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A Study of the Water Reality of Managing the Euphrates River in Anbar Governorate in Light of the Growing Water Demand for the Period (2020-2040)

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Abstract. The research aims to demonstrate the current water reality for managing the water of the Euphrates River in Anbar Governorate in light of the worsening population increase and the consequent increase in water consumption in various human activities such as cultivation, industry, and individual consumption. In developed countries, what will be the consequences of water consumption for the period from 2020-2040, which is an advanced study in the field of water management. Taking into consideration the governorate's actual share of water, which represents (17%) of the water resource. The future demand has been determined by providing (WEAP) with the water supply of the Western Husaybah station for the period from (1990-2019) In order to estimate the water discharge for the period from (2020-2040) using the method of linear increase (Linear Program), the Anbar governorate's share of (17%) of the total amount of water of the Euphrates River was determined.

INTRODUCTION

Water management is a coordinated process between water policy makers and various sectors working to meet the required water needs and reduce the gap between supply and demand without compromising the sustainability of ecosystems. [(1)] Methods of integrated management of water resources. The issue of equitable water distribution is essential for the sustainability of water and the provision of environmental protection at the same time, and securing the needs of future generations for water, in order to achieve the goals of water policy, and in order to manage water resources in an integrated manner, effective methods should be used, including:

1. Integrated Approach
2. Holistic Approach
3. Participatory Approach
4. Approach Economic

There is a great convergence between the integrated approach and the holistic approach, if the two approaches consider that water resources are limited, and the limited resources require the development of a water policy for various sectors, which the state undertakes in order to achieve development of the economic and social sectors, by managing and solving the problems of sectors such as the residential, agricultural and industrial sectors more closely. They are independent for each sector. As for the participatory approach, it is based on the principle of partnership between the government sector (owners of water policy) and the population, in planning and managing water projects. This approach requires that the population organize themselves through unions and associations,

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working on coordination with government agencies to express their interests and desires. The role of these associations and unions in spreading awareness, guidance and education in water management. They play an active role in the process of integration between residents and water policy makers. As for the economic approach, this approach is used in solving water problems through its effective tools, as it works to use water efficiently, which in turn is reflected in various economic activities. On the use of water in the various sectors, whether directly or indirectly [1, 8].

Overview of Water Evaluation and Planning (WEAP)

Many areas face great challenges in managing freshwater. The allocation of confined water resources, environmental quality, and sustainable water use insurance policies are problems of developing importance. Presentation-oriented standard simulation fashions are no longer constantly sufficient. Over the previous decade, an built-in method to water improvement has emerged that locations water provide initiatives in the context of demand-side issues, as nicely as problems of water pleasant and ecosystem preservation. The Water Assessment and Planning System (WEAP) goals to combine these values into a realistic water aid planning tool. The WEAP application points an built-in strategy to simulate water structures and their political orientation. WEAP places the demand facet of the equation - water use patterns, tools efficiency, and reuse on a par with the furnish aspect is a laboratory to take a look at choice water improvement and administration strategies.

Problem Statement

Does the current water management of the Euphrates River achieve sustainable development for future generations in light of the expected increase? Are there studies explaining what will happen to the current situation of water management?

Hypothesis

Studies indicate that Iraq is heading to a large water deficit in light of the policy pursued by the riparian states on the Euphrates River, and the current mismanagement predicts a major problem unless it is remedied by the decision-makers.

PROGRAM METHOLOGY

Computer modeling in the subject of water assets has a lengthy history. Many complicated fashions have faltered through being mathematically indistinct and overly formidable in an strive to "improve" options to real-life problems. Experience indicates that the fine strategy is to build, however now not a replacement for, a direct and bendy device to aid the consumer of the form. WEAP represents a new era of water planning software program that makes use of the strong energy of current private computer systems to supply water authorities in all places get entry to to the proper tools. WEAP graph is guided by using a quantity of methodological considerations: an built-in and complete planning framework; Use state of affairs evaluation to apprehend the influences of distinctive improvement options; Demand administration ability; Capacity for environmental assessment; Ease of use.

CURRENT REALITY OF THE EUPHRATES RIVER IN ANBAR PROVINCE

The water management of the Euphrates River in Anbar governorate faces a set of challenges, the decrease of water resources by the upstream countries that assert that the Euphrates River is a cross-border rivers and is a natural resource of its own to confirm its dominance over the river, and focus in all negotiations on the optimal use of water, without sharing Water with the countries of the Basin [2], as shown in Figure 1, and the climate changes that have contributed to high temperatures and low rainfall values, as well as opportunities for achieving sustainable development.

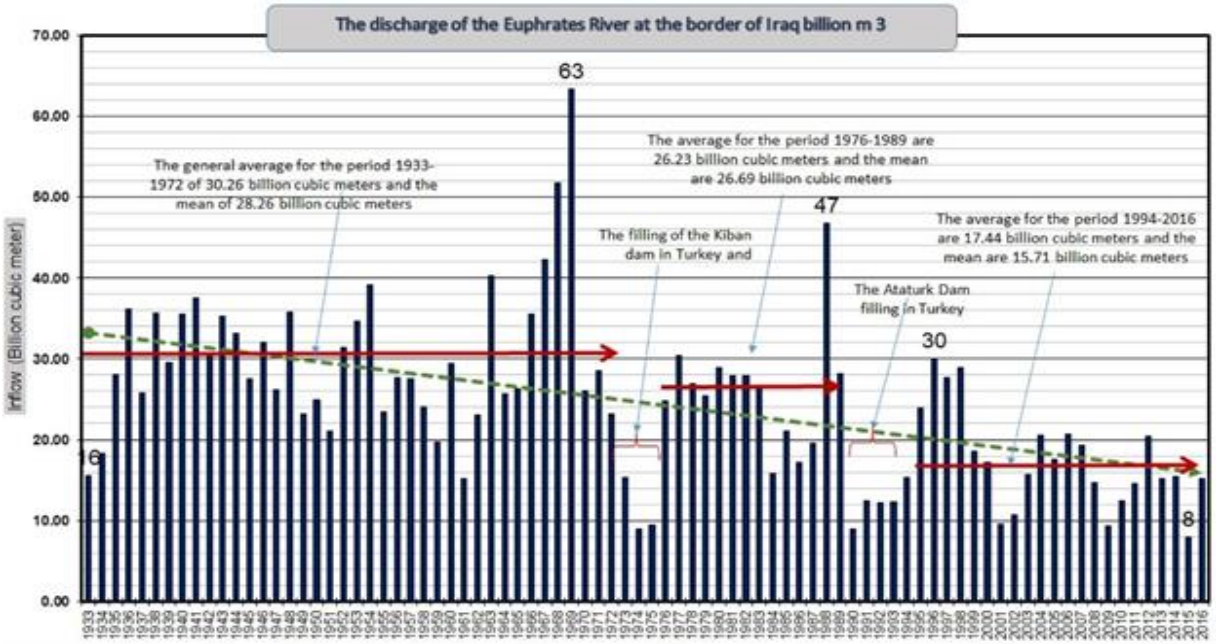

FIGURE 1. Water imports of the Euphrates River at Husaybah Station for the period (1933-2016) [3]

Through the analysis of the data of Fig.1, it becomes clear that there is a decline in the drainage coming to Husaybah station, and this is a result of the water policies of the upstream countries, in terms of building dams in both Turkey and Syria to secure storage operations of the Euphrates water, in addition to the high water demand resulting from Population growth, and the accompanying expansion of the agricultural area and industrial projects, which requires knowledge of the water reality due to the use of traditional irrigation methods and the high water demand of the residential sector as well as the industrial sector. Taking into account the governorate's actual share of water, which represents (17%) [1] of the water supply to the Hasiba station, the future demand has been determined by providing the (WEAP) program with the water resources of the Hasiba West station for the period from (1990-2019) to estimate the drainage The water discharge for the period from (2020-2040) as in Fig.2 using the method of linear increase (Linear Program), and the water discharge per second was converted to a volume (quantity) through the following equation:

Discharge x Number of seconds per hour x Number of hours of the day x Number of days of the year ……..... (1)

T × 3600 × 24 × 365 = per year / m^3 in this way, the annual amount of water contained in the Euphrates River was determined, and through it, the Anbar Governorate's share, which is 17% [1], of the total amount of Euphrates's water, was determined. Provided with the program, the program shows the future forecast of the Euphrates water.

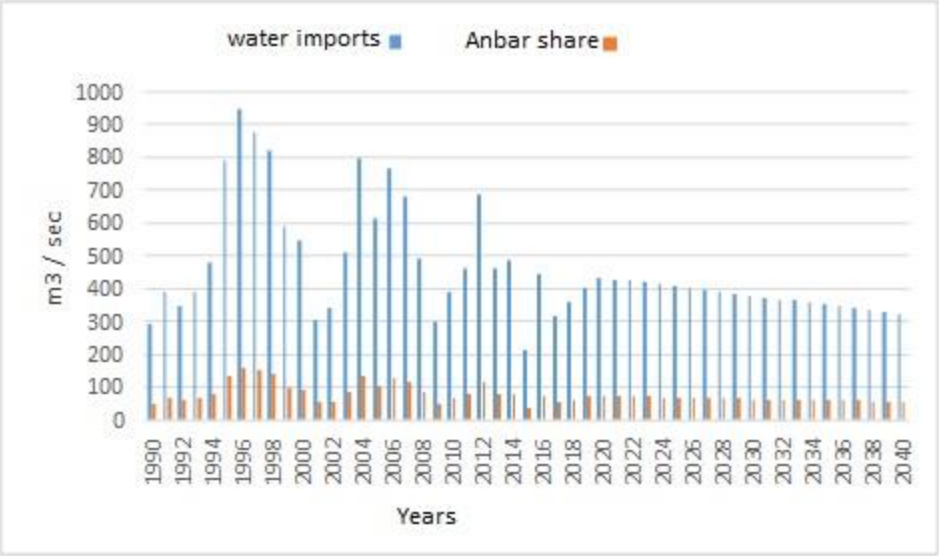

FIGURE 2. The water reality and future prediction of the waters of the Euphrates according to Ministry of Water Resources and the results of WEAP-Model

The agricultural plans have been adopted in determining the irrigated areas in all the governorate districts that are approved in the water demand on the Euphrates River, which includes crops of wheat, barley, orchards, crops, summer vegetables, crops and winter vegetables, so that the water demand of the agricultural sector is determined through the following equation:

Volume = total area x water requirement per hectare, m^3 ……..……. (2)

And determining the individual's share in cubic meters, which is (392 liters / day) [4] is done by determining the number of inhabitants in the individual's share. We obtain the water demand for the domestic sector, and the household demand is expressed through algorithms for the WEAP program where the population increase is calculated by the following equation of Growth form:

(% Growth rate, Year, Population census) …….. (3)

Through this equation, the population increase is calculated, and the population of the districts in the governorate and the population increase rate for each district are approved to determine the future population, as well as the individual's share in cubic meters As for the industrial sector, the number of establishments and the quantity of demand for each factory and the total water demand for these establishments were determined. Table (1)

Total water demand = number of establishments x water requirement of the facility ……...…. (4)

In order to determine the total demand of the industrial sector that depends on the river, the current water demand for the various sectors constitutes varying percentages in Anbar Governorate. Fig 3 notes where the agricultural sector represents (84%) of the total demand, and the residential sector represents about (9%) As for the industrial sector, it is the lowest in terms of water demand, reaching (6%)

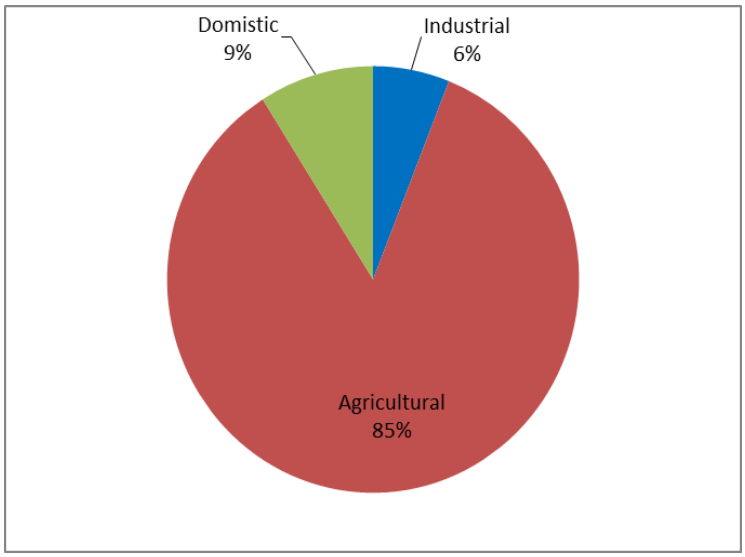

FIGURE 3. The percentage of current water demand in the governorate by using WEAP

The water demand based on the Euphrates River was addressed only, and the base year was adopted in 2019 and was considered the target year, 2040, in order to determine through these estimates the locations of weakness in the water efficiency of the sectors and treatment methods, the aim of which is to create a state of balance between the water demand of various sectors and the supply [5-7],[9,10] Controlling environmental system pollution, i.e. reducing pollution processes resulting from wastewater returning from all sectors, and the amount of water demand is the amount needed by the various sectors in the governorate, and what is meant by the available is the amount of water available per year for Anbar Governorate measured in cubic meters, while the deficit is the result of The difference between the total demand for different sectors on the available river water to cover the demand.

TABLE 1. Total water demand, amount of available water, and deficit by using WEAP

Year	Domestic	Industrial	Agricultural	Total Demand	Available from the river	The Difference
2019	253.26	169.607	2304.7787	2727.64	2333.66	-393.98
2020	258.40	173.847	2450.08373	2882.33	2318.15	-564.18
2025	285.72	196.692	2704.62293	3187.04	2172.52	-1014.5
2030	315.94	222.539	2959.16213	3497.64	2026.89	-1470.8
2035	349.36	251.782	3213.70132	3814.84	1881.26	1933.6
2040	386.32	284.869	3468.24052	4139.43	1735.63	-2403.8

In 2020, about (2882.33 million m3) according to Table (1), so that the deficit amounted to (-564.18 million m3), and in 2030 the demand for water increased by (3497.64 million m3) and this increased the deficit by (-1470.8 million m3), while the demand increased In the year 2040 to (4139.43 million m3) million m3 and the deficit rate reached (-2403.8 million m3) and here it becomes clear that the total demand for the governorate is on the rise and this is the result of the population increase and a per capita demand rate of (392 liters) according to the United Nations, which is higher than the amount of global demand the amount (200 liters) per capita [4], the expansion of agricultural plans and the use of traditional methods of irrigation, industrial growth in the governorate, as well as the decrease in the water resources of the Euphrates River from the source countries, and at the same time when comparing the water resources of the governorate with the total demand of the sectors, a deficit appears. Great in fulfilling the demand, and this It requires optimal solutions in managing the water of the Euphrates River for various sectors in order to reduce the deficit. They undertake to bridge the gap between the growing demand and the scarcity of water supplies.

CONCLUSIONS

1.The study shows a deficit due to an increase in the demand rates for various sectors while maintaining the traditional methods of water management. This rise is a natural product of population growth and the expansion of agricultural areas as well as the expansion of the industrial sector.
2.There is a failure to rationalize the water demand of the agricultural sector by following the traditional irrigation methods that cause the high waste of the Euphrates water.
3.Failure to use water rations for agricultural crops is a result of the failure to instruct the farmer on the importance of using rationing.
4- The lack of strategic plans with clear dimensions involving various ministries such as water resources, agriculture, industry, housing and related departments to reduce water depletion and develop solutions for its sustainability

RECOMMENDATIONS

1.Working to reduce the water demand of the various sectors through awareness-raising operations on the importance of water and its role in the sustainability of life.
2.Rationalizing consumption for the household sector by reducing the per capita share of water, or following a price policy that would rationalize consumption.
3.Using water rationing in the agricultural sector in order to rationalize demand and cultivate crops with available water through the use of rationing.
4- Working to develop strategic plans involving all ministries and institutions concerned with water, to rationalize consumption, and to search for renewable water sources to compensate for the shortage.

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