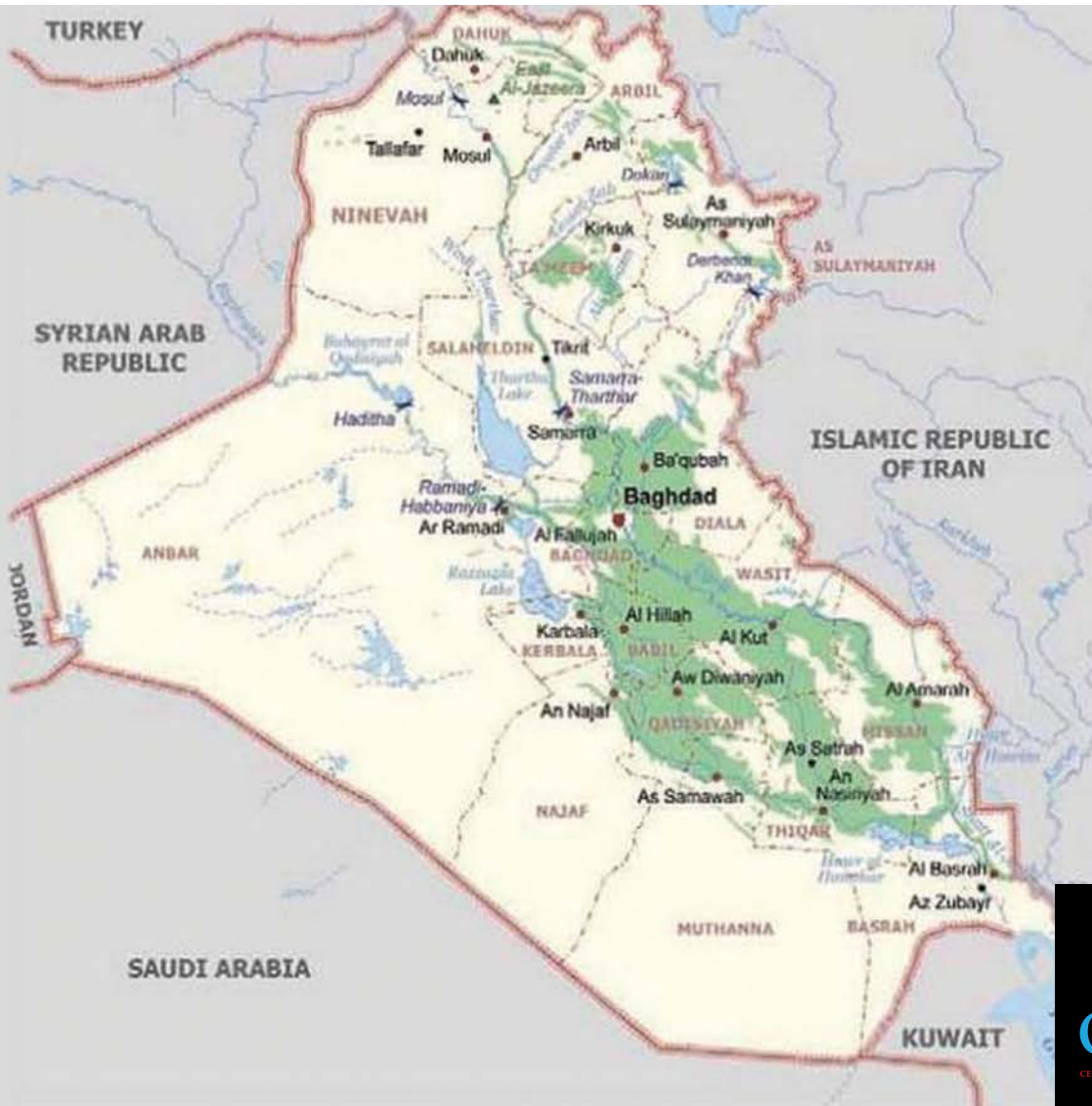


WATER RESOURCES MANAGEMENT IN IRAQ

IRAK'TA SU KAYNAKLARI YÖNETİMİ

ادارة مصادر المياه في العراق

ORTADOĞU STRATEJİK ARAŞTIRMALAR MERKEZİ
CENTER FOR MIDDLE EASTERN STRATEGIC STUDIES
مرکز الشرق الأوسط للدراسات الاستراتيجية



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STRATEGIC INFORMATION MANAGEMENT AND INDEPENDENT THOUGHT PRODUCTION

CENTER FOR MIDDLE EASTERN STRATEGIC STUDIES

History

In Turkey, the shortage of research on the Middle East grew more conspicuous than ever during the early 90's. Center for Middle Eastern Strategic Studies (ORSAM) was established in January 1, 2009 in order to provide relevant information to the general public and to the foreign policy community. The institute underwent an intensive structuring process, beginning to concentrate exclusively on Middle affairs.

Outlook on the Middle Eastern World

It is certain that the Middle East harbors a variety of interconnected problems. However, neither the Middle East nor its people ought to be stigmatized by images with negative connotations. Given the strength of their populations, Middle Eastern states possess the potential to activate their inner dynamics in order to begin peaceful mobilizations for development. Respect for people's willingness to live together, respect for the sovereign right of states and respect for basic human rights and individual freedoms are the prerequisites for assuring peace and tranquility, both domestically and internationally. In this context, Turkey must continue to make constructive contributions to the establishment of regional stability and prosperity in its vicinity.

ORSAM's Think-Tank Research

ORSAM, provides the general public and decision-making organizations with enlightening information about international politics in order to promote a healthier understanding of international policy issues and to help them to adopt appropriate positions. In order to present effective solutions, ORSAM supports high quality research by intellectuals and researchers that are competent in a variety of disciplines. ORSAM's strong publishing capacity transmits meticulous analyses of regional developments and trends to the interested parties. With its web site, its books, reports, and periodicals, ORSAM supports the development of Middle Eastern literature on a national and international scale. ORSAM supports the development of Middle Eastern literature on a national and international scale. ORSAM facilitates the sharing of knowledge and ideas with the Turkish and international communities by inviting statesmen, bureaucrats, academics, strategists, businessmen, journalists, and NGO representatives to Turkey.

About the Programme

Water is irreplaceable, valuable and one of the most important substances for the sustainability of the life not only for human beings, plants and animals but also for the whole ecosystem. The surface and ground waters are utilized for domestic, agricultural and industrial aims. However, there is a dual pressure over water sources due to the human activities and natural changes. Especially, in the places where water shortage is experienced, over-population, immigration from rural areas to urban, food security policies, growing socio-economic wealth, agricultural, domestic and industrial based contamination, the changes in precipitation due to the global climate changes, affects the hydrological cycle. Thus, the water sources are exposed to some changes in respect of their quantity and quality. While demand for water has been gradually growing up, in water stressed areas, the water supply stays stable. While the problems on the management of water resources are experienced, on the other hand the effects of environmental problems on water resources are gradually increasing. Turkey and its close environment, especially, the Middle East are the most influenced regions by such problems.

On the other hand, Turkey's relations with Euphrates-Tigris Basin riparian neighbours are very important when taken into consideration that Turkey has more than 40 percent of the water resources potential on the transboundary basins. In order to reach the political target which both Turkey and other riparian states pursue, of establishing regional stability, augmentation of welfare and deepening the relationship among the neighbouring states, it is essential for all the parties, to have good faith and knowledge based active cooperation in the water resources utilization. In addition, during the process of Turkey's EU candidacy, the agenda of harmonization of EU Water Framework Directive with her own national legislation will along with bring the future water policies to have a new content.

In accordance with the foregoing factors, "ORSAM Water Research Programme" was established on 1st January, 2011 within ORSAM, for the aim of presentation of the enlightening findings and the observations of the current developments on water issues of Turkey's close environment and in the worldwide, to the public opinion and to the decision-makers, which have been acquired by means of analysis.

In the studies of ORSAM Water Research Programme, the Middle East engaged issues are given priority as there is a big increase in the political, economic and social problems, due to the both climate changes and inefficient utilization of water sources in the Middle East and as existing problems in the water budget.

ORSAM Water Research Programme aims to produce new ideas that offer different political alternatives on water issues, to encourage and diversify the qualified studies of competent reseachers and intellectuals from different disciplines in order to form vigorous solution offers and to support the development of water literature in Turkey.

In this scope, ORSAM Water Research Programme aims both, to facilitate the hosting of academics, the representatives of the non-governmental organizations, bureaucrats, statesmen, diplomats, strategists, journalists and businessmen, who studies on the water issues in region countries and to provide the sharing of informations and considerations of those, with the public opinion both in Turkey and in the worldwide.

PRESENTATION

Population growth, climate change, urbanization, increasing water demand increases pressure on natural resources gradually. Water resources are not distributed to the worldwide equally. In the Middle East region which Turkey is also located, water resources and precipitation is under the global average. For the Iraq, Turkey's neighbour and one of the riparians of the Euphrates-Tigris basin, situation is almost the same. Iraq experiences decreasing precipitation rates, and long periodical droughts. Besides, long lasting war, occupation and civil war circle demolished the water infrastructure in Iraq. Thus big losses have been occurred during the process of water delivery.

In this report, ORSAM Water Research Programme Specialists write the report titled "Water Resources Management in Iraq" which depends both on the field research in Northern Iraq in February 2012 and to the sources in the related literature and evaluate the water resources and management in Iraq.

The ORSAM Water Research Program is going to continue its on the water policy issues in the Middle East, in the forthcoming period. We would like to indicate that we are always open to your opinions and assessments about all the subjects related to the Water policy studies.

Hasan KANBOLAT
ORSAM Director

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Contents

Presentation	38
Executive Summary	41
Introduction	42
I. Water Resources in Iraq	42
I.I Surface Waters	42
I.I. I Hydrology of the Euphrates-Tigris Basin	43
I.I. II Main Crisis in the Basin	46
I.I.III Views of the Parties Relating to the Dispute	49
I.II Groundwater	50
I.III Dams in Iraq	50
II. Water Use and Management	52
II.I Water problems in Iraq	52
II.II Water Management in Iraq	53
II.III Iraq's Federal Structure and Water Management Issues	56
III. Case Study: Water Resources in Kurdish Regional Government (KRG)	58
Conclusion	60
References	65

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WATER RESOURCES MANAGEMENT IN IRAQ

Executive Summary

Water problems are getting more acute day by day especially in arid and semi-arid regions like Middle East. Not only economic activities like agriculture and daily life but also relations among countries which are riparians to a transboundary watercourse are also affected directly by this shortage. In the Euphrates-Tigris basin crisis erupted when a riparian state started to develop its water resources. The water problem in the Euphrates-Tigris basin is wanted to indicate as a conflict factor by many western specialists. However, the approach of Turkey on the transboundary watercourses issue is quite clear and cooperative. Iraq which is a downstream country often accuses Turkey by interrupting the waters of Euphrates and Tigris and sees Turkey's utilizations the main source of the water problem in Iraq. However, long lasting war, occupation and civil war circle demolished the water infrastructure in Iraq. Additionally, improper utilizations and mismanagement of water resources are the main problems that Iraq faces. In this report, the water resources of Iraq and water management issues are discussed in technical, political and legal aspects.

Introduction

Iraq, with a total area of 438 320 km², have a total cultivated area of about 6 million ha. The climate in Iraq is subtropical and semi arid. Rainfall distribution is not even. Rainfall is seasonal and seen in the winter from December to February. Average annual precipitation is estimated at 216 mm (According to World Bank report annual precipitation is 154 mm),¹ and ranges from 1200 mm in the northeast to less than 100 mm in the south of the country.² The mountains region of Northern Iraq gets more precipitation than the central and southern desert region. Rainfed agriculture is applied in the northern region of the country.

The Gross Domestic Product (GDP) was US\$ 82,1 billion in 2010 and total population is

about 32,03 million in 2010. In 2000, the agricultural sector accounted for 5 percent of GDP. While the agricultural labour force represented 31 percent of the economically active population in 1975, it decreased to about 8 percent in 2004.³

Total amount of water in Iraq is 75.61 billion m³ annually while total water withdrawal is 66 billion m³ of which 79 percent for agricultural purposes, 6.5 percent for domestic supplies and 14.5 percent for industrial use. In 1991 urban areas have access in 100 percent to safe water supplies but only 54 percent in rural areas. The water supply and sanitation situation has deteriorated as a result of the wars. In 2006, access to improved drinking water sources reached 77 percent of the population.⁴

Table 1: According to World Bank report 2006, water resources in Iraq (BCM)

Period	Euphrates	Tigris	Groundwater	Total
1932-1970	30	48	1	79
1971-2003	19	48	1	68

I. Water Resources in Iraq

I.1 Surface Waters

Originating in Turkey, the Tigris and the Euphrates are transboundary rivers in Iraq. Before their confluence, the Euphrates flows for about 1.000 km and the Tigris for about 1.300 km within the territory of Iraq. The area of the Tigris River Basin in Iraq is 253 thousand km², which is 54 percent of the total river basin area. According to DSI data, the average annual runoff is 16,24 MCM at Cizre gauging station. The Tigris tributaries are;⁵

- The Greater Zab, which originates in Turkey, generates 13.18 billion m³ at its confluence with the Tigris and 62 percent of

the total area of this river basin is in Iraq. The daily flow of the Greater Zab is varied from 118 m³/sec to 2.439 m³/sec. in 1970-1973 period the Greater Zab's average flow was 313 m³/sec at Eskikelek station,

- The Lesser Zab, which originates in Iran, generates about 7.17 km³. The daily flow of the Lesser Zab is varied from 82 m³/sec to 1265 m³/sec,
- The Al-Adhaim drains about 13.000 km² entirely in Iraq and generates about 0.79 billion m³ at its confluence with the Tigris,
- The Diyala originating from Iran generates about 5.74 billion m³ at its confluence with the Tigris,

- The Nahr at Tib, Doveyrich and Shehabi rivers, draining together more than 8,000 km² bring together about 1 billion m³ of highly saline waters⁶ in the Tigris,
- Karkheh river originates from Iran is. Its discharge area is 46,000 km² and annual discharge is 6.43 billion m³.

Utilizing Euphrates-Tigris basin waters dates back about to four thousand years.⁷ Like any other basins, this activity occurred primarily in the lower parts of the basin. However with the twelfth and thirteenth centuries, large scale land abandonment has occurred due to the Mongol invasion. Without a central government, this arranges the irrigation schemes; vast areas of land in the basin remained uncultivated.

By the twentieth century, modern civil engineering techniques pave the way to build large scale irrigation network. The main riparian's, namely Turkey, Syria and Iraq started to develop their water resources at the same time, in 1950's.

Without big store facilities water management of the basin limited since there is not enough water for irrigation throughout the year out of from April to June. This low flow conditions causes crop failures because there would not be enough water for the crops at some distance from the river. Adversely in the period from April to June high flood conditions could not be arranged by inadequate irrigation systems, thus crop failure could occur by excess amounts of water. Beside, excess water causes salination of soil which is another primary concern.

I.I. I Hydrology of the Euphrates-Tigris Basin

In order to understand the effects and importance of the development of water resources in the basin, it is vital to understand the hydrology of the basin. Both the Euphrates and the

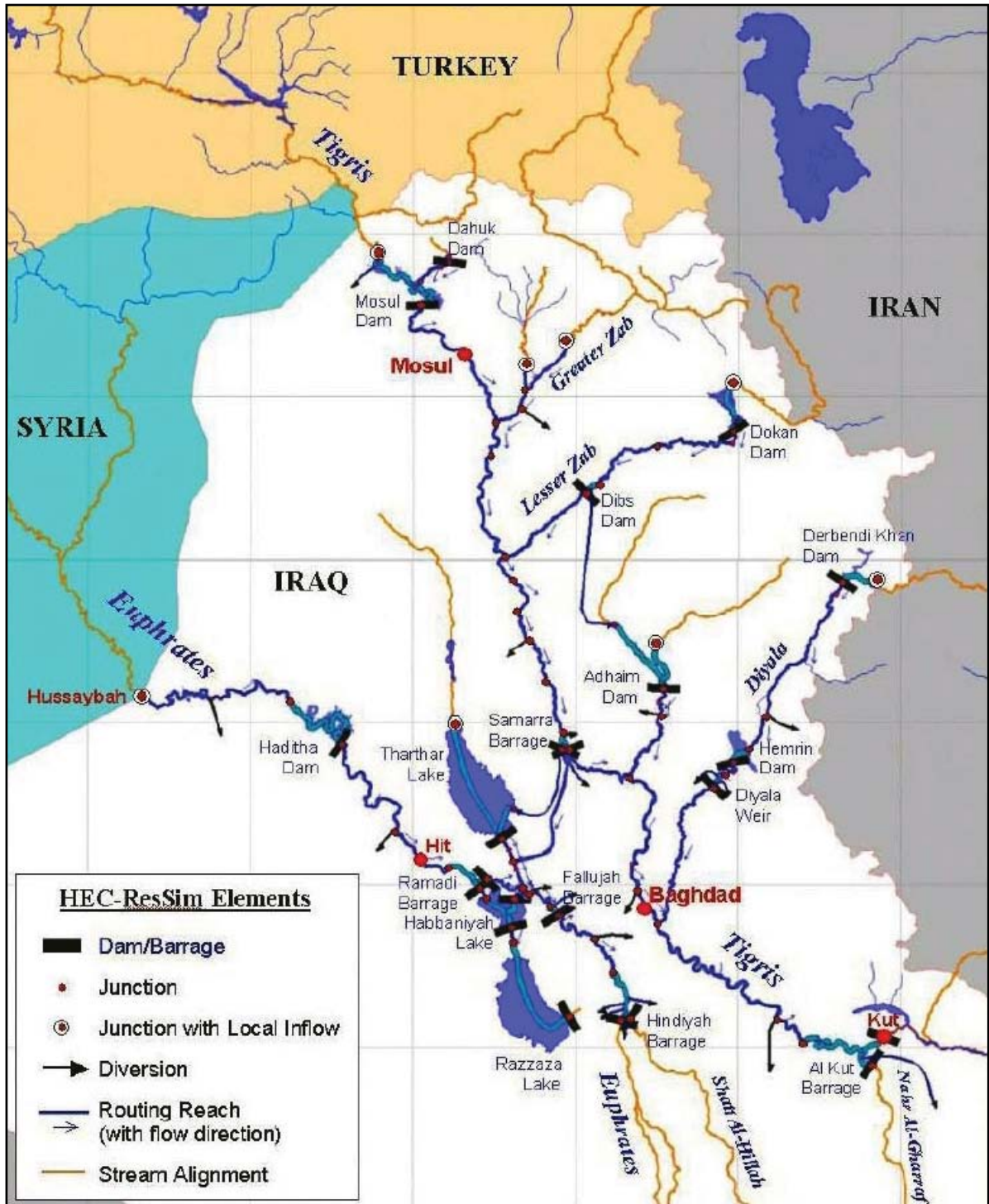
Tigris rivers regimes depend on strong snow-melt peaks. Tigris River's peak recharges seen on April, while Euphrates' seen on May. Both rivers originate from Turkey's eastern regions, just 30 kilometres far away. However for the Tigris River, Iraq's and Iran's highland regions also contribute to the flow of the river. The Euphrates River originates near Erzincan province in Turkey. Tigris River originates from Hazar Lake in Elazığ province. Eastern Anatolia highlands that two rivers originate have more than 1,000 mm precipitation level. Precipitation in the Euphrates-Tigris basin is particularly seen in winter months from October to April. As a consequence of winter precipitation, a large total falls as snow and stays as solid on the highlands and flows in spring and early summer.

Though there are many similarities on flow regimes of the two rivers, in some respects they differ. First difference is about snow-melt peaks. On the Tigris River month of peak discharge is in April. However on the Euphrates it is on May, one month later. In Iraq, maximum flow of the Euphrates can be observed usually in April and May. It is shorter than the Tigris' maximum flow. Euphrates' maximum flow in April and May accounts for approximately 42% of the total annual flow. Though there is some controversy on the total annual flow of the Euphrates River it is roughly between 31-32 billion cubic meters. Tigris River has a greater volume than the Euphrates. Total annual discharge of the Tigris is around 50 billion cubic meters.⁸

Second difference between two rivers is on their discharge patterns. While Euphrates takes nearly all of its discharge from Turkey with a rate of 88%, the Tigris River receives water from serious major tributaries in the mid-portion of its course, in Iraq.

According to Beaumont's book (1985), the Euphrates' flow is 31,820 MCM and the Tigris' flow is 52,665 MCM. Tigris River receives water from tributaries in Northern Iraq. Tigris' discharge in Mosul is 23,210 MCM and

the contribution of the tributaries is 29,455 MCM.⁹ Greater (Upper) Zab is the main tributary and it produces half of the contribution of all tributaries. The other tributaries are Lesser (Little) Zab, Adhaim and Diyala Rivers.



Map 1: Water Resources in Iraq

In Euphrates-Tigris River; the rate of the flow changes from year to year. This situation is the main problem in the basin. Critical drought period has defined as the period the least amount of water is available in the basin during the historical period. Besides this, critical wet period is the period that the largest excess water is available in the basin. Under the circumstances, water supply has been problem in the basin. Before the constructions of the big dams in Upper Euphrates (1937-1964) long term records had set out that minimum flow can decline to 16,871 BCM in 1961, maximum value is recorded as 43,457 BCM in 1963. Wettest year was recorded in 1969 and discharge of the Euphrates river discharge at the Turkish border point is 53,548 BCM. As to Tigris River, the average discharge of the river is 16,800 BCM in Cizre station in Turkey. The minimum flow value was 7,891 BCM in 1961 and the maximum flow value was 34.340 BCM.¹⁰ On the other hand, there have been years in the mid-1960s when 68 km³ were recorded in the two rivers and years in the mid-1970s when the amount reached over 84 km³. Such variations in annual discharge have caused large and possibly disastrous floods as well as periodic severe droughts. In the southern part of the country, immense areas are regularly inundated, levees often collapse, and villages and roads must be built on high embankments. The Tharthar Reservoir was planned in the 1950's to protect

Baghdad from the ravages of the periodic flooding of the Tigris.¹¹

Tigris Rivers is originated from Turkey and Turkey provides nearly 32% of the river's mainstream flow with the addition of the Greater Zab which originates in Turkey, contribution of Turkey is 44%. Euphrates river is originates from Turkey like Tigris river. The contribution of Turkey is 88% and the rest which is nearly 12%, is coming from Sajur, Balikh and Khabur rivers. These rivers occur in Turkey's territory.¹²

When we take into consideration the Tigris River, it has more excess water for Iraq. First of all, as mentioned above, just 16,800 million cubic meters of water annually passes the Turkey-Iraq border in Cizre, while total volume of the river is around 52,000 million cubic meters. Turkey plans to utilize a small portion of that water, nearly 5,500 million cubic meters. As seen from the figures, Iraq has a greater control on the waters of the Tigris than Turkey. After the Turkey's planned utilizations, there are still approximately 47,000 million cubic meters of water are available for Iraq's utilizations. This huge amount of water can irrigate, theoretically, 3,628,000 ha. with a rate of 13,000 cubic meters per hectare or 4,716,500 ha. with a rate of 10,000 cubic meter per hectare.¹³

Table 2: Approximate Water Balance for a Year of Average Hydraulic Data in Tigris Sub-basin (BCM/year)¹⁴

Natural flow at Cizre in Turkey	17.5
Natural flow of Greater Zab from Turkey	4.5
Natural flow of the other tributaries from Turkey	2.0
Total natural flow originating from Turkey	+24.0
Evaporation from Middle Tigris reservoirs	-1.0
Irrigation in Middle Tigris (650.000 ha)	-6.5
Return flow in Middle Tigris (to main river)	+0.5
Return flow in Middle Tigris (to tributaries)	+0.5
Evaporation from Eastern Tigris reservoirs	-0.5
Water losses in Urban & Industrial users	-0.5
Flow from Turkey to Syria-Iraq in Tigris	+16.5
Flow originating from Syria	0.0
Irrigation in Syria	-0.5
Flow to Iraq in Tigris	+16.00
Flow originating from Iran	+10.00
Flow originating from Iraq	+23.00
Evaporation from reservoirs in Iraq	-6.0
Irrigation in Iraq (incl. Euphrates) (3.500.000 ha)	-45.0
Return flow in Iraq (-)	+7.0
Water losses in Urban & Industrial users	-1.0
Flow from the Tigris to Shatt-al-Arab and Gulf delta	+4.0

Karun River is another important river, which is originated from Khozestan province in Iran. Its catchment area is 58.000 km² and its annual discharge is 24.7 BCM. Karun River's tributary is Dez River. Karun River joins Shatt Al-Arab at the South of Al Muhamara city with discharge of 14.4 BCM.¹⁵

I.I. II Main Crisis in the Basin

It should be noted that, before the second half of the twentieth century, there was no substantial upstream utilization from the waters

of the Euphrates-Tigris basin. However, after the 1950's situation has changed and upstream water storage projects gained momentum like downstream diversion efforts.

Turkey started to construct Keban dam in 1965 on the upper Euphrates which is for the generation of hydroelectricity. This dam has a total of 30,700 million cubic meters capacity which 17,000 million cubic meters is active storage. After this dam the volume of water flowing downstream did not change; however flow pattern of the Euphrates River unifor-

med considerably. The minimum flow limited to 400 cubic meters per second and maximum to 1000 cubic meters per second.¹⁶ It is clear that just with the Keban dam low flow or flood risk eliminated at the main tributary of the Euphrates River. Since 1960's, three main riparian states namely Turkey, Syria and Iraq have invested huge amounts of resources and efforts in order to develop water resources in the Euphrates-Tigris basin. However, there is friction on the waters of Euphrates-Tigris basin. Above all the general disagreement on the waters of Euphrates-Tigris basin, the frictions have been occurred when a riparian state, generally Syria and Turkey, midstream and upstream respectively, implement water resources development project.

Before the major projects in the basin, to the 1960's, riparian countries relations on Euphrates-Tigris basin waters can be deemed as harmonious. In this era, Syrian and Iraqi concerns were just about the flooding.¹⁷ All riparian's launched big water resources development projects in 1960's. While Turkey started to build Keban dam in 1965, Syria put the cornerstone of the Tabka dam in 1966 with Soviet assistance. In this era Iraq announced new irrigation schemes with abundant fiscal resources that come from oil revenues.¹⁸

After the Turkey's decision to construct Keban dam, a new era opened for Euphrates-Tigris basin. The Keban dam has a very positive impact for Syrian and Iraqi storage facilities by regulating the Euphrates waters.¹⁹ However Iraq insisted that a guaranteed flow of 350 cubic meters per second must be released by Turkey during the impounding period of the Keban dam. Donors of the Keban dam pressured Turkey in this aspect and Turkey guaranteed to undertake all measures to maintain 350 cubic meters of water flow to downstream with an agreement that signed in Ankara in 1966. While Turkey decided to

construct Karakaya dam, downstream of Keban, the World Bank, new donor, also insisted a guaranteed flow to downstream during the impounding period and operation of reservoir. These two experiments of Turkey caused a negative approach for third party involvement to the issue. Donor's intervention has perceived as to defend just the rights of downstream countries, not a balanced attitude both for upstream and downstream. The first meeting of the riparians' held in 22-27 June 1964 in order to decide the flow of the river during the impounding period of Keban dam. While Iraq insisted on a fixed amount, Turkey asserted that it was impossible to reach a single formula.²⁰ The second meeting of the riparian was held in Ankara again in 1964, which delegations of Syria and Turkey met. Both sides gave each other the achievements on Keban and Tabqa dam projects. After those bilateral meetings, the first trilateral meeting was held in Baghdad in 1965 and exchanged the information about Keban, Tabqa and Haditha dams.²¹ In this meeting, establishing the Joint Technical Committee (JTC) discussed among the riparians. Iraq proposed an agreement which contains a permanent JTC and to have authority to supervise the implementation of the agreement. In accordance with Turkey, Syria rejected the Iraqi proposal and claimed a counter proposal that, JTC might have investigated possibilities of water transfer from Tigris River to Euphrates River. However Iraq opposed this proposal and insisted that the debate is on the Euphrates not the both rivers. However Syria changed its attitude in 1980's and this change perceived as an Arab stance against Turkey.

In this era, the achievement on the negotiation process among the riparian countries was forming a JTC at least on ad hoc basis. Three riparians agreed on joint trips to gauging stations and main water resources development projects. After the observations of three ri-

parians, Iraq asserted that, Iraq's water needs was about 18 billion cubic meters. However Turkish delegation evaluated this figure as Iraq's effort in order to guarantee future utilizations and rejected the Iraq's figures. Turkish delegation also emphasised that wasteful utilization of water in Iraq refutes the Iraqi demands.²² Inappropriate utilization of water in irrigation is still an issue in negotiations among the riparians.

The Tabqa dam in Syria and Keban Dam in Turkey were complicated in 1974 and 1975 respectively. Thus impounding period of two dams caused a water shortage in Iraq. This shortage gave a reason to two downstream riparians Syria and Iraq to escalate the situation to a political crisis in the spring of 1975.²³ The two hostile Baath regimes, which were in the brink of a war, were mediated by Saudi Arabia and additional water was released by Syrians. In 1976 Turkey started to construct Karakaya dam at the downstream of Keban as a first step of Southeastern Anatolia Project, with the Turkish acronym GAP (Güneydoğu Anadolu Projesi). Since the Turkey guaranteed to release 500 cubic meters to the downstream, no crisis had erupted during the impounding period and operation of the dam which became operational in 1987.

In 1980's Turkey started to implement the plans to irrigate the region mainly from the Euphrates river waters, downstream countries raised their objection based on historical rights claims. Being aware of Turkey planned to utilize more from the Euphrates, Syria and Iraq both rejected the Turkish proposal to evaluate both rivers as a single basin. By admitting the hydrological reality that both rivers constitutes a single basin, water transfer from Tigris to the Euphrates river can solve the alleged shortage in the Iraqi part of the Euphrates river. However as a midstream country Syria was aware of that if Iraq gets more

water Syria could utilize those waters because of her location. On the other hand Iraq concluded that, Turkey's utilization plans focused on Euphrates not Tigris, hence decided to negotiate just Euphrates' waters.²⁴

In 1987 the Turkish-Syrian Joint Economic Commission have met and signed a protocol named Protocol of Economic Cooperation between Turkey and Syria. Protocol was not only about the water issue. However this protocol is important since Turkey pledged to release 500 cubic meters per second at the Turkish Syrian border. According to the article 6 of the protocol, during the filling up period of Atatürk Dam reservoir and until the final allocation of the waters of Euphrates among three riparian countries, the Turkish side undertakes to release a yearly average of more than 500 cubic meters per second at the Turkish-Syrian border and in cases where monthly flow falls below the level of 500 cubic meters per second, the Turkish side agrees to make up the difference during the following month.

Article 7, 8 and 9 arranges joint efforts on Euphrates and Tigris rivers' waters with Iraq, JTC works on regional waters and principle about to construct and operate irrigation and hydroelectric power projects. It is clear that while article 6 of the Protocol guarantees the flow pursuant to downstream concerns, articles 7, 8 and 9 reflects Turkey's attitude on Euphrates-Tigris issue. However with the 1987 Protocol downstream countries get a concrete gain with article 6, Turkey just managed to get general goodwill expressions. Even so, Syria and Iraq did not satisfy with this protocol on the base that this is an interim reconciliation and the waters of Euphrates River must be shared equally by the three riparians.

Despite the clear article of the 1987 Protocol, in the impounding period of Atatürk dam in 1990 both Syria and Iraq raised reactions. Turkey urged both governments in November 1989 and explained technical reasons behind the interruption. However, during the interruption of Euphrates River from 13 January to 12 February 1990, Turkey assured Syria would receive at least 120 cubic meters per second from the tributaries downstream of the Atatürk dam and released water at a rate of 750 cubic meters per second from November 1989 to 13 January 1990, the starting period of impounding. This interruption and Syrian and Iraqi reactions was caused a wave of water war scenarios.²⁵ In this period, (from November 1989 to 12 February 1990), Turkey released an average flow of 509 cubic meters per second which is proper to the 1987 Protocol. Additionally Turkey emphasized that, the impounding period was planned when the irrigation needs of both countries at the lowest level. In April 1990 13th JTC held in Baghdad. In this meeting Syria and Iraq signed an agreement which allocates Euphrates river waters in a rate of 42% to Syria and 58% to Iraq.

There was another crisis among the riparians of the Euphrates River when Turkey started to construct Birecik dam which was planned to regulate the extreme flow of the Atatürk dam during the hydroelectricity production. Both Syria and Iraq sent official notes to Turkey in December 1995 and January 1996 by asserting that the Birecik dam would affect adversely quality and quantity of the Euphrates waters.²⁶

I.I.III Views of the Parties Relating to the Dispute

Syria, as a midstream and Iraq as a downstream country in the Euphrates-Tigris basin, proposed parallel solutions with small disparities.

Iraqi proposal, in the beginning of the dispute from 1960's to the Turkey's plans to construct dams in Tigris river, based on three stages and on just about Euphrates river. As a first step, each riparian would announce its water needs not only for completed projects but also for future plans. In the second step, hydrological data would be exchanged among the three riparians and at the end JTC would calculate the demands of water for the projects in operation, then in construction and for planned projects. According to the Iraqi proposal, determination of how much water was needed for each project might depend on the each riparian country.²⁷

Syrians proposal was based on an approach that, Euphrates and Tigris rivers are "shared resources" and should be divided among the riparian countries according to a quota. This quota would be determined by an approach that, each riparian should declare its needs on each river and if the demand of three riparian's does not exceed total flow of each river, the waters should be shared according to riparian's demands. If total demand exceeds the amount of each river, the exceeding amount should be deduced proportionally from the demand of each riparian state.²⁸

However Turkey's proposal was Three Stage Plan for Optimum, Equitable and Reasonable Utilization of the Transboundary Watercourses of the Euphrates-Tigris Basin. This plan was based on the criteria that, Euphrates-Tigris rivers constitutes a single basin. The plan was first emerged in 1960's in State Hydraulic Works (DSİ) and depends on the approach that the water problem stems from mismanagement and misallocation of water resources. Turkey claimed that cooperation in the basin could be reached by an agreement on fundamental data on water and land resources of the basin. After reaching the whole data of the basin, coordination on water management

and joint projects could be realized.²⁹ The final goal of the Turkish plan was a basin-wide planning. Turkey's Three Stage Plan for Optimum, Equitable and Reasonable Utilization of the Transboundary Watercourses of the Euphrates-Tigris Basin can be summarized as the first stage, water inventory of the basin should be determined, for the second stage land resources of the basin should be studied. At the third and final stage water and land resources should be matched and allocation of water to each country would be determined.

This plan was rejected both by Iraq and Syria since the belief that this plan could harm their sovereignty. In fact emphasising on sovereignty is a common criticism for Turkey in international arena.

I.II Groundwater

Groundwater aquifers are formed by extensive alluvial deposits of the Tigris and Euphrates rivers, and are composed of Mesopotamian-clastic and carbonate formations. The alluvial aquifers potential is restricted cause of the poor water quality. The Mesopotamian-clastic aquifers in the north western foothills consist of Fars, Bakhtiari alluvial sediments. The Fars formation which cover a large area in Iraq, is compose of anhydrite and gypsum inter-bedded with limestone. The Bakhtiari alluvial formations are formed by a variety of material, including silt, sand, gravel, conglomerate and boulders, with a thickness of up to 6000 metres.

Water quality ranges from 300 to 1.000 ppm. The other significant aquifer system is contained in the carbonate layers of the Zagros Mountains. Two main aquifers are found in the limestone and dolomite layers, as well as in the Quaternary alluvium deposits. The li-

mestone aquifer contributes large volumes of water through a number of springs. The alluvial aquifers contain large volume reservoirs and annual recharge is estimated at 620 million m³ from direct infiltration of rainfall and surface water runoff. Water quality is good, ranging from 150 to 1.400 ppm.³⁰

Subterranean water with good quality has been placed in the foothills of the mountains in the northeast of the country and in the area on the right bank of the Euphrates. The aquifer in the northeast of Iraq has an estimated safe yield of between 10 and 40 m³/sec at depths of 5–50 metres. Its salinity increases towards the southeast of the area until it reaches between 0.5 and 1 mg/l. Gypsum and dolomite reserved the aquifers on the right bank of the Euphrates River, at depths increasing towards the west where water is found at 300 m (at Abu-Aljeer), have an estimated safe yield of 13 m³/sec. When comparing with the eastern section 0.5–1 mg/l, the salinity of the water in the western part of that area is only 0.3 mg/l. Good quality water is fairly limited in other areas of the country cause of the high levels of salinity. Also, An estimated 0.08 km³/year of water from the Umm er Radhuma aquifer enters Iraq from Saudi Arabia.³¹

I.III Dams in Iraq

Water resources in Iraq can be classified as surface, groundwater and reservoirs which are used as a source of water storage. Seasonality of rivers' discharge, floods, drought period causes problems in agriculture periods, to overcome those problems, building dams and barrages are the best solution. So, Iraq has construct dams and reservoirs on both rivers and tributaries. Dams have been built for hydropower, irrigation, flood control and water supplying for cities.

Table 3: Iraq's dam and their storage capacity and hydropower generation³²

Name of dam	River	Storage with normal level BCM	Energy produced by hydroelectric station (Megawatt)
Mosul dam	Tigris	11,11	750 main dam, 60 organization's dam, 200 pumped storage
Dokan Dam	Lesser Zab	6,8	400
Darbandikhan Dam	Diyala	3,00	240
Himreen Dam	Diyala	2,45	50
Haditha Dam	Euphrates	8,28	660
Dohuk Dam	Royar Dohuk	0.047	-
Al-Udaim Dam	Al-Udaim	1.5	27 being constructed
Thartar Reservoir	Tigris	85,39	35.81 bcm dead storage
Habaniye Reservoir	Euphrates	3.31	-
Total (ex. Thartar)		33.14	

The Dokan Dam, which was built in 1961 for irrigation and energy production purposes, is located within the borders of the Kurdish Regional Government in Suleimaniyah. The dam is located at 75 kilometres northeast of Kirkuk, 116 metres high and has a reservoir capacity of 6800 million cubic metres. The river Little Zab on which the dam is located originates from Iran and runs through Kirkuk before it meets river Tigris. This river is an important water source for Samad and thousands of its farmers. The recent decrease in the levels of precipitation has resulted in a corresponding decrease in the Dokan Dam's level of water.

Comparing to the previous year, the water level have decreased by 6 metres by February 2011. The amount of water that used to flow from the Dokan Dam to the Kirkuk water project was 75 cubic metres per second. At

the present, this amount is said to be reduced to 30 cubic metres per second. The farmers of the region have noted that this is not enough even for their drinking needs.³³

Two more dam will build; Bakhma Dam on the Greater Zab and Badoosh Dam on Tigris are under construction. In total, according to the Ministry of Water Resources, 85.000 kilometres of draining systems and 43.000 kilometres of irrigation streams are being developed.³⁴

Furthermore, Third River (The Main Outfall Drain/ Masab Elam Canal), which is constructed in 1992, is 565 km with total discharge of 210 m³/ sec. The aim of the Third River; is increasing water transport efficiency; minimize losses and water logging, and improve water quality. It collects drainage water from more than 1,5 million hectares of irrigated

agricultural land. In 1995, approximately 17 million tons of salt have been transported to the Gulf through the Third River. By this river; much of the drainage water has reached the sea without polluting the mainstream.³⁵

II. Water Use and Management

There is a high demand on water resources from different sectors in Iraq. Water demands for hydropower production, managing sustainable ecosystems, agriculture, households and industry. 42,8 BCM water had withdrawn in 1990 in Iraq. 92 percent of water was

used for agriculture purposes, 3 percent of water was used for households' supplies and 5 percent was used for industry. According to FAO report 2008, total water withdrawal was 66 BCM in 2000. 79 percent of water was used for agriculture, 6.5 percent of water was used for household's purposes and the rest, 14,5 percent was used for industry. Hydroelectric power generation is about 17 percent of the total energy production in Iraq. Considering the World Bank report in 2003/4, 51,7 BCM water had been withdrawn. 90 percent of the water was used for irrigation, 4 percent of water was used for households and 6 percent of the water is used for industry.³⁶

Table 4: Water Withdrawals by sector³⁷ (BCM)

Withdrawals for:	1990	%	1998-2002	%	2003/4	%
Agriculture	39.4	92	39.4	92	46.0	90
Domestic	1.3	3	1.4	3	2.1	4
Industry	2.1	5	2.0	5	3.6	9
Total	42.8	100	42.8	100	51.7	100

II.I Water problems in Iraq

The information provided from Iraq states that there is a decline in precipitation, and because of that the complaints related to the fact that water problem exists are increasing with each passing day.

The United Nations states that in Iraq six million people do not have an access to clean water and that 50 per cent of water resources is wasted.³⁸ The fact that traditional irrigation techniques are leads to excessive amount of water loss, besides it creates the risk of salination in the soil because of the rapid evaporation. During the periods, when precipitation is dense; in Iraq, where severe floods take place, insufficient management of water resources

and incomplete water resources development projects rather than insufficient water quantity come to the forefront. The inadequacy of budget for the projects related to water resources leads to the fact that the projects cannot be completed and that they stay dysfunctional for a long period of time. In Iraq, where the average precipitation is 216 mm, 79% of water resources are used for irrigation. In Iraq, where the available amount of water per capita in a year is 2400 cubic meters,³⁹ the fact that population has increased, cities are expanding and industry is growing. Additionally, the importance of wetland areas and marshes have increased and have been brought to the agenda, thus the demand for water resources and the competition between the users have been increased.

The studies of the “Inter-Agency Information and Analysis Unit” which is an UN body indicate that Iraq will have difficulties in meeting the goal of enabling 91% of households with safe drinking water supply by 2015. It was stated, today 20% of households uses unsafe

drinking water source, and 16% of them have problem with supplying the daily water. In rural areas, where the situation is much worse, 43% of households can access safe drinking water. And this situation increases the rural-urban migration.

River status in the upstream without discharge of any sewage



River status in 1 km after discharge of sewage and destruction of the river bed



Picture 1- Qlyasan River in Suleimaniyah (February 2012)

Because of the decline in precipitation, the groundwaters have started to be used in order to meet the water demand in Iraq. The leakages in sewer pipes and septic tanks contaminate drinking water. In addition to this, floods; waters returning from irrigation; domestic and industrial wastes also lead to impairment of quality in water resources.

80% of the households use drinking water without any purification. Only 18% of waste water is purified; and the rest is left to water-courses. For 2015, the estimated water demand in Iraq is 66,85 billion cubic meters in total. According to this information, which is provided by the 2010 studies of the Iraq Ministry of Irrigation, 8,4 billion cubic meters of the aforesaid figure will disappear as a result of evaporation and through other ways. According to estimates, among the rest of the

water; 40,5 billion cubic meters will be used for agriculture; 11 billion cubic meters will be used in wetland areas; 3,78 billion cubic meters will be reserved for the household uses; 2,77 billion cubic meters for industrial use; and 0,4 billion cubic meters will be used for the energy generation.⁴⁰

II.II Water Management in Iraq

When we multiply the annual average precipitation with the surface area of Iraq, the average figure we obtain is 94, 68 billion cubic meters. According to the FAO datum, the annual average precipitation rate in Iraq is 216 mm, and her surface area is 438.320 square kilometres. According to the figures of FAO, the aforesaid figures belong to year 2000, and its annual amount is 2632 cubic meters per capita. According to the World Bank, this fi-

gure is over 2500 cubic meters, as the report of year 2006 indicates. In the publication entitled, "Water in Iraq Factsheet", prepared by the UN, this value is 2400 for the year 2010. While the annual average precipitation in Iraq was indicated as 154 mm/year in the work entitled, "Water Resources and war in Iraq", which was published in 2011; the renewable amount of water per capita was indicated as 3287 cubic meters/capita/year. The inconsistency in datum constitutes a major problem on its own.⁴¹

The water storage structures and water transportation systems of Iraq, who had been in war for many years, were damaged to a great extent. In addition to this, the troubles in management, which stem from the lack of productive use of water resources, increase the current water problem. According to the data of World Health Organization (WHO) and UNICEF in 1995, before the war, safe water supply was provided to cities at the rate of 96 per cent; and to rural areas at the rate of 48 per cent. The 93 per cent of the city population and 31 per cent of the rural population can reach clean water through different sanitation methods. As a result of the U.S. invasion in March 2003; dams, pumping stations, canals, sea water desalination plants and wastewater treatment plants were damaged. According to the datum after the American invasion in the year 2004, 73 per cent of the city population, and 43 per cent of the rural population can have access to clean water. And 25 per cent of the population, who lives in Baghdad, is not included in water distribution network. According to the datum of the year 2007, only 17 per cent of the wastewater is treated and discharged into rivers. As a result, waterborne diseases increased among children, and quality problem started to be observed in surface waters and aquifers. According to the datum of the Water in Iraq Factsheet, this was prepared by the UN, 884.000 diarrhoea cases, among

which 57 per cent is children under the age of 5 years, were detected in 2010. Because of waterborne diseases, 41 children out of 1000 die before the age of 5 years. In Iraq, where the water quality also became a major problem, the quality of water, which is used for drinking and agricultural purposes, remain way below the values of Iraqi National Standards and the World Health Organization.⁴²

In Iraq, The Ministry of Water Resources (MWR) is the main institution which consists of five commissions and eleven companies. The MWR is responsible for supplying water for the whole country and national water planning, operating dams, hydropower station and pumping stations. Also, the Ministry of Agriculture, the Ministry of Energy, the Ministry of Municipalities and Public Works, the Ministry of Environment and local governorates are the other institutions which are related with water works. Universities and institutions have a role to provide technical support on water issues.⁴³

Water resources development and management plans were prepared in the 1960's and 1980's. These studies included a comprehensive and detailed analysis of needs, opportunities and plans for the development and management of Iraq's water resources.

The legal regulations about water resources in Iraq are;

- Ministry of Water Resources Law, No. 50 of 2008,
- Regulations on Preservations of Water Resource, No. 2 of 2001,
- Maintained of Irrigation and Drainage Systems Law, No. 12 of 1995,
- Law on Environment, No.3 of 1997,44
- Irrigation Law, No. 6 of 1962.

According to UN, it is predicted that Iraq will have difficulty in fulfilling the amount of domestic use of water, which is targeted to be 91 per cent, in 2015. The Iraqi Ministry of Water Resources has started to work on 20 year Strategy for Water and Land Resources in Iraq, which covers the years between 2015 and 2035, in order to find a solution for the problem of water management that will increase in the forthcoming years. The evaluation and detailed mapping of 121 irrigation projects, 7 major dams and 18 barrages across the country take place within this plan, which firstly focuses on collecting data and collecting analytic tools, which are necessary to implement the plan. While the first 5 years of the plan is planned as a busy period, it is planned to update the plan every 5 years until 2035.⁴⁵

The content of the plan of “Strategy for Water and Land Resources in Iraq” is as follows;⁴⁶

- The status of pastures,
 - Hydroelectric,
 - Transportation and transfer,
 - Fishery,
 - Flood control,
 - Basra Marshes,
 - Searching effects of the projects of upper riparian countries,
 - Desertification and its effect on agricultural lands,
 - Other factors such as climate change, which could affect water management and sustainable utilization.
- This plan will be conducted by the assistance of the management committee, decision-makers and technical committee, which are selected from ministries, and also by the assistance of shareholders. With the approach of integrated water resources management, a master plan will be prepared for the years 2015, 2020, 2025 and 2035. The water structures will be privatized within this integrated approach, and capital will be invested by different sectors for sustainable development.
- In addition, this plan also includes conducting negotiations by recognizing the principles of a “secure-efficient” and equitable use of water with the Euphrates-Tigris basin riparian’s and the principle of not causing significant harm. It is foreseen that this plan will be completed within 42 months with a consortium, created by three companies from Italy and Jordan.
- Current and Forthcoming agricultural development and productivity,
 - The efficiency of the current irrigation and relevant water structures,
 - The appropriation of water for domestic, rural and industrial purpose; waste water treatment, its recycle, and reuse of water turning back from drainage,
 - Ground waters (connection between ground water and surface water),
 - Current situation for each irrigation project, and appropriation of water for the future,
 - Drainage system,
 - Salinity and its effect on agriculture,

II.III Iraq's Federal Structure and Water Management Issues

Iraq is known as a water stress country. This is an expected situation due to arid and semi-arid climate conditions of Iraq's geographical location. However, relating Iraq's water stress with only geographical and climatic conditions is inadequate since it means ignoring the whole problem.

One of the most important components of Iraq's water stress is destroyed water infrastructure due to long lasting circle of war, embargo, occupation and civil war. According to FAO datum, water per capita per annum in Iraq is 2461 cubic meters.⁴⁷ This amount is high relative to neighbouring countries. Water per capita per annum is 1652 cubic meters in Turkey,⁴⁸ 837 cubic meters in Syria,⁴⁹ 1880 cubic meters in Iran,⁵⁰ 155, 5 cubic meters in Jordan⁵¹ and 89, 52 cubic meters in Saudi Arabia.⁵²

Despite the fact that water per capita per annum is higher compared to the neighbouring countries, Iraq faces a heavy water stress. 25% of the capital Baghdad does not have water network and the population depends on unsecured and expensive water resources. 30% of the urban population out of Baghdad is deprived of water services. This ratio is much higher in rural areas.

Oil and natural gas are the two leading natural resources of Iraq. Those two resources are the most important issues that take attention both in Iraq and in assessments about Iraq. As an addition, those resources are also constitutes the ground for the debates about federalism, new administration system in Iraq, along with the ethnic and sectarian issues. However, water issue is mentioned as a prob-

lem for a long time and this issue gradually became on the agenda in Iraq.

Iraq sees neighbouring countries in general and Turkey specifically as responsible for the water problem in the country. Iraq asserts that, because of the Southeast Anatolia Project (GAP) which Turkey implements as a multi dimensional project, the amount of water which flows to the country from Turkey is decreased.

After the invasion of Iraq and overthrow of Saddam Hussein by coalition forces with the leadership of USA, the debates were about the new government system in the country. In this era ethnic and sectarian strife emerged and caused a civil war. With the United Nations Security Council's Resolution No: 1546 it is come on the scene that, new governmental system will depend on federalism. In that resolution federal, democratic, pluralist and united Iraq is mentioned and therefore future of Iraq is constituted.⁵³ After forming of Interim Administration Council, Transitional Period Administrative Law has been adopted and this law constituted the basic of 2005 Iraqi Constitution.

According to the first article of the Iraqi Constitution, dated 15 October 2005, Iraq is a parliamentarian, democratic and federal republic.⁵⁴ Moreover, with the federalism law adopted in October 2006, establishment and regulation of federal regions are provided however, not only because of the tension between federal government and Kurdish Regional Government but also among sectarian and ethnic groups, the law could not come into force.

Federal structure of Iraq cannot be considered apart from the ethnic and sectarian identities. Thus, the structure expected to be a

unifier seems to have a secessionist character. The basic argument that strengthens the thought that there is a long way for democracy in Iraq is the organization of political parties in ethnic and sectarian basis. Each group in Iraq considers federalism differently. Particularly, the Kurdish Regional Government considers federalism as a mechanism softening the power of federal government on Kurdish areas and increasing the influence of regional government. Tragic events in the past strengthen their determination on this issue.

There are some groups rejecting federalism as well as some groups that consider establishing a Shi'ite region composed of 9 governorates. Iraqi Sunnis are concerned that federalism will harm the unified Iraq.⁵⁵

According to the Iraqi Constitution, governorates have the right to organize into a region except Baghdad and temporarily Kirkuk governorates. However to date there is no region other than the Kurdish Regional Government have been established. Even if there are demands for establishing regions, it can be considered that dissents to these demands are more dominant.

Kurdish Regional Government is constituted from Dohuk, Suleimaniyah and Erbil. The region that covers the mountainous areas of northern Iraq has rich water resources with respect to other areas of Iraq. Many tributaries of the Tigris River are in this region. Moreover Dukan and Darbandikhan HEPP's are also located in this region. Even if the greatest dam and HEPP of the country, Mosul Dam, is not located in the borders of the Kurdish Regional Government, de facto, it is controlled jointly by KDP and PUK.

Iraqi Constitution states in article 111 that oil and natural gas resources belong to all Iraqis. On the other hand, in article 112 points out that the federal government will manage oil and natural gas resources with the producing governorates and distributes its revenues in a fair manner in proportion to the population distribution in all parts of the country. At the same time this article stresses that the regions which were deprived of by the old regime will have priority in this distribution. These expressions bring an ambiguous regulation and provide sufficient arguments to all parties about the management and distribution of oil and natural gas revenues.

The same ambiguity appears about water resources. Constitution diversifies the water resources as external and internal and gives exclusive authority to the federal government on waters which comes outside Iraq. Article 110 arranges exclusive authorities of the federal government. According to the 8. paragraph of the article, "Planning policies relating to water sources from outside Iraq and guaranteeing the rate of water flow to Iraq and its just distribution inside Iraq in accordance with international laws and conventions" is in the authority of federal government. 114. Article arranges the competencies shared between the federal authorities and regional authorities. 7. Paragraph of the related article expresses that the competencies about formulating and regulating the internal water resources policy in a way that guarantees their just distribution are shared between federal and regional governments and this will be arranged by a law.

It is explicitly stated in the article 115 of the constitution that, in the case of conflicting water resources development policies between federal and regional governments, the policies of the regional governments have prio-

rity.⁵⁶ Furthermore, article 121 states, “in case of a contradiction between regional and national legislation in respect to a matter outside the exclusive authorities of the federal government, the regional power shall have the right to amend the application of the national legislation within that region.”

In the case of a disagreement about water resources development policies between Kurdish Regional Government and Federal Government Iraq will face a new problem. Current constitution does not give much hope for a solution. Kurdish Regional Government has much experience on regional government practices since 1992. It is clear that Kurdish Regional Government will behave jealously, by stating their tragic experiences, on the rights given by the current constitution. Nowadays, importance of holistic approach in water management is understood. Consequently, it must be taken into account by all parties that a disintegrated water management will create heavy problems.

In the Iraqi Constitution authority shared between federal and regional governments is not clear about waters originate inside and outside Iraq. By the definition “the waters originate outside Iraq” on which federal government has exclusive authority, Tigris and Euphrates rivers are implied. There is no tributary in Iraq that joins Euphrates River, thus there is no problem with respect to the constitution in this issue. The issue must be considered for Tigris River. It must be kept in mind that just before leaving Turkish territory, in Cizre gauging station, main tributary of the Tigris River’s average flow is 16 billion cubic meters. Average annual flow of the river is about 50 billion cubic meters. A part of the difference between these two figures originates from northern Iraq while another important part of it comes from tributaries such as Khabur, Greater Zap that originate

from Turkey and Lesser Zap that originates from Zagros mountains in Iran. Since there is a distinction of authority for waters originating inside and outside Iraq, it must be determined that which water will be included in which scope. If Tigris River’s tributaries that originate from other countries and join Tigris in Iraq are included in the authority of the federal government, water management competency of Kurdish Regional Government will be limited. On the other hand, in the case that these waters are considered as waters originating inside Iraq, this implies ignoring of a hydrological fact and another dimension will be created in water management issues in Iraq. In order to solve this problem a legal arrangement is required.

III. Case Study: Water Resources in Kurdish Regional Government (KRG)

Water resources in KRG can be classified as surface and ground waters. There are three important dams in KRG. They are Dukan, Darbandikan and Dohuk Dams. The total amount of the storage capacity of these dams is 9.852 MCM. In addition to this, there are small dams in Dohuk with 1.505 MCM storage capacities. The names of the dams are respectively; Benata, Bilijonka, Ghilishe, Kora, Ghilbob, Bihere, Darkor-ajom, Basali, Beghabor, Levo and Girbir. Also, there are several dams which are under construction or planned. These dams’s storage capacity will be 38.000 MCM.⁵⁷

KRG has many rivers, springs and channels which are diverting Tigris River waters to the other areas. Tigris River is the most important river in KRG which enters into region in Zakho. There are five tributaries of Tigris in KRG. These rivers are Upper Zab, Lower Zab, Uzaym, Sirwan and Chabour.

Table 5: Quantity of Water from the Rivers⁵⁸

Rivers	Length (km)	Area (km ²)	Rate of waste water(m ³ /sec)	Rate of Water to Tigris %	Total Water Supply (bcm)
Greater Zab	473	26,470	421.4	32.6	14.32
Lesser Zab	456	22,250	226.0	16.7	7.07
Uzaym	220	1,200	27.6	1.6	0.79
Sirwan	386	17,850	160.6	13.6	5.86
Chabour	160	6,268	-	-	-

Groundwater especially springs are important water resources in KRG. Groundwater is fed by rainfall and snow and the drought periods affect the groundwater potential.

When we compare the rainfall and snowfall quantities in KRG between the years of 2000 and 2008 there is deficit between the amounts of the precipitation.

In Erbil; amount of precipitation in 2000-2001 was 61 MCM, in 2007-2008 that amount was 19 MCM. In Suleimaniyah; amount of precipitation in 2000-2001 was 68 MCM, in 2007-2008 that amount was 21 MCM. In Dohuk; amount of precipitation in 2000-2001 was 27 MCM.

There are number of wells in the region, just some of them are legal. Primarily, the wells are used for drinking water. In KRG, the number of legal wells is 14.392 and the number of the illegal wells is 18.652.⁵⁹

• Agriculture Sector

There are two type of agriculture in the region. One of them is cereals and the other is fruits, vegetables and legumes. The amount of wheat produced is 300-375 thousand tonnes in the region and wheat demand of the region is 500 thousand tones.

The area of cultivated land is 1.479.092 dunam in Erbil, 921.202 dunam in Suleimaniyah and 533.241 dunam in Dohuk in 2006.⁶⁰

• Industry

Groundwater is used in the industry sector and the largest portion of that water is used for producing concrete and iron products. In the drought periods, the production of those have decreased and affected the price of the products. Also, the other consumer of the groundwater resources in industry sector is mineral water production.⁶¹

• Household sector

The population of Erbil is nearly 850.000. Water which is allocating for per capita is nearly 350 lt. per day according to the planning, which equals 297.500 m³ per day for the all population of the city. In Suleimaniyah governorate, water is pumping from Dukan Project and the city receives 50.000 m³ of water per day. The other water source is Sarchinar Project with capacity of 30.000 m³ per day. Local well production is another source of the city with 4000 m³ per day. Total supply of the water is 84.000 m³. 20 percent of this water is wasted cause of the network losses; this amount is equal to 16,800 m³ per day. With calculation, actual water supply amount is 67,200 m³ per day. The population of the Suleimani-

yah is 800.000. Water which is allocating per capita is 350 lt. per day as in Erbil, total need of the Suleimaniyah is 280.000 m³ per day. In Dohuk governorate, there are three sources for water needs of the governorate, one of them are Chum Barakat area, the second

is substitution water and Gali Dohuk Project, and the third is groundwater. The total water supply is 56,160 m³ per day. Water resources has managed by own policy of the KRG apart from federal government.

Basra Marshlands Issue

In addition to the water shortage in Iraq, the risk of destruction of marshlands in the southern Iraq is frequently brought to agenda. With its socio-cultural and environmental importance, the Basra marshland is the largest wetland area of the Middle East. The wetland, which is located within the borders of Basra, Missan, and Thi-Qar provinces, is composed of three marshes that are connected to each other. These marshes are the Central marsh, Al Hammar marsh, and Al-Hawizeh marsh.⁶² Nowadays, 90% of the area, which started to be destroyed as from 1970's, has been lost.⁶³ If measures are not taken, the area is estimated to be totally destructed within five years. The primary problems of the wetland area are the destruction of the wetland, the lack of drinking water, and the lack of sanitation. The water quality reached such dimension that it threatens human health, and living organisms because of pesticides, untreated industrial wastes, sanitary sewerage, and salinization.

The fact that the region, which was the source of income and water resource of approximately 500.000 Iraqis, was drained in the post-1980 and post-1991 negatively affected the local community making their livings from reeds and fishing. In 2004, UNEP (United Nations Environment Programme) started to the support studies for the environmental management of Iraq's marshlands. The goal of this study is to provide the sustainable management of the wetland, and to restore the area. The restoration of the wetland, whose surface area is approximately 15.540 km², has become a glimmer of hope for the return of the Marsh Arabs, who left the region.⁶⁴ In the first stage of the UNEP project, which was completed in 2009, and which is composed of three stages, was carried out between the years 2004-2007. Within the stage, which was carried out by the financial contribution of the Japanese government, is found creating data collection and analysis, capacity building, EST (Environmentally Sound Technology) systems, and raising the awareness of the society. Advancing in two parts (A and B parts) the second stage, which was carried out in parallel with the first stage, and which was supported by the Italian and Japanese governments, continued between the years 2006-2008. The A stage is composed of studies such as; supporting the data collection related to water resources and analysis, and supporting the environmental, socioeconomic and land planning. Besides, providing the coordination that would enable the inter-institutional data sharing for the wetland management plan is another subject, which has been dealt with. And the B stage deals with subjects such as; implementing pilot project in order to provide drinking water, implementing EST systems, providing social participation, raising the awareness. The last stage, which covers the years between 2007 and 2009, was supported by the Japanese government. The last stage contains capacity building for the wetland and solid waste treatment, enabling EST systems and social participation, the analysis and distribution of the obtained datum. The Iraq Ministry of Water Resources, the Centre for the Restoration of the Iraq Marshes,

the Iraq Ministry of Environment, and the Iraq Ministry of Municipalities and Public Works also participated in the project. Within the project, pilot projects such as; drinking water, sanitation, marsh rehabilitation and management were implemented. Thanks to the established stations, marsh monitoring, water quality, biological diversity datum could be collected. In the project, which was indicated to have been successfully completed, it was stated that ecosystem rehabilitation and redevelopment was a long process along with precautions and interventions. Above all, the requirement of the sustainable management of this area was indicated to take place on the national development agenda. The two-year-long drought led to a decrease in the level of water in the marshland in 2009, and to the destruction of the vegetation.⁶⁵ Drought, desertification, climate change, decrease in the precipitation affected the whole country.⁶⁶

The largest wetland of the Middle East has a great importance in ecological terms. Besides it is an important living land for the people, who are also called “Marsh Arabs”, and who live in this region. The Iraq Ministry of Water Resources also added 11 billion cubic meters water need for the restoration of the marshlands to the amount of water requirement calculations that the Ministry made for 2015, in order to restore the marshes again. ⁶⁷ Among 66,85 billion cubic meters of water requirement in total, this amount of water equals with 16,4%. Following the agricultural use in the country, the second greatest amount of water was reserved for the restoration of marshes.

Conclusion

It is clear that there is a water problem in Iraq. However this problem is not stem from upstream utilizations of the Euphrates-Tigris Basin as Iraq asserts for a long time, but because of ineffective utilization and inappropriate water management of water resources in Iraq. For the efficient use of water resources in Iraq, above all water infrastructure systems are supposed to be repaired as soon as possible, and the projects are supposed to be completed. In agricultural utilization, where water loss is huge both because of leakages and evaporation, it is necessary to adopt modern irrigation techniques, and to implement proper plant patterns. According to statements that the Iraq Ministry of Water made this year, it was indicated that projects related to irrigation have been carried out, and budget for irrigation equipment and techniques have been arranged.

In the forthcoming months, the fact that water problem will increase as a result of decline in precipitation since climate conditions of

summer season and will frequently take place on the Iraqi press. In the near future, Iraq will made statements indicating her water demand from Turkey. This situation will directly affect the riparian relations of the Euphrates-Tigris basin.

Another fundamental problem in water management in Iraq is the Iraqi constitution dated 2005. According to the Constitution while waters that flows outside Iraq is under the authority of Federal Government in Baghdad, other waters which originate in Iraq is under the control of regional governments. This duality in water resources management also seems to create problems inside Iraq. Water management in Iraq must cover the whole country to reach effective and reasonable utilization of water.

Cooperation in the Euphrates-Tigris Basin is a necessity for optimum, equitable and reasonable utilization of the basin's waters. However, it is clear that the cooperation among the riparians needs goodwill and political stability in the region.

In the statement on World Water Day, 2011, the UN indicated that, 50 per cent of water at the level of usage is lost in Iraq. The current water loss stems from mismanagement of water resources and damaged water structures (dams, canals, water networks, irrigation

systems etc.), as indicated above. If the Strategy for Water and Land Resources in Iraq can be implemented and succeeds, it is believed that it will provide a major benefit for Iraq in terms of the efficient use of water resources, and will eliminate the current water problem.

ENDNOTES

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