arab waterway to navigation, and war subsequently broke out between the two countries. As can be seen from this history, navigation on the Shatt Al-Arab waterway has been continuously influenced by the international relations of the various powers in the Tigris-Euphrates valley.

**History of Water Diversion**

Until the post-World War I era, water diversions from the Tigris and Euphrates Rivers did not constitute an international problem because these streams were entirely within the jurisdiction of one national entity, the Ottoman Empire. Even after the creation of the modern states of Turkey, Syria, Iraq, and Iran, the diversion of water did not create conflict because the amount of water taken from the rivers represented only a very minimal portion of the total flow. Ample water was available to satisfy the needs of all of the riparians at that time. As irrigation increased in the 1920s, however, minor shortages began to occur. These shortages,

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20 Al-Rawie, pp. 98-106.

in conjunction with other difficulties over the waters of the Jordan River, led the mandate powers, Britain and France, to include in a treaty signed in 1920 a provision for creating an international commission to study the various irrigation plans that were being proposed for the Tigris and Euphrates Rivers. Article 3 of this treaty stated,

The British and French governments shall come to an agreement regarding the nomination of a commission, whose duty it will be to make a preliminary examination of any plan of irrigation formed by the government of the French mandatory territory, the execution of which would be of a nature to diminish in any considerable degree the waters of the Tigris and Euphrates at the point where they enter the area of the British mandate in Mesopotamia.  

Although the treaty did not specifically state how the waters of the Tigris and Euphrates Rivers were to be allocated, it did establish a framework for cooperative action in developing these water resources.

The principle of mutual consultation over water development plans was extended in another treaty between Turkey and Iraq in 1946. This treaty encompassed the water rights of both rivers and their tributaries and stated,

Turkey shall keep Iraq informed of her plans for the construction of conservation

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works on either of the two rivers or their tributaries, in order that these works may as far as possible be adapted by common agreement to the interests of both Iraq and Turkey.\(^2^3\)

Until the end of the 1950s, the diversion of water by Turkey, Syria, and Iran continued to represent a small proportion of the total flow, but from that time until the present these nations have used more and more water from the rivers, particularly for irrigation. Many multi-purpose projects have been built, especially on the Euphrates, by the riparian nations. Iran has also increased its use of water for irrigation on some tributaries of the Tigris River. All of the riparians are diverting the waters of the two rivers and their tributaries to meet rising demands, and these diversions by the upper riparian nations are being made without consideration of the needs of the lower riparians. No comprehensive agreement has been reached by all four riparians with regard to water use, and, if this situation continues, water diversion will become an increasingly conflictual issue among them.\(^2^4\)

The instances in the 1970s, when both Turkey and Syria diverted the flow of the Euphrates River to fill major reservoirs without considering the

\(^{2^3}\text{Ibid.}, \text{p. 101.}\)

impact of such actions on downstream inhabitants, are good examples of the seriousness of this problem.\(^{25}\)

International Law and the Problems of Conflict Resolution over the Waters of International Drainage Basins

Conflict over the use of water on international rivers is a problem that can be traced back to earliest times but one that has become much more serious since the rise of nation-states and the development of modern water technology.\(^{26}\) Conflict resolution concerning the water of international rivers differs from conflict resolution on national rivers because of the lack of a central authority in international affairs that can make and enforce water laws. Furthermore, managing international rivers is difficult because of the absence of accepted general rules of international law concerning such problems.\(^{27}\)

There are, however, some widely accepted customs and conventions concerning water use on international streams which influence how nations act in regard to international

\(^{25}\)Khadduri, Socialist Iraq, pp. 161-164.


water issues. It is, therefore, important to consider international water law and its development and how these rules apply to international drainage basins.

**International Water Law and Navigation on International Rivers**

Navigation is the first and oldest legal problem in relation to water use on international rivers. From the breakup of the empire of ancient Rome until the end of the eighteenth century, navigation on international rivers was subject to the exclusive use of local jurisdictions along those rivers, although a number of attempts were made in the seventeenth century to free navigation on international streams such as the Scheldt, the Meuse, the Danube, and others. These early attempts to open international rivers failed, however, and not until 1792 did the first successful opening of an international river to free navigation occur. In that year the Scheldt and Meuse Rivers were opened to free navigation under an order by the Conseil Exécutif Provisoire of the French Republic. Then, in 1795, France and the Netherlands

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signed a treaty extending free navigation to the whole course of these two rivers.

In the 1800s the concept of open navigation on international rivers was greatly extended. Under the terms of the treaty of Tilsit in 1807, free navigation was granted to riparians only on the Netze, Nogat, Warthe, and Vistula Rivers and the Bromberg Canal in Europe. In 1810, the treaty of Lemberg opened free navigation to the riparians on the Diester River. Still other applications of the idea of open transportation on international rivers were made in this period. In 1814, the treaty of Paris established free navigation on the Rhine River, and the Congress of Vienna in 1815 issued a general declaration providing for free navigation on all European international rivers, but not until the treaty of Paris in 1856 was the Danube River opened to ships of all nations.  

This concept of open international rivers was extended to non-European rivers for the first time by the treaty of Berlin in 1885, which established free navigation on the Congo River. Other treaties and conferences dealing with navigation on international rivers included the Barcelona Conference of 1921 and the peace treaties of 1919-1920 following World War I. At the present time these treaties represent important sources of international water law;

Glos, pp. 158-172.
in fact, free navigation on international streams is a generally accepted principle in the international community.\textsuperscript{31}

On the Tigris and Euphrates Rivers, only the Shatt Al-Arab waterway is navigable. As previously discussed, the boundary disputes between Iraq and Iran raised questions as to whether the Shatt Al-Arab is an international waterway. This issue is currently complicated by the war between the two countries. Since the late 1950s, Iran has used the boundary dispute over the Shatt Al-Arab waterway in its strategy to exert pressure on Iraq with respect to other political issues concerning the powers in the region.\textsuperscript{32} Under these conditions, international law has had little effect in resolving conflicts, and as long as the political disputes remain unsolved there is little hope that international legal principles can solve the problems of navigation on the Shatt Al-Arab waterway.

\textbf{International Law and Surface Water Diversions from International Rivers}

Water diversion from international drainage basins represents an increasingly serious legal problem. Four conflicting principles have influenced the development of

\textsuperscript{31}\textit{Ibid.}, p. 174. \hspace{1cm} \textsuperscript{32}\textit{Ismael}, p. 1.
legal thought pertaining to this issue. The first is that of absolute territorial sovereignty of a state. Under this principle a state may do as it sees fit with the waters and other resources within its boundaries, without concern for other riparians. Absolute sovereignty clearly works to the advantage of upper riparian nations.

This principle was forcibly made by U.S. Attorney General Judson Harmon in 1895 in a conflict between the United States and Mexico over the waters of the Rio Grande River. Harmon stated,

The case presented is a novel one. Whether the circumstances make it possible or proper to take any action from considerations of comity is a question which does not pertain to this department; but that question should be decided as one of policy only, because, in my opinion, the rules, principles, and precedents of international law impose no liability or obligation upon the United States.

In 1903, when the United States signed a treaty with Mexico under the provisions of which the former nation released 74 million cubic meters of water per year to the latter, the United States made clear in the treaty that this release of water did not constitute any

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\(^3\) Berber, p. 15.
recognition of the Mexican claim to the water of the Rio Grande River.\textsuperscript{35}

A number of noted scholars in the field of international law have supported the principle of absolute territorial sovereignty. For example, in his comprehensive work \textit{On International Law Chiefly as Interpreted and Applied by the United States} in 1945, Hyde stated that an upper riparian state may claim the right to divert at will and without restraint such water as it may require regardless of the effect produced on downstream riparians. Hyde upheld this legal principle even though he recognized that such unilateral action was not conducive to international harmony.\textsuperscript{36}

Similarly, Fenwick's \textit{International Law} in 1948 pointed out that international law does not recognize the rights of lower riparians to waters as does municipal or national law. He stated,

\begin{quote}
It is doubtful whether international law can be said to have recognized any servitude corresponding to that existing in civil and common law in the form of a right to the uninterrupted flow of streams and rivers. Conscious of the possession
\end{quote}


of the traditional right of sovereignty, states in possession of the upper waters of a river have not recognized any general obligation to refrain from diverting its waters and thereby denying to the states in possession of the lower waters the benefits of its full flow. Such restrictions as have been recognized have been in every case the result of treaty stipulations.  

Finally, in 1952, in *The Law of Nations* Briggs pointed out that no general rule exists that can impede upper riparian nations from exclusive use of the waters of international rivers.

The principle of absolute sovereignty leads to acts by upper riparians that have detrimental effects upon other riparian nations. Thus, the international community in recent years has objected to this doctrine, and scholars have begun to consider other principles for regulating water diversions from international streams.

A second principle that has been advocated to govern diversions from international streams is that of absolute territorial integrity. This principle states that a state has the right to demand absolute territorial integrity and to demand the continuation of the natural flow of water coming from other states. This doctrine operates in

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favor of lower riparian nations, in direct contrast to the principle of absolute sovereignty.

The principle of absolute territorial integrity is embodied, according to one interpretation, in the Charter of the United Nations. Some scholars believe that the U.N. Charter supports the principle of absolute territorial integrity as it pertains to the waters of international streams since, in general terms, the Charter provides for territorial integrity and forbids members from using force or the threat of force against each other. For instance in his 1955 book *International Law: A Treatise*, Oppenheim states,

... the flow of not-national, boundary, and international rivers is not within the arbitrary power of one of the riparian states, for it is a rule of international law that no state is allowed to alter the natural conditions of its own territory to the disadvantage of the natural conditions of the territory of a neighboring state. For this reason a state is not only forbidden to stop or to divert the flow of a river which runs from its own to a neighboring state but likewise to make such use of the water of the river as either causes danger to the neighboring state or prevents it from making proper use of the flow of the river on its part.

... A state, in spite of its territorial supremacy, is not allowed to alter the natural conditions of its own territory to the disadvantage of the natural conditions of a territory of a neighboring state—for instance, to stop or to divert the flow

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of a river which runs from its own into neighboring territory.\textsuperscript{4,9}

One problem attendant upon the principle of absolute territorial integrity can be illustrated by the conflict between France and Spain over the diversion of the water of Lake Lanox. This lake, which is entirely within the territory of France, is drained by the Font-Vive River, and this river feeds into the Carol River, which is shared by both France and Spain and ultimately empties into the Segre River. In 1917, France diverted some of the water of Lake Lanox for power generation. The amount of water diverted constituted about 25 per cent of the flow of the Carol River. Conflict over this diversion arose; although France guaranteed the return of the diverted water after its use for power generation, Spain insisted on the principle of absolute territorial integrity and viewed the diversion as a change in the natural flow of the Carol River that required its prior approval. In 1957, the issue was finally decided by the International Court of Justice. France won the case when the tribunal declared that France did not need to obtain the approval of Spain before diverting water from Lake Lanox since the diversion did not affect the amount of water in the watershed.

As such examples illustrate, the principle of absolute territorial integrity may work to the detriment of upper riparians. It may also impede the finding of solutions to problems of competition and conflict over water on international rivers.\(^1\)

The third principle for governing water diversions from international streams proposes community of property in water. According to this principle, community in water exists by virtue of which every state has the right to use water from an international stream but not to the detriment of other riparians. Under this doctrine, continuation of the natural flow of water may not be interrupted.\(^2\)

Some noted international law scholars have supported the community of interest doctrine. One of these was Smith, who stated in The Economic Uses of International Rivers in 1930,

> The first principle is that every river system is naturally an indivisible physical unit and that as such it should be so developed as to render the greatest possible service to the whole human community which it services, whether or not that community is divided into two or more political jurisdictions. It is the positive duty of every government concerned to cooperate to the extent of its power in promoting this development.\(^3\)

\(^1\)Shaipro-Libai, pp. 92-95. \(^2\)Berber, p. 13.

The community of property principle obviously differs from those of absolute sovereignty and territorial integrity. It treats the international river as a unit that should be used to the benefit of all of the communities through which it flows. This doctrine rests upon a base of natural law and might function well under a fully developed municipal legal system, but, in view of the problems surrounding international law, which is a less advanced legal system, the principle of community of property ignores the realities of power politics.\(^4\)

The fourth principle for governing water diversions from international streams proposes that water usage by a nation should be limited to recognize the needs of other riparians. Unlike the doctrine of absolute territorial integrity, this principle restricts both upper and lower riparians according to their needs and maintains that each state must consider the impact of its actions on the others.\(^5\) Therefore,

Equitable utilization is the division of the waters of an international river among the coriparian states in accordance with the legitimate economic and social needs of each, in such manner as to

\(^4\)Shaipro-Libai, p. 97.

achieve the maximum benefit for all with a minimum of detriment to each.\(^6\)\(^6\)

In 1958, the International Law Association in its forty-eighth conference in New York advocated the principle of equitable utilization. The Association's report stated,

> Except as otherwise provided by treaty or other instruments or customs binding upon the parties, each coriparian state is entitled to a reasonable and equitable share in the beneficial uses of the waters of the drainage basin. What amounts to a reasonable and equitable share is a question to be determined in the light of all the relevant factors in each particular case.\(^7\)

The International Law Association's 1966 conference in Helsinki added some other relevant factors to this statement—although they were not considered as all-inclusive—such as the physical conditions of the basin, past and present utilization of the basin, the economic and social needs of the riparians, the possibility of satisfying those needs by alternative means, and the compensation of riparians as a means of adjusting conflicts among users.\(^8\)

Various scholars of international law have recommended the principle of equitable utilization of the waters of international streams. Its usefulness in resolving conflict over water diversion on international

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\(^6\) Lipper, p. 63. 
\(^7\) Berber, p. 43. 
\(^8\) Shaipro-Libai, p. 108.
rivers is limited, however, because a sense of community that is necessary for the application of the doctrine is lacking within the international system.\textsuperscript{49}

Unfortunately, no agreement concerning the allocation of water among the riparians has been made in the Tigris-Euphrates valley, nor does any agreement exist as to principles governing diversions of water from the rivers, with the exception of the doctrine of absolute sovereignty. When demands for water increase in these four countries in the future, conflict will intensify as the upper riparians divert more water to the detriment of the lower riparians.\textsuperscript{50}

\textbf{International Law and Groundwater in International River Basins}

Use of groundwater resources rises as demands on surface water surpass the quantities available. Increased pumping from underground aquifers that extend under the territory of several states raises complex legal problems.

Unfortunately, the development of rules or principles to govern competition over international groundwater is still in its infancy. Conflict over international groundwater is a new issue, and, despite growing recognition of the importance of these resources in economic

\textsuperscript{49}Ibid., p. 140. \hfill \textsuperscript{50}Al-Khashab, pp. 92-94.
development, only a few riparian nations have included groundwater in their international agreements. 51

Two authorities on groundwater law, Dante A. Caponera and Dominique Alheritiere, emphasize this point:

In international treaties, references to groundwater are scanty and too limited in scope to propose them on terms of customary law. The international courts do not appear to have rendered any decision specifically on groundwater. 52

Although treaties pertaining to international groundwater are largely lacking, Caponera and Alheritiere have recommended that the principle of equitable utilization be adopted with regard to the use of groundwater. In an article entitled "Principles for International Groundwater Law" they state,

Regarding applicable legal standards, while there are no specific rules which may be derived from treaties or from court decisions, the same criterion of equitable utilization as has been accepted for surface water is also valid for groundwater. 53


53 Ibid., p. 619.
In the Tigris and Euphrates drainage basin, groundwater is of vital importance, especially in areas where surface water is scarce. Since ancient times inhabitants of the Tigris-Euphrates valley have sunk wells in the desert to tap life-giving groundwater sources. Recently the economic significance of groundwater on a regional scale has become more evident as a result of the introduction of modern drilling methods and mechanical pumping equipment. Yet, the four riparians of the Tigris-Euphrates basin have reached no agreements concerning how groundwater in the basin should be allocated among them. In part, this is due to a lack of comprehensive knowledge about groundwater and about the hydrologic parameters and boundaries of aquifer systems in the region. As the use of groundwater increases, the need for international regulations in the Tigris-Euphrates valley is certain to increase as well.

International Law and Pollution in International Drainage Basins

As discussed earlier in this chapter, disputes over water in international drainage basins have historically focused upon the right of navigation; only in more recent times have water supply and water quality become

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international issues. Population increases, urbanization, industrial expansion, and modern irrigated agriculture have increased water consumption and the possibility of pollution of international rivers and aquifers. Only a very few international pollution controversies have been decided by international adjudication, and, because of the complexity of the pollution question and the uniqueness of these controversies, no general legal principles have emerged that are applicable to all cases. As a result, most of the controversies over international water pollution have been resolved through multilateral agreements.

These agreements, conference pronouncements, and the work of various international law scholars constitute the only sources of international law on pollution.\(^5^5\)

According to one scholar, the rules regarding international pollution established at the Helsinki conference of the International Law Association in 1966 are the most advanced formulation of international law on this subject.\(^5^6\)

These rules, as summarized by Bourne, are as follows.

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1. ... a state is not liable to a co-basin state for causing changes in the natural quality of the waters of an international drainage basin if that change results in no injury.

2. ... a state is not liable to a co-basin state for causing changes in the natural quality of the waters of an international drainage basin if that change results only in minor or slight injury.

3. ... when a state causes changes in the natural quality of the waters of an international drainage basin and those changes cause serious injury to co-basin states, it is liable for that injury only if the pollution use does not fall within its right to a reasonable and equitable share in the beneficial uses of the waters of the basin.57

Utton also recognized the need for the development of rules specifying the rights and the obligations of riparian states in such a way that they may be used in settling international pollution conflicts, and, furthermore, he recognized the need for an organizational institution to manage waters on international streams. He stated,

What is needed is an administrative process, a basin authority which could supervise and make ongoing policy decisions for the best management of the resource. ... The quest must be for continuous policy to make continuing adjustments to changing conditions and new technology. ... Informed opinion correctly and strongly supports the idea of the management of international fresh water resources, rather than relying principally on ad hoc international negotiations of after-the-fact adjudication.58

57Mosely, pp. 141-142.

In the Tigris and Euphrates drainage basin pollution (other than natural pollution) is not yet a major issue. As the pollutants generated by activities in the four riparian states increase and these societies become more urbanized and industrialized, however, the problem of pollution will become increasingly serious.

Conclusion

This chapter has demonstrated that international law is limited in dealing with disputes concerning water use in international drainage basins. Principles of international water law are not fully developed, and the lack of a central international authority to enforce those principles impedes the efficacy of international law in solving various issues related to the use of water on international streams.

Thus, disagreements among the riparians concerning water in the Tigris-Euphrates basin ultimately must be resolved by political means. The politics of the region and the involvement of the superpowers in the area are the most important factors that will shape both the nature of the conflicts and any possible solution to present and future disputes over water use among the nations in the Tigris and Euphrates drainage basin.
CHAPTER VII

CONFLICTUAL FACTORS AMONG THE FOUR RIPARIANS
OF THE TIGRIS AND EUPHRATES BASIN

Controversies over the waters of international drainage basins act as barriers to cooperation in the use and management of these vital resources. In order to understand how cooperative international arrangements between riparian nations may be developed, it is necessary to examine both the nature of the conflict over water and the integrative factors which help to overcome this conflict. In this chapter, the nature of the conflict in international drainage basins in general and in the Tigris and Euphrates valley in particular is considered. The following chapter will deal with the factors of interdependence in the basin.

Conflict is a form of social interaction and a struggle over claims to resources, power, or status.¹ It implies more than mere competition because in the latter condition individuals, groups, or societies may not be fully aware of the competition in which they are engaged or they may not seek to prevent their competitors from

attaining their objectives. Competition may become conflict, however, when competitors attempt to strengthen their positions at the expense of others or when they attempt to impede others from achieving their goals.\textsuperscript{2}

Conflict over water resources in international drainage basins often originates in competition between water users. When demands exceed the amount of water available in the basin, competition becomes conflict because each riparian attempts to satisfy its needs for water at the expense of other riparians. Conflict over water in international basins is a struggle among various users for an essential scarce resource.\textsuperscript{3} Many of the factors influencing such conflicts over water are common to all international drainage basins. The location of surface and groundwater in the basin, climatic conditions, surface features of the region, population density and diversity, the location of political boundaries, internal conditions of the riparian countries, and the foreign relations of


these states all influence the nature of conflicts over scarce water resources."

Water Conflicts in International Drainage Basins

The intensity of controversies over water differs in international basins because the conditions in each situation vary. The characteristics of international drainage basins listed above may be studied and arranged in accordance with the potential degree of conflict they may generate. The impact of the factors common to all international basins is examined here.

Location of Surface and Groundwater in International Drainage Basins

The location of international rivers, lakes, and aquifers is an important factor affecting the potential for and the intensity of conflict in a basin. Boundary or continuous international rivers tend to be less conflictual than international streams that successively cross political borders of the riparian nations. In the case of boundary streams each riparian has access to the waters either for navigation, irrigation, or other uses, and these water resources represent a common pool. Every riparian has the


ability to draw on the water, and any harmful act by one riparian will be detrimental to the interests of all and may lead to retaliatory acts. Since more than two countries seldom share a common pool water course, the incentive for cooperation and collective action is enhanced.

In cases where streams successively cross political borders, however, the concept of a common resource pool is not applicable, and the potential for conflict is greater because upper riparians have the capability to limit lower riparians' access to the water or they may utilize the water resources in a way that is harmful to the interest of the downstream users. Power may thus be exerted by the upper riparians upon the lower riparians, and this, in turn, increases the likelihood of conflict. Therefore, the conflictual potential is a function of the ability of lower riparian states to assert their rights and of the upper riparians' inclination to acknowledge the rights of the lower riparians. The intensity of conflict also depends upon the number of riparian states in an international drainage basin. As the number of nations increases, the potential for and the intensity of conflict over water in the basin increase as well.

Climatic Conditions in International Drainage Basins

A close relationship exists between the climatic conditions in international drainage basins and conflict
over water. Water has a different functional association in arid regions than in humid areas. Water courses in arid regions are used primarily for consumptive purposes such as drinking and irrigation, but in humid regions water resources are used primarily for non-consumptive purposes such as navigation and power generation. Thus, potential conflict over water in arid basins is greater and more intense than in humid basins because water is so vital to life and economic development. In arid regions, therefore, agreements among users are more difficult to achieve because present demands are difficult to satisfy and perceived needs and future demands hinder cooperation based upon present use. Furthermore, conflict concerning the pollution of international streams in arid basins is more intense than in humid ones because it is a greater threat in that adequate water to dilute pollutants is not available.

**Surface Features of International Drainage Basins**

The surface features of international basins also affect the potential for and the intensity of conflict over

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Ibid., pp. 16-18.
water. When the topography of an international drainage basin is mountainous, particularly in the upper riparian portion of the region, conflict over water, especially water used for consumptive purposes, will not be as great as in a basin where the topography of the upper riparians' land is suitable for agriculture. The intensity of the conflict will increase, however, if the upper riparian is able to divert water from the mountainous portions of the basin to other adjacent areas that may be cultivated.

Population Density and Diversity in International Drainage Basins

Other important factors influencing conflict over water in international basins are the population density and diversity within the area and, concomitantly, the extent of the demand for water. Generally, international basins that are densely populated experience higher and more intense conflict than those basins that are not. In addition, when most of the inhabitants in a basin—especially in an arid basin—are employed in agriculture, conflict will be higher than in those basins where a smaller population depends on agriculture. In highly


Nijim, pp. 19-21.
urbanized and industrialized basins, on the other hand, conflict is more complicated and often more intense than in basins with less developed riparian states because developed nations are heavily dependent upon water for municipal consumption and for sewage and industrial disposal, which may seriously pollute water resources. Unless other incentives for cooperation are present, intense conflict is likely to arise over this issue since there is often no economic incentive to motivate the upper riparian to spend funds on the treatment of pollutants and wastes.

Population diversity is another important factor influencing the potential for and the intensity of conflict over water resources. An international drainage basin with a homogeneous population is likely to have a lower conflictual level than one with a heterogeneous population. Homogeneity of the population, particularly when the riparian societies share a common race, culture, religion, or language, tends to facilitate cooperative action. In more heterogeneous basins, on the other hand, it is more difficult to achieve cooperation; population diversity complicates the communication process among riparian

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societies because animosities, suspicions, and jealousies often keep people apart.

Location of Political Boundaries in International Drainage Basins

The location of political boundaries within an international drainage basin determines the degree of saliency of the water issue to each of the riparian states. The more of the basin that lies within a riparian nation, especially if it drains a densely populated area or a region suitable for agriculture, the more salient the issue of water will be to that country. On the other hand, when the basin occupies only a small portion of a state or flows through mountainous and sparsely populated areas, the river may be of little importance to that country. The different attitudes held by the various riparian states may act as a disincentive to cooperation over the use or management of water.

Location of political boundaries also influences the degree of conflict in international drainage basin. Borders of riparian nations located in high mountainous or in desert areas are likely to cause less conflict than those that cross fertile lands or bodies of water. In

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addition, when political borders divide minority groups that have a strong desire for unity, conflict will be intensified. Finally, if a particular international river is only one of several flowing through or between neighboring countries, riparians may not be as concerned with that single basin as they are with a water policy that includes all international streams.

Internal Conditions of Riparian Nations in International Drainage Basins

The internal conditions of each of the riparian states is another factor affecting conflict in international drainage basins.\textsuperscript{11} For example, the potential for conflict in an international basin shared by nations with similar political and economic ideologies is less than that in a basin shared by nations having opposing political and economic ideologies. The political stability of the riparians also influences the nature of the conflict; a drainage basin containing states whose internal conditions are dominated by centrifugal rather than centripetal forces possesses a high conflict potential. At first one might be inclined to think that conditions of international weakness and divisiveness within a country would serve to decrease the potential for conflict over water with other riparian states since the weak nation

\textsuperscript{11}Ibid., p. 1045.
would be too preoccupied with its internal problems to become actively involved in external disputes, but one can also argue that a state beset with international difficulties may well choose to pursue an aggressive (at least vocally) foreign policy to distract attention from its domestic difficulties and to attempt to bring about a modicum or semblance of internal unity in the face of a presumed external danger.¹²

Dissimilarities in the legal and administrative regimes of the riparian states influence the potential for conflict among them in that, when riparians have dissimilar legal or administrative water systems, the possibility of conflict is increased. In addition, a riparian country's perceptions of future needs for water inclines it to be cooperative or uncooperative in its interactions with other riparians on the water issue. If a riparian nation foresees a great need for additional water in the future, it will be more defensive in negotiating with other countries; in contrast, if it has little concern about water use, it will more readily agree to the institution of water allocation and management measures.¹³

¹²Nijim, p. 22.

The international relations of riparian states also influence the degree and the intensity of conflict potential in international drainage basins.\textsuperscript{14} Issues related to international streams are one of the major concerns of international relations for riparian countries. In general, international basin agreements are intended to satisfy social, economic, or domestic demands. They may help to inaugurate and maintain good relations among neighboring countries, and they often establish frontiers between riparian nations, sometimes providing that a river serve as a boundary between two or more nations. In other instances, when boundary disputes are not a major concern, international agreements among riparians are usually concerned with such matters as the use or allocation of water resources or the development or management of water in the basin.

Several significant factors in international relations influence the degree and intensity of conflict over water use in international drainage basins. One of these factors is the political perceptions of the riparian nations. In international basins where riparians desire to pursue a friendly "good neighbor" policy or perceive

\textsuperscript{14}Lemarquand, pp. 11-15.
the present political environment as satisfactory, there
is less conflict than in basins where countries do not
have such perceptions.

Another important component in international relations
is the riparians' attitude toward international law. In
the absence of a central authority on the international
level to develop or implement rules and statutes, nations
may either ignore or adhere to the principles of interna-
tional law as they see fit. Often riparians support only
those principles of water law that favor their position in
a basin, but they may accept widely espoused international
principles even when they are to their disadvantage because
they do not want to appear to be opposed to international
law or to lose their credibility in the world community.
In the latter case, the world or political image of the
riparian nations may serve to mediate conflict. This is
especially true when a breach of international law is
likely to have serious consequences such as war or when
an escalation in conflict among highly independent ri-
parians would injure their economic and other relations.

The potential for conflict in international basins
where riparian nations share a history of stable and
friendly relations is less than that in a basin where
the riparians have had hostile foreign policies in the
past. The potential for conflict is also lower in
basins where the riparians are all within one international coalition.

Summary

The preceding discussion of factors influencing conflict over water resources is summarized in Table XIII, which displays the potential for conflict along a continuum from low to high. It appears that conflict potential is higher in a basin where the lower riparian faces an upper riparian that adheres to the principle of absolute territorial sovereignty, when the basin is located in an arid region and has a large amount of fertile land suitable for irrigated agriculture, and where unsettled frontier problems exist. Basins that are highly populated, diverse, and undergoing rapid economic development also tend to have a higher potential for conflict. In addition, conflict is more likely to be intense where the riparians have divergent political ideologies and unfriendly foreign relations and are attached to different political and military alliances. In contrast, the potential for conflict is lower when riparian nations recognize the equitable principle of water allocation, the water supply is abundant, population density is low, economic incentives exist for basin-wide cooperation, and the states have similar political ideologies and a history of friendly foreign relations.
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<th>Location of surface and groundwater</th>
<th>+ Conflict Potential +</th>
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<tr>
<td>Type of international river</td>
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<td>Type of water use</td>
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<td>Pollution</td>
<td>In humid region</td>
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<td>Riparians' perceptions of future water needs</td>
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<td>Unfriendly</td>
</tr>
<tr>
<td>Riparians' political perceptions</td>
<td>Friendly</td>
</tr>
<tr>
<td>Riparians' attitude toward international law</td>
<td>Acceptance</td>
</tr>
</tbody>
</table>

*TABLE XIII
SUMMARY OF CONFLICTUAL FACTORS IN INTERNATIONAL DRAINAGE BASINS*
TABLE XIII--Continued

<table>
<thead>
<tr>
<th>Factor</th>
<th>+ Conflict Potential +</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low</td>
</tr>
<tr>
<td>Foreign relations (continued</td>
<td></td>
</tr>
<tr>
<td>Riparians' history of rela-</td>
<td></td>
</tr>
<tr>
<td>tions</td>
<td></td>
</tr>
<tr>
<td>Riparians' membership in</td>
<td></td>
</tr>
<tr>
<td>alliances</td>
<td></td>
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<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>


Conflict over Water Resources in the Tigris and Euphrates Drainage Basin

It is important next to examine conflict over water use in the Tigris and Euphrates valley in terms of the impact of the various conflictual factors discussed above.

Location of Surface and Groundwater

The location of surface and groundwater in the Tigris and Euphrates valley is an important factor influencing the potential for conflict. Although no complete data concerning groundwater sources in the basin are available, it is known that some aquifers are shared by all four of the riparian countries, and as their use of groundwater increases the likelihood of conflict also increases.¹⁵

Both the Tigris and Euphrates Rivers cross political borders of the various riparian nations successively. The headwaters of both rivers and of some of their major tributaries are located in the mountainous eastern area of Turkey, which supplies about 66 per cent of the basin's total surface water. The Euphrates River flows through the eastern region of Syria; this area is sparsely populated, but the water of the Euphrates constitutes about 80 per cent of Syria's total surface water. Iran is an upper riparian with regard to the tributaries of the Tigris River, such as the Lesser Zab and the Diyala. These tributaries arise in the mountainous Zagrous region of Iran, which is quite heavily populated. Iraq, the lower riparian, is most dependent upon the waters of both rivers, and, unlike the other riparians, it has no other national or international rivers. Water issues pertaining to the Tigris and Euphrates, therefore, are more salient to Iraq than they are to Turkey, Syria, or Iran, and this may lead to greater conflict as the latter three countries increase their usage of water from the two rivers.  

The location of groundwater and especially of surface water in the Tigris-Euphrates basin is a major factor affecting the potential for conflict and for cooperation.

16Mehdi Al-Sahaf, Pollution Control and Water Resources of Iraq (Baghdad, Iraq, Al-Hurria Printing House, 1976), pp. 57-69.
In recent years, the upper riparian nations have become capable of controlling water use from both rivers and their tributaries and in some instances have utilized them in a manner that caused harm to the lower riparians. Although none of the riparians has proclaimed that the principle of absolute territorial sovereignty applies to the waters of the rivers, the ideological differences among them and the fact that they are allied with different powers may lead the upper riparians to embrace this doctrine in the future and to undertake actions that will be detrimental to the lower riparians. Should this happen, conflict in the basin will be intensified.

The location of the Shatt Al-Arab waterway as a boundary river between Iraq and Iran and as the former country's only outlet to the sea complicates navigation. Ordinarily the potential for conflict on boundary rivers is less than that on rivers that successively cross the political boundaries of more than one state, but when the boundary river is essential to one riparian and less important to another, as is the case for the Shatt Al-Arab, serious disputes are likely to arise, particularly

17Ibid., p. 283.

when one of the riparians attempts to place pressure on the other in order to gain other political objectives, as has occurred between Iraq and Iran.¹⁹

**Climatic Conditions**

Most of the Tigris and Euphrates valley is located in an arid region, especially the lowlands, which lie largely within the boundaries of Iraq. Rainfall in most parts of the basin, including the areas suitable for agriculture, is less than 100 mm per year. Most agriculture, therefore, is dependent upon irrigation from the Tigris and Euphrates Rivers.

The climate of the upper riparian nations of Turkey and Iran is relatively humid, but agriculture in these two countries is limited to summer crops in the valleys because of their mountainous topography. Thus, the climatic and topographic conditions in this section of the basin tend to lessen conflict over the water of the two rivers.

The most agriculturally productive areas in the basin are the Mesopotamian trough in Iraq and the irrigated portion of the Al-Jazira region in Syria. These two segments of the valley are arid and entirely dependent upon the

waters of the Tigris and Euphrates Rivers for irrigation. Thus, the arid climate in Syria and Iraq and in those regions of Turkey and Iran to which water could be diverted from adjacent mountainous areas creates conditions that may intensify conflicts concerning water.\textsuperscript{26}

**Surface Features**

Surface features in the Tigris and Euphrates basin are another important factor affecting the potential for conflict over water. As noted in Chapter III, the Tigris and Euphrates valley includes several regions. The mountainous northern area lies primarily in Turkey and Iran, although a small portion of it is within the boundaries of Iraq. The semi-mountainous region located to the south of the mountains of Turkey, Iran, and Iraq is also not well suited to agriculture. The lowlands, where topography and soil characteristics permit agriculture, are arid and almost completely dependent upon the waters of the Tigris and Euphrates Rivers to support cultivation. Most of this region is located in Iraq. The desert region, to a large extent, is also located in Iraq and extends into other neighboring countries.

The mountainous surface features of the upper part of the valley and its humid climate tend to reduce conflict in the Tigris-Euphrates basin. Future conflict potential, however, will also depend upon the plans of upper riparians to divert large amounts of water to adjacent areas. When this occurs, conflict will be intensified.\footnote{1}

**Population Density and Diversity**

The population of the Tigris and Euphrates valley has grown rapidly in the past several decades. Turkey's population, for example, has more than tripled since 1927. In addition, the urban residents of that nation, who constituted between 20 to 25 per cent of the total population in 1927, comprise almost 60 per cent of the country's population today.\footnote{2} Despite Turkey's recent industrial and economic development, however, almost 60 per cent of the labor force still works in agriculture.\footnote{3} A lack of regional population data prohibits a determination of the percentage of Turkey's population living in the area.


in which the headwaters of the Tigris and Euphrates Rivers are located.

Syria's population is also growing rapidly and has more than doubled since the 1950s. It is estimated that at the present time the population of Syria is growing at an average rate of 3.2 per cent annually. The proportion of the state's urban population has increased from 26 per cent in 1960 to about 50 per cent at the present time. Approximately 50 per cent of the labor force, however, continues to be employed in agriculture.\textsuperscript{24} The majority of Syria's population resides in the western region of the country, but as a result of greater availability of water from a new multipurpose water project on the Euphrates River the amount of irrigated land in eastern Syria has increased and its population has grown from approximately a half million in 1973 to over one million. As more people move into the eastern region of Syria and the demand for water in that area increases, the potential for conflict over the waters of the Euphrates River will increase.\textsuperscript{25}


Iraq's population doubled between 1950 and 1984 from 7 million to 14 million, and the proportion of urban residents rose from 44 per cent of the total in 1965 to 63.5 per cent in 1977. Agriculture is still one of the dominant economic sectors in Iraq, employing 30 per cent of the nation's labor force.

Iran's population has grown from 19 million in 1950 to more than 40 million at the present time, and its urban population has risen from 28 per cent of the total in 1960 to approximately 50 per cent. Agriculture is still the dominant economic sector in Iran, comprising 30 per cent of the labor force. The Iranian portion of the Tigris and Euphrates basin is in the Zagrous region, which is one of the most densely populated areas in the country. Since only the valleys in this region can be cultivated, major increases in the demand for water are likely to be caused by diversions of water to adjacent areas that are more


suitable for agriculture. Unfortunately, no current data are available about the percentage of Iran's population living in the Zagrous region.

The rapid population growth in all four of the riparian countries increases their domestic and industrial water consumption and their demand for water for the irrigation necessary to feed their larger numbers of inhabitants. Population growth is thus a major factor influencing the potential for conflict over water in the Tigris-Euphrates basin.

To complicate the matter, the populations of the nations are heterogeneous. Numerous ethnic and religious groups are present in these societies. Three ethnic groups—Turk, Arab, and Farsi—are dominant in the four countries, and various minorities, the largest being the Kurds, reside in them as well. Historically, these groups have been rivals and have fought one another in an attempt to control the region. The major common denominator among these diverse people is the Islamic religion.  


31 Fisher, The Middle East: A Physical, Social, and Regional Geography, pp. 101-120.
Location of Political Boundaries

Political boundaries among the riparian nations may represent the most conflictual factor in the Tigris and Euphrates basin, particularly the boundary between Iraq and Iran. The boundary between these two countries extends from the mountainous area in the north to the Shatt Al-Arab waterway, where unresolved border disputes led to war in 1980. This boundary, as discussed in Chapter VI, has been a source of continuing conflict throughout the history of the region. The boundary between Turkey and Iraq is also located in a mountainous area, but at the present time it is not disputed. Nor do boundary problems exist between Syria and Iraq, in part, perhaps, because the frontier is located in a sparsely populated desert area and because both states have a common Arabic culture.

The political boundaries in the northern portion of the basin divide an important minority, the Kurds, among the four riparian countries. About half of the Kurds live in Turkey, a small number reside in Syria, and the rest are divided between Iraq and Iran. In all four states, the Kurds live in the mountainous areas in which the headwaters of the Tigris and Euphrates Rivers and their tributaries rise. The desire of the Kurdish minority for

\[12\] Ibid., pp. 369-373; also see Al-Khashab, pp. 4-7.
autonomy has often caused high conflict in the riparian nations, and in some instances an individual country or countries have supported the revolts of the Kurds against neighboring riparian states.\textsuperscript{33} The superpowers have also at times encouraged such support of Kurdish insurrections.\textsuperscript{34}

**Internal Conditions of the Riparians**

Several important differences exist with regard to the internal conditions of the four riparians in the Tigris-Euphrates basin. Each has a political system which represents a different ideology. These divergent ideologies, of course, are important factors affecting present and future conflict among the nations. The four states also differ in their perceptions of future development in the basin, and, furthermore, these perceptions tend to change as the countries enter new phases of economic development. Differing perceptions of the future of the basin, therefore, have a significant influence upon intensity of conflict over water. Similarly, the level of


economic development in the four societies may lead to greater conflict because all of the riparians are stressing the importance of water in their development plans.

The fact that the four states are relatively equal in military strength, as the stalemated war between Iraq and Iran seems to demonstrate, may serve to reduce future potential for conflict. On the other hand, the countries' alliance with different international coalitions which supply them with military arms may upset this apparent balance and intensify conflict among them.\(^{35}\)

**Foreign Relations of the Riparians**

The foreign relations of the four riparians in the Tigris-Euphrates basin have fluctuated widely since they came under the influence of western powers following World War I. After World War II, these western powers attempted to bring the four countries into their coalition through military alliances such as Turkey's membership in NATO and later the Baghdad Pact, which included Turkey, Iraq, Iran, and Pakistan as well as Britain.\(^{36}\)


The Baghdad Pact broke down, however, after the 1958 revolution in Iraq. The Soviet Union began to play a more important role in the region, and the political differences in the foreign relations of the riparian countries tended to reflect the conflicting interests of the superpowers in the area. For instance, the overthrow of the monarchy in Iraq in 1958 and the unification of Syria with Egypt in that same year posed a threat to the monarchical political system in Iran and to western interests in the Tigris-Euphrates valley.37

Open conflict over the waters of the two rivers, especially the Shatt Al-Arab waterway, developed as a result of these changes in the internal and external relations of the riparian countries. In the 1960s, Iran abrogated the 1937 treaty that had established its boundary with Iraq and demanded full control over the Shatt Al-Arab. Deteriorating relations between Iraq and Iran caused Iran to support the insurrection of Mustafa Al-Barzani's faction of the Kurds in northern Iraq as a means of applying political pressure against its opponent. As these events indicate, differences in the foreign relations of the riparians and the interests of the superpowers greatly

influence the water issue and constitute an important factor affecting the potential for conflict in the valley.\footnote{Tareq Y. Ismael, \textit{Iraq and Iran: Roots of Conflict} (Syracuse, New York, Syracuse University Press, 1982), pp. 19-24.}

**Economic Development Plans and Conflict over Future Water Development and Use**

As a result of the rapid increase in population and economic development in the four countries in the Tigris-Euphrates basin, future demands for water are projected to be much greater than present ones. All of the riparians have formulated ambitious development plans that include large water investments to meet growing needs, particularly for agriculture and power generation.

Turkey, which currently irrigates approximately 200,000 hectares of land with water from the Euphrates River, intends to increase the acreage under irrigation by 2,500 hectares per year and ultimately plans to irrigate between 450,000 and 4 million hectares in the future. It is estimated that to irrigate 450,000 hectares of land will require more than 6 km$^3$ of water, or approximately 20 per cent of the total average flow of the Euphrates River. Turkey's development plans also call for multi-purpose projects to produce additional hydroelectric power. Turkey's lack of oil increases its dependency upon
hydroelectric power and motivates the development of its water resources. Turkey has already constructed four major water projects on the Euphrates River and its tributaries and plans to develop others. For instance, the Keban Project, which was completed in 1973, has a storage capacity of 30.5 km$^3$ and produces 1,110 megawatts (mw) of electrical power per year. A second facility completed in 1980, the Karakaya Project, has a total storage capacity of 9.5 km$^3$ and generates 1,800 mw per year. The Golkdi Project, also completed in the early 1980s, is much smaller and is able to generate only 500 mw of electrical power per year. A fourth project on the Euphrates River which is currently under construction will serve as a multipurpose facility with a storage capacity of 48 km$^3$, which is about twice the average yearly flow of the Euphrates River. The proposed generating capacity of this project is 800 mw of electrical power per year. In addition, Turkey intends to pump water from the reservoir of this project for irrigation of the plains located in southeastern Anatolia.

Syria also has plans calling for additional development and use of the waters of the Euphrates River. At the present time it has only one multipurpose project on the river, completed in 1973, which has a storage capacity of 11.7 km$^3$ and a total hydroelectric generating capacity
of 824 mw. At present, Syria irrigates approximately 300,000 hectares of land with water from the Euphrates but plans to increase this amount to 640,000 hectares by the year 2000, which will require about 12 km$^3$ of water, or nearly 46 per cent of the annual flow of the river.

Iraq is the major user of the water of both the Tigris and the Euphrates Rivers. Approximately 12 million hectares of land in Iraq are suitable for agriculture, 4 million in the foothills and northern Al-Jazira region, which depends upon rainfall and groundwater for cultivation, and the remaining 8 million in the lowlands, especially the Mesopotamian trough, where agriculture is entirely dependent upon the waters of the two rivers for irrigation. Iraq has increased the amount of land under irrigation from approximately 3 million hectares in 1975 to about 4 million at the present time, and it consumes more than 52 km$^3$ of water per year. The country's development plans state that the Iraqi government intends to irrigate about 6 million hectares of land by 1990. In addition, currently only 11 per cent of the total land area under irrigation in Iraq is irrigated in the summer.


40Samman, pp. 106, 144.
but national plans state that this proportion will be raised to 40 per cent. It is estimated that this increase in summer irrigation will require approximately 66.3 km$^3$ of water from the Tigris and 24 km$^3$ from the Euphrates.$^4$¹

Iran's development plans call for increased water development of the tributaries of the Tigris River in the Zagrous region. At the present time, no large-scale development projects have been constructed on the major tributaries of the Tigris River, but such projects are planned for the future.$^2$²

Water development projects in the Tigris-Euphrates basin, particularly those in the upper portion of the valley, may benefit all of the riparians because they can be used to stabilize the flow of the rivers and to store or release water as it is needed. The impact of floods can thus be reduced and water which would otherwise be lost can be retained to meet needs in times of shortage. Such development projects may cause problems, however, especially for the lower riparians in the basin. The construction of many reservoirs may lead to greater

$^4$¹Al-Sahaf, pp. 131-161.

water loss through evaporation. In addition, since no basin-wide management system has been established in the valley, national development projects may actually increase the chance of flooding or water shortages because each country may retain or release waters from its projects without consideration of how its actions will affect downstream riparians. The coordination of such actions is potentially the purpose of an intergovernmental organization.

Another problematic issue is the fact that individual national water plans are not based upon complete information pertaining to water needs in the basin. Several attempts have been made to forecast future water needs, but these studies have serious shortcomings. Some have utilized an experimental approach to estimate water needs for certain agricultural crops in particular regions of the riparian states. Although this approach is not without merit, it cannot be used to accurately forecast future water needs for the entire basin. To do this, a model of the basin must be employed that includes all relevant factors affecting future water use such as present population and population projections, current types of industry and agriculture and forecasts of economic development in the future, degree of urbanization and pollution disposal needs, and the like.
According to the available forecasting studies based upon an experimental approach, water needs for agriculture alone in Turkey, Syria, and Iraq, as can be seen in Table XIV, exceed the average flow of both the Tigris and the Euphrates Rivers. The annual average flow of the two

### TABLE XIV


<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Turkey</td>
<td>1.5</td>
<td>6</td>
</tr>
<tr>
<td>Syria</td>
<td>4.0</td>
<td>12</td>
</tr>
<tr>
<td>Iraq</td>
<td>52.0</td>
<td>90</td>
</tr>
<tr>
<td>Iran*</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>Total</td>
<td>57.5</td>
<td>108</td>
</tr>
</tbody>
</table>


*Complete data for Iran are not available.*
rivers is equal to approximately 77.7 km³, but in arid years it may decrease to 40 km³ or less. Furthermore, the projected needs for the future portend even greater shortfalls, which are certain to increase the level of conflict among the riparian nations unless an effective basin-wide system of management and allocation can be established.

Summary

In conclusion, the conflictual factors with regard to the water resources of the Tigris and Euphrates Rivers are summarized in Table XV. As that table demonstrates, the potential for conflict in the basin is high because it has two successive rivers, a highly conflictual contiguous stream (the Shatt Al-Arab waterway), four riparian states to compete for scarce water resources, and an arid climate with high consumptive water uses in which most of the land of the basin is fertile and upper riparians can divert the water of both rivers for irrigation. Furthermore, the region has a large and growing population which is very heterogeneous, rapid economic development is being undertaken by the four riparians, and the boundary issue between Iraq and Iran is unsettled. The four riparian countries also adhere to divergent political ideologies, they have a history of hostile relations, and, finally, they are influenced by competing international powers.
### TABLE XV

**SUMMARY OF CONFLICTUAL FACTORS IN THE TIGRIS AND EUPHRATES BASIN**

<table>
<thead>
<tr>
<th>Factor</th>
<th>Conflict Potential</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>High</td>
</tr>
</tbody>
</table>

#### Location of surface and groundwater
- Type of international river: Shatt Al-Arab (contiguous)
- Tigris/Euphrates (successive)
- Number of riparians

#### Climatic conditions
- Type of climate: Arid
- Type of water use: Consumptive
- Pollution: In arid region

#### Surface features
- Type of region: Arable
- Physical interdependence: Low

#### Population
- Population density: High
- Population diversity: Heterogeneous
- Level of development: Medium

#### Political boundaries
- Type of land crossed by borders: Mountainous/desert
- Boundary issues: Unsettled

#### Internal conditions
- Riparians' political ideologies: Opposite
- Riparians' political stability: Unstable
- Riparians' legal and administrative structures for water resources: Similar
- Riparians' perceptions of future water needs: Large increase
TABLE XV--Continued

<table>
<thead>
<tr>
<th>Factor</th>
<th>Conflict Potential</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Low</strong></td>
<td><strong>High</strong></td>
</tr>
<tr>
<td><strong>Foreign relations</strong></td>
<td></td>
</tr>
<tr>
<td>Riparians' political perceptions</td>
<td>Unfriendly</td>
</tr>
<tr>
<td>Riparians' history of relations</td>
<td>Hostile</td>
</tr>
<tr>
<td>Riparians' membership in alliances</td>
<td>Different coalitions</td>
</tr>
</tbody>
</table>

*Source: Adapted from Basheer Khalil Nijim, "The Indus, Nile, and Jordan: International Rivers and Factors in Conflict Potential," unpublished doctoral dissertation, Indiana University, Bloomington, Indiana, p. 24, and applied to the specific case of the Tigris-Euphrates basin.*
CHAPTER VIII

INTERDEPENDENCE AMONG RIPARIANS: THE CASE OF THE
TIGRIS AND EUPHRATES BASIN AND INTERNATIONAL
EXPERIENCE

Conflict is only one dimension of the interactions of parties in international drainage basins. Cooperative interactions that help to create a sense of community are another dimension that works to counteract conflictual factors. This chapter describes the factors promoting interdependence that may engender cooperation among riparian nations in international drainage basins, particularly in the Tigris and Euphrates valley. Cooperative international experiences in a number of international basins are also examined in order to discover how other riparian nations were able to overcome conflictual barriers and to develop joint arrangements for developing, managing, and allocating water resources.

International Community and Interdependence

In order for nations to be willing to cooperate in allocating, developing, or managing their vital water resources, as a precondition trust must exist which can grow only out of a sense of community. A sense of
community among independent countries develops in part from cooperative interactions that reflect the degree of interdependence among them.¹

The nations of the world are becoming increasingly interdependent in many ways, including economic conditions, communication, technology, and even human aspirations.² "Interdependence in world politics refers to situations characterized by reciprocal effects among countries or among actors in different countries."³ The transactional flows of people, goods, and the like that are continuously crossing the political borders of nation-states as well as common cultural factors such as religion, history, language, and race help to foster a sense of interdependence and community.⁴

In today's world nations must be concerned with national security, but this consideration does not consistently dominate a country's policy agenda, and strong military states often find it difficult to use force to


⁴Ibid., pp. 21-37.
resolve issues with their weaker neighbors. Furthermore, individual states are not the only actors that participate directly in such international transactions. Individuals, bureaucrats, groups, businesses, and others also interact continuously and thus help to develop the norms, rules, and procedures that provide the basis for trust and community. These norms, rules, and procedures which serve as catalysts for further cooperative action are known as international regimes. \(^5\)

In the international setting one speaks of developing a world or regional sense of community only in the context of increasing interdependence as a means of fostering confidence and trust among countries. The development of fruitful interactions in one sphere may affect the willingness of nations to agree about other issues. It should be noted, however, that when interdependence prevails the potential for conflict does not disappear; instead, conflict resolution may take a new form in that disputes often can be resolved by using the power of reciprocal interdependence rather than military force. The state that is less dependent can often use asymmetrical interdependence as a source of power in its bargaining with other nations. For instance, in order to obtain leverage with an upstream riparian nation over water resources,

\(^5\)Ibid., pp. 23-37.
the downstream riparian may employ the power of asymmetrical interdependence in some other policy area--economic, political, technological, etc.--that is vital to the upstream riparian.\(^6\)

The power of asymmetrical interdependence involves two important dimensions, sensitivity and vulnerability. According to Keohane and Nye, sensitivity means . . . liability to costly effects imposed from outside before policies are altered to try to change the situation. Vulnerability can be defined as an actor's liability to suffer costs imposed by external events even after policies have been altered. Since it is usually difficult to change policies quickly, immediate effects of external changes generally reflect sensitivity dependence. Vulnerability dependence can be measured only by the costliness of making effective adjustments to a changed environment over a period of time.\(^7\)

For instance, in an international drainage basin a lower riparian nation is sensitive to uses of water by upper riparian states that may reduce the flow of or pollute a river. If the lower riparian has access to alternative sources of water such as other national or international streams but their use would be costly, that nation is both sensitive and vulnerable. When the downstream riparian does not have access to any alternative source of water, it is very sensitive and highly vulnerable to the actions of upper riparians, and this potential threat

\(^6\)Ibid., pp. 18-19. \(^7\)Ibid., p. 13.
to its vital resources may even lead to war. Therefore, when the lower riparian is very sensitive or vulnerable on the water issue, this constitutes a major source of power for the upper riparian unless the lower riparian can apply asymmetrical power on some other issue in which the upper riparian is sensitive or vulnerable.

Factors Influencing Interdependence among Riparian Nations in International Drainage Basins

Interdependence that may lead to cooperation among riparian nations is influenced by physical, economic, political, technical, administrative, and cultural factors. These factors affecting interdependence, although common to most international basins, vary from basin to basin and from country to country, and their influence is dependent upon the degree of sensitivity or vulnerability of each riparian nation. The influence of the factors affecting interdependence is examined in the following pages.8

Physical Characteristics of International Basins

The degree of interdependence within an international basin is affected by its physical characteristics, and they may be important factors influencing cooperation among riparian nations.9 The greater the degree of physical

8Fox and Lemarquand, p. 1043.

interdependence—that is, the mutual dependence upon water resources caused by the physical characteristics of the basin—the more likely the riparian nations are to enter into cooperative action. A higher degree of physical interdependence makes all riparians sensitive, perhaps even vulnerable, to any change in water use by any one of them.

Physical interdependence on international rivers varies from one location to another. For instance, in the case of successive international streams, cooperation may be more difficult to achieve than on contiguous streams because in the former case the upper riparian has the power to affect the lower riparian but the lower riparian has no leverage over the upper riparian unless it can exert some form of asymmetrical power. On successive international streams, the lower riparian is sensitive or even vulnerable to any change in water uses by the upper riparian. Such complete dependence of the lower riparian is not conducive to cooperation unless, as noted above, the power of the upper riparian is offset by the lower riparian's asymmetrical power derived from some other policy area.

In the case of navigable successive international streams where the navigation function of the river is important to all riparians, especially the upper one, the potential for cooperation is greater because this type
of physical interdependence creates reciprocal influences and benefits among the riparians. Thus, changes in the water uses of any of the riparians affect all of the riparians that are equally sensitive or vulnerable to such changes. Thus, power cannot be used by a riparian without consideration for the others. The same concept is applicable to contiguous waterways that are vital to all riparian nations.

International basins which have seasonal and climatic conditions that affect rivers' natural flow and the need for water cause riparian nations to be more dependent upon each other and may increase the possibility of cooperation among them.10 Cooperation is more likely because climatic variations and extremes in seasonal flow make all riparians vulnerable to those changes. In order to reduce their vulnerability, the riparians are more likely to be willing to undertake joint actions such as collecting data and building dams and reservoirs to store water and to control water flow.

The potential for cooperation in an international basin with well-defined political borders is greater than that in a basin where borders are subject to dispute.11

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11 Fox and Lemarquand, pp. 1043-1044.
Political border issues are closely related to national sovereignty, and international agreements intended to resolve border problems may not produce reciprocal costs and benefits for all of the parties concerned.\footnote{Lemarquand, pp. 14-15.} For instance, a conflict over changing a national border that involves changing the status of a river from a national to a border stream will reduce the possibility for cooperative action since one of the nations will feel vulnerable and threatened by the power of the other. Such border disputes increase countries' sense of vulnerability and lessen the likelihood of cooperation.

**Economic Factors**

Economic interdependence—that is, the mutual dependence which develops among nations as a result of trade and economic relationships—is another factor which helps to create an environment that may promote cooperation among riparians in international basins.\footnote{Karl-Eric Hansson, "Economic and Other Considerations for Cooperation in the Development of Shared Water Resources," Experiences in the Development and Management of International River and Lake Basins, Natural Resources/Water Series No. 10 (New York, United Nations, 1983), pp. 83-84.} When water development projects are expected to be beneficial to all riparians, the possibility of cooperation is enhanced, but
when all nations will not benefit equally—and perhaps some
will not benefit at all—cooperation will be difficult to
obtain since self-interest is a major motivational factor
for all of the nations involved.

The possibility of cooperation is greater in a basin
in which nations have strong trade or technological ties.
Riparians often use these economic relationships in order
to influence cooperative action pertaining to international
waters. For instance, an agreement between upstream and
downstream riparians pertaining to trade, technological or
military assistance, or other issues may help one of them
to gain concessions from the others pertaining to water
resource issues. Economic interdependence makes riparian
nations sensitive or even vulnerable to each other, and
such reciprocal sensitivity or vulnerability increases
the possibility of cooperation among them.

Technical and Administrative Factors

Interdependence fostered by joint activities in
gathering technical data or undertaking administrative
functions may be an important factor that can promote
cooperation among riparian nations.14 For example, the

14Maxwell Cohen, "River Basin: Observations from In-
ternational and Canada-United States Experience," Experi-
ences in the Development and Management of International
River and Lake Basins, Natural Resources/Water Series No.
possibility of cooperation is greater when riparians have the same understanding or perceptions of the technical aspects of the problems in the drainage basin. The possibility of cooperation is also heightened in an international basin when the riparians rely on the same technological systems (e.g., in dealing with problems of water quality) and use the same types of anti-pollution technology and when they have similar legal and administrative codes and administrative structures.

Cooperative action is more likely to occur in international basins where great amounts of hydrological and technical data are available. Riparian nations are more inclined to agree to cooperative arrangements if they are able to examine various alternative methods of developing and utilizing the waters of international streams. The potential for cooperation is also greater in basins where all of the riparian nations have competent and well-staffed water agencies. These personnel from national agencies often serve as technical representatives or advisors for their respective countries in any cooperative efforts among the riparians. Joint studies and fact-sharing among these water experts help to increase the level of trust and confidence and to improve the communication among riparian

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nations, all of which are essential for international cooperation.

International organizations may foster cooperation among riparian nations on international streams through their services as impartial agents in collecting hydrological and technical data or in financing development projects in drainage basins. Regional or international organizations on the basin level often help to promote a sense of community and to create shared perceptions among riparians. In some instances international organizations play an essential role in bringing the various riparians to a common definition or understanding of water resource problems and in clarifying alternative solutions to those problems.

Cultural Factors

Cultural interdependence—that is, the cultural similarities that influence the willingness of nations to cooperate with each other—also may increase the potential for cooperation in an international basin. Cooperation

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is more likely in a basin where nations have a common cultural heritage in race, language, religion, or a history of friendly relations. A common cultural heritage often encourages trust and mutual confidence among riparians, and this in turn enhances the possibility of cooperative action among them. Compromise, which is also essential in any international agreement, is easier to attain when cultural interdependence exists.

Political Factors

Political interdependence—that is, the common political ties, values, and relationships among the various political systems in an international basin—is another important factor affecting the possibility for cooperation among riparian nations. Political interdependence may be a primary condition leading to cooperation and integrated development in an international basin, even when other incentives are not strong enough to trigger such actions. Therefore, the greater the political interdependence within a basin, the greater is the possibility of cooperation among the riparian nations.

Political interdependence includes a number of components such as the nature of the relationships among the leaders of the riparian nations, similarities of political

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18 Fox and Lemarquand, pp. 1045-1046.
and economic ideologies, and military alliances. The possibility for cooperative agreements is much greater among riparian nations that are politically interdependent since such interdependence helps to create a sense of trust that is essential to cooperation.

Similarity in political and economic ideologies encourages cooperation among riparian nations. The possibility of cooperation within an international basin whose countries have similar or at least not competing political and economic ideologies is higher than that in a basin where the riparians espouse competing or conflictual ideologies. Agreements on international water resources require bargaining and compromising, and compromise is impeded by competing national ideologies. Compromises made by a leader of one riparian nation with others who adhere to different ideologies or with members of a competing alliance may subject him to international pressures that could pose a political threat to him.19

The international political perceptions of riparian nations are also an important factor that can affect the cooperative process within any international basin. When all or at least some of the riparians wish to be viewed

by other countries as law-abiding, peaceful members of the international community, cooperative actions are more likely to occur since such nations may be willing to enter into agreements that are not completely to their advantage in order to avoid damaging their international image.\textsuperscript{20}

Internal political conditions in riparian nations also affect the possibility of achieving cooperation within an international basin. For example, the potential for cooperation is greater in a basin with economically developed and politically stable systems. Economic development and political stability are essential for the planning and execution of integrated water development projects on international streams. Leaders of stable political systems may turn their attention more fully to national economic problems, whereas leaders in more unstable political systems are forced to devote more of their energies to problems of political instability and nation-building, which hinders them from considering major, long-term cooperative arrangements for water resources.\textsuperscript{21}

Interest or pressure groups within individual riparian nations also play a major role with regard to cooperative agreements among countries on international streams. The possibility of cooperation is greater in basins where major interest groups favor international cooperation pertaining

\textsuperscript{20}Lemarquand, pp. 12-13. \textsuperscript{21}Nijim, p. 12.
to water resources. Interest groups that can benefit from cooperative agreements over international waters often serve as a force to build the necessary internal political consensus needed to support cooperative action. Conversely, if major groups in a country oppose international cooperative actions, cooperation will be more difficult to achieve.\textsuperscript{22}

Table XVI summarizes the various factors of interdependence in international drainage basins. In this table willingness to cooperate is displayed as a continuum showing the possibility of cooperation. Nations are more likely to cooperate in international drainage basins with contiguous streams that are vital to all riparians or in basins with successive streams where navigation is important to all countries, particularly to the upper riparians. Countries are also more willing to cooperate when great climatic and seasonal variations cause extreme changes in river flow and water need, when well-defined political borders are present, and when all riparians will benefit from water resource development. Furthermore, riparians are more likely to cooperate when they have strong economic ties with one another, share similar perceptions of the problems related to water resources, and use similar technological methods for dealing with water pollution.

\textsuperscript{22}Lemarquand, p. 46.
### TABLE XVI

FACTORS AFFECTING WILLINGNESS TO COOPERATE AMONG NATIONS IN INTERNATIONAL DRAINAGE BASINS

<table>
<thead>
<tr>
<th>Factor</th>
<th>Less Willingness to Cooperate</th>
<th>More Willingness to Cooperate</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Physical characteristics</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type of international river</td>
<td>Non-navigable stream</td>
<td>Navigable stream</td>
</tr>
<tr>
<td>Successive</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seasonal and climatic variation</td>
<td>Small</td>
<td>Great</td>
</tr>
<tr>
<td>Political borders</td>
<td>Not well defined</td>
<td>Well defined</td>
</tr>
<tr>
<td><strong>Economic factors</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Economic incentives from water</td>
<td>Some riparians benefit from projects</td>
<td>All riparians benefit from projects</td>
</tr>
<tr>
<td>resource development projects</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trade and technological exchange</td>
<td>Small amount</td>
<td>Large amount</td>
</tr>
<tr>
<td><strong>Technical and administrative factors</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Riparians' perceptions of the tech-</td>
<td>Divergent</td>
<td>Similar</td>
</tr>
<tr>
<td>nical aspects of water problems</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Riparians' technological systems</td>
<td>Different</td>
<td>Similar</td>
</tr>
<tr>
<td>Availability of hydrological and</td>
<td>Scarce</td>
<td>Abundant</td>
</tr>
<tr>
<td>technical data</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Structure of riparians' water</td>
<td>Different</td>
<td>Similar</td>
</tr>
<tr>
<td>institutions and water codes</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Cultural Factors</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Riparians' cultural heritage</td>
<td>Different</td>
<td>Common</td>
</tr>
<tr>
<td>Riparians' communication and relations</td>
<td>Limited and carried on</td>
<td>Extensive and freely carried on</td>
</tr>
<tr>
<td></td>
<td>with difficulty</td>
<td></td>
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TABLE XVI--Continued

<table>
<thead>
<tr>
<th>Factor</th>
<th>Willingness to Cooperate</th>
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</thead>
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<tr>
<td></td>
<td>Less</td>
</tr>
<tr>
<td><strong>Political factors</strong></td>
<td></td>
</tr>
<tr>
<td>Relationships among riparian leaders</td>
<td>Unfriendly/not close relations</td>
</tr>
<tr>
<td>Riparians' political and economic ideologies</td>
<td>Divergent</td>
</tr>
<tr>
<td>Riparians' membership in alliances</td>
<td>Members of different alliances</td>
</tr>
<tr>
<td>Riparians' international image</td>
<td>Of little concern</td>
</tr>
<tr>
<td>Riparians' stability</td>
<td>History of instability</td>
</tr>
<tr>
<td>Support from interest groups</td>
<td>Opposition or weak support</td>
</tr>
</tbody>
</table>

The potential for cooperation among riparians is greater when adequate technical data are available and when the countries in the basin have similar water codes and administrative agencies and are willing to share and jointly undertake technical studies. Regional and international organizations also foster cooperation through their hydrological and technical studies and by virtue of their ability to help finance development. When riparian nations have a common cultural heritage, congruent political ideologies, similar alliances, friendly relationships among political leaders, stable political systems, concern for their international images, and major interest groups that support international water resource development, the potential for cooperation is enhanced.
Factors Influencing Interdependence among Riparian Nations in the Tigris and Euphrates Drainage Basin

The possibility of future cooperation in the Tigris and Euphrates drainage basin is influenced by the degree of interdependence and the sense of community within the valley and among the four countries of the basin. Factors influencing interdependence in the Tigris and Euphrates valley are examined in the following pages.

Physical Characteristics of the Basin

Both the Tigris and Euphrates Rivers flow successively through the political borders of the four riparian states, and the upper riparians have complete control over the natural flow of both streams. Thus, the physical environment does little to encourage a sense of interdependence among the riparian nations. For example, Turkey has control over the flow of the headwaters of the Tigris and Euphrates Rivers. Syria, as the middle riparian, also has control over the Euphrates River within its territory and over some of its main tributaries. Similarly, Iran has control over the headwaters of some of the major tributaries of the Tigris River. Iraq and Syria, as lower riparians, are therefore dependent upon the actions of the upper riparians.23

Climatic and seasonal variations of river flow vary widely in the Tigris and Euphrates valley, and these variations make Syria and Iraq—especially the latter—very vulnerable since the region is hot and arid and the lower riparians depend almost entirely on the waters of the two rivers. The extreme variations in water flow, which periodically result in floods followed by periods of drought, may force the riparians to cooperate in the development and management of the rivers as their demands for water continue to grow.\(^2\)

Iraq, the lower riparian with the most developed system of irrigation in the basin, is vulnerable. Physical interdependence does not provide Iraq with leverage over the upper riparians since neither of the rivers is navigable (with the exception of the Shatt Al-Arab waterway). The physical character of the basin does not give the lower riparians a means of making the upper riparians feel sensitive or vulnerable concerning water resources.\(^5\)

**Economic Factors**

Economic interdependence among nations normally results from trade, economic assistance, technological


exchange, and the like. At the present time, relatively little economic interdependence exists among the four states in the Tigris and Euphrates drainage basin. As can be seen in Table XVII, trade among these countries has been limited, although the total has increased over the last three decades, especially among Turkey, Syria, and Iraq. Economic ties between Iraq and Iran, however, are almost nonexistent and no trade has been conducted between them for more than ten years. This is due to the unfriendly relations between these two countries, which in part reflect their conflict over unsettled political borders.

As an oil-producing country, Iraq ships oil by pipeline through Syria and Turkey. Syria and Turkey, on the other hand, produce little oil and are dependent on outside sources to meet their needs. An agreement between Iraq and Turkey calls for the former to provide the latter with oil in return for the privilege of transporting oil through Turkish pipelines. Syria and Iraq also had such an agreement, but differences between their political systems in recent years have prevented Iraq from shipping oil through Syria. The fact that Turkey and—to a lesser degree—Syria need Iraqi oil resources makes them subject to asymmetrical power from Iraq that may be used to promote cooperative action pertaining to water resources.
TABLE XVII

<table>
<thead>
<tr>
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<td>2.0</td>
<td>2.8</td>
<td>3.7</td>
<td>23.5</td>
<td>28.9</td>
<td>73.5</td>
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<td>16.4</td>
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<td>....</td>
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<td>12.0</td>
<td>638.5</td>
<td>703.3</td>
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<tr>
<td>Turkey</td>
<td>3.6</td>
<td>1.9</td>
<td>15.9</td>
<td>6.2</td>
<td>80.9</td>
<td>26.3</td>
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<tr>
<td>Iraq</td>
<td>14.4</td>
<td>6.7</td>
<td>26.5</td>
<td>6.6</td>
<td>560.0</td>
<td>10.0</td>
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<tr>
<td>Iran</td>
<td>1.1</td>
<td>0.1</td>
<td>1.3</td>
<td>....</td>
<td>2.7</td>
<td>0.4</td>
</tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Turkey</td>
<td>0.1</td>
<td>14.3</td>
<td>19.2</td>
<td>30.3</td>
<td>713.0</td>
<td>1,243.0</td>
</tr>
<tr>
<td>Syria</td>
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<td>4.7</td>
<td>5.2</td>
<td>24.1</td>
<td>11.0</td>
<td>510.0</td>
</tr>
<tr>
<td>Iran</td>
<td>2.0</td>
<td>0.3</td>
<td>....</td>
<td>....</td>
<td>....</td>
<td>....</td>
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</tr>
<tr>
<td>Turkey</td>
<td>...</td>
<td>6.4</td>
<td>16.0</td>
<td>13.0</td>
<td>774.0</td>
<td>580.0</td>
</tr>
<tr>
<td>Syria</td>
<td>...</td>
<td>0.7</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>2.7</td>
</tr>
<tr>
<td>Iraq</td>
<td>0.4</td>
<td>2.2</td>
<td>...</td>
<td>...</td>
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*Totals quoted for imports/exports between pairs of countries may differ because the importing country includes shipping fees and the exporting country does not.

**Technical and Administrative Factors**

Cooperation in water data collection does exist among some of the riparian nations in the Tigris and Euphrates basin, particularly between Turkey and Iraq. In the late 1940s, both Turkey and Iraq signed a treaty in which the former nation agreed to permit Iraqi officials to collect climatic and hydrological information in its territory. No such agreements have been established among the other riparians permitting the joint collection of hydrological data. The success of the cooperative arrangement between
Turkey and Iraq may help in the future to increase the possibility that similar actions will be undertaken among the other riparians since it offers a pattern of cooperation for all of the countries in the basin.26

The fact that the water laws of the four riparian states are influenced by Islamic principles also may enhance the possibility of cooperation among them. In addition, the administrative structures for water management in the riparian nations are basically similar, although Turkey has a somewhat more decentralized system than the other three countries. This similarity in water laws and administrative structures may make cooperative efforts among the riparians easier to attain.27 After the nations begin to share data and undertake joint water studies, their perceptions regarding water resource problems and possible solutions to those problems may tend to coincide and cooperation may thus be easier to achieve.

Cultural Factors

Although the Tigris and Euphrates valley includes people of various races and languages and has a history of


conflict that hinders cooperative efforts, a number of cultural factors may foster cooperation among the riparian societies. For example, the vast majority of the people in the region are followers of the Islamic faith, and this common religious background can enhance cooperative efforts among the four riparians. Shared religious beliefs normally help to create a sense of oneness and to increase feelings of trust and confidence among people. Therefore, as the religion of the majority of the population in the Tigris-Euphrates valley, Islam may be a factor in bringing about future cooperative action and may give such international groups as the Islamic Conference the potential to serve as mediators in negotiations among the riparians.

**Political Factors**

Political factors within the Tigris and Euphrates basin have shaped the politics of water from the earliest times. During the period of Ottoman domination, the two rivers were under the complete control of the Empire, and thus the politics of water was dealt with as a national problem. During the era of colonialism following World War I, the politics of water was dominated by western powers. Following the rise of independent nation-states

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in the region, coupled with population growth and economic
development, the politics of water has come to be shaped
by the national interests and international alliances of
the four riparian states.

At the present time, the political environment of
the riparians is not very conducive to cooperation. All
of the countries in the basin have divergent political
and economic ideologies, particularly Iraq and Iran. Such
ideological differences influence water issues within the
Tigris and Euphrates valley, making the riparians less
willing to compromise. Ideological differences also
restrict personal relationships and communications among
the political leaders of the countries.²⁹

The riparians in the Tigris and Euphrates valley are
members of various regional or international organizations.
All belong to the United Nations and the Islamic Conference.
Syria and Iraq are Arab countries and are members of the
Arab League. Syria, Iraq, and Iran are members of the non-
aligned movement, whereas Turkey is a member of NATO.
Finally, as oil-producing nations, Iraq and Iran are mem-
bers of OPEC.³⁰

²⁹Tareq Y. Ismael, Iraq and Iran: Roots of Conflict
(Syracuse, New York, Syracuse University Press, 1982), pp.
1-40.

³⁰Arthur S. Banks and William Overstreet, editors,
Political Handbook of the World: 1982-1983 (New York,
473-474, 492-493.
Despite the fact that some of the riparians are affiliated with rival alliances or organizations, international or regional entities may play a role in fostering cooperation among them. The Arab League, for example, could promote cooperation between Syria and Iraq and also may influence the other riparians since all of the countries are basically Muslim. The Islamic Conference is another political organization that may promote cooperative action concerning water among the four countries. OPEC does not represent a strong factor for interdependence in the Tigris and Euphrates valley, but it may contribute to cooperation among the four riparians by helping to finance development in the region. Generally, the influence of these international organizations depends upon the political stability and the development of the states in the region as well as upon the involvement of the superpowers in the area.

The preceding discussion regarding the factors influencing interdependence among the nations in the Tigris and Euphrates basin is summarized in Table XVIII, which presents the factors that influence the willingness of the riparians to cooperate in matters regarding water resources. This table shows that the physical characteristics of the basin do little to promote interdependence since both rivers flow successively through the various
TABLE XVIII
FACTORS AFFECTING WILLINGNESS TO COOPERATE AMONG THE FOUR RIPARIAN STATES IN THE TIGRIS AND EUPHRATES DRAINAGE BASIN

<table>
<thead>
<tr>
<th>Factor</th>
<th>+ Willingness to Cooperate +</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Less</td>
</tr>
</tbody>
</table>

**Physical characteristics**
- Type of international river: Successive
- Navigation: Non-navigable streams
- Seasonal and climatic variation
- Political borders: Unsettled between Iraq and Iran
- Great
- Settled among Turkey, Syria, and Iraq

**Economic factors**
- Trade and other economic ties: Weak between Iraq and Iran
- Improving among Turkey, Syria, and Iraq

**Technical and administrative factors**
- Availability of hydrological and technical data: Limited
- Structure of riparians' water institutions and water codes: Similar

**Cultural factors**
- Riparians' cultural heritage:
  - Race: Different
  - Language: Different
  - History: Confictual
  - Religion: Similar

**Political factors**
- Riparians' political and economic ideologies: Divergent
- Riparians' membership in international and regional organizations: Various
nations and they are not navigable. Furthermore, unsettled political borders between Iraq and Iran further diminish the possibility of cooperation. The climatic conditions and variations in seasonal flow of the rivers, however, may serve as a factor fostering future cooperation among the riparians since the problems of flooding and water shortages affect all of the nations in the basin. Trade among the four riparians has grown during the past two decades, and as their economic development continues trade may be more influential in causing the nations to become more interdependent. Some technical and administrative factors may help to foster interdependence among the riparians in the future; for example, all four of the countries have basically similar water codes, and their administrative structures for water programs are also similar. Cooperative arrangements have been established between Turkey and Iraq for gathering hydrological data. Few cultural similarities, however, are present in the valley to help create a sense of regional community. Each nation is dominated by a different ethnic group, with the exception of Syria and Iraq, which are both predominantly Arabic, and each--again with the exception of Syria and Iraq--has a different official language. In fact, a shared religion is the only major cultural factor among the riparians. All of them are predominantly Islamic, and this commonality
in the region could help to foster future cooperation. Historically, political relations among the four countries have been conflictual, and they exhibit little political interdependence. Furthermore, the four riparians have divergent political and economic ideologies, they are allied with different international coalitions, and few personal or political ties exist among their political leaders.

In spite of the seeming preponderance of conflictual factors and the lack of a sense of regional interdependence or community in the basin, the possibility of cooperation among the riparians may improve in the future. Hope for such improvement is based upon an expected increase in the recognition of the importance of cooperative water management to the future economic development and stability of the region. The four riparians may become more sensitive or even vulnerable politically and economically to each other as they develop, and increased sensitivity or vulnerability may serve as an influence to bring them into cooperative action, particularly on the issue of water resource development.

Cooperative International Experience in International Drainage Basins

Although it is of value to analyze the conflictual and interdependence factors in international basins, such an analysis does not fully demonstrate the dynamic nature
of the policy process in the international arena. Other environmental factors also influence this process; therefore, it may be more fully understood by examining the experience of cooperative action among riparian nations in other international drainage basins.

Four cases of cooperation in international drainage basins are examined here in order to determine the kinds of interdependence and other environmental conditions that act as catalysts to bring about cooperative agreements. The relationship between the degree of interdependence among riparians and the types of joint administrative arrangements they have established to manage international drainage basins will also be discussed.

Cooperative Arrangements between the United States and Canada over Shared Water Resources

The United States and Canada have a long common border and share a number of international water courses. As early as 1905, the two countries formed an ad hoc joint international commission to undertake hydrological studies and to recommend solutions to their water problems. As a result of the commission's report a treaty was entered into in 1909 which established the basic guidelines for resolving differences arising from the shared waters on the U.S.-Canadian boundary. A permanent joint international commission composed of three members from each
country was also created by this agreement. This commission was given the authority to conduct studies, to approve or disapprove water projects, to settle disputes over water between the two nations, and, in instances when disputes could not be resolved, to recommend proposals for a final solution to both the U.S. and Canadian governments.\textsuperscript{31}

Since the creation of the permanent joint commission a number of water agreements have been signed by the United States and Canada, such as the agreement concerning the Columbia and the St. Lawrence treaty, which established the guidelines for water development in those basins.\textsuperscript{32} Another cooperative agreement between the United States and Canada over their shared water resources was the 1972 agreement concerning pollution in the Great Lakes, which formulated bases for resolving pollution problems.\textsuperscript{33}

As these agreements indicate, cooperation between the United States and Canada concerning international waters


\textsuperscript{32} J. D. Chapman, editor, The International River Basin (Vancouver, British Columbia, Publications Centre, University of British Columbia, 1963), pp. 32-35.

\textsuperscript{33} Mosely, pp. 84-124.
has been extensive, and this cooperation has been enhanced by a high level of cultural, social, economic, and political interdependence between the two countries. The histories of the United States and Canada are very similar. They share a common English ancestry, English is their major language, and both maintain freedom of religion with dominance of Christian sects. Furthermore, the two nations share a long history of peaceful relations, and their sense of community has been strengthened by the fact that they have been allies since World War I and are today joint members of NATO. Strong economic and technological ties also contribute to the sense of community between the United States and Canada. Free exchange of students and faculty and of technology and expertise helps to draw the nations closer together. The stable and similar political systems, similar economic and political ideologies, and developed economies of the United States and Canada create common perceptions and understandings of their mutual problems, including water issues.34

Despite this strong sense of interdependence, however, some conflicts exist between the two countries because of their opposing interests. This is particularly true

with regard to water resources since Canada is the upper riparian on the waterways it shares with the United States and joint agreements may not completely satisfy the various concerns affected by joint water developments.

Various environmental conditions work as catalysts to bring about cooperation between the United States and Canada. For example, the joint international commission's tradition of acting as an impartial institution serves as a means of bringing the two nations into cooperative action over their shared water resources. Furthermore, the United States' growing concern with national defense and the vital role that Canada plays in this defense because of its location and its membership in NATO cause the United States to seek agreements with Canada over various issues, including boundary water resources. Without these environmental factors that promote international cooperation, agreements between the United States and Canada concerning conflictual water issues would be more difficult to attain despite their high degree of interdependence.35

Cooperative Arrangements between the United States and Mexico over Shared Boundary Water Resources

The United States and Mexico also have a long common border and share a number of international drainage basins.

35Lemarquand, pp. 68-75.
such as those of the Colorado, Rio Grande, and Tijuana Rivers. The United States' relations with Mexico, however, have not been as close as its relations with Canada.\textsuperscript{36} The histories of these two countries differ, and they have different heritages and speak different languages. Ties between the United States and Mexico have not been close in part because of the consequences of the Mexican-American war and subsequent border conflicts. Furthermore, Mexico's level of political and economic development has been lower than that of the United States, and trade and mutual interdependence did not spring up between the two countries as in the case of Canada. In addition, Mexico is the lower riparian and can exert little leverage over the United States. International agreements are complicated by the fact that the Rio Grande and Colorado Rivers flow through arid sections of the United States and major American interests are opposed to international water agreements that do not favor them.\textsuperscript{37}

In 1895, conflict between the United States and Mexico over the waters of the Rio Grande River, caused


by the former nation's increased use of water for irrigation, prompted U.S. Attorney General Harmon to write an opinion concerning the United States' right to utilize the waters of the river. In his opinion Harmon relied on the theory of territorial sovereignty over water resources and stated that the United States had no legal obligation to give Mexico any of the water in the Rio Grande. In practice, however, the United States did not adhere to this legal stance, and the two countries have entered into a number of agreements concerning the allocation of water from the Rio Grande River. The Colorado River Compact of 1922 also provided for cooperative developments in that drainage basin. In the 1940s, increased water consumption and growing demands for power development and flood control in international river basins resulted in a more comprehensive agreement between the United States and Mexico. Still more recently, in 1974, the two nations signed the Colorado River Salt Pollution Treaty, in which the United States pledged to immediately improve the quality of water entering Mexico and to build a reverse osmosis desalting plant in order to deliver water with a

38Berber, p. 15.  39Nijim, p. 5.

lower concentration of salinity to Mexico. Pursuant to the provisions of this treaty, the United States spent over $119.5 million to improve the quality of water in the Colorado River flowing into Mexico. ¹¹

An 1884 agreement between the United States and Mexico established a joint international water commission responsible for conducting hydrological studies and for planning and implementing water agreements between these nations. This international commission has not evolved to the same extent as its U.S.-Canadian counterpart. The powers of the U.S.-Mexican commission are limited in resolving disputes over water use; it functions primarily as a communication link between the two nations and can only recommend actions to the U.S. and Mexican governments for their final approval. ²²

Despite the fact that the United States and Mexico exhibit relatively little interdependence compared with the U.S.-Canadian relationship, the two nations have entered into cooperative arrangements in water development programs. Various factors enhance these cooperative developments, such as the fact that the United States as a superpower is concerned about taking actions which may not be accepted by the international community, particularly by

¹¹Lemarquand, p. 36. ²²Friedkin, pp. 204-205.
Latin America. This concern with its international image is an important factor influencing the willingness of the United States to cooperate with Mexico. In addition, since the 1970s Mexico has become an important source of oil for the United States, and the growing economic ties between the two countries are causing the United States to be more amenable to cooperative agreements over shared water resources.

Other environmental conditions have also served as catalysts to encourage cooperation between the United States and Mexico. The Arab oil embargo in the 1970s made the United States aware of how sensitive and even vulnerable it was to an oil shortage, and this awareness, in turn, caused it to devote more attention to its relations with Mexico in order to ensure the availability of needed oil supplies. Growing competition between the United States and the Soviet Union for influence in Central and South America is another factor that has made the United States more desirous of maintaining a close and friendly relationship with Mexico.

3 Lemerquand, p. 12.

Cooperative Arrangements between Egypt and Sudan over Water Use in the Nile Drainage Basin

Nine riparian nations share the Nile drainage basin: Burundi, Kenya, Ethiopia, Rwanda, Uganda, the United Republic of Tanzania, Zaire, Sudan, and Egypt. The Nile drainage basin is located mainly in an arid region, and its waters are vital for irrigated agriculture. This is particularly true in Egypt, which is entirely dependent upon the water of this international river.

Egypt and Sudan, the lower riparian nations, have the most arable land under cultivation and are the major users of water in the basin. Other riparians, however, could use additional water from the Nile if major water development projects were constructed in the upper part of the Nile basin.45

In 1929, while Sudan was still under the domination of Britain, conflict between Egypt and Sudan over the waters of the Nile caused by their increased use of water for irrigation motivated the two countries to enter into an agreement allocating the water of the Nile between them.46 By


46Ibid., pp. 296-297.
the 1950s, increased water consumption and growing demands for power development and flood control in the Nile basin resulted in a second international agreement between Egypt and Sudan in which the water allocations were adjusted and Sudan's allotment was increased. **7**

Since 1960, a joint international technical commission has been responsible for conducting hydrological studies and implementing water projects that are approved by both nations. The degree of cooperation on the development of the waters of the Nile, however, is limited since a number of factors impede comprehensive agreements among all of the riparians. The physical characteristics of the Nile basin are not conducive to cooperative actions, and its many heterogeneous societies have divergent political and economic systems and exhibit little economic and political interdependence. **8**

On the other hand, cooperation between Egypt and Sudan over the waters of the Nile River is enhanced by several factors. The two countries are the major water consumers on an international river characterized by great variations in natural flow, which motivates them to join in


**8**Ibid., pp. 159-163.
cooperative arrangements. In addition, Egypt and Sudan are culturally, economically, and politically interdependent. They share common Arabic ancestors, Arabic is the major language in both countries, and Islam is their dominant religion. The two nations also have similar political and economic systems, strong ties of friendship exist between their leaders, and they are members of the Arab League.⁴⁹

Other environmental factors also foster cooperative arrangements between Egypt and Sudan. Among these are pan-Arabism, the Arab-Israeli conflict, and the competition of the superpowers in the region. The help of the Soviet Union in building the Aswan dam in the 1960s, for example, helped to motivate Egypt and Sudan to formulate a cooperative arrangement regarding water use and the reservoir created by the dam.⁵⁰

Agreement between India and Pakistan over the Indus River System

After the partition of India in 1947, the Indus became an international basin with India as the upper riparian and West Pakistan as the lower riparian nation.

⁴⁹Fox and Lemerquand, p. 1046.
Conflict over the water of this river arose immediately after the partition and the establishment of these two independent states. Disputes over the water of the Indus drainage basin, which led to a diversion of the water by India, were exacerbated by the lingering ill feelings resulting from massacres between the Hindus and the Muslims following the withdrawal of the British from India and continuing hostilities between the two nations.\(^5\)

Despite the strength of such conflictual factors and the absence of interdependence between India and Pakistan, in 1960 they agreed upon a limited arrangement pertaining to the waters of the Indus basin. Several environmental conditions helped to bring about this solution to the conflict over water in this drainage basin. First, both of the riparians were greatly influenced by western powers since they were in great need of economic aid from the west. The western powers, in turn, were particularly interested in solving the conflict between India and Pakistan over the water resources of the Indus River system in order to prevent unstable conditions that might encourage Soviet intervention in the region. Reflecting these

western interests, the World Bank acted as an impartial third party in attempting to resolve the conflict between India and Pakistan and thus served as an important catalyst in bringing the two countries together to discuss their disputes. The World Bank conducted hydrological and engineering studies and offered financial assistance for the undertaking of water development programs in this international basin.\(^5\)

The World Bank's first approach to the Indian-Pakistani conflict was basically economic. It stressed the economic advantages of integrated development but neglected serious problems caused by the political differences between the two nations. When India and Pakistan rejected this approach, the World Bank proposed another plan that recognized the seriousness of the political differences which made integrated development of water resources impossible. In the second plan a division of the various tributaries of the Indus River system was made between India and Pakistan. The eastern rivers, such as the Ravi, Beas, and Sutlej, were given to India, and the western tributaries, such as the Indus, Jhelum, and Chenab, were assigned to Pakistan. Both nations also received

financial assistance from the World Bank to construct water projects in the basin. In 1960, India and Pakistan agreed to this arrangement, and a joint international commission was established to gather data and report problems in the implementation of the agreement.\textsuperscript{53}

**Summary**

The foregoing studies illustrate that the degree of riparian nations' interdependence affects their willingness to cooperate concerning the waters of international drainage basins. The more interdependent the countries are—as in the case of the United States and Canada—the more willing they are to enter into cooperative action involving integrated management arrangements such as joint water management agencies. Even when a strong sense of interdependence exists, however, other environmental factors must also be present to act as catalysts in bringing about agreements among riparian nations. The reverse is also true; that is, when little or no interdependence exists among riparians, they experience more difficulty in reaching agreements, and at best they create very weak jointly managed agencies. The fact that agreements may be made even when the relations between the countries in question are hostile—as in the case of India and Pakistan—

\textsuperscript{53}Chapman, pp. 35-37.
demonstrates that other strong environmental factors can act as catalysts to bring about cooperation between the disputing parties.

In the conclusion of this dissertation, the analysis of conflictual and interdependence factors in the Tigris and Euphrates basin will be used as the basis for suggesting possible strategies to bring about cooperative arrangements among the valley's riparian states.
CHAPTER IX

SUMMARY AND POSSIBLE STRATEGIES FOR BRINGING THE RIPARIANS OF THE TIGRIS AND EUPHRATES BASIN INTO INTERNATIONAL COOPERATIVE ACTION

Summary

Conflict over water resources in the Tigris and Euphrates drainage basin is an old, yet a new, problem for the four riparians in the valley. The problem is old in the sense that the border between Iraq and Iran has been contested since the time of the Ottoman and Persian Empires and the dispute remains unsettled today. The border conflict continued following the collapse of the Ottoman Empire after World War I, and in the 1930s, after Iraq obtained its independence, hostilities concerning navigation on the Shatt Al-Arab waterway became even more acute and brought these two countries almost to the point of war. After the Iraqi revolution of 1958 and the overthrow of the monarchical system in that state, the conflict between Iraq and Iran again became more intense. Iraq's withdrawal from the Baghdad Pact and its movement toward the eastern bloc heightened the antagonism between the two countries. Iran's ambition to control the Shatt Al-Arab...
waterway, which would give it a major source of power over Iraq since this waterway is the latter's only outlet to the sea, led to very conflictual relations between the countries in the 1970s. The shah of Iran sought to become the dominant power in the region, and Iraq was a major obstacle to that goal. During this period, the Arab-Israeli conflict, which was occupying much of Iraq's attention, motivated the Iranian government to seek to undermine Iraq by supporting an insurrection by Mustafa Al-Barzani's faction of the Kurds. Some scholars have contended that Iran's purpose in this action was to weaken Iraq and to divert it from supporting the Arab cause in the war with Israel.¹

After the overthrow of the shah's government in 1979, the new Iranian political system caused instability in the region by attempting to interfere in the internal affairs of its neighbors. In 1980, war broke out between Iraq and Iran.

Conflict over water resources in the Tigris and Euphrates drainage basin, on the other hand, is a new problem in the sense that the countries in the region did not emerge as independent states until the years between the two world wars, and only in the last three decades has the

population growth in the area, coupled with economic development, caused the water issue to become a major concern. Before World War I, the waters of both rivers were within the territory of the Ottoman Empire, and all matters relating to them were dealt with as national issues. The collapse of the Ottoman Empire after World War I changed the status of the Tigris and Euphrates valley from a national drainage basin to an international basin. During the mandate period, however, relatively little conflict arose over water resources for non-navigational uses since the riparians' level of economic development was low and only a limited amount of land was being cultivated under irrigation in the upper portion of the valley. In general, the slow population growth and the economic stagnation in the region placed little pressure on water resources. Only in the late 1960s, when all of the nations in the basin increased their water consumption for irrigation and other non-navigational purposes as a result of their growing populations and accelerating economic progress, did the issue of water become a major problem in the region. All of these countries are now stressing irrigated agriculture in their development plans, and all of them are planning water projects to divert larger amounts of the waters of the Tigris and Euphrates Rivers, despite the fact that demands upon the water resources of both streams already
exceed their natural flow. Intensification of the conflict over water seems inevitable because of these increased uncoordinated water diversions and the probability that pollution problems will become more serious as a result of industrial development and growing urbanization in the region. This conflict over water resources threatens the economic development and political stability of the four riparian states and perhaps the political stability of the entire Middle East. Thus, the issue of water resources is among the most serious problems facing the Tigris-Euphrates valley and the Middle East as a whole.

The need for basin-wide coordinated development and management in the valley seems obvious. The present uncoordinated system leads to waste and less than optimum utilization of vital water resources. Floods and droughts still periodically plague the region, and unused water still runs into the sea. It would be to the collective good of all of the riparian nations in the basin to establish a basin-wide system of development and management through which they could maximize the use of water resources.

If the Tigris and Euphrates drainage basin were located within a national system, one would propose the enactment of a national policy and the creation of a basin-wide river valley authority to administer all aspects of
the development and management of water resources in the basin. In a national system, such a central authority could bring various water users together under the provisions of a binding national policy and enforce that policy with laws, rules, and regulations. In the case of international basins such as that of the Tigris and Euphrates Rivers, however, no central authority exists through which riparian nations can achieve coordinated management to ensure optimum utilization of their shared water resources.

The question to be answered is how riparians can be brought together into international cooperative action over water. The purpose of this study, as stated earlier, is to frame the various policy issues pertaining to water resources in the Tigris and Euphrates valley and suggest possible strategies for bringing about a policy for developing an effective international management system for water in this basin. In framing the policy issues in the Tigris and Euphrates valley, a great number of conflictual factors that may act as obstacles to cooperation among the four riparians were identified. A number of factors that enhance interdependence and cooperation among these riparian states were also described. Generally, the conflictual factors far outweighed the integrative ones, and therefore it will not be easy to reach a comprehensive cooperative arrangement in the region.
Possible Strategies for Bringing the Riparians of the Tigris and Euphrates Basin into International Cooperative Action

Despite the weakness of the ties of interdependence among the riparians in the Tigris and Euphrates drainage basin and the lack of a sense of community in the region, some factors are present in the four countries that may assist in bringing about cooperative action. The fact that all of the states have ambitious economic development programs may help to encourage cooperation among them since the goals of such development plans cannot be achieved unless political stability is present in the valley and unless optimum use is made of available water resources. The riparians' hopes for development, therefore, may be an incentive for cooperation.

Other factors of interdependence may also encourage the four states to enter into cooperative arrangements over water resources. Trade has increased among Turkey, Syria, and Iraq and between Turkey and Iran in the past few decades. Improving economic ties among the countries in the region are of benefit to all of them, particularly to Turkey since Turkey has long stressed industrial development and needs markets for its industrial products. Turkey also needs additional hydroelectric energy and oil resources to fuel its industrial plants. Since Turkey is not an oil producer and has only limited financial resources to fund
all of its planned programs, oil from its neighbors, especially Iraq, is very important to the attainment of its developmental goals. Such trade may help those two countries to agree on other issues such as water use and management. Recently, Iraq has shipped most of its oil via pipelines through Turkey to ports on the Mediterranean Sea. This agreement is mutually advantageous to both countries since it gives Iraq an outlet for its oil and allows Turkey to benefit from increased economic activity by having access to a ready source of oil resources.

The location of the headwaters of the Tigris and Euphrates Rivers in the mountainous eastern region of Turkey decreases the saliency of the water issue to that riparian. Turkey, therefore, should be amenable to increasing economic interdependence and possibly cooperative development of hydroelectric power that could be of assistance to Syria and Iraq as well. Turkey would benefit from the increased electrical power generated by large-scale hydroelectric facilities within its territory, and the construction of such facilities would raise the economic prosperity in one of the poorest areas in Turkey and thus relieve the unemployment problem among its Kurdish population. Syria and Iraq would also benefit from hydroelectric facilities in Turkey because they would stabilize the flow of the two rivers and prevent the pattern of flooding followed by acute water shortages.
It is hoped that cooperative agreements concerning the management of the waters of the Euphrates River can be negotiated. The possibility of increased interdependence between Turkey and Iraq provides a basis for such a hope. Furthermore, the fact that the majority of the people of Syria and Iraq are Arab and Muslim has promoted the creation of regional organizations such as the Islamic Conference and the Arab League that can act as neutral third parties in bringing the riparians together for deliberations about cooperative water programs. Since Syria's economic base is not adequate to fully meet its development plans, financing from a regional organization like OPEC may encourage that country to cooperate. Iraq, as the downstream riparian, may also participate in developing water projects when those projects promise to be mutually advantageous.

Turkey's status as the upper riparian on both the Tigris and the Euphrates Rivers may give it some leverage over Syria and help to promote cooperation. Should Turkey carry out its proposed major water diversions from the Euphrates and its tributaries without a cooperative agreement to ensure the welfare of the downstream riparians, both Syria and Iraq would be seriously injured. It is, therefore, to the best interests of all three riparians to negotiate an agreement before undertaking their water development projects.
Because of war and lingering hostilities between Iraq and Iran, negotiations for a water agreement between these two countries should be separated from the cooperative actions taken by the other riparians. After peace is attained between Iraq and Iran and when the Iranian regime becomes more oriented toward national development, cooperation may be possible. Until then Iran is a riparian only on a few of the tributaries of the Tigris River, so Turkey and Iraq, the other two riparians on that river, should proceed to seek their own arrangements with regard to the water resources of the mainstream and the groundwater resources in the basin.

Cooperative agreements, however, do not occur spontaneously between nations; someone must assume a leadership role and attempt to create environmental conditions conducive to bringing the parties together and ensuring the success of negotiations. It seems appropriate that Iraq, the largest water user on both of the rivers in the valley, should assume this role of helping to create conditions that would encourage negotiations, but, unfortunately, as a result of the war between Iraq and Iran and the rift between Iraq and the government of Syria, Iraq would have difficulty in performing this function directly. Furthermore, the Tigris and Euphrates water issue is not high on Turkey's policy agenda since these rivers are only two of
its many national and international streams. By continuing its policies to enhance interdependence in the region, however, Iraq may promote relationships among the riparians, particularly between itself and Turkey. Therefore, Turkey and Iraq may work together to advance the cause of cooperation over water resources in the Tigris-Euphrates valley. They might seek assistance from regional organizations such as the Islamic Conference, the Arab League, the non-aligned movement, or OPEC to bring the riparians of this international drainage basin into a dialogue about the development and management of water and to serve as advocates in negotiations.

After a dialogue on the water issue is begun and a commitment to cooperate is made by the riparians' top-level political representatives, available geological, meteorological, legal, economic, social, engineering, and administrative expertise must be mobilized. The four countries are much more likely to enter into cooperative agreements if they have full, accurate basin-wide data that permit them to examine all of the possible alternatives regarding water use and development. Since lack

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3Ibid., p. 64.
of adequate data plagues all of the riparians, Turkey and Iraq or perhaps a regional organization could sponsor a series of conferences to address the technical aspects of water problems. Such conferences would promote communication and an exchange of hydrological information that would enlarge the data base concerning water resources, and such an expansion of data is essential if each riparian is to be able to fully evaluate the alternative approaches to water use and development. Regional conferences may also stimulate the development of more advanced hydrological studies in the various countries and could lead to an invitation to specialized United Nations water agencies to undertake basin-wide studies and to consider possible alternative methods of developing water resources.

The involvement of U.N. water agencies or other such neutral third parties would provide basin-wide data and development plans from an impartial perspective for the leaders of the riparians to consider. In general, the exchange of technical data and the holding of joint conferences among scientific, engineering, and technical personnel may help to depoliticize conflictual political issues.

"Ibid., p. 128.

Increased information about water problems and possible ways of developing and managing water may enhance basin-wide understanding and foster mutual confidence among the riparians and thus make it easier for leaders of the countries to deal with these complex issues.

After the riparians' top-level political leaders have agreed to cooperate over water resources and technical studies have been undertaken, an extensive mobilization effort must be inaugurated to move water policy issues higher on the political agendas of all of the riparian nations. Topics concerning water are ordinarily mid-range policy issues on countries' political agendas, and this is particularly true in Turkey, Syria, and Iran, where many other issues seem more salient to their people and political leaderships than the question of water use in the Tigris and Euphrates basin. The national water agencies of the four countries, under the direction of their governments and with the assistance of U.N. specialized agencies, should promote educational programs to explain that the political stability and economic prosperity of the region depend upon dealing with water problems on a basin-wide cooperative basis. This mobilization will help to develop support for cooperative action with regard to water resources in this international basin.

Before the political leaders of the four riparians are ready to negotiate specific water agreements, they
must understand not only the various alternative ways in which water might be used or developed but also the types of institutional arrangements required to operationalize water policies, the legal implications of water resource agreements, and the financial aspects of implementing them. Fortunately, a number of institutional models from international experience\(^6\) are available to serve as guides in this regard, and the specialized agencies of the United Nations are presented to consult with the riparians in an international basin as to their advantages and disadvantages. Such institutional models range from very simple, even irregular consultations to complex full-time organizations with wide authority to arbitrate disputes among riparian nations, and a number of other joint arrangements lie between these contrasting extremes. The four riparians of the Tigris and Euphrates basin should consider an institutional arrangement that complements their perceived needs and reflects the degree of international cooperation among them concerning water resources.

Subsequent to these preliminary activities, a formal proposal for undertaking water development programs may be initiated by one of the riparian countries or may arise from the suggestions of U.N. specialized agencies or

regional organizations. The success of negotiations concerning water development will depend, to some extent, upon how well these preliminary activities have been carried out and upon the diplomatic skills and commitment of the parties involved. A regional organization such as those previously mentioned may also assist in the negotiations by serving as a mediator in resolving differences that arise among the riparians and by maintaining the focus of the proceedings on the vital need for cooperation.

As this scenario demonstrates, bringing about cooperation over water use in the Tigris and Euphrates drainage basin will not be easy, and it will occur only if a great deal of goodwill and rational action can be mobilized so as to create conditions under which the riparian nations might agree. Nevertheless, difficult as the task appears to be, it is imperative that it be undertaken for the good of the inhabitants of the region. The cost of not making the effort to promote full, optimum utilization of the water resources in the Tigris-Euphrates valley will be immense; the consequences of failing to seek and work for cooperation among the riparians will affect the lives of the peoples of each of the four countries and perhaps of the entire Middle East.
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