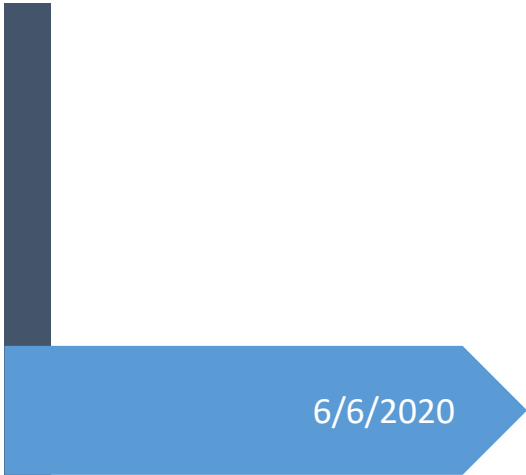
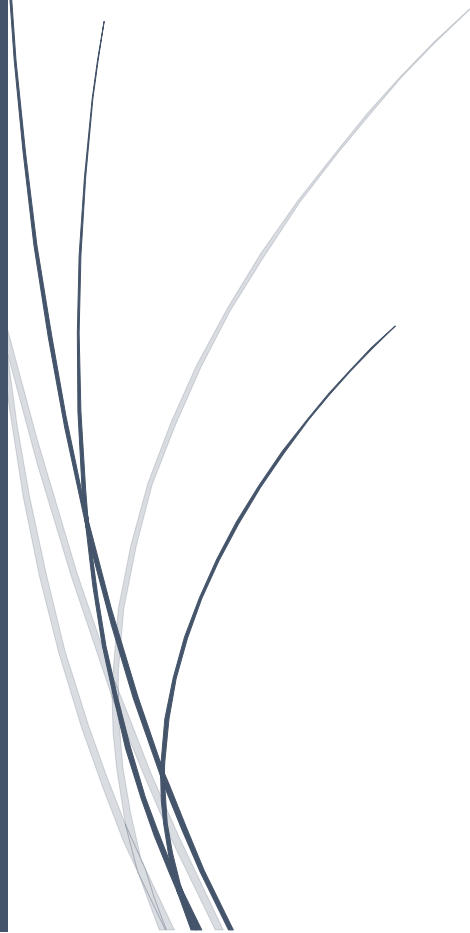


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6/6/2020

Scientific Report No.3

Model for Spatial Allocation of Water Resources in Iraq

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Supervisor: Prof.Univ.Dr.Eng.Radu DROBOT

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INTRODUCTION

Iraq is a country in the Middle East, and the country is currently facing a serious water shortage problem. This problem is expected to be more severe in the future, as it is estimated that the discharge of the Euphrates and Tigris rivers will continue to decrease over time. The government should take action to obtain a strategic vision for water management, including regional cooperation and coordination, research and development, and the improvement of the agriculture and sanitation sector, as well as a public awareness program. (Al-Ansari., 2013)

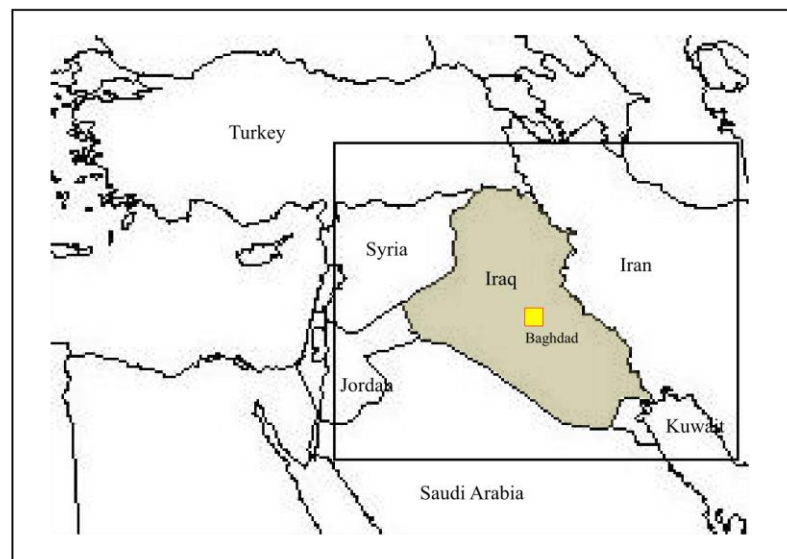
Water is God's gift to creatures and an important resource upon which life on this planet depends and is the most important component of the environment and plays a "fundamental" role in all its aspects. Therefore, attention to water resources in Iraq is considered "vital" to cover the human needs of drinking water and civil uses and secure the requirements of the environment, agriculture, generating electricity and industrial needs.

The demand for water resources in Iraq increasing as a result of population growth and economic development is offset by a decrease in this vital resource and its poor quality as a result of the continuation of the neighboring countries in the upper reaches of the Tigris and Euphrates basins by establishing and developing storage and irrigation projects with the aim of achieving the largest exploitation of water and converting some of it to other basins in addition to the phenomenon of climate change, which clearly affected the region and Iraq, where it is noticed since the beginning of the current century that the Middle East region in general and Iraq in particular are exposed to successive drought years.

The last decade of the years was the lowest period in registering water revenues, as the scarce years of it reached 50%, and this indicates a "great" risk, so raising awareness of this risk at all levels and legalizing and rationalizing water uses is very important "to preserve this vital wealth for us and for future generations." By putting in place internal laws and legislations that limit excessive water use and holding accountable those who go beyond it, otherwise not addressing this problem will lead to disruption of sustainable development and threaten the environment of Iraq to the prospects of increased desertification and dust storms and thus endangering the lives and security of citizens to a serious threat this highlights the importance of finding quick and effective solutions, both internally and externally, to positively reflect on the social and economic development, security and stability of the country.

This report includes the hierarchical data of the water resources system in the Tigris and Euphrates basins inside Iraq, which were achieved for the period from 1/1/1987 to 1/7/2019 in addition to water supplies and other matters related to the operation of that system, the most important of which are:

1. Water revenues of the Tigris and its tributaries and the Euphrates.
2. Operation of water resources in the Euphrates and Tigris basins through the Dams and Reservoirs in it.
3. The relative deficit in the supply of water resources due to the increasing demand.
4. Obstacles and goals achieved from operating the Tigris and Euphrates basins system.
5. Recommendations.



Iraq and Surrounding Countries

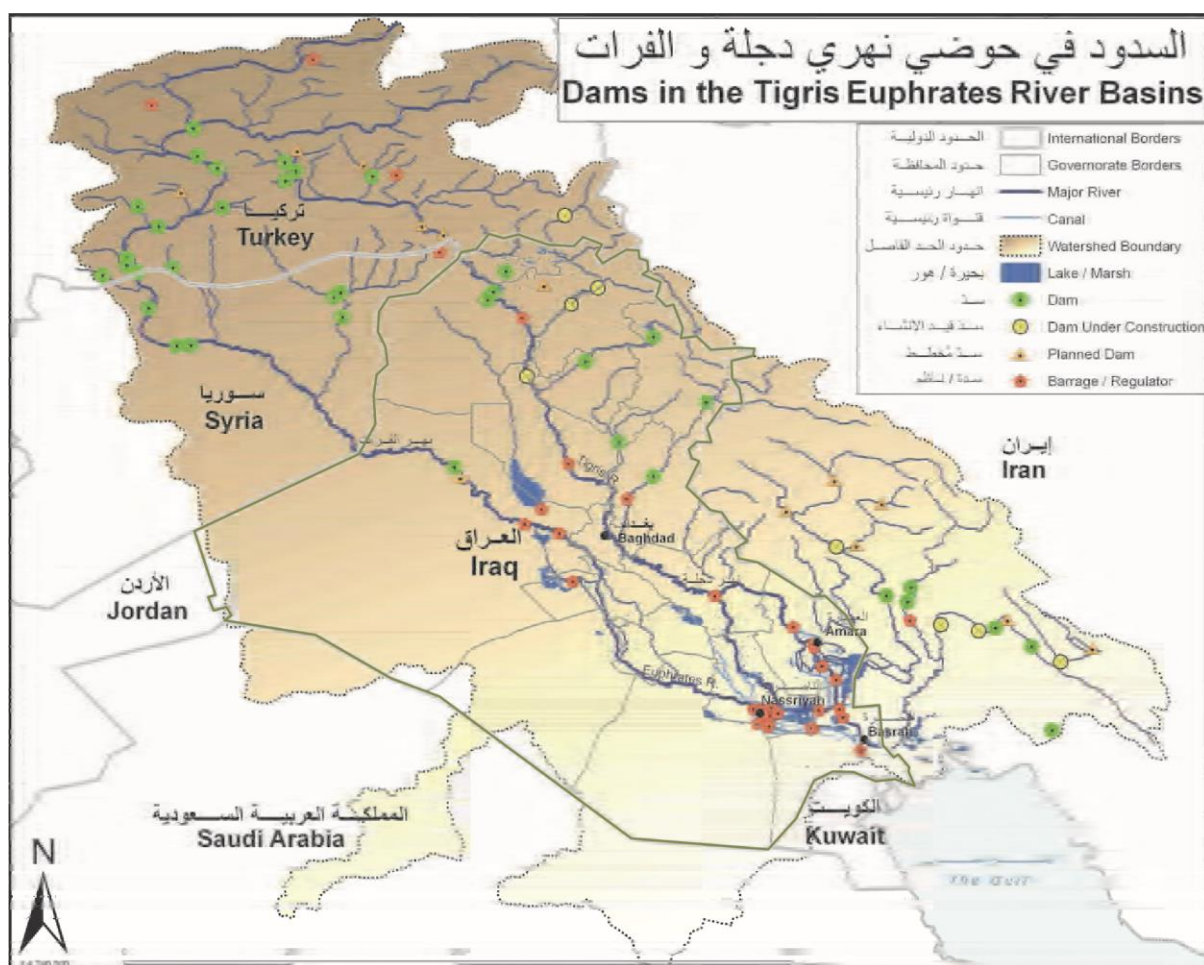


Figure 1 Watershed of Tigris and Euphrates Rivers

WATER DEMAND IN IRAQ

Municipal water demand

The overall amount of produced drinking water from surface water network in present time is shown in table below:

ID Governorate	Governorate	Demand in m3/d
1	DOHUK	305,460
2	NINAWA	818,907
3	ERBIL	471,952
4	SULAYMANIYAH	393,166
5	KIRKUK	659,813
6	SALAH AD DIN	621,548
7	ANBAR	572,343
8	DIYALA	452,223
9	BAGHDAD	3,783,965
10	WASIT	432,851
11	BABIL	748,328
12	KARBALA	457,903
13	NISSAN	451,823
14	DIWANIYAH	387,304
15	NAJAF	482,230
16	THI-QAR	486,322
17	MUTHANNA	273,632
18	BASRAH	981,720
TOTAL		12,691,487

The production of drinking water is given by the amount of water diverted from surface water network (overall amount of drinking water) is **4,633 MCM/y**.

(Ministry of municipalities and ministry of water resources, 2017)

CURRENT WATER WITHDRAWAL (MCM/Y)	
Source	Municipality
Tigris	3,052
Euphrates	1,216
Shatt-Al Arab	175
TOTAL of surface water network	4,443
TOTAL of groundwater	190
IRAQ TOTAL	4,633

Industrial water demand

Water consumption for oil fields has been identified considering the gathered data from Ministry of Oil and integrating this information with reference to “Iraq Energy Outlook”. This document reports data about oil production and from them a hypothesis on the related water need has been conducted. The water withdrawal is **709 MCM/y** for oil fields and **45 MCM/y** for refineries.

For what concerns thermo power plants, the dataset provided by the Ministry of Energy was comprehensive thus the overall amount of water withdrawal is **155 Mm³/y**.

The water use for other main industries has been calculated. Besides, it has to be underlined that generally major industries do not rely on the public network having installed their own water supply schemes while minor industries have been included, as the non-domestic consumption, within the municipality water demand.

As already explained, the resulting amount of water withdrawal for other main industries is **190 MCM/y**.

(Ministry of Oil, Ministry of Energy and Ministry of Water resources, 2017)

CURRENT WATER WITHDRAWAL (MCM/Y)					
Source	Other industries	TPP	Oil fields	Refineries	TOTAL
Surface network	154	119	709	45	1,027
Groundwater	36	36	0	0	72
TOTAL	190	155	709	45	1,099

Agricultural water demand

Water consumption for agricultural projects was determined by looking at data collected from The Ministry of Agriculture and the Ministry of Water Resources where this document contains data on agricultural areas and from them a hypothesis was made on the need for related water. The water withdrawal is about 42 billion cubic meters / year.:

CURRENT WATER WITHDRAWAL (MCM/Y)	
Source	Agricultures demand (Irrigation)
Surface network	42,000

(Ministry of Agricultural and Ministry of Water resources, 2017)



Figure 2 Location Map of Irrigation Areas in Iraq Distributed on Administrative Governorate

Environmental water demand

1. The marshes require a minimum of 5.305 billion cubic meters/Year of fresh water to prevent socio-economic losses countrywide.
2. At least 50 m³/s needed to stop salinity intrusion from the sea to the Shat Al Arab.
(Ministry of Water resources, 2017)

Evaporation consumptions

Evaporation consumptions (MCM/Y)		
Marshlands	Lakes	Reservoirs
3,645	6,090	2,680

(INTERNATIONAL RIVER FLOW CONTROL AND WATER USE, 2014)

EXISTING DAMS AND LAKES IN IRAQ

Name	Watershed	Water use (billion m ³)	Year completed
Mosul dam	Tigris	11.11	1986
Dukan dam	Lesser Zab	6.8	1959
Darbandikhan dam	Diyala	3.00	1961
Hemrin dam	Diyala	2.45	1981
Haditha dam	Euphrates	8.28	1986
Adhaim dam	Adhaim	1.5	1999
Tharthar lake	Tigris	-----	1957
Habbaniyah reservoir	Euphrates	----	

Outline of Existing Dams and Lakes

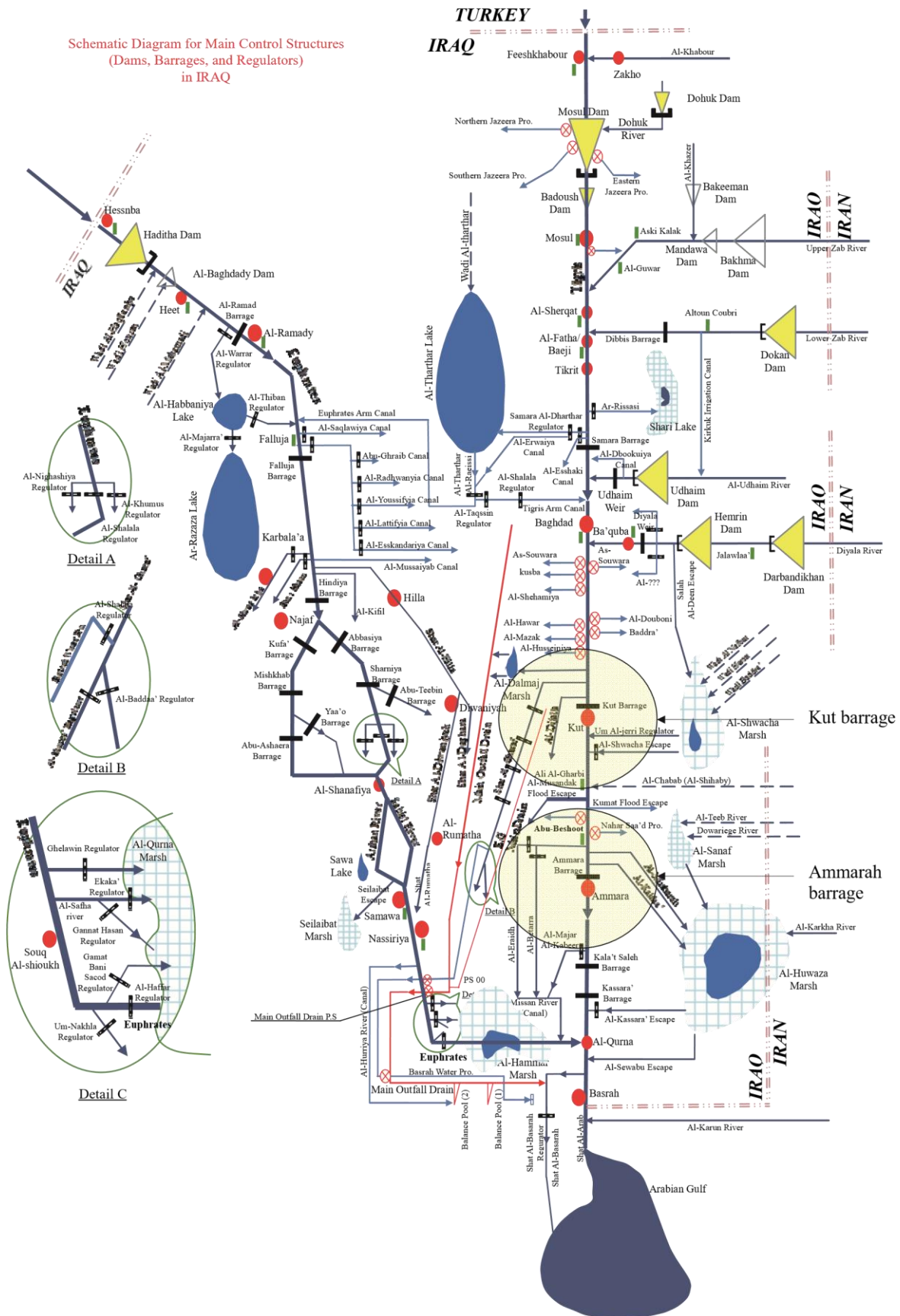


Figure 3 Schematic Diagram for Main Control Structures (Dams, Barrages, and Regulators)

MODEL OF SPATIAL ALLOCATION

A simulation network has been created for "the spatial distribution of all water resource needs in Iraq (which I mentioned in the second chapter of this report) within the water resources operating system for specific time periods to indicate the distribution of these resources according to" the request with an indication of priority in processing to (municipal demands) , Industrial demands, agricultural demands and then environmental requirements) using the **MIKE HYDRO Basin** software and, accordingly, the water demand was calculated for each component (city, industrial project and agricultural project) for the period 1987-2019. For the purpose of its application in the program, we need to define the dams and reservoirs system and define all the technical details and data as follows:

MIKE HYDRO Basin

MIKE HYDRO is the common Graphical User Interface framework some of the Water Resources products of MIKE Powered by DHI.

Embedded in one setup editor, MIKE HYDRO offers a state-of-art, map-centric user interface for intuitive model build, parameter definition and results presentation for water resources related applications.

MIKE HYDRO Basin is a versatile and highly flexible model framework for a large variety of applications concerning Management and Planning aspects of water resources within a river basin.

Typical basin module applications

- Integrated Water Resources Management (IWRM) studies
- Multi-sector solution alternatives to water allocation and water shortage problems
- Reservoir and hydropower operation optimization.
- Exploration of conjunctive use of groundwater and surface water
- Irrigation scheme performance improvements

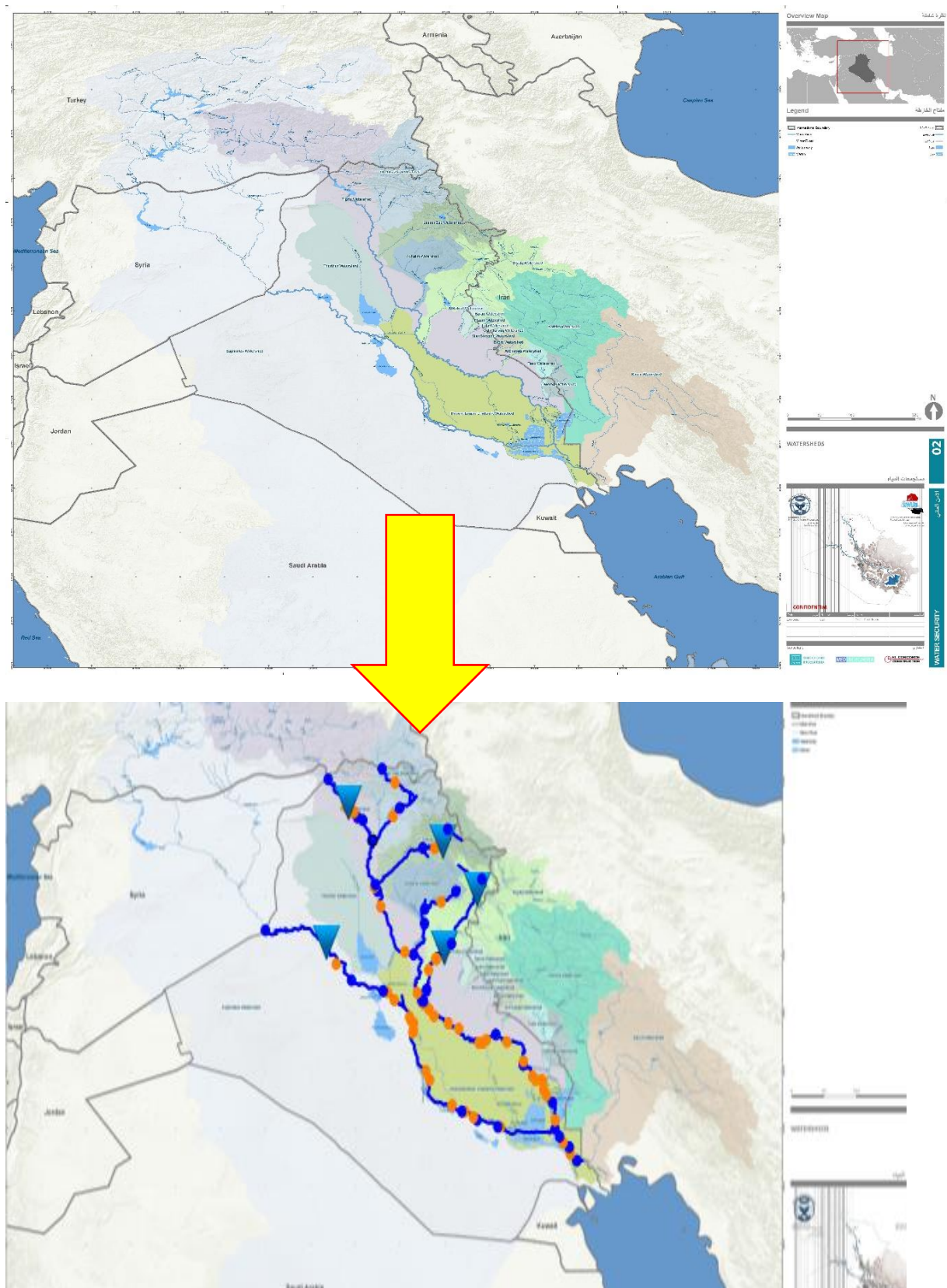
MIKE HYDRO Basin models utilize a river network and catchments within the specific river basin as the basic model-data. On top of this, a number of features can be applied depending on the type of application. Features include; River routing, Water users (regular as well as Irrigation users) and Reservoirs.

MIKE HYDRO Basin is the successor of DHI's former product for Integrated water resources management and planning; 'MIKE BASIN'

River Network

The River network forms the basis of all Basin applications. The river network is defined as a combination of connected river segments and computational nodes, and module specific features are then generally added to the model using the river network as a base.

Creating a River Network

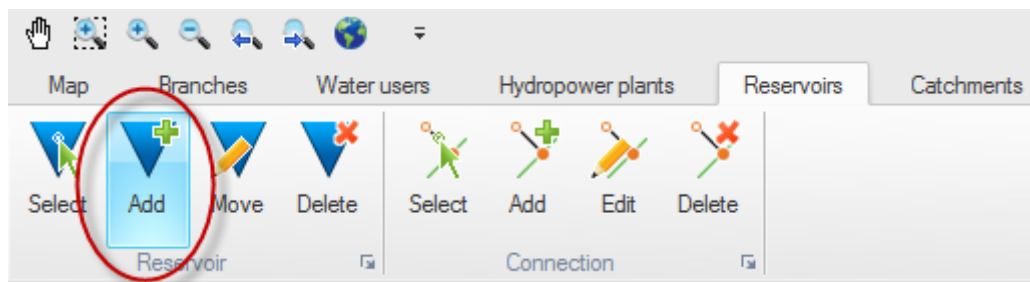


Reservoirs

The Basin module accommodates multiple multi-purpose Reservoir systems.

Individual Reservoirs can simulate the performance of specified operating policies using associated operating rule curves. These define the desired storage volumes, water levels and releases at any time as a function of current water level, the time of the year, demand for water, and losses and gains.

- Inserting a reservoir:



Specifying reservoir properties

The Reservoir properties dialogue contains the following tabs:

- General
- Operations
- Users
- Remote Flow Control
- Storage Demand
- Spillways.

Under the General tab five reservoir properties are specified:

- Reservoir type
- Level-area-volume (LAV) table
- Characteristic levels time series
- Losses and gains time series (optional)

Operations

Under the Operations tab six different operating rules can be specified:

1. Minimum release requirement (optional): release required to support environmental flows in the river downstream of the reservoir. This release takes place as long as the water level is above the Dead zone level (Top of dead storage).
2. Maximum release requirement (optional): a restriction on the flood control release when the water level in the Reservoir is above Flood control level (or Spillway bottom level, if defined).
3. Minimum operation level requirement (optional): the minimum level at which water is supplied to water users. Below the minimum operation level, only minimum flow requirements are released. If minimum operation level is not specified, the model uses the Dead zone level (Top of dead storage) as the minimum operation level.
4. Flood control level time series (mandatory): the level above which water is released for flood control purposes.
5. Guide curve level (optional only for allocation pool reservoirs): the level below which the Reservoir is 'divided' into pools.
6. Pool ownership for downstream river time series (mandatory only for allocation pool reservoirs)

Mosul Dam

Dam characteristics

Height (m)	Max. releasing m ³ /s	Min. releasing m ³ /s	Spillway capacity	
			Level (m)	Discharge m ³ /s
113	3000	50	317.5	0
			338	13000

Reservoir characteristics

Specification	Level (m)	Area (ha)	Volume (m ³)	Evaporation mm/year
Top of the dam	343.2	48,556	16,738,426,176	1542
Conservation	335	41622	12,985,215,000	
Conservation	316.55	27,564	6,486,313,754	
Conservation	315.9	27,107	6,306,486,294	
Conservation	307.5	21,448	4,283,403,750	
Conservation	318.7	29,092	7,104,951,206	
Min Hydropower	300	16,769	2,949,000,000	
Inactive	270	2,975	400,000,000	

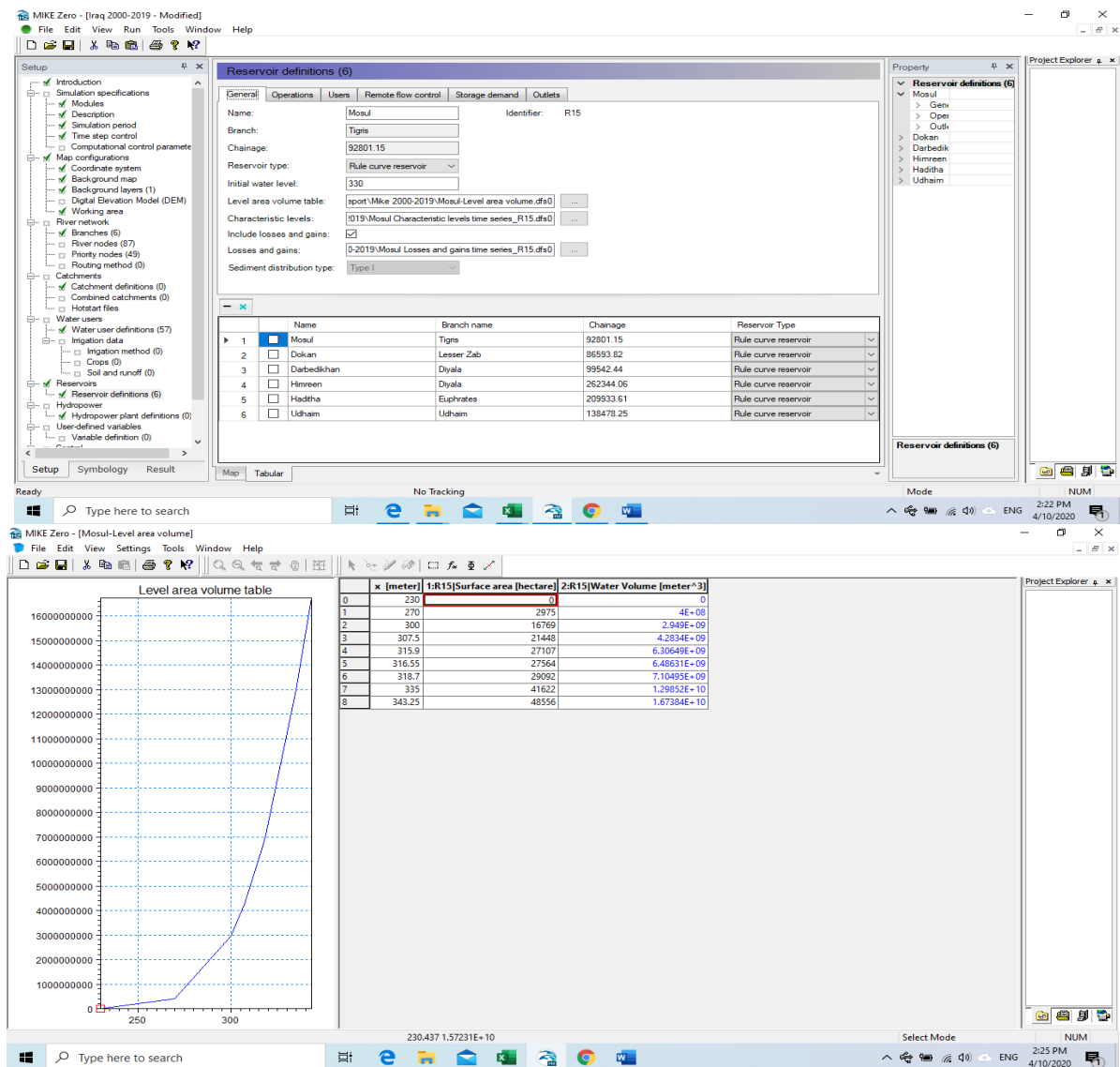


Chart 1 Average Monthly Inflow for Mosul Dam in m³/s

Dokan Dam

Dam characteristics

Height (m)	Max. releasing m3/s	Min. releasing m3/s	Spillway capacity	
			Level (m)	Discharge m3/s
116	3000	50	496.5	0
			511	1880
			515	4260

Reservoir characteristics

Specification	Level (m)	Area (ha)	Volume (m3)	Evaporation mm/year
Top of the dam	516	-----	-----	2013
Conservation	515	34,078	8,343,348,070	
Conservation	500	22,460	4,022,106,091	
Conservation	505.5	27,009	5,406,266,307	
Conservation	511	32,179	7,017,456,908	
Min Hydropower	480	7,902	1,151,114,056	
Inactive	470	4,309	527,634,797	

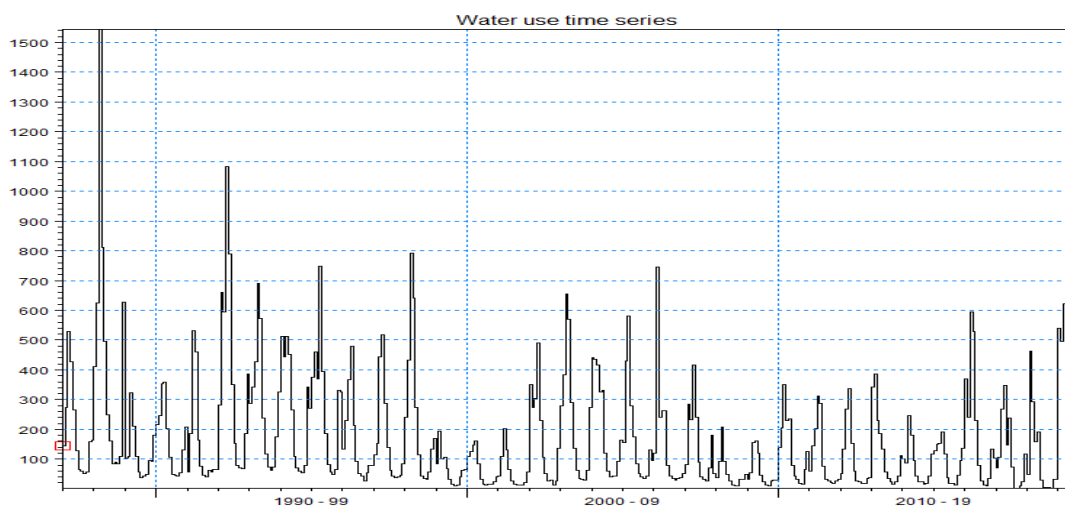
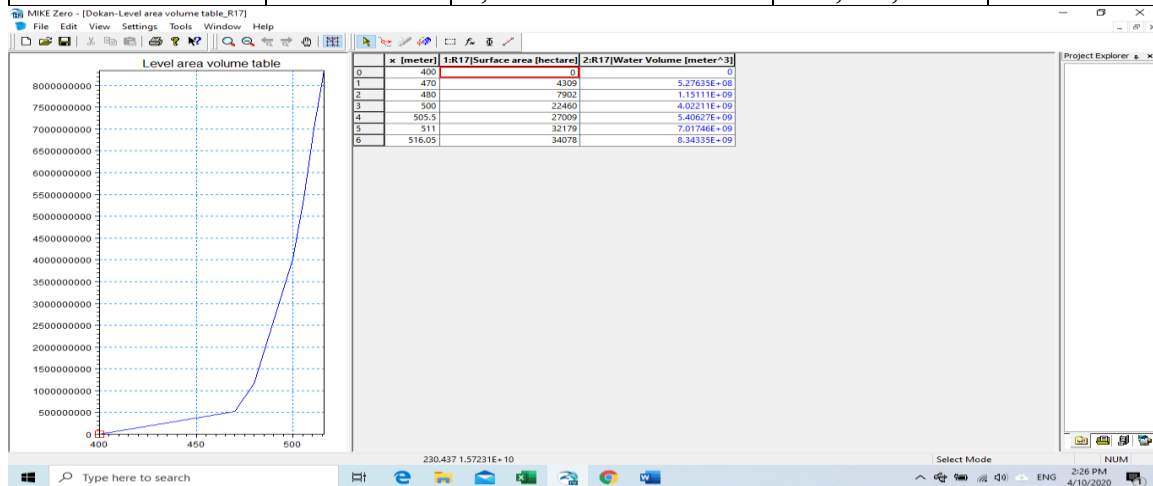


Chart 2 Average Monthly Inflow for Dokan Dam in m3/s

Udhaim Dam

Dam characteristics

Height (m)	Max. releasing m3/s	Min. releasing m3/s	Spillway capacity	
			Level (m)	Discharge m3/s
62	750	10	131.5	0
			143.5	1150

Reservoir characteristics

Specification	Level (m)	Area (ha)	Volume (m3)	Evaporation mm/year
Top of the dam	146.5	31,681	4,442,147,650	2263
Conservation	143.5	27,809	3,878,000,128	
Conservation	124	8,058	836,400,000	
Conservation	126.5	9,629	1,052,500,032	
Conservation	129	11,432	1,307,000,064	
Conservation	131.5	13,503	1,607,000,064	
Min Hydropower	118	5,166	454,200,000	
Inactive	110	2,835	160,900,000	

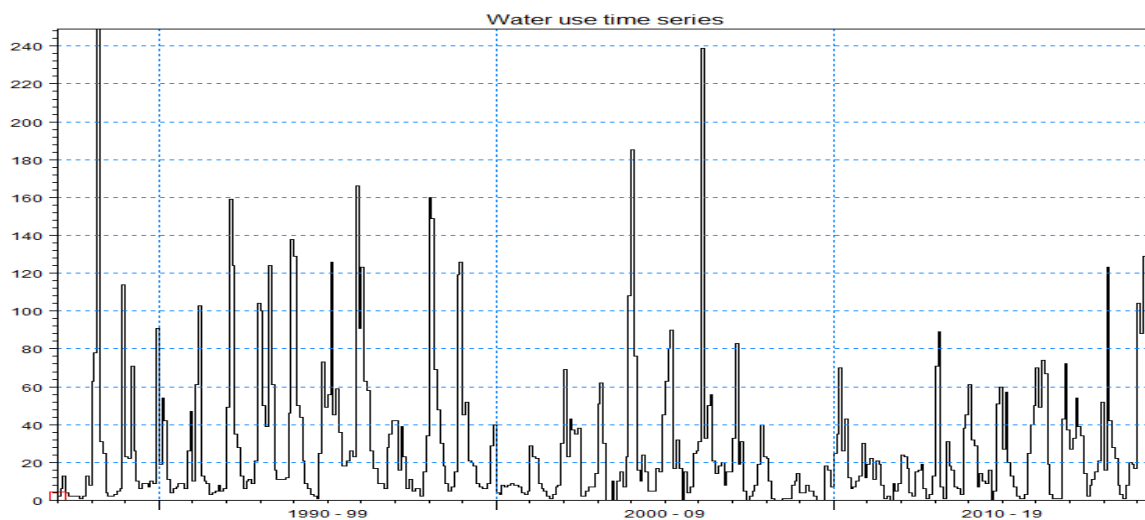
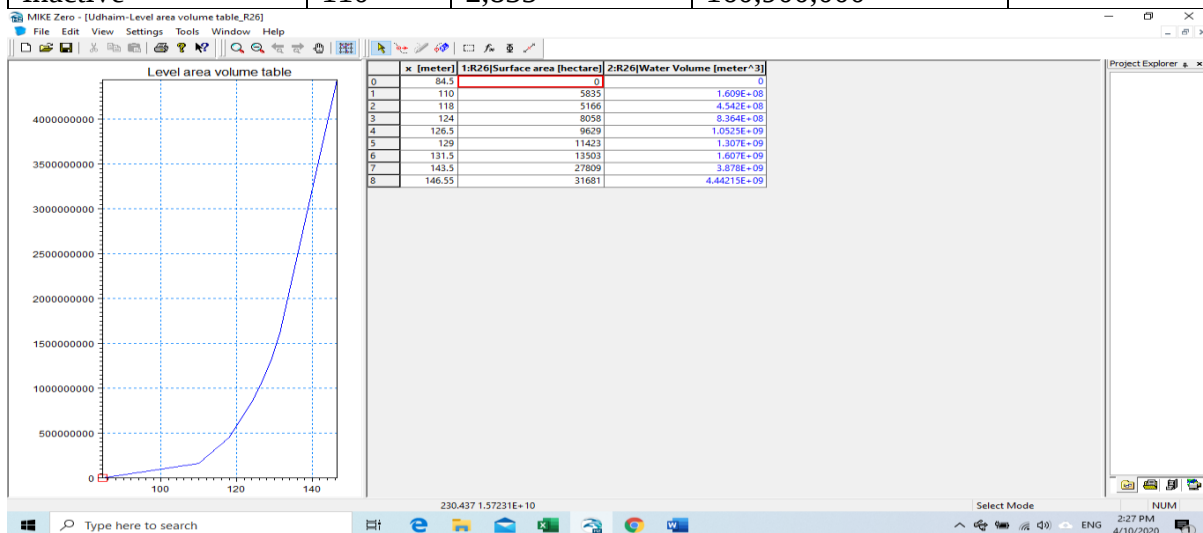


Chart 3 Average Monthly Inflow for Udhaim River in m3/s

Derbandikhan Dam

Dam characteristics

Height (m)	Max. releasing m ³ /s	Min. releasing m ³ /s	Spillway capacity	
			Level (m)	Discharge m ³ /s
128	3000	50	470	0
			494	11900

Reservoir characteristics

Specification	Level (m)	Area (ha)	Volume (m ³)	Evaporation mm/year
Top of the dam	495	23,000	4,197,110,000	2089
Conservation	493.5	19,969	4,019,546,777	
Conservation	460	3,444	952,738,497	
Conservation	466.3	4,414	1,199,672,973	
Conservation	468.3	4,768	1,292,081,463	
Conservation	472.5	5,730	1,502,097,768	
Conservation	476.7	7,707	1,764,966,173	
Conservation	478.8	8,467	1,926,434,667	
Conservation	485	12,131	2,572,044,255	
Min Hydropower	434	1,906	283,480,382	
Inactive	410	296	2,884,758	

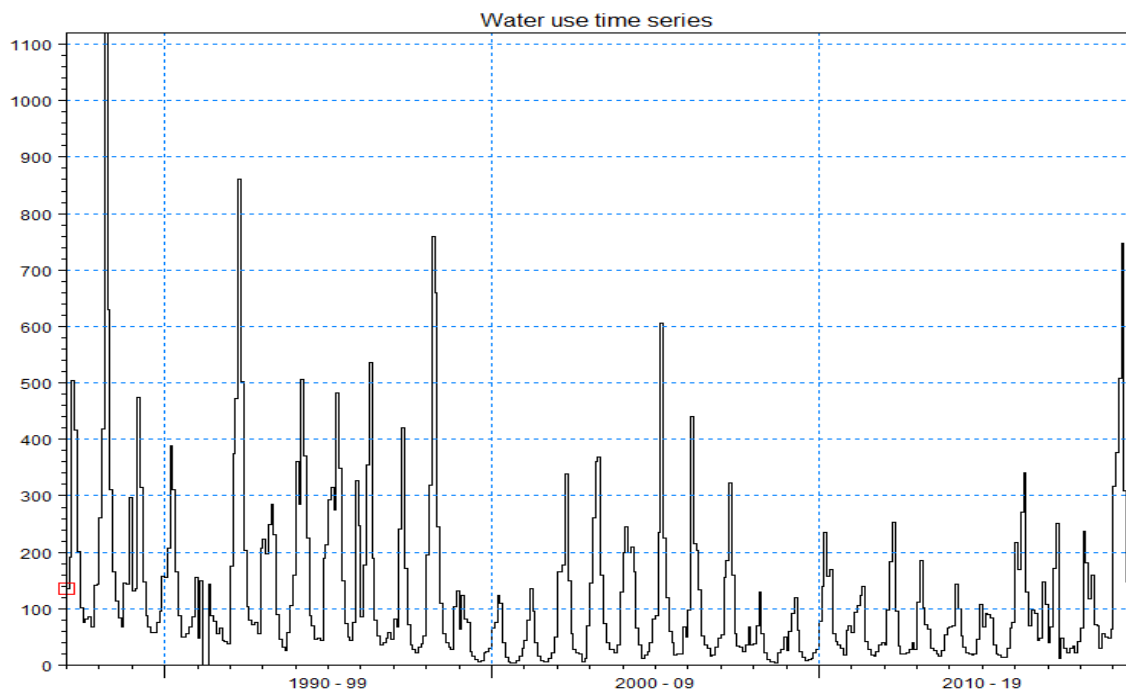


Chart 4 Average Monthly Inflow for Darbandikhan Dam in m³/s

Himreen Dam

Dam characteristics

Height (m)	Max. releasing m ³ /s	Min. releasing m ³ /s	Spillway capacity	
			Level (m)	Discharge m ³ /s
53	2000	50	92	0
			108	7250

Reservoir characteristics

Specification	Level (m)	Area (ha)	Volume (m ³)	Evaporation mm/year
Top of the dam	109.5	54,320	4,939,500,032	2267
Conservation	104	31,792	2,400,000,000	
Conservation	100	20,574	1,318,000,000	
Min Hydropower	89	4,630	102,000,000	
Inactive	84.1	1,878	20,000,000	

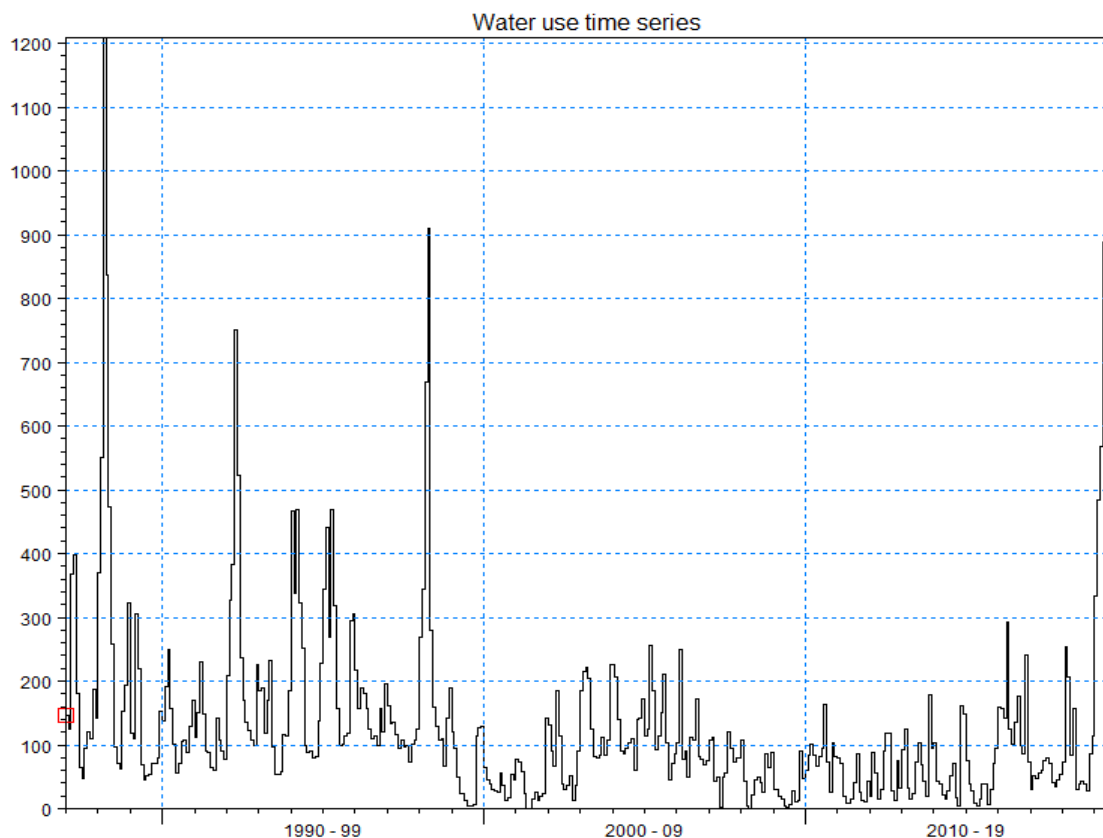


Chart 5 Average Monthly Inflow for Himreen Dam in m³/s

Hadeetha Dam

Dam characteristics

Height (m)	Max. releasing m ³ /s	Min. releasing m ³ /s	Spillway capacity	
			Level (m)	Discharge m ³ /s
54	4500	50	134	0
			150.2	11000

Reservoir characteristics

Specification	Level (m)	Area (ha)	Volume (m ³)	Evaporation mm/year
Top of the dam	154	67,282	12,029,157,200	2306
Conservation	150.2	57,778	9,968,055,668	
Conservation	143	41,494	6,624,473,300	
Conservation	144.3	44,215	7,188,182,352	
Conservation	145.7	47,049	7,777,106,382	
Conservation	147	49,993	8,391,245,300	
Min Hydropower	112	9,550	240,000,000	
Inactive	100.5	3,220	10,000,000	

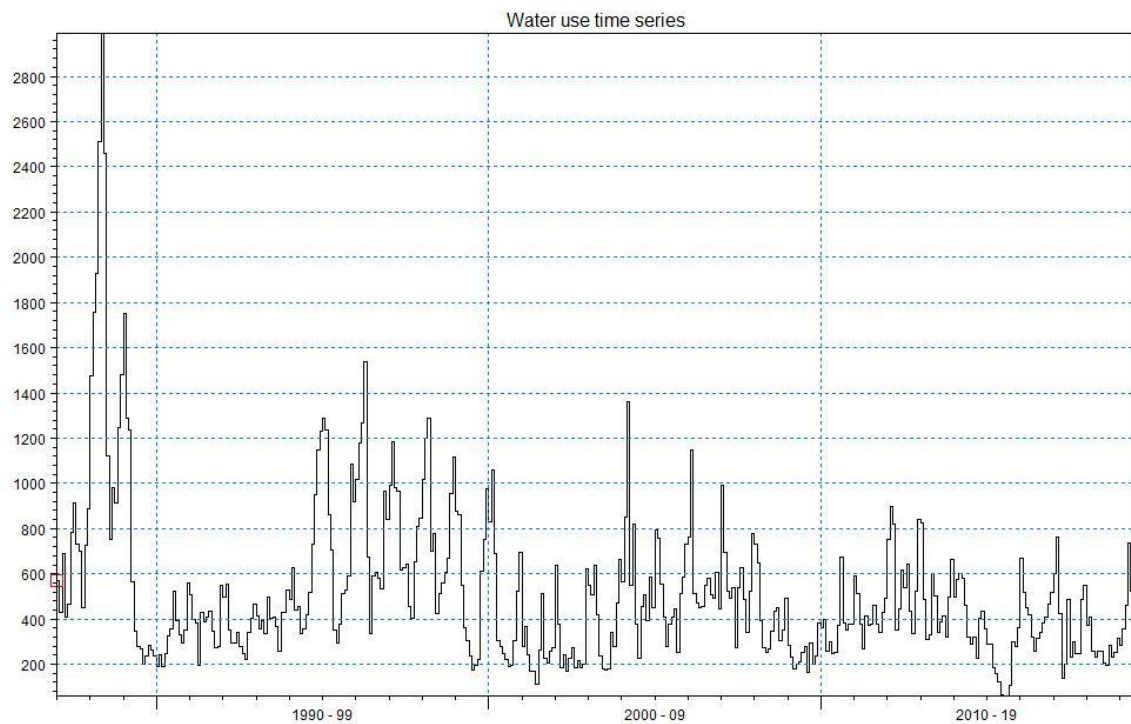


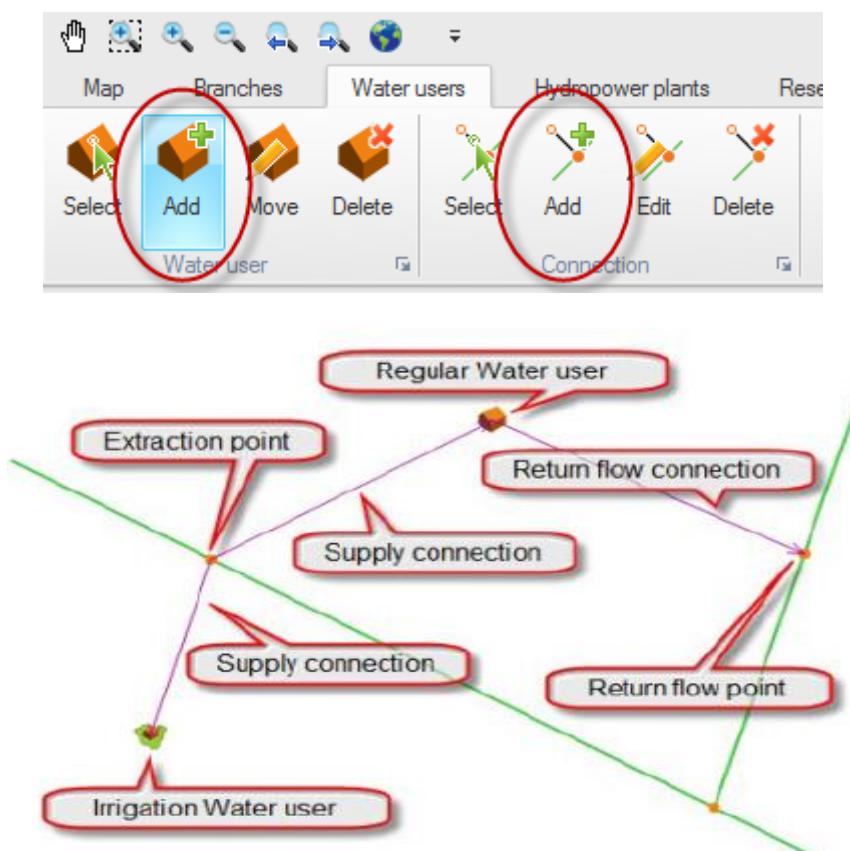
Chart 6 Average Monthly Inflow for Hadeetha Dam in m³/s

Water Users

Water users represent water consuming activities withdrawing water from the river or a reservoir.

A model setup may contain any number of Water users where MIKE HYDRO overall supports two types of water users; Irrigation water users and Regular water user (e.g. municipal, industrial and any other type of Water user).

Water users are connected to the river network through Supply flow connections and Return flow connections, where supply flow is being extracted from the supply connection point and the Return flow is the water returned from the water user once the final consumption has been calculated.



Priorities

When more than one Water user is connected to the Priority node, a set of rules that defines how the available water is allocated in case of water shortage is required. Two different options are available:

1. Supply by priority: Each of the Water users is getting their demand fulfilled in order of priority, i.e. each water user is assigned a priority and the demands will be fulfilled according to the assigned priorities.

2. Supply by fraction of flow: Each Water user is assigned a fraction of the available water at the priority node. The sum of the assigned fractions must be equal to one.

In my case, defined priority (1) for municipality, (2) for industry and (3) for irrigation.



Figure 4 Iraq's Network (Rivers, Dams and Users)

Then feed the reservoirs and dams with inflow water at the monthly average rate of expenditures for the target time period (1987 - 2019) and also linking users with all the water demands (municipal, industrial, agricultural and environmental) so that we can do simulations and know the results.

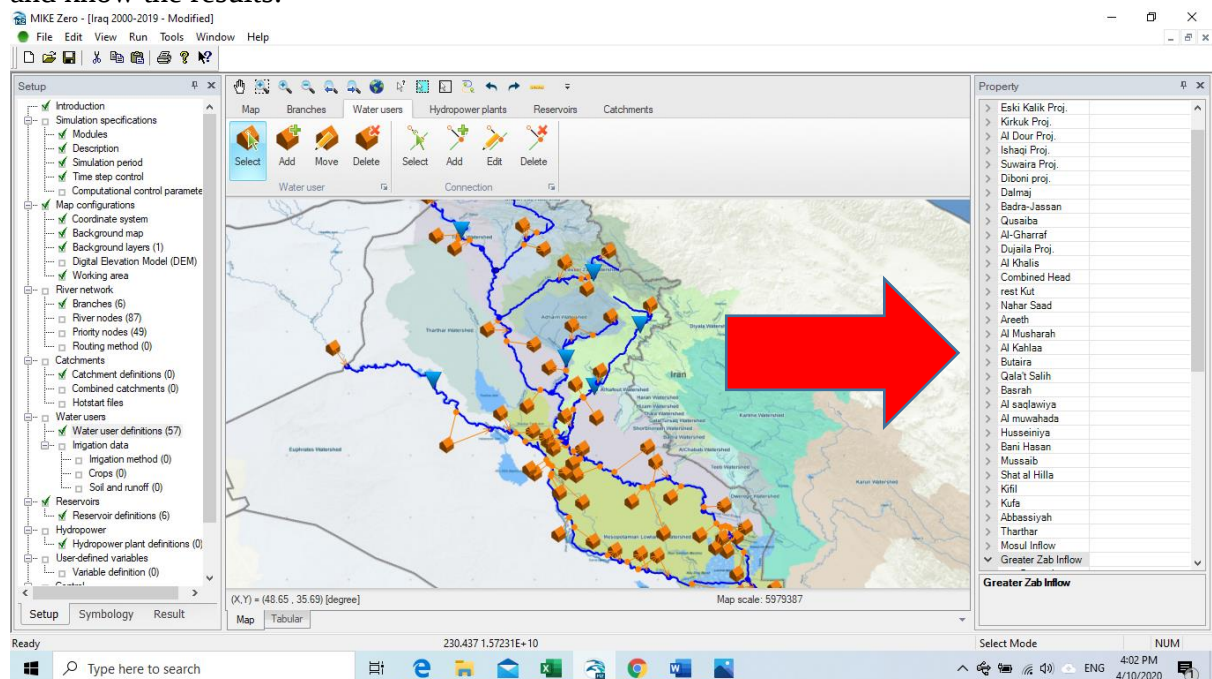


Figure 5 List of Water Users for Case study

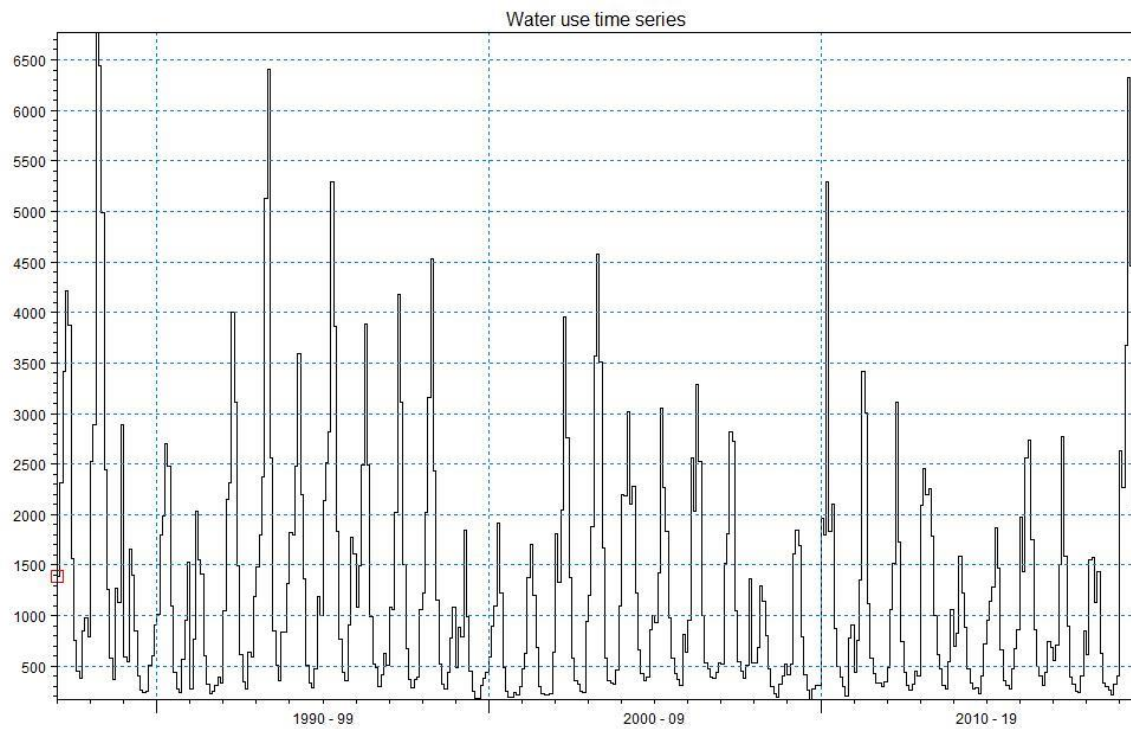


Chart 7 Average Monthly Inflow for Tigris and Its tributaries in m3/s

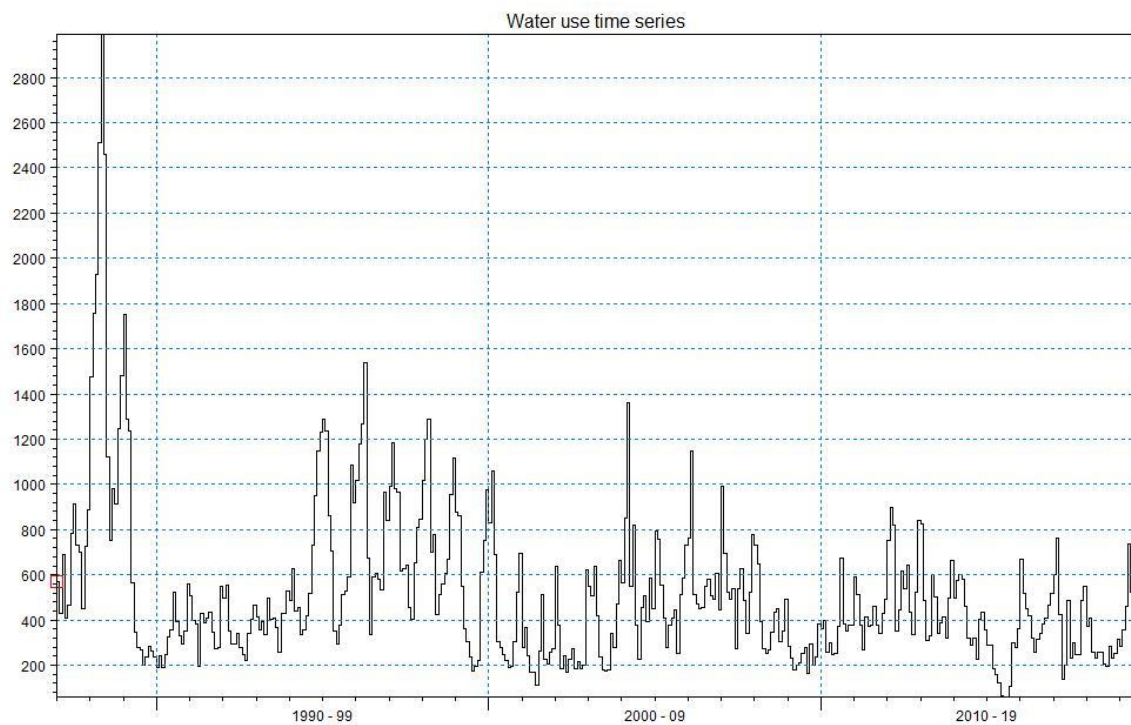


Chart 8 Average Monthly Inflow for Euphrates River in m3/s

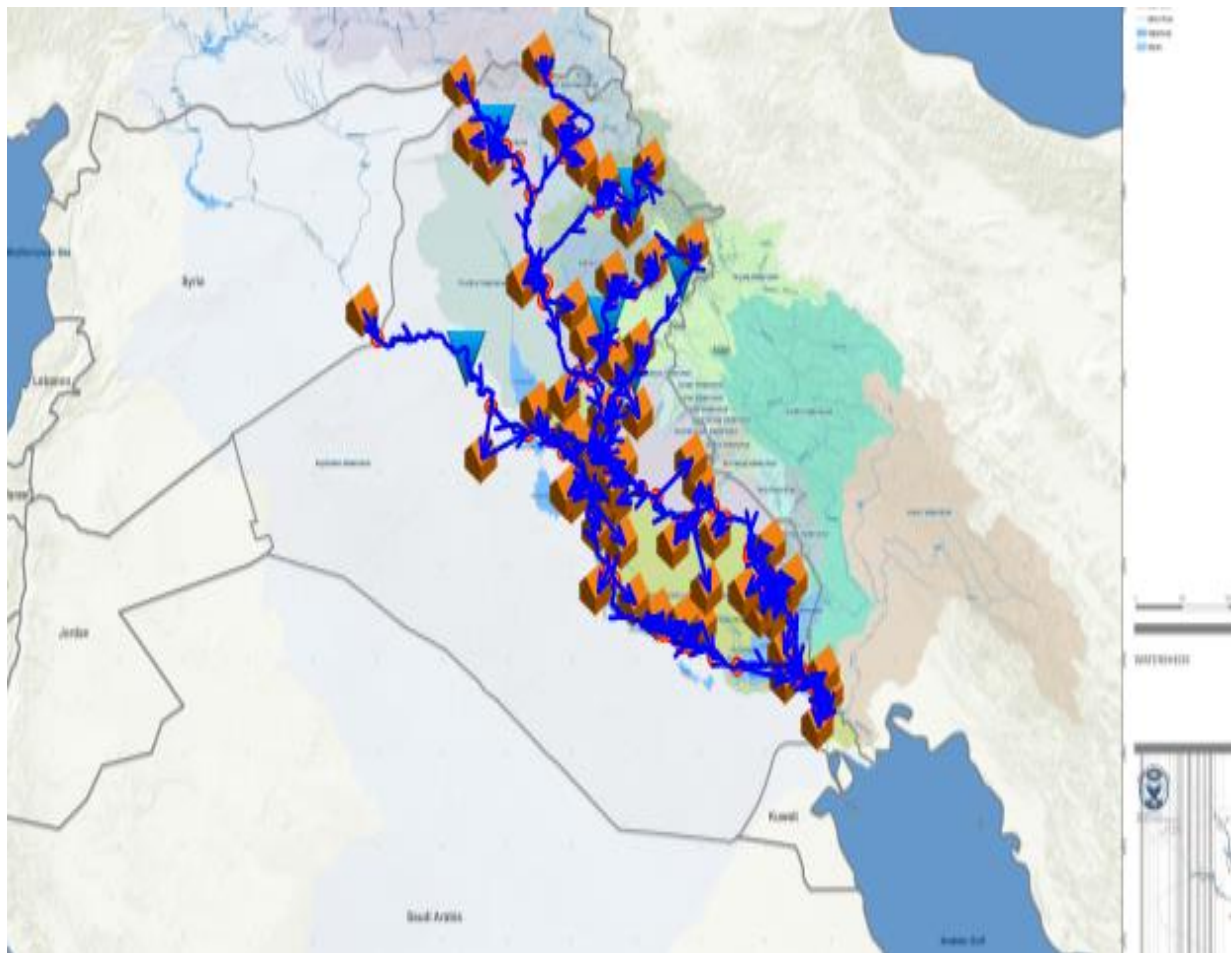
(Al-Shahrabaly, 2008), (Iraq, 2019)

RESULTS

Notes:

- The software calculates for each time step that specified in the form under time step control. This means that the program calculates the water balance in the first month (Time step = 1 month) then takes the result and considers it the first condition for simulating the second month, etc. So in conclusion, the program takes into account the volume of water at the end of each time step.
- All reservoirs are working together to cover the water needs downstream.

After simulating using the Mike-Zero program for the period 1987-2019, the results were as follows:



The amount of water released from Tharthar to Euphrates

Discharge in m3/sec												
Year	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1987	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0
1990	194	161	254	245	232	444	465	450	450	324	258	229
1991	34	90	164	328	350	425	543	591	565	560	562	335
1992	103	74	236	194	139	603	762	684	583	385	369	193
1993	187	145	375	250	329	813	932	936	965	559	375	287
1994	311	406	386	440	457	487	485	466	300	476	473	539
1995	378	234	149	179	388	625	788	505	546	231	79	72
1996	45	0	0	0	85	187	121	14	10	60	26	150
1997	0	0	0	6	225	256	15	0	0	101	38	0
1998	0	0	0	82	130	55	185	45	15	0	0	0
1999	0	0	0	0	62	55	95	86	60	225	345	0
2000	1	0	0	0	26	2	3	1	2	113	50	0
2001	25	47	95	145	105	120	135	95	115	0	11	10
2002	125	160	167	215	270	392	400	330	277	5	15	0
2003	0	10	104	120	148	333	398	362	444	215	210	143
2004	10	85	170	135	150	205	510	440	250	480	425	195
2005	0	0	65	120	215	390	415	225	215	145	210	120
2006	90	0	0	75	130	415	320	310	165	170	260	210
2007	0	0	140	105	80	260	300	190	80	80	25	30
2008	65	44	88	84	33	101	95	68	51	141	140	91
2009	25	47	95	145	105	120	135	95	115	0	11	10
2010	125	160	167	215	270	392	400	330	277	5	15	0
2011	0	10	104	120	148	333	398	362	444	215	210	143
2012	10	85	170	135	150	205	510	440	250	480	425	195
2013	65	44	88	84	33	101	95	68	51	141	140	91
2014	25	47	95	145	105	120	135	95	115	0	11	10
2015	125	160	167	215	270	392	400	330	277	5	15	0
2016	0	10	104	120	148	333	398	362	444	215	210	143
2017	10	85	170	135	150	205	510	440	250	480	425	195
2018	65	44	88	84	33	101	95	68	51	141	140	91
2019	0	0	0	0	0	0	0					

- Al Dour Agricultural Project

The water source for the Al-Dour agricultural project is the left side of the Tigris River, Upstream Samarra barrage.

The total irrigation area of Al-Dour canal command area is 32000 ha.

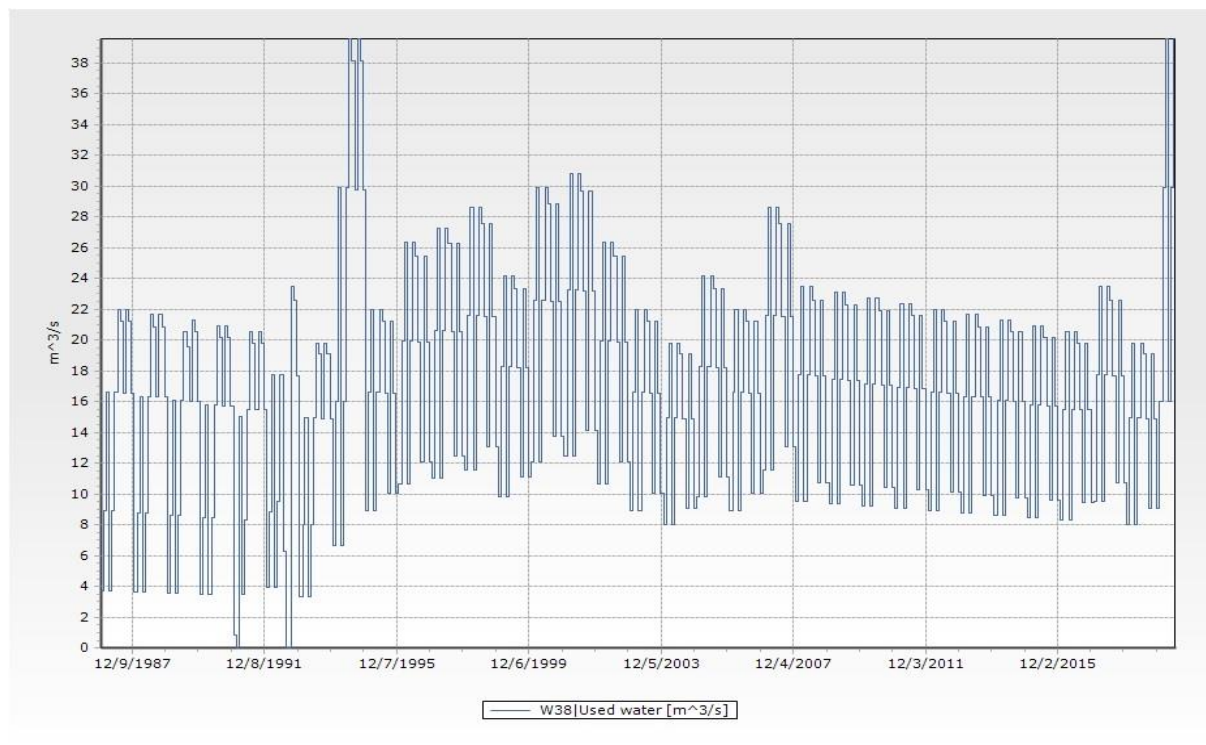
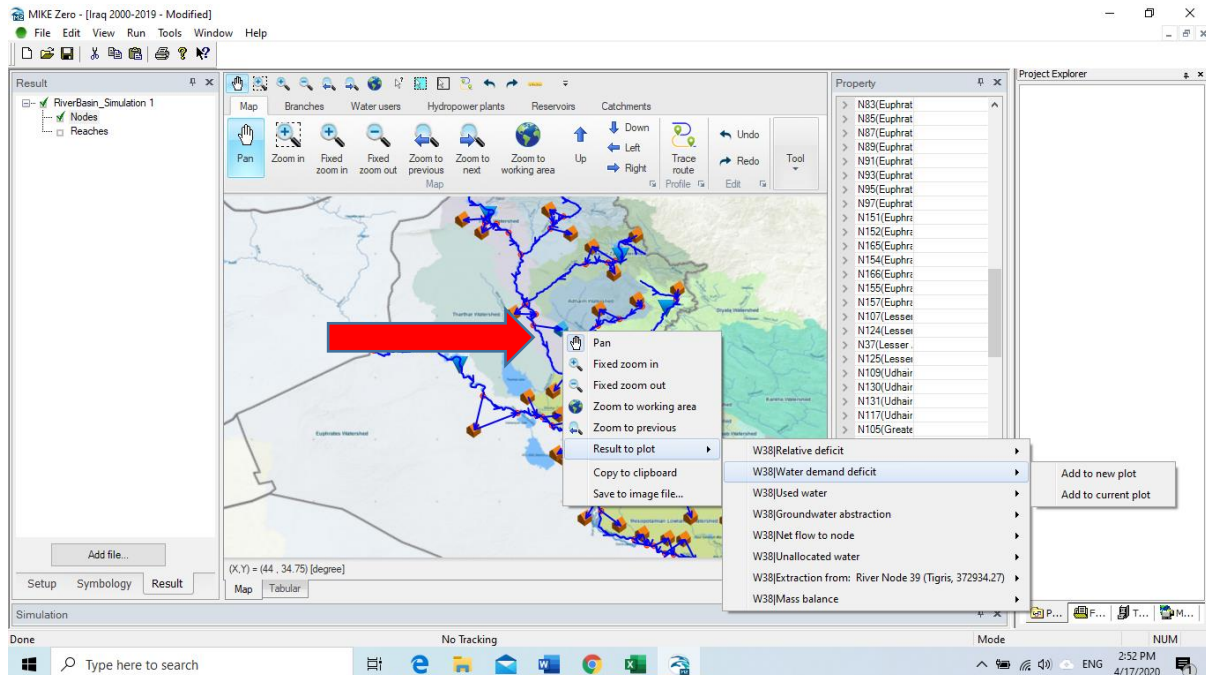


Chart 9 Al Dour Agricultural Project Used water

- Gharraf Agricultural Project

The water source for the Al-Gharraf agricultural project is the right side of the Tigris River, up-stream Al-Kut barrage.

The total irrigation area of the Shatt Al-Gharraf canal command area is 262750 ha.

It also covers "Al-Nasiriyah city" with municipal and industrial water.

(JICA, 2016)

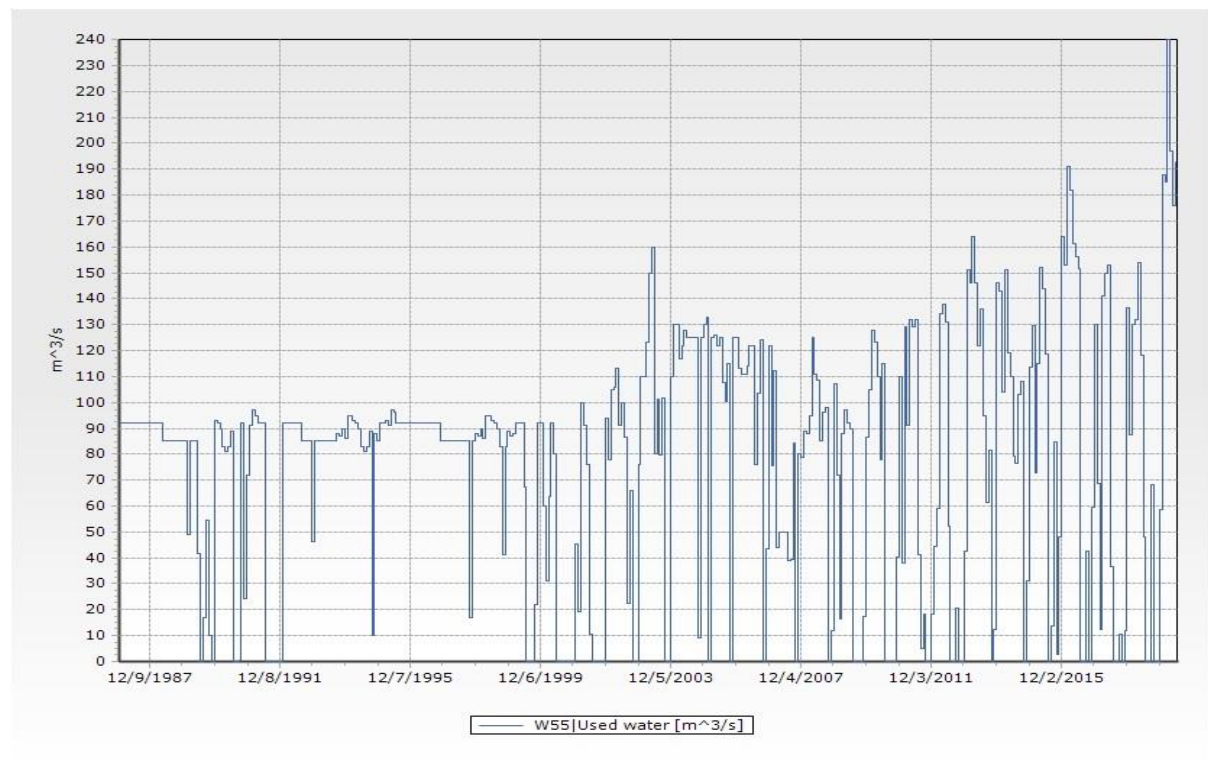
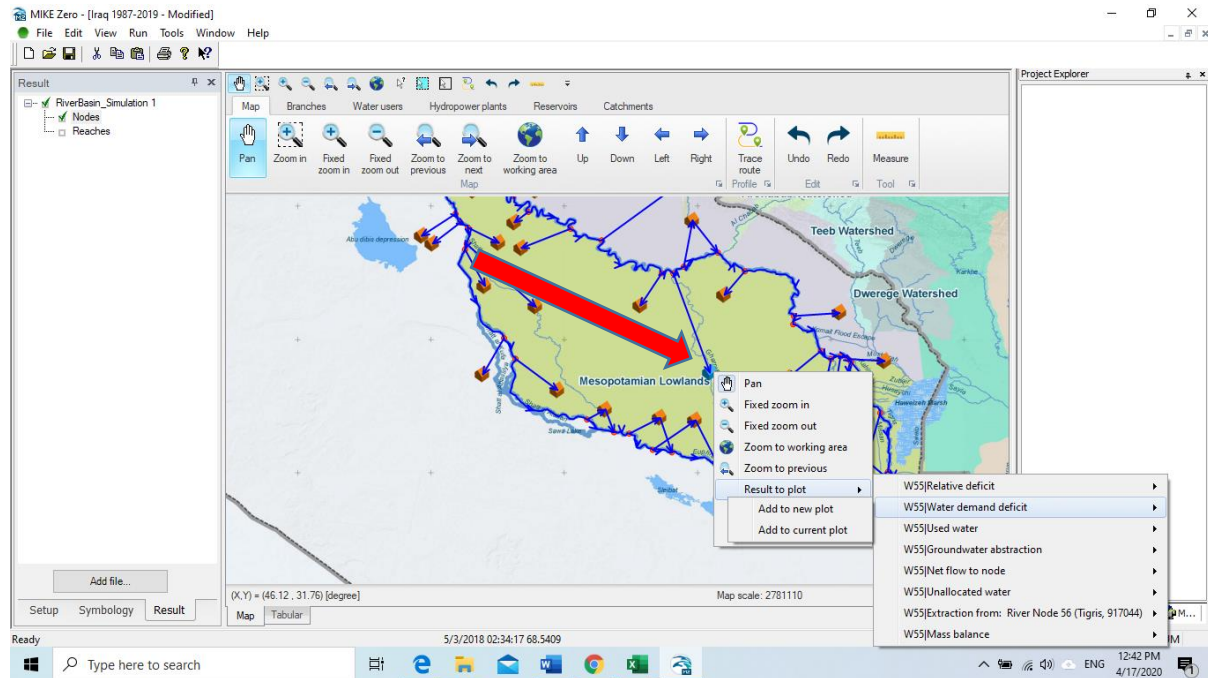


Chart 10 Gharraf Agricultural Project Used Water

- Saqlawiyah Agricultural Project

The water source for the Saqlawiyah agricultural project is the left side of the Euophrates River, up-stream Falluja barrage.

The total irrigation area of Saqlawiyah canal command area is 35000 ha.

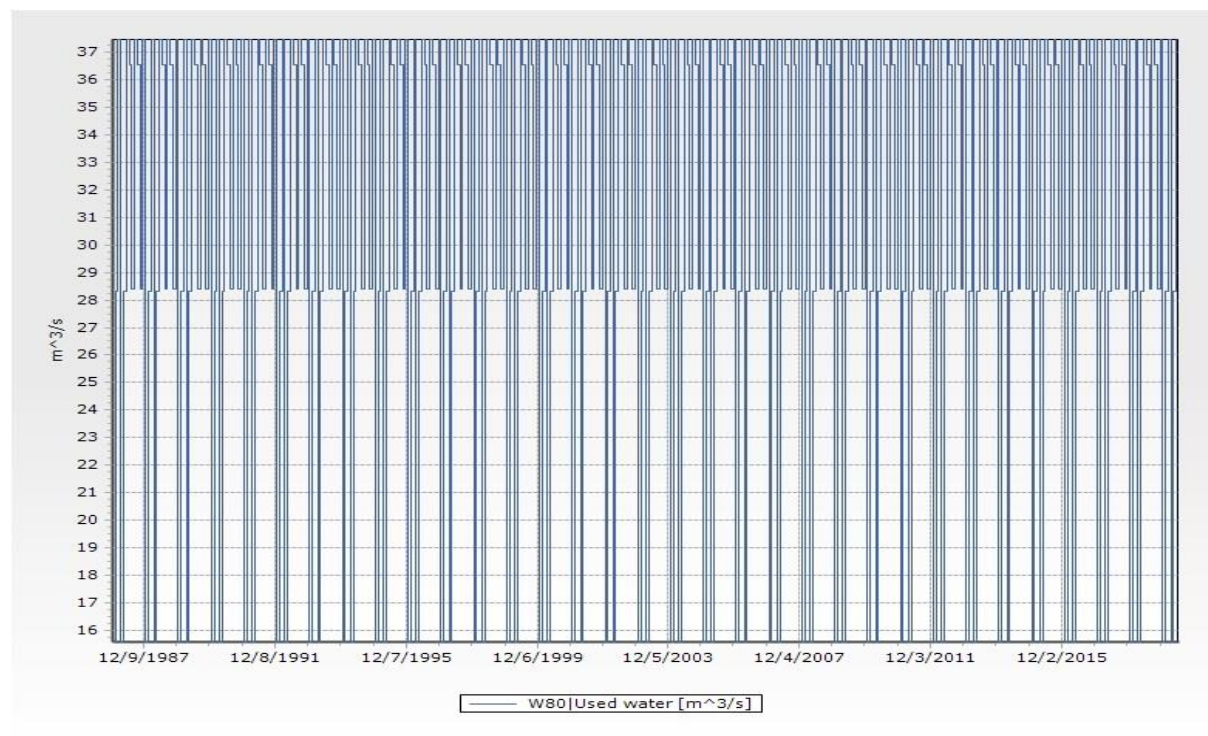
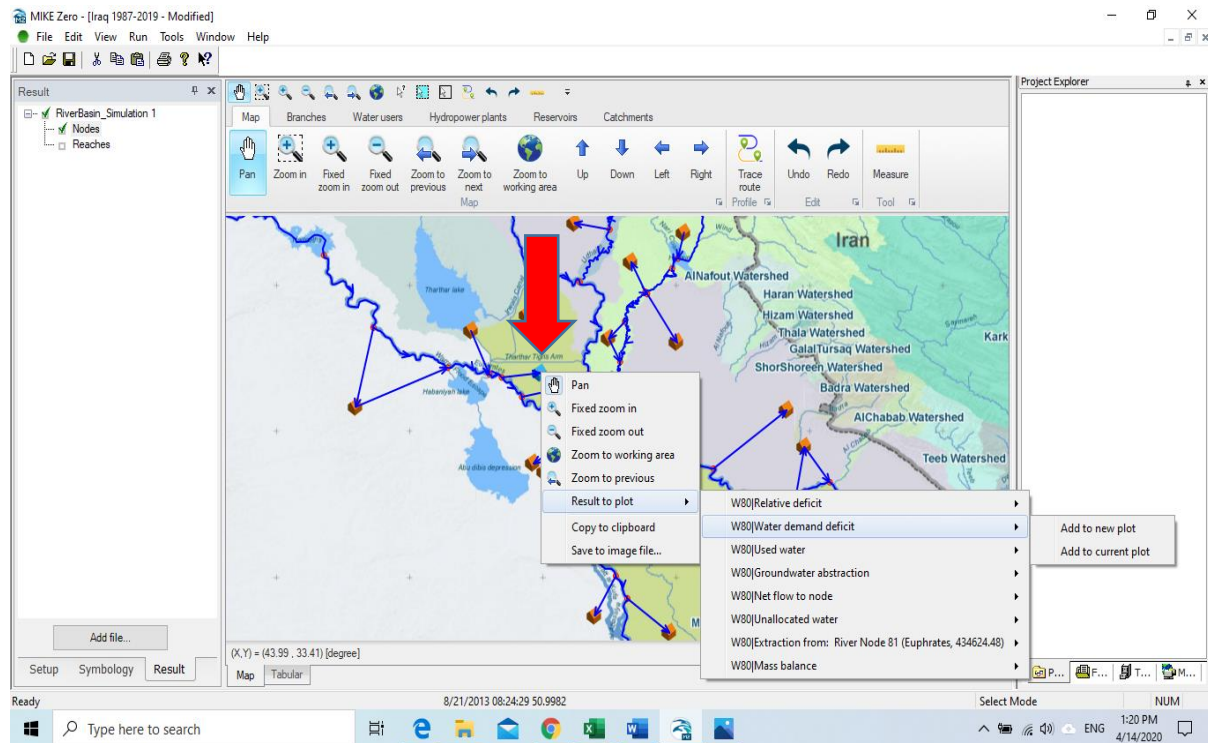


Chart 11 Saqlawiyah Agricultural Project Used Water

- Shatt Al-Hilla

The water source for Shatt Al-Hilla is the left side of the Euophrates River, up-stream Al-Hindiyah barrage.

The total irrigation area of the Shatt Al-Hilla command area is around 360000 ha.

It also covers "Babel and Diwaniyah cities" with municipal and industrial water.

(JICA, 2016)

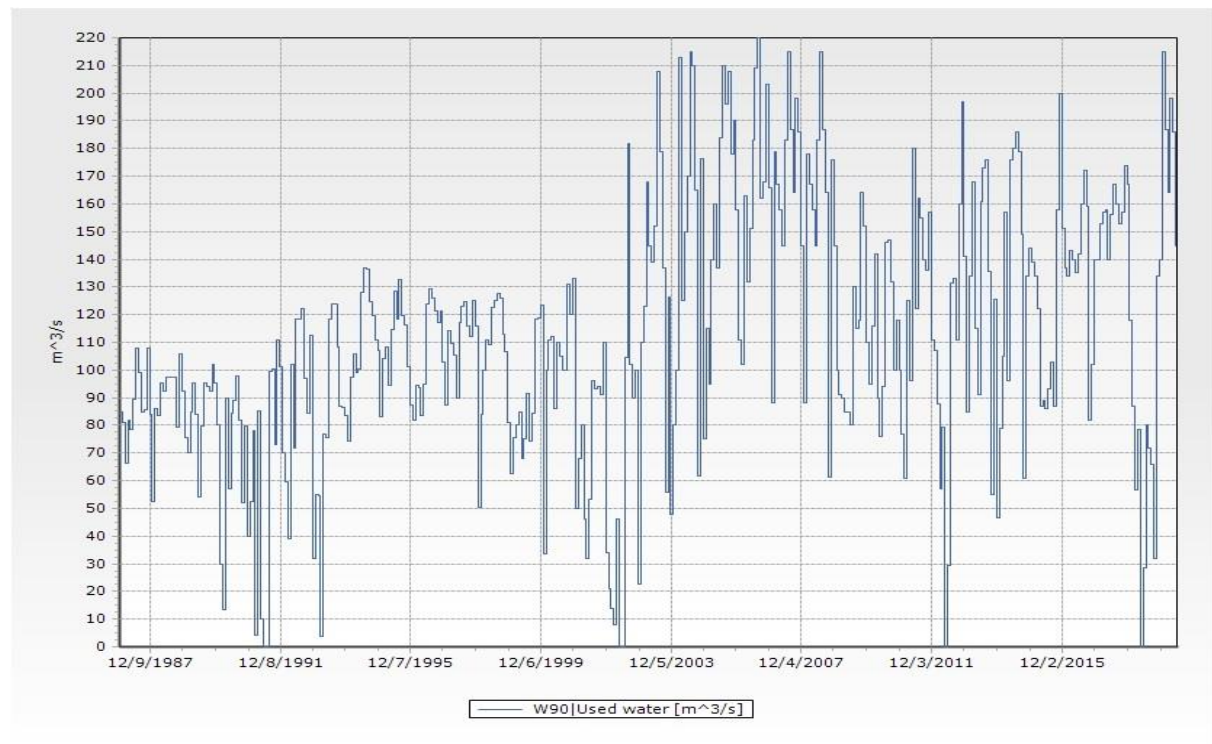
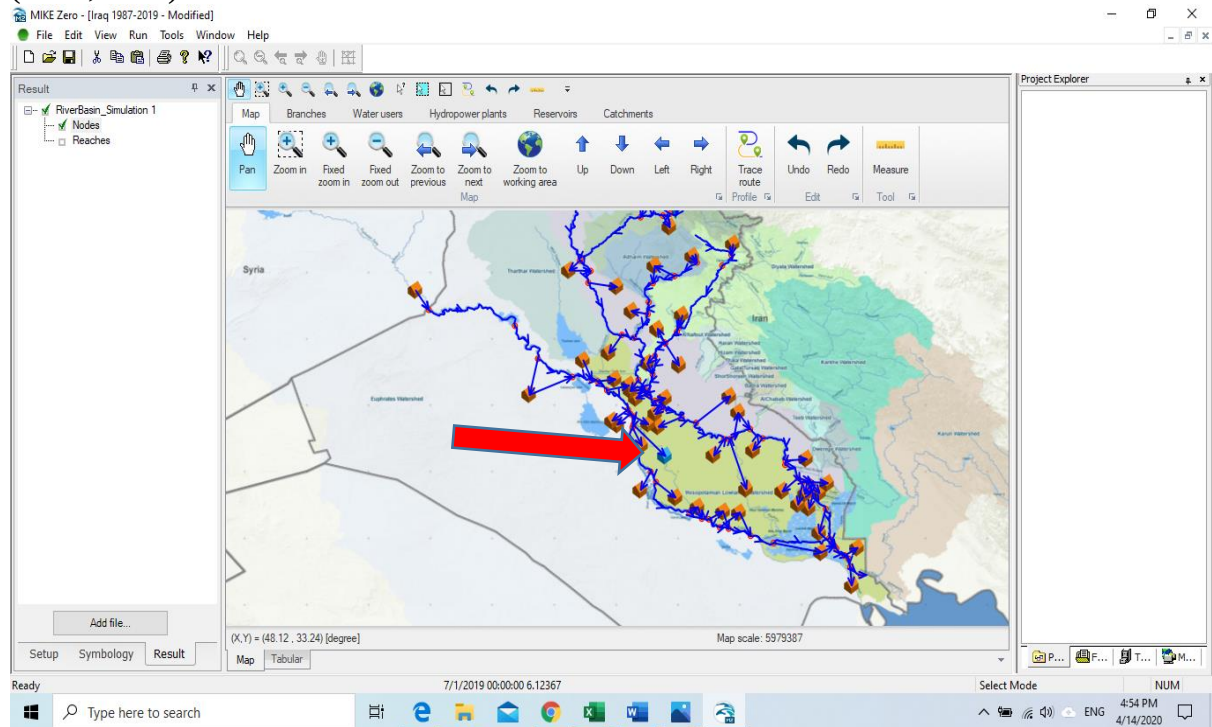


Chart 12 Shatt Al-Hilla Used Water

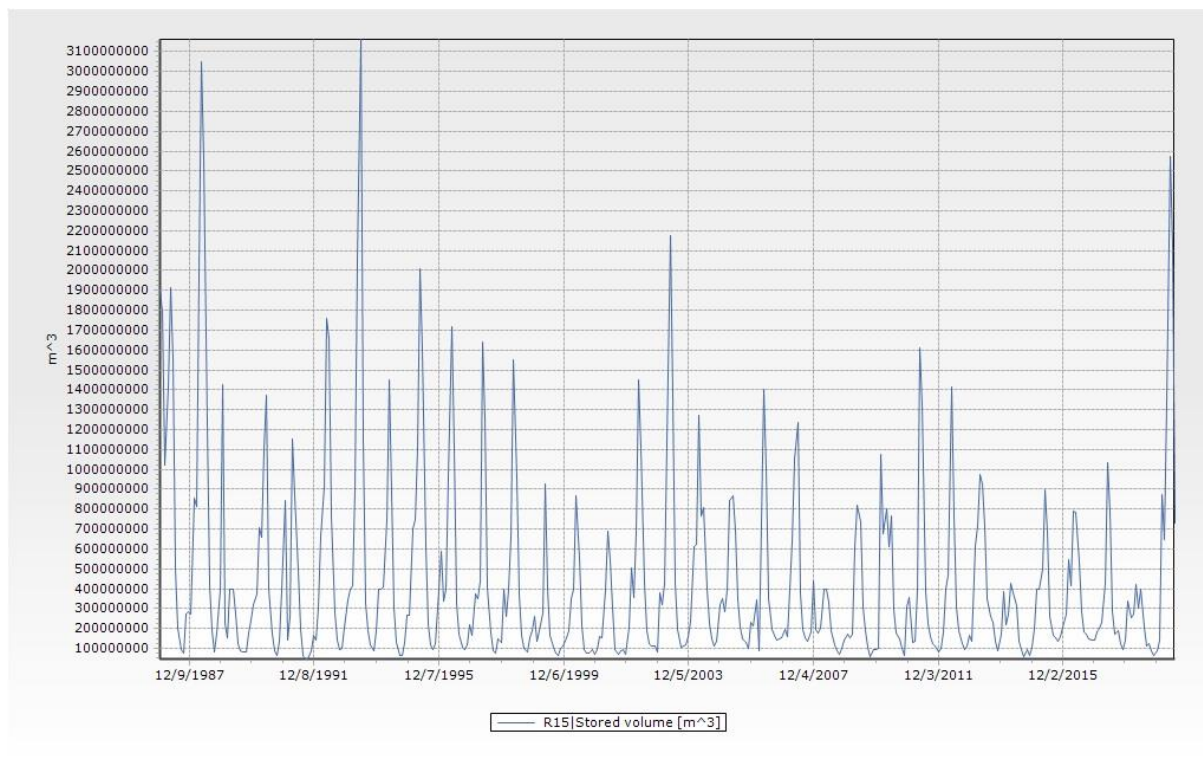


Chart 13 Stored Volume in Mosul Dam versus Time

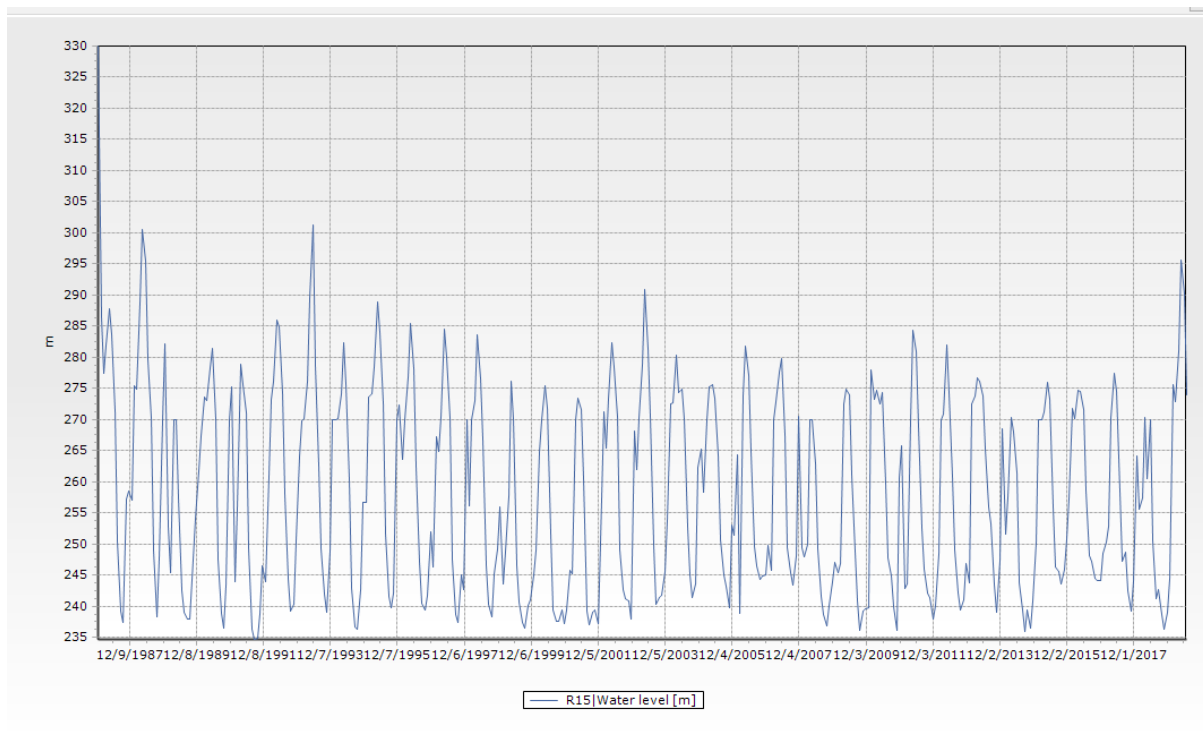


Chart 14 Water level in Mosul Dam versus Time

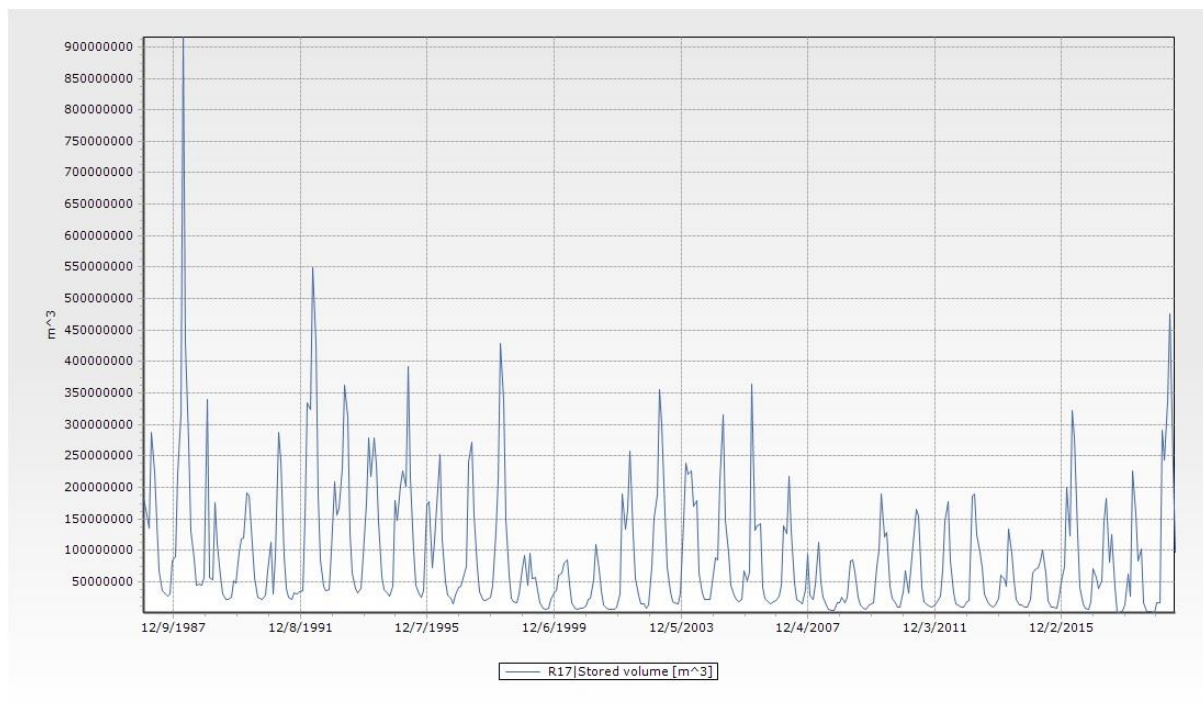


Chart 15 Stored Volume in Dokan Dam versus Time

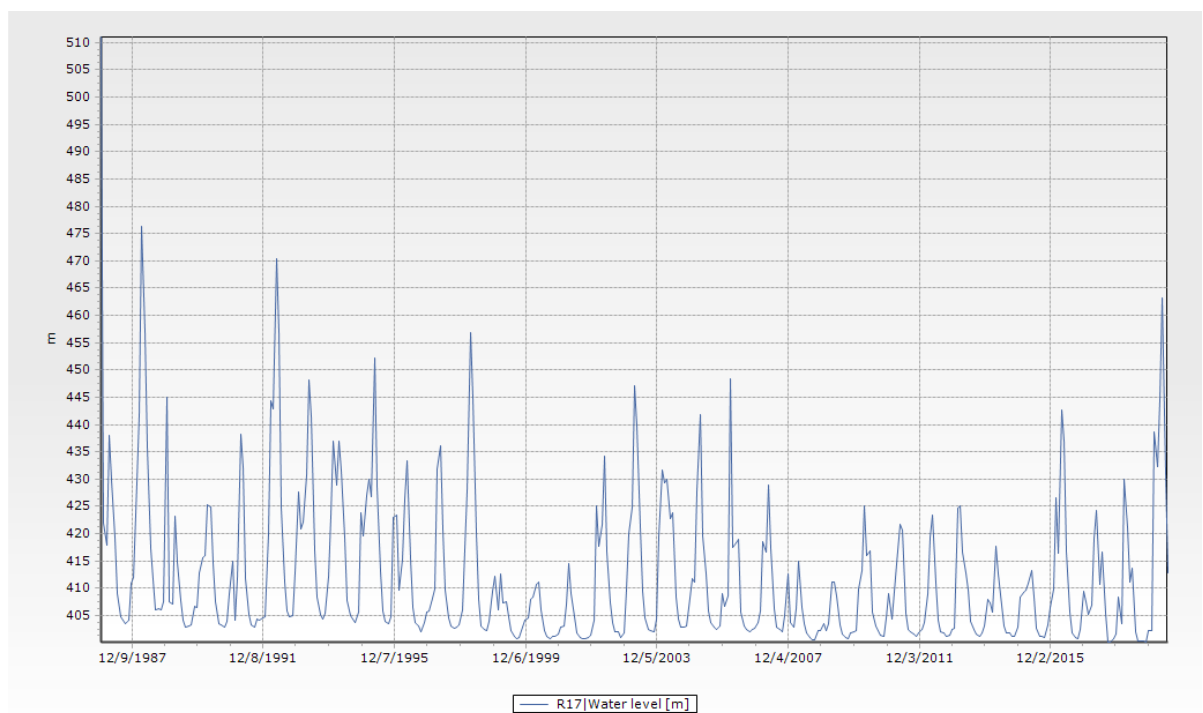


Chart 16 Water level in Dokan Dam versus Time

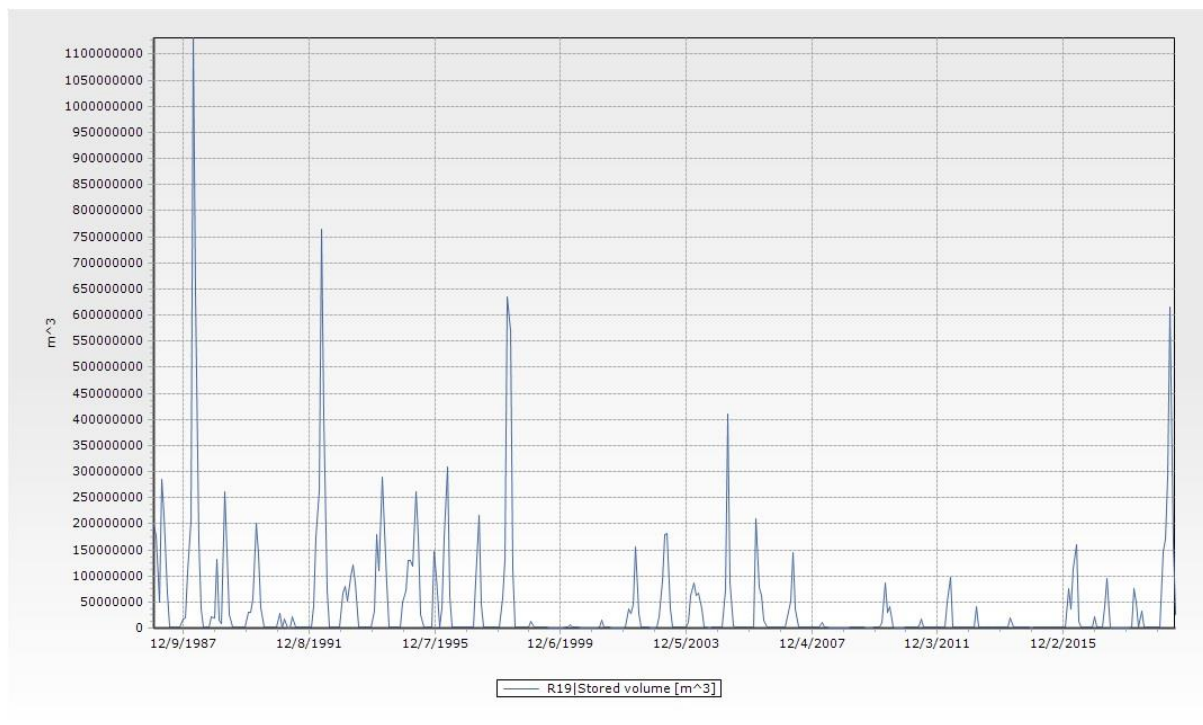


Chart 17 Stored Volume in Darbendikhan Dam versus Time

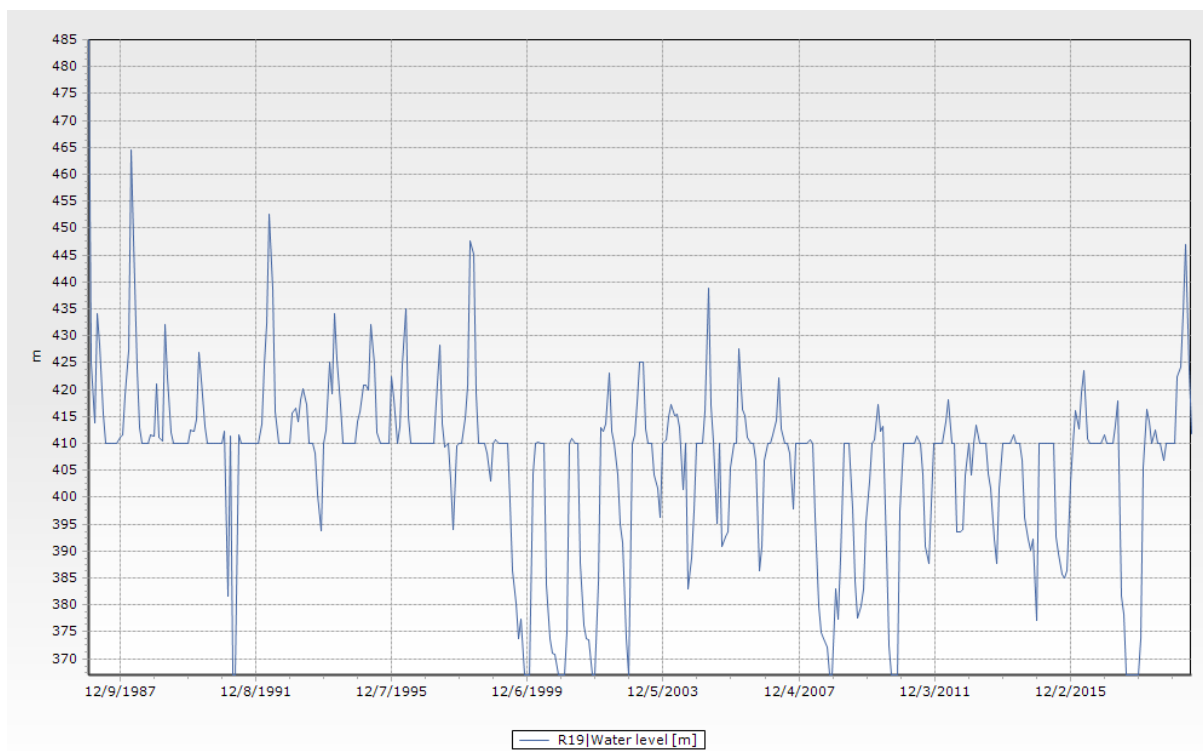


Chart 18 Water level in Darbendikhan Dam versus Time

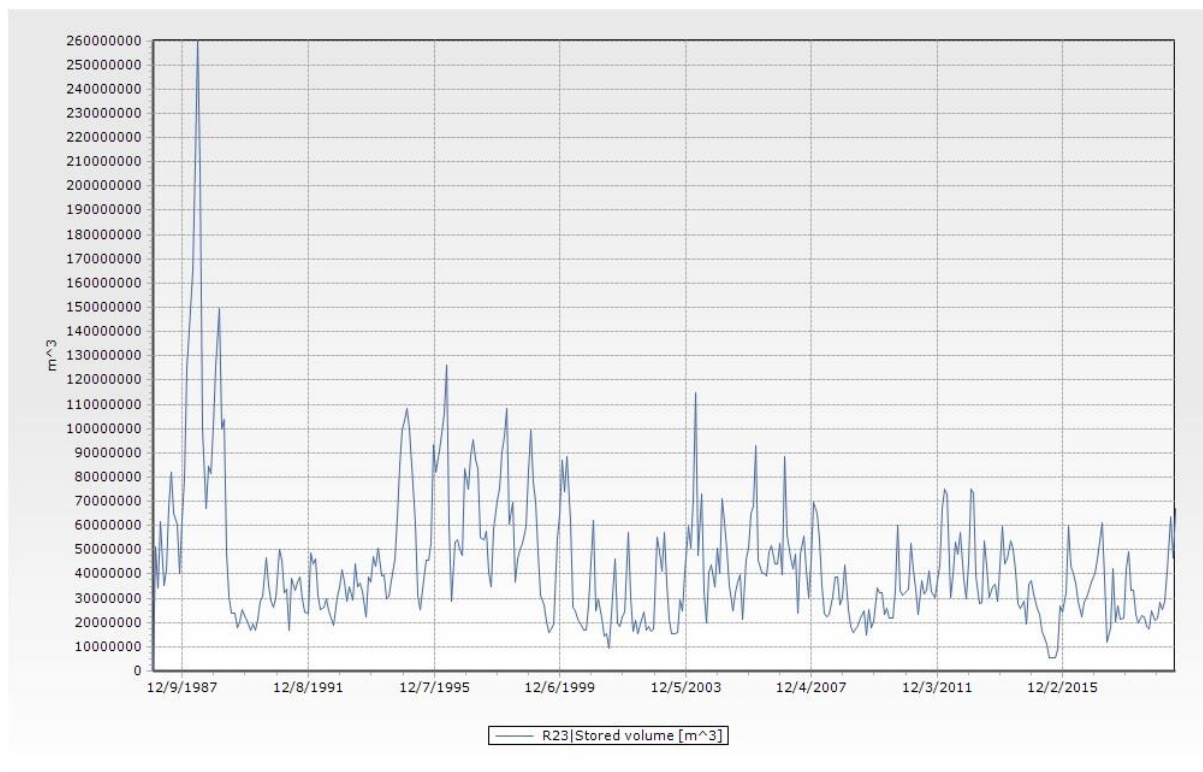


Chart 19 Stored Volume in Hadeetha Dam versus Time

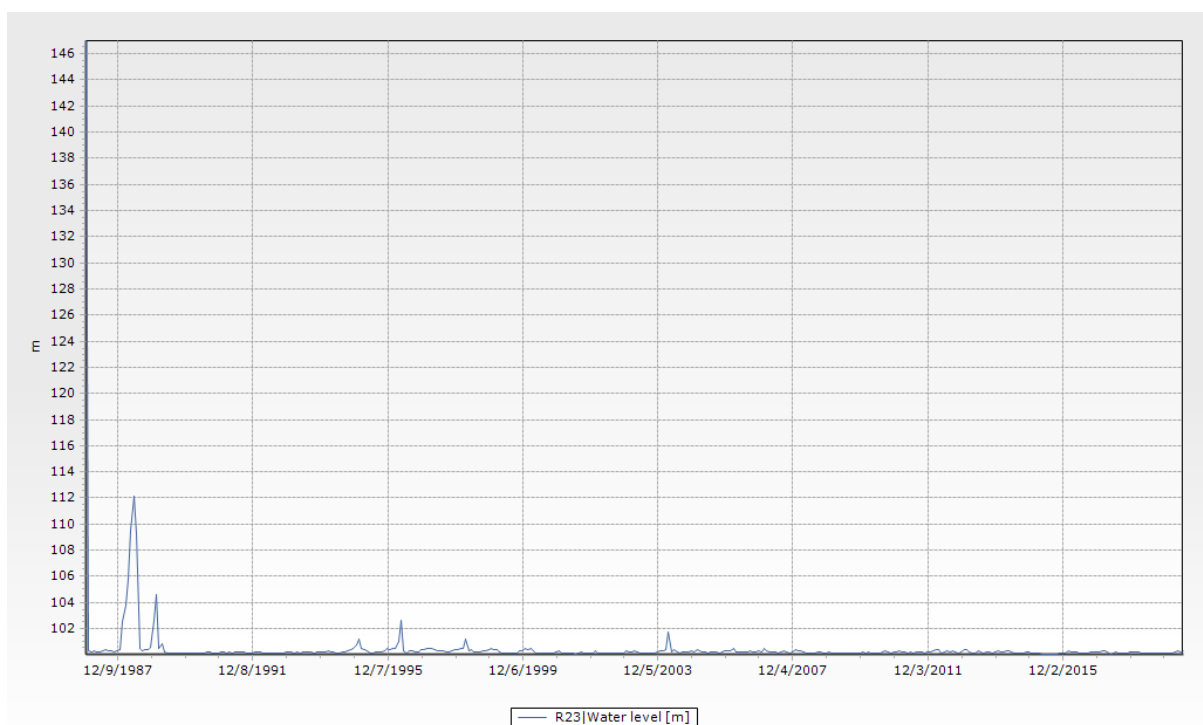


Chart 20 Water level in Hadeetha Dam versus Time

Degree of security of water supply:**1. Lesser Zab basin (covered totally from Dokan dam)**

Municipality Demand in M3/s												
year	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1987	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9
1988	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2
1989	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4
1990	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6
1991	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9
1992	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1
1993	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4
1994	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6
1995	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
1996	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.2
1997	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5
1998	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9
1999	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2
2000	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5
2001	10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8
2002	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.2
2003	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5
2004	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9
2005	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4
2006	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8
2007	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1
2008	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5
2009	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8
2010	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2
2011	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5
2012	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9
2013	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2
2014	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6
2015	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9
2016	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3
2017	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6
2018	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0
2019	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3

Municipality Used (delivered) in M3/s												
year	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1987	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9
1988	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2
1989	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4
1990	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6
1991	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9
1992	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1
1993	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4
1994	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6
1995	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
1996	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.2
1997	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5
1998	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9
1999	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2
2000	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5
2001	10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8
2002	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.2
2003	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5
2004	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9
2005	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4
2006	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8
2007	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1
2008	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5
2009	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8
2010	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2
2011	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5
2012	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9
2013	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2
2014	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6
2015	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9
2016	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3
2017	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6
2018	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0
2019	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3

Water demand deficit = 0

Degree of security of water supply for Municipality (P):

$$P = (m-0.3)/(n+0.4)$$

where: n - is the number of years for which the simulation was undertaken = 33 years

m - is the number of years for which the water users receive the amount of water they need, (For Municipality = 33 years)

So, $P_{\text{Municipality}} = (33-0.3)/(33+0.4) = 97.9 \%$

Industry Demands in M3/s												
year	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1987	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24
1988	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24
1989	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24
1990	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24
1991	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24
1992	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24
1993	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24
1994	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24
1995	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24
1996	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47
1997	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47
1998	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47
1999	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47
2000	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49
2001	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49
2002	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49
2003	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49
2004	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55
2005	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55
2006	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55
2007	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55
2008	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61
2009	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63
2010	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65
2011	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67
2012	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69
2013	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71
2014	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73
2015	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
2016	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77
2017	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79
2018	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
2019	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83

Industry Used (delivered) in M3/s												
year	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1987	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24
1988	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24
1989	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24
1990	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24
1991	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24
1992	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24
1993	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24
1994	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24
1995	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24
1996	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47
1997	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47
1998	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47
1999	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47
2000	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49
2001	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49
2002	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49
2003	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49
2004	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55
2005	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55
2006	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55
2007	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55
2008	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61
2009	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63
2010	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65
2011	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67
2012	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69
2013	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71
2014	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73
2015	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
2016	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77
2017	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79
2018	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
2019	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83

Water demand deficit = 0

Degree of security of water supply for Industry (P):

$P = (m - 0.3) / (n + 0.4)$, $n = 33$ years and $m = 33$ years

So, $P_{\text{industry}} = (33 - 0.3) / (33 + 0.4) = 97.9 \%$

Irrigation Demands in M3/s

year	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1987	23.99	49.14	70.30	23.99	49.14	70.30	64.34	51.28	29.88	64.34	51.28	29.88
1988	39.99	86.90	23.99	23.99	49.14	70.30	23.99	49.14	70.30	64.34	51.28	29.88
1989	64.34	51.28	29.88	39.99	86.90	23.99	23.99	49.14	70.30	23.99	49.14	70.30
1990	64.34	51.28	29.88	64.34	51.28	29.88	39.99	86.90	23.99	23.99	49.14	70.30
1991	23.99	49.14	70.30	64.34	51.28	29.88	64.34	51.28	29.88	39.99	86.90	23.99
1992	23.99	49.14	70.30	23.99	49.14	70.30	64.34	51.28	29.88	64.34	51.28	29.88
1993	39.99	86.90	23.99	23.99	49.14	70.30	23.99	49.14	70.30	64.34	51.28	29.88
1994	64.34	51.28	29.88	39.99	86.90	23.99	23.99	49.14	70.30	23.99	49.14	70.30
1995	64.34	51.28	29.88	64.34	51.28	29.88	39.99	86.90	23.99	23.99	49.14	70.30
1996	23.99	49.14	70.30	64.34	51.28	29.88	64.34	51.28	29.88	39.99	86.90	23.99
1997	23.99	49.14	70.30	23.99	49.14	70.30	64.34	51.28	29.88	64.34	51.28	29.88
1998	39.99	86.90	23.99	23.99	49.14	70.30	23.99	49.14	70.30	64.34	51.28	29.88
1999	64.34	51.28	29.88	39.99	86.90	23.99	23.99	49.14	70.30	23.99	49.14	70.30
2000	64.34	51.28	29.88	64.34	51.28	29.88	39.99	86.90	23.99	23.99	49.14	70.30
2001	23.99	49.14	70.30	64.34	51.28	29.88	64.34	51.28	29.88	39.99	86.90	23.99
2002	23.99	49.14	70.30	23.99	49.14	70.30	64.34	51.28	29.88	64.34	51.28	29.88
2003	39.99	86.90	23.99	23.99	49.14	70.30	23.99	49.14	70.30	64.34	51.28	29.88
2004	64.34	51.28	29.88	39.99	86.90	23.99	23.99	49.14	70.30	23.99	49.14	70.30
2005	64.34	51.28	29.88	64.34	51.28	29.88	39.99	86.90	23.99	23.99	49.14	70.30
2006	23.99	49.14	70.30	64.34	51.28	29.88	64.34	51.28	29.88	39.99	86.90	23.99
2007	23.99	49.14	70.30	23.99	49.14	70.30	64.34	51.28	29.88	64.34	51.28	29.88
2008	39.99	86.90	23.99	23.99	49.14	70.30	23.99	49.14	70.30	64.34	51.28	29.88
2009	64.34	51.28	29.88	39.99	86.90	23.99	23.99	49.14	70.30	23.99	49.14	70.30
2010	64.34	51.28	29.88	64.34	51.28	29.88	39.99	86.90	23.99	23.99	49.14	70.30
2011	23.99	49.14	70.30	64.34	51.28	29.88	64.34	51.28	29.88	39.99	86.90	23.99
2012	23.99	49.14	70.30	23.99	49.14	70.30	64.34	51.28	29.88	64.34	51.28	29.88
2013	39.99	86.90	23.99	23.99	49.14	70.30	23.99	49.14	70.30	64.34	51.28	29.88
2014	64.34	51.28	29.88	39.99	86.90	23.99	23.99	49.14	70.30	23.99	49.14	70.30
2015	64.34	51.28	29.88	64.34	51.28	29.88	39.99	86.90	23.99	23.99	49.14	70.30
2016	23.99	49.14	70.30	64.34	51.28	29.88	64.34	51.28	29.88	39.99	86.90	23.99
2017	23.99	49.14	70.30	23.99	49.14	70.30	64.34	51.28	29.88	64.34	51.28	29.88
2018	39.99	86.90	23.99	23.99	49.14	70.30	23.99	49.14	70.30	64.34	51.28	29.88
2019	39.99	86.90	23.99	23.99	49.14	70.30	23.99	49.14	70.30	64.34	51.28	29.88

Irrigation water Used (Delivered) in M3/s

year	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1987	23.99	49.14	70.30	23.99	49.14	70.30	64.34	51.28	29.88	64.34	51.28	29.88
1988	39.99	86.90	23.99	23.99	49.14	70.30	23.99	49.14	70.30	64.34	51.28	29.88
1989	64.34	51.28	29.88	39.99	86.90	23.99	23.99	49.14	70.30	23.99	49.14	70.30
1990	64.34	51.28	29.88	64.34	51.28	29.88	39.99	86.90	23.99	23.99	49.14	70.30

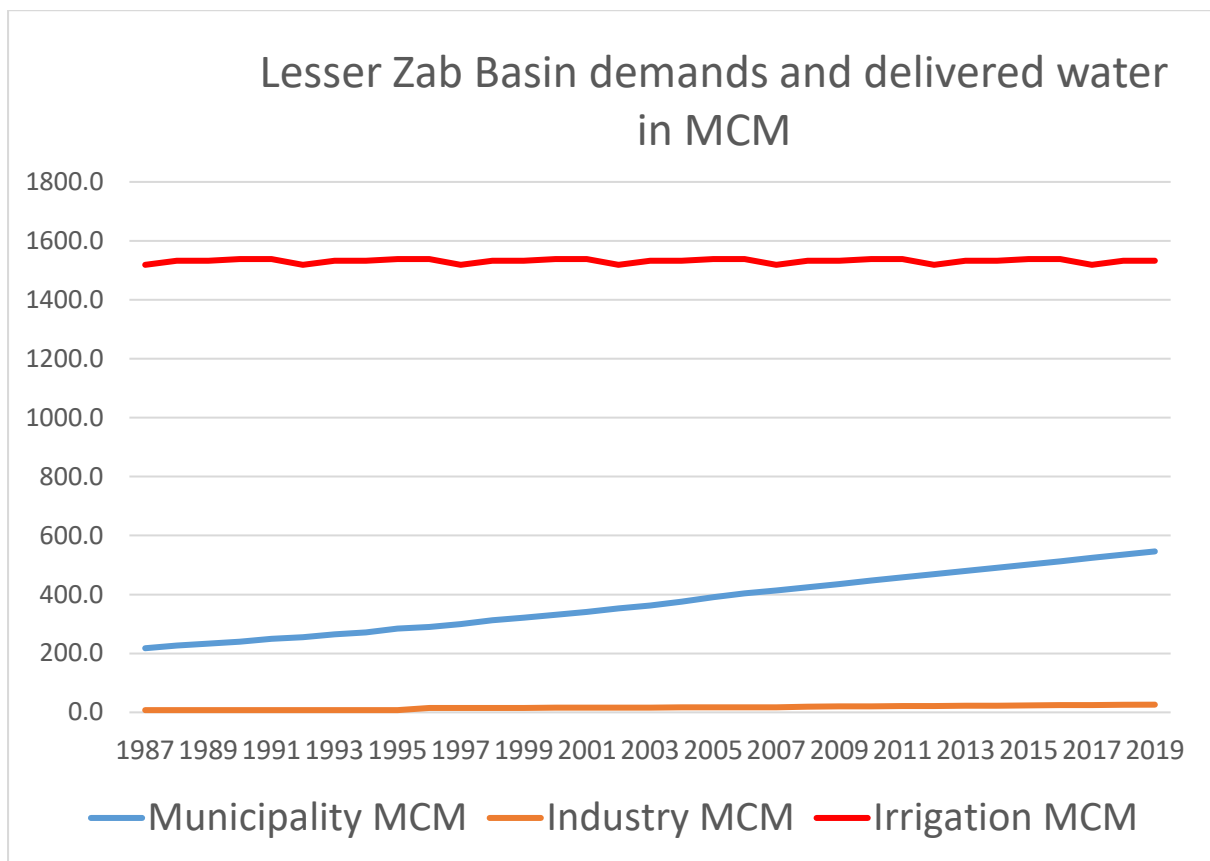
1991	23.99	49.14	70.30	64.34	51.28	29.88	64.34	51.28	29.88	39.99	86.90	23.99
1992	23.99	49.14	70.30	23.99	49.14	70.30	64.34	51.28	29.88	64.34	51.28	29.88
1993	39.99	86.90	23.99	23.99	49.14	70.30	23.99	49.14	70.30	64.34	51.28	29.88
1994	64.34	51.28	29.88	39.99	86.90	23.99	23.99	49.14	70.30	23.99	49.14	70.30
1995	64.34	51.28	29.88	64.34	51.28	29.88	39.99	86.90	23.99	23.99	49.14	70.30
1996	23.99	49.14	70.30	64.34	51.28	29.88	64.34	51.28	29.88	39.99	86.90	23.99
1997	23.99	49.14	70.30	23.99	49.14	70.30	64.34	51.28	29.88	64.34	51.28	29.88
1998	39.99	86.90	23.99	23.99	49.14	70.30	23.99	49.14	70.30	64.34	51.28	29.88
1999	64.34	51.28	29.88	39.99	86.90	23.99	23.99	49.14	70.30	23.99	49.14	70.30
2000	64.34	51.28	29.88	64.34	51.28	29.88	39.99	86.90	23.99	23.99	49.14	70.30
2001	23.99	49.14	70.30	64.34	51.28	29.88	64.34	51.28	29.88	39.99	86.90	23.99
2002	23.99	49.14	70.30	23.99	49.14	70.30	64.34	51.28	29.88	64.34	51.28	29.88
2003	39.99	86.90	23.99	23.99	49.14	70.30	23.99	49.14	70.30	64.34	51.28	29.88
2004	64.34	51.28	29.88	39.99	86.90	23.99	23.99	49.14	70.30	23.99	49.14	70.30
2005	64.34	51.28	29.88	64.34	51.28	29.88	39.99	86.90	23.99	23.99	49.14	70.30
2006	23.99	49.14	70.30	64.34	51.28	29.88	64.34	51.28	29.88	39.99	86.90	23.99
2007	23.99	49.14	70.30	23.99	49.14	70.30	64.34	51.28	29.88	64.34	51.28	29.88
2008	39.99	86.90	23.99	23.99	49.14	70.30	23.99	49.14	70.30	64.34	51.28	29.88
2009	64.34	51.28	29.88	39.99	86.90	23.99	23.99	49.14	70.30	23.99	49.14	70.30
2010	64.34	51.28	29.88	64.34	51.28	29.88	39.99	86.90	23.99	23.99	49.14	70.30
2011	23.99	49.14	70.30	64.34	51.28	29.88	64.34	51.28	29.88	39.99	86.90	23.99
2012	23.99	49.14	70.30	23.99	49.14	70.30	64.34	51.28	29.88	64.34	51.28	29.88
2013	39.99	86.90	23.99	23.99	49.14	70.30	23.99	49.14	70.30	64.34	51.28	29.88
2014	64.34	51.28	29.88	39.99	86.90	23.99	23.99	49.14	70.30	23.99	49.14	70.30
2015	64.34	51.28	29.88	64.34	51.28	29.88	39.99	86.90	23.99	23.99	49.14	70.30
2016	23.99	49.14	70.30	64.34	51.28	29.88	64.34	51.28	29.88	39.99	86.90	23.99
2017	23.99	49.14	70.30	23.99	49.14	70.30	64.34	51.28	29.88	64.34	51.28	29.88
2018	39.99	86.90	23.99	23.99	49.14	70.30	23.99	49.14	70.30	64.34	51.28	29.88
2019	39.99	86.90	23.99	23.99	49.14	70.30	23.99	49.14	70.30	64.34	51.28	29.88

Water demand deficit = 0

Degree of security of water supply for Industry (P):

$P = (m - 0.3) / (n + 0.4)$, n= 33 years and m= 33 years

So, $P_{\text{Irrigation}} = (33 - 0.3) / (33 + 0.4) = 97.9 \%$



2. *Diyala basin* (covered totally from Darbendikhan and Himreen dams)

- Municipality

Water demand deficit = 0

Degree of security of water supply for Industry (P):

$P = (m - 0.3) / (n + 0.4)$, n= 33 years and m= 33 years

So, $P_{\text{Municipality}} = (33 - 0.3) / (33 + 0.4) = 97.9 \%$

- Industry

Water demand deficit = 0

Degree of security of water supply for Industry (P):

$P = (m - 0.3) / (n + 0.4)$, n= 33 years and m= 33 years

So, $P_{\text{Industry}} = (33 - 0.3) / (33 + 0.4) = 97.9 \%$

- Irrigation

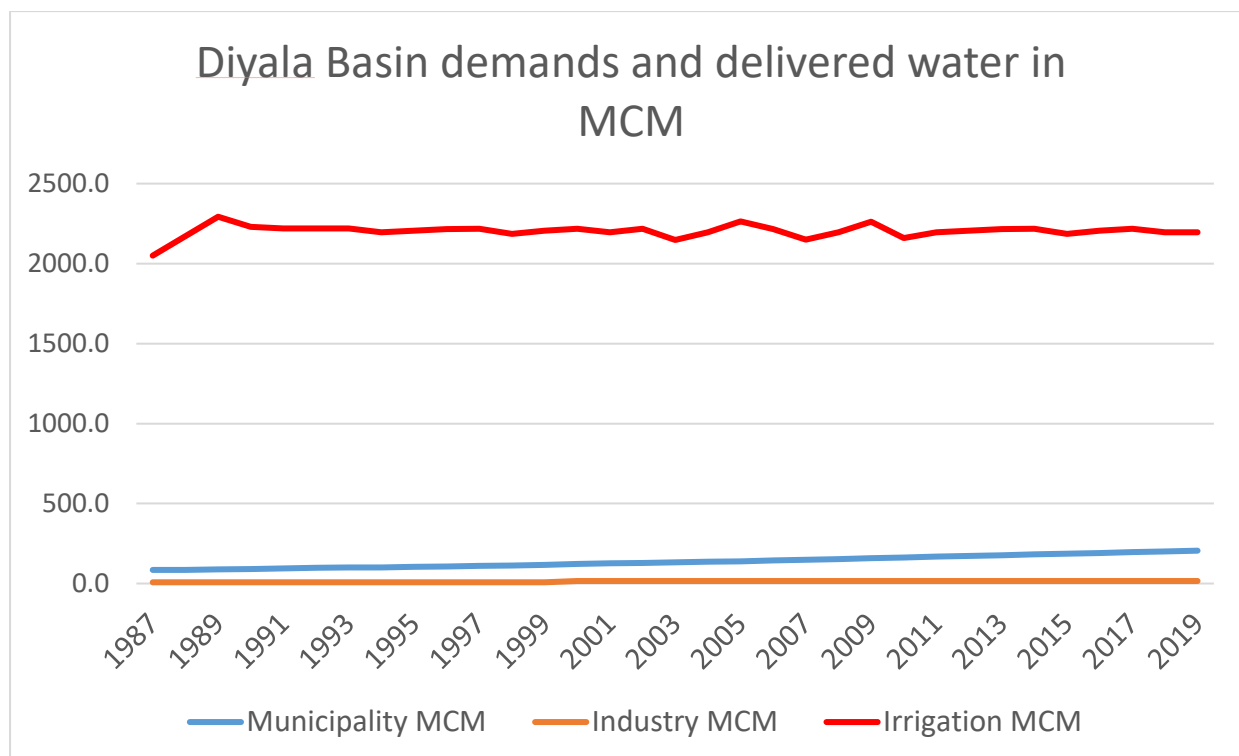
Water demand deficit = 0

Degree of security of water supply for Industry (P):

$P = (m - 0.3) / (n + 0.4)$, n= 33 years and m= 33 years

So, $P_{\text{Irrigation}} = (33 - 0.3) / (33 + 0.4) = 97.9 \%$

Note: All the tables in Annex



3. **Tigris column basin** covered (totally from Mosul dam, Udhaime dam and Greater zab inflow) (partially from Dokan dam, Darbendikhan dam and Himreen dam)

- Municipality

Water demand deficit = 0

Degree of security of water supply for Industry (P):

$P = (m - 0.3) / (n + 0.4)$, $n = 33$ years and $m = 33$ years

So, $P_{\text{Municipality}} = (33 - 0.3) / (33 + 0.4) = 97.9\%$

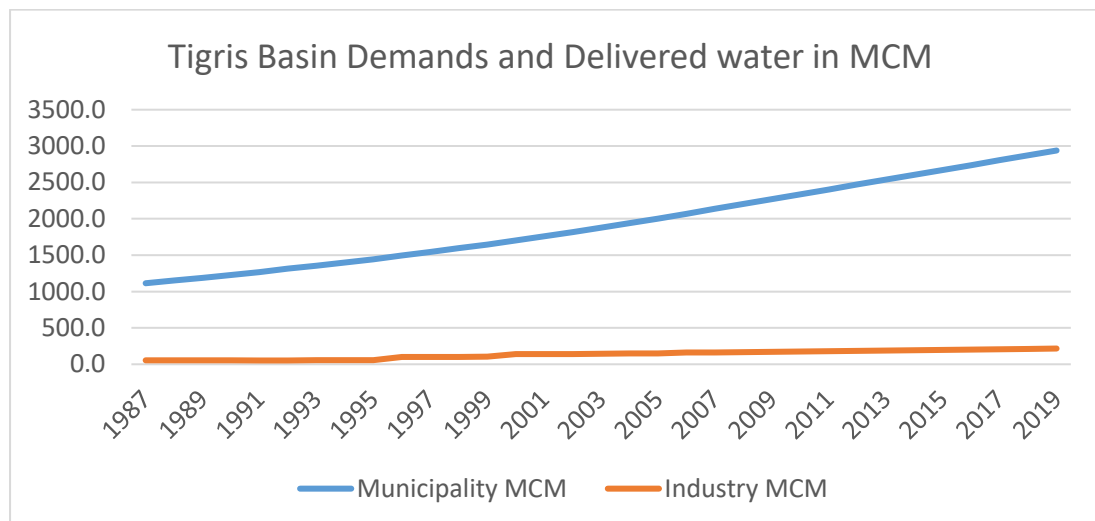
- Industry

Water demand deficit = 0

Degree of security of water supply for Industry (P):

$P = (m - 0.3) / (n + 0.4)$, $n = 33$ years and $m = 33$ years

So, $P_{\text{Industry}} = (33 - 0.3) / (33 + 0.4) = 97.9\%$



- Irrigation

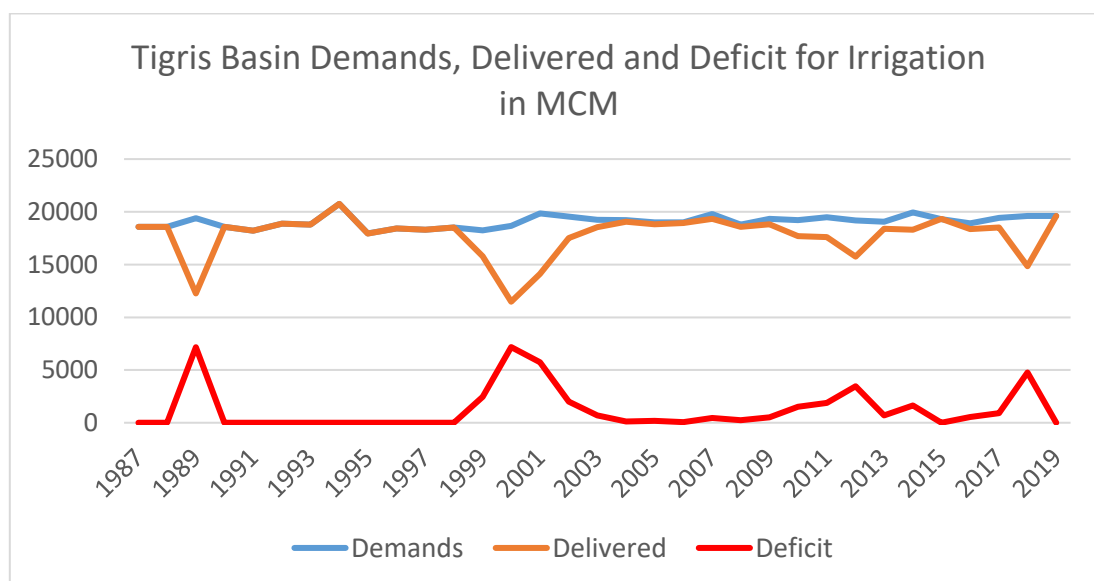
Irrigation water Deficit in M3/s												
year	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1989	0.0	0.0	0.0	0.0	313.7	641.5	726.1	590.1	449.2	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	47.2	241.3	0.0	131.7	195.8	162.8	125.1	29.3	0.0	0.0	0.0
2000	239.4	266.5	153.5	0.0	163.7	326.4	326.9	269.6	110.6	307.0	274.1	292.5
2001	115.7	243.4	180.9	0.0	119.7	201.7	222.0	96.0	0.0	411.7	406.1	189.4
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	341.7	302.0	121.4
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	192.6	71.6	0.0
2004	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	49.4	0.0	0.0
2005	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	64.2	0.0	0.0
2006	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	19.0	0.0	0.0
2007	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	172.9	0.0	0.0
2008	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	48.7	38.6
2009	0.0	0.0	0.0	153.5	0.0	0.0	0.0	0.0	0.0	8.6	35.0	0.0
2010	0.0	0.0	0.0	0.0	0.0	35.2	0.0	0.0	0.0	314.5	221.9	0.0
2011	118.4	156.2	117.9	0.0	0.0	0.0	0.0	0.0	0.0	23.6	74.6	228.3
2012	236.5	290.5	72.2	0.0	0.0	342.4	133.6	61.8	61.6	0.0	13.1	102.7
2013	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	187.8	72.3	0.0
2014	0.0	18.1	0.0	0.0	0.0	0.0	39.6	0.0	0.0	208.4	132.4	221.5
2015	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2016	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	187.5	11.5	9.7
2017	0.0	108.5	193.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	42.3
2018	99.4	0.0	0.0	0.0	0.0	444.8	396.3	256.1	125.7	220.2	229.1	37.0
2019	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Degree of security of water supply for Irrigation (P):

$P = (m - 0.3) / (n + 0.4)$, $m = 13$ years and $n = 33$ years

So, $P_{\text{Irrigation}} = (13 - 0.3) / (33 + 0.4) = 38 \%$



4. *Euphrates basin* (covered totally from Hadeetha dam and Tharthar lake)

- Municipality

Water demand deficit = 0

Degree of security of water supply for Industry (P):

$P = (m - 0.3) / (n + 0.4)$, $n = 33$ years and $m = 33$ years

So, $P_{\text{Municipality}} = (33 - 0.3) / (33 + 0.4) = 97.9\%$

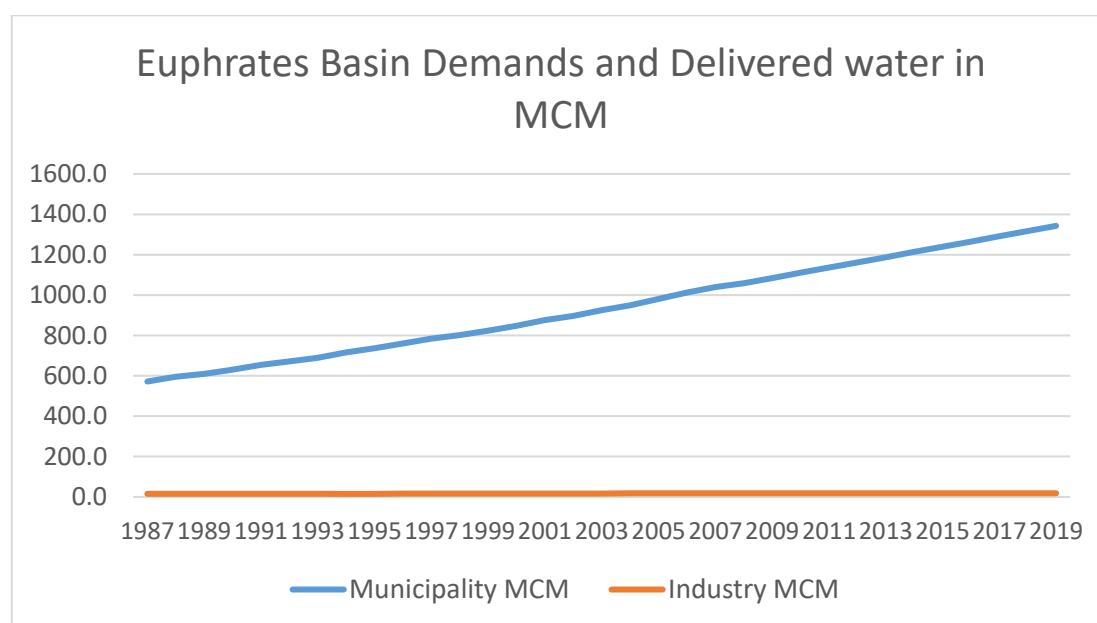
- Industry

Water demand deficit = 0

Degree of security of water supply for Industry (P):

$P = (m - 0.3) / (n + 0.4)$, $n = 33$ years and $m = 33$ years

So, $P_{\text{Industry}} = (33 - 0.3) / (33 + 0.4) = 97.9\%$



- Irrigation

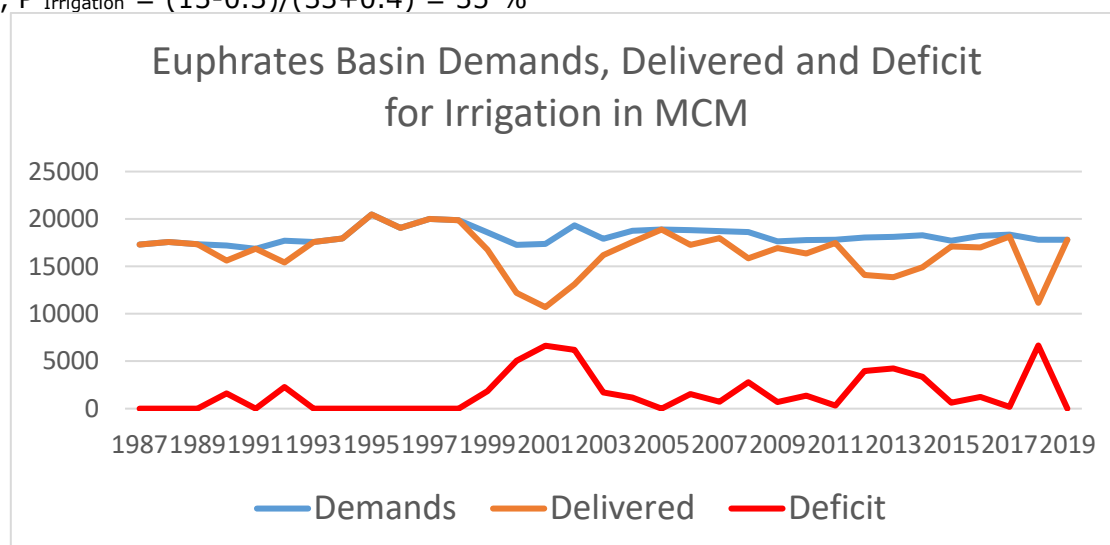
Irrigation water Deficit in M3/s												
year	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1990	55.1	124.2	98.7	0.0	83.9	0.0	0.0	0.0	0.0	35.2	102.5	107.8
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1992	156.6	229.8	96.8	37.6	219.8	0.0	0.0	0.0	0.0	0.0	0.0	128.1
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	47.4	242.1	187.7	221.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	273.5	224.7	217.9	140.0	291.6	202.6	128.3	0.0	95.7	100.1	86.9	164.7
2001	295.6	299.8	263.8	215.4	320.5	235.5	130.2	89.7	110.4	176.5	89.3	305.1
2002	270.5	304.2	320.7	197.3	301.5	130.6	0.0	0.0	77.8	215.9	194.0	351.3
2003	0.0	36.1	51.6	85.2	136.6	0.0	0.0	0.0	0.0	128.1	43.9	168.7
2004	236.7	192.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.8
2005	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2006	83.7	0.0	184.2	88.7	146.9	0.0	0.0	0.0	0.0	76.4	0.0	0.0
2007	0.0	0.0	91.8	15.4	53.3	0.0	0.0	0.0	0.0	0.0	0.0	115.6
2008	199.2	249.2	0.0	0.0	21.4	29.6	63.8	2.0	24.5	227.3	99.9	139.0
2009	0.0	0.0	0.0	0.0	144.2	62.1	0.0	0.0	0.0	128.2	67.5	11.5
2010	30.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	194.2	141.8	161.1
2011	0.0	0.0	117.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2012	168.7	283.9	227.7	216.2	340.4	230.8	0.0	0.0	43.7	0.0	0.0	0.0
2013	0.0	22.8	81.5	127.3	236.0	164.2	103.7	56.9	222.6	226.4	135.0	238.3
2014	235.1	229.6	0.0	0.0	0.0	18.2	18.0	0.0	0.0	370.0	208.3	196.1
2015	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	128.6	76.1	28.7
2016	176.0	0.0	77.4	43.0	134.4	0.0	0.0	0.0	0.0	0.0	0.0	35.5
2017	0.0	0.0	77.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2018	126.1	338.1	327.3	281.6	459.1	306.7	160.5	182.2	213.7	41.3	27.1	71.7
2019	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Degree of security of water supply for Irrigation (P):

$P = (m - 0.3) / (n + 0.4)$, $m = 12$ years and $n = 33$ years

So, $P_{\text{Irrigation}} = (13 - 0.3) / (33 + 0.4) = 35 \%$



CONCLUSION

The water flows in the Euphrates and Tigris basins are constantly decreasing as a result of the control of the upstream countries over the water by building dams and reservoirs, which causes a major imbalance in the control of water distribution in Iraq as a result of the increasing need and demand for water due to the population increase that requires securing their municipal needs. As well as the expansion of agricultural projects by increasing areas suitable for agriculture, where this sector represents food security for Iraq, as well as the expansion of the industrial sector, and this is due to the nature of growth in countries as a result of population increases, where Iraq has a high rate of growth (about 3 %). The irrigation systems in Iraq, diverting its water mainly from the Tigris and Euphrates rivers, is comprised of dams and pumping stations, with a total network of about 27,000 km, and irrigation efficiency is estimated at 30~40%, all of that make the demands are very high.

Recent development of large dams and irrigated farmlands in neighboring countries situated in the upstream of the Tigris and Euphrates rivers, is causing reduction in the flow into Iraq, and thus, is becoming a problem. In addition, occupation of the Mosul dam in the Tigris basins by ISIS, a destabilizing force in Syria and in central and western Iraq since 2014, had also contributed to water use instability.

Through my studies in this report, and given "the data I obtained from official institutions for water demand in the municipal, agricultural, industrial and environmental sectors and distributed them spatially for the period 1987-2019 according to the needs of each sector and across the network I found water resources in Iraq to notice a deficit in the demand of water to some sites where this deficit is concentrated in the down-stream of river basins and this deficit increases with the advancement of years for the reasons mentioned above.

The most important goals that were achieved as a result of operating the water resources system in the Tigris and Euphrates basins are:

1. Providing drinking water and municipal needs as a first priority for all cities.
2. Providing water for industrial plants and power stations.
3. Securing water to provide the most possible areas to secure a large part of food security for Iraq.

Iraq is need of local irrigation systems that lead to:

- A - Water saving.
- B - Reduce water use.
- C - Increase productivity.
- D - Reduce water demand.
- E - Increase irrigation efficiency.

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ANNEX

- Diyala basin (covered totally from Darbendikhan adn Himreen dams)

Municipality Demand in M3/s												
year	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1987	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
1988	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
1989	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8
1990	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9
1991	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
1992	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
1993	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2
1994	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2
1995	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
1996	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4
1997	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
1998	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
1999	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
2000	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9
2001	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
2002	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
2003	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2
2004	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
2005	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4
2006	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6
2007	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7
2008	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9
2009	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
2010	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2
2011	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3
2012	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
2013	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6
2014	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8
2015	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9
2016	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1
2017	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2
2018	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4
2019	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5

Municipality Used (delivered) in M3/s												
year	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1987	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
1988	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
1989	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8
1990	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9
1991	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
1992	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
1993	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2
1994	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2
1995	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
1996	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4
1997	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
1998	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
1999	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
2000	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9
2001	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
2002	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
2003	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2
2004	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
2005	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4
2006	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6
2007	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7
2008	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9
2009	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
2010	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2
2011	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3
2012	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
2013	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6
2014	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8
2015	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9
2016	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1
2017	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2
2018	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4
2019	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5

Industry Demands in M3/s												
year	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1987	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
1988	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
1989	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
1990	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
1991	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
1992	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
1993	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
1994	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
1995	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
1996	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
1997	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
1998	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
1999	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
2000	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
2001	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
2002	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
2003	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
2004	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
2005	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
2006	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
2007	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
2008	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
2009	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
2010	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
2011	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
2012	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
2013	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
2014	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
2015	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
2016	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
2017	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
2018	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
2019	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5

Industry Used (delivered) in M3/s												
year	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1987	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
1988	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
1989	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
1990	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
1991	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3

1992	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
1993	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
1994	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
1995	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
1996	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
1997	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
1998	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
1999	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
2000	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
2001	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
2002	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
2003	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
2004	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
2005	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
2006	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
2007	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
2008	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
2009	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
2010	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
2011	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
2012	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
2013	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
2014	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
2015	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
2016	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
2017	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
2018	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
2019	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5

Irrigation Demands in M3/s

year	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1987	36.28	67.77	89.90	36.28	67.77	89.90	86.87	67.78	41.40	86.87	67.78	41.40
1988	38.44	71.79	95.23	38.44	71.79	95.23	92.02	71.80	43.86	92.02	71.80	43.86
1989	40.59	75.81	100.56	40.59	75.81	100.56	97.18	75.82	46.31	97.18	75.82	46.31
1990	53.50	91.90	75.86	44.89	83.85	92.85	65.47	83.85	56.14	65.47	83.85	51.23
1991	49.14	91.90	75.86	44.89	83.85	92.85	65.47	83.85	56.14	65.47	83.85	51.23
1992	49.14	91.90	75.86	44.89	83.85	92.85	65.47	83.85	56.14	65.47	83.85	51.23
1993	49.14	91.90	75.86	44.89	83.85	92.85	65.47	83.85	56.14	65.47	83.85	51.23
1994	49.14	83.85	92.85	44.89	83.85	75.86	65.47	83.85	51.23	69.72	83.86	51.23
1995	49.20	91.89	66.70	71.04	61.95	70.95	91.62	83.85	46.97	91.62	66.87	46.97
1996	71.04	61.95	70.95	71.05	61.95	71.01	99.66	57.71	73.12	69.72	61.96	73.12
1997	71.04	57.70	92.85	54.06	57.70	92.85	69.72	61.96	73.13	69.72	62.01	81.16

1998	44.89	83.85	70.95	49.14	83.85	92.85	65.47	83.85	56.14	65.47	83.85	51.23
1999	49.14	83.86	70.95	49.20	91.89	66.70	91.62	61.96	51.23	91.62	83.85	46.97
2000	71.04	66.86	66.70	71.04	61.95	70.95	91.63	61.96	51.28	99.66	57.71	73.12
2001	49.14	61.95	92.85	71.04	57.70	92.85	74.63	57.71	73.12	69.72	61.96	73.13
2002	49.14	62.00	100.89	44.89	83.85	70.95	69.72	83.85	73.12	65.47	83.85	56.14
2003	44.89	83.85	70.95	49.14	83.86	70.95	69.78	91.89	46.97	91.62	61.96	51.23
2004	71.04	83.85	66.70	71.04	66.86	66.70	91.62	61.96	51.23	91.63	61.96	51.28
2005	79.08	57.70	92.85	49.14	61.95	92.85	91.62	57.71	73.12	74.63	57.71	73.12
2006	49.14	61.95	92.86	49.14	62.00	100.89	65.47	83.85	51.23	69.72	83.85	73.12
2007	44.89	83.85	75.86	44.89	83.85	70.95	69.72	83.86	51.23	69.78	91.89	46.97
2008	71.04	61.95	70.95	71.04	83.85	66.70	91.62	66.87	46.97	91.62	61.96	51.23
2009	71.05	61.95	71.01	79.08	57.70	92.85	69.72	61.96	73.12	91.62	57.71	73.12
2010	54.06	57.70	92.85	49.14	61.95	92.86	69.72	62.01	81.16	65.47	83.85	51.23
2011	49.14	83.85	92.85	44.89	83.85	75.86	65.47	83.85	51.23	69.72	83.86	51.23
2012	49.20	91.89	66.70	71.04	61.95	70.95	91.62	83.85	46.97	91.62	66.87	46.97
2013	71.04	61.95	70.95	71.05	61.95	71.01	99.66	57.71	73.12	69.72	61.96	73.12
2014	71.04	57.70	92.85	54.06	57.70	92.85	69.72	61.96	73.13	69.72	62.01	81.16
2015	44.89	83.85	70.95	49.14	83.85	92.85	65.47	83.85	56.14	65.47	83.85	51.23
2016	49.14	83.86	70.95	49.20	91.89	66.70	91.62	61.96	51.23	91.62	83.85	46.97
2017	71.04	66.86	66.70	71.04	61.95	70.95	91.63	61.96	51.28	99.66	57.71	73.12
2018	49.14	61.95	92.85	71.04	57.70	92.85	74.63	57.71	73.12	69.72	61.96	73.13
2019	49.14	61.95	92.85	71.04	57.70	92.85	74.63	57.71	73.12	69.72	61.96	73.13

Irrigation water Used (Delivered) in M3/s

year	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1987	36.28	67.77	89.90	36.28	67.77	89.90	86.87	67.78	41.40	86.87	67.78	41.40
1988	38.44	71.79	95.23	38.44	71.79	95.23	92.02	71.80	43.86	92.02	71.80	43.86
1989	40.59	75.81	100.56	40.59	75.81	100.56	97.18	75.82	46.31	97.18	75.82	46.31
1990	53.50	91.90	75.86	44.89	83.85	92.85	65.47	83.85	56.14	65.47	83.85	51.23
1991	49.14	91.90	75.86	44.89	83.85	92.85	65.47	83.85	56.14	65.47	83.85	51.23
1992	49.14	91.90	75.86	44.89	83.85	92.85	65.47	83.85	56.14	65.47	83.85	51.23
1993	49.14	91.90	75.86	44.89	83.85	92.85	65.47	83.85	56.14	65.47	83.85	51.23
1994	49.14	83.85	92.85	44.89	83.85	75.86	65.47	83.85	51.23	69.72	83.86	51.23
1995	49.20	91.89	66.70	71.04	61.95	70.95	91.62	83.85	46.97	91.62	66.87	46.97
1996	71.04	61.95	70.95	71.05	61.95	71.01	99.66	57.71	73.12	69.72	61.96	73.12
1997	71.04	57.70	92.85	54.06	57.70	92.85	69.72	61.96	73.13	69.72	62.01	81.16
1998	44.89	83.85	70.95	49.14	83.85	92.85	65.47	83.85	56.14	65.47	83.85	51.23
1999	49.14	83.86	70.95	49.20	91.89	66.70	91.62	61.96	51.23	91.62	83.85	46.97
2000	71.04	66.86	66.70	71.04	61.95	70.95	91.63	61.96	51.28	99.66	57.71	73.12
2001	49.14	61.95	92.85	71.04	57.70	92.85	74.63	57.71	73.12	69.72	61.96	73.13
2002	49.14	62.00	100.89	44.89	83.85	70.95	69.72	83.85	73.12	65.47	83.85	56.14
2003	44.89	83.85	70.95	49.14	83.86	70.95	69.78	91.89	46.97	91.62	61.96	51.23
2004	71.04	83.85	66.70	71.04	66.86	66.70	91.62	61.96	51.23	91.63	61.96	51.28

2005	79.08	57.70	92.85	49.14	61.95	92.85	91.62	57.71	73.12	74.63	57.71	73.12
2006	49.14	61.95	92.86	49.14	62.00	100.89	65.47	83.85	51.23	69.72	83.85	73.12
2007	44.89	83.85	75.86	44.89	83.85	70.95	69.72	83.86	51.23	69.78	91.89	46.97
2008	71.04	61.95	70.95	71.04	83.85	66.70	91.62	66.87	46.97	91.62	61.96	51.23
2009	71.05	61.95	71.01	79.08	57.70	92.85	69.72	61.96	73.12	91.62	57.71	73.12
2010	54.06	57.70	92.85	49.14	61.95	92.86	69.72	62.01	81.16	65.47	83.85	51.23
2011	49.14	83.85	92.85	44.89	83.85	75.86	65.47	83.85	51.23	69.72	83.86	51.23
2012	49.20	91.89	66.70	71.04	61.95	70.95	91.62	83.85	46.97	91.62	66.87	46.97
2013	71.04	61.95	70.95	71.05	61.95	71.01	99.66	57.71	73.12	69.72	61.96	73.12
2014	71.04	57.70	92.85	54.06	57.70	92.85	69.72	61.96	73.13	69.72	62.01	81.16
2015	44.89	83.85	70.95	49.14	83.85	92.85	65.47	83.85	56.14	65.47	83.85	51.23
2016	49.14	83.86	70.95	49.20	91.89	66.70	91.62	61.96	51.23	91.62	83.85	46.97
2017	71.04	66.86	66.70	71.04	61.95	70.95	91.63	61.96	51.28	99.66	57.71	73.12
2018	49.14	61.95	92.85	71.04	57.70	92.85	74.63	57.71	73.12	69.72	61.96	73.13
2019	49.14	61.95	92.85	71.04	57.70	92.85	74.63	57.71	73.12	69.72	61.96	73.13

- Tigris column basin (covered totally from Mosul and Udhaim dams, Greater Zab tributary and Partially from Darbendikhan adn Himreen dams)

Municipality Demand in M3/s												
year	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1987	35.0	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4
1988	36.2	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5
1989	37.4	37.7	37.7	37.7	37.7	37.7	37.7	37.7	37.7	37.7	37.7	37.7
1990	38.6	38.9	38.9	38.9	38.9	38.9	38.9	38.9	38.9	38.9	38.9	38.9
1991	39.9	40.2	40.2	40.2	40.2	40.2	40.2	40.2	40.2	40.2	40.2	40.2
1992	41.5	41.8	41.8	41.8	41.8	41.8	41.8	41.8	41.8	41.8	41.8	41.8
1993	42.9	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0
1994	44.3	44.4	44.4	44.4	44.4	44.4	44.4	44.4	44.4	44.4	44.4	44.4
1995	45.8	45.8	45.8	45.8	45.8	45.8	45.8	45.8	45.8	45.8	45.8	45.8
1996	47.4	47.4	47.4	47.4	47.4	47.4	47.4	47.4	47.4	47.4	47.4	47.4
1997	49.0	49.0	49.0	49.0	49.0	49.0	49.0	49.0	49.0	49.0	49.0	49.0
1998	50.6	50.6	50.6	50.6	50.6	50.6	50.6	50.6	50.6	50.6	50.6	50.6
1999	52.2	52.2	52.2	52.2	52.2	52.2	52.2	52.2	52.2	52.2	52.2	52.2
2000	54.0	54.0	54.0	54.0	54.0	54.0	54.0	54.0	54.0	54.0	54.0	54.0
2001	55.9	55.9	55.9	55.9	55.9	55.9	55.9	55.9	55.9	55.9	55.9	55.9
2002	57.6	57.6	57.6	57.6	57.6	57.6	57.6	57.6	57.6	57.6	57.6	57.6
2003	59.6	59.6	59.6	59.6	59.6	59.6	59.6	59.6	59.6	59.6	59.6	59.6
2004	61.6	61.6	61.6	61.6	61.6	61.6	61.6	61.6	61.6	61.6	61.6	61.6
2005	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5
2006	65.6	65.6	65.6	65.6	65.6	65.6	65.6	65.6	65.6	65.6	65.6	65.6
2007	67.8	67.8	67.8	67.8	67.8	67.8	67.8	67.8	67.8	67.8	67.8	67.8
2008	69.9	69.9	69.9	69.9	69.9	69.9	69.9	69.9	69.9	69.9	69.9	69.9

2009	72.0	72.0	72.0	72.0	72.0	72.0	72.0	72.0	72.0	72.0	72.0	72.0
2010	74.1	74.1	74.1	74.1	74.1	74.1	74.1	74.1	74.1	74.1	74.1	74.1
2011	76.2	76.2	76.2	76.2	76.2	76.2	76.2	76.2	76.2	76.2	76.2	76.2
2012	78.4	78.4	78.4	78.4	78.4	78.4	78.4	78.4	78.4	78.4	78.4	78.4
2013	80.5	80.5	80.5	80.5	80.5	80.5	80.5	80.5	80.5	80.5	80.5	80.5
2014	82.6	82.6	82.6	82.6	82.6	82.6	82.6	82.6	82.6	82.6	82.6	82.6
2015	84.7	84.7	84.7	84.7	84.7	84.7	84.7	84.7	84.7	84.7	84.7	84.7
2016	86.8	86.8	86.8	86.8	86.8	86.8	86.8	86.8	86.8	86.8	86.8	86.8
2017	89.0	89.0	89.0	89.0	89.0	89.0	89.0	89.0	89.0	89.0	89.0	89.0
2018	91.1	91.1	91.1	91.1	91.1	91.1	91.1	91.1	91.1	91.1	91.1	91.1
2019	93.2	93.2	93.2	93.2	93.2	93.2	93.2	93.2	93.2	93.2	93.2	93.2

Municipality Used (Delivered) in M3/s												
year	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1987	35.0	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4
1988	36.2	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5
1989	37.4	37.7	37.7	37.7	37.7	37.7	37.7	37.7	37.7	37.7	37.7	37.7
1990	38.6	38.9	38.9	38.9	38.9	38.9	38.9	38.9	38.9	38.9	38.9	38.9
1991	39.9	40.2	40.2	40.2	40.2	40.2	40.2	40.2	40.2	40.2	40.2	40.2
1992	41.5	41.8	41.8	41.8	41.8	41.8	41.8	41.8	41.8	41.8	41.8	41.8
1993	42.9	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0
1994	44.3	44.4	44.4	44.4	44.4	44.4	44.4	44.4	44.4	44.4	44.4	44.4
1995	45.8	45.8	45.8	45.8	45.8	45.8	45.8	45.8	45.8	45.8	45.8	45.8
1996	47.4	47.4	47.4	47.4	47.4	47.4	47.4	47.4	47.4	47.4	47.4	47.4
1997	49.0	49.0	49.0	49.0	49.0	49.0	49.0	49.0	49.0	49.0	49.0	49.0
1998	50.6	50.6	50.6	50.6	50.6	50.6	50.6	50.6	50.6	50.6	50.6	50.6
1999	52.2	52.2	52.2	52.2	52.2	52.2	52.2	52.2	52.2	52.2	52.2	52.2
2000	54.0	54.0	54.0	54.0	54.0	54.0	54.0	54.0	54.0	54.0	54.0	54.0
2001	55.9	55.9	55.9	55.9	55.9	55.9	55.9	55.9	55.9	55.9	55.9	55.9
2002	57.6	57.6	57.6	57.6	57.6	57.6	57.6	57.6	57.6	57.6	57.6	57.6
2003	59.6	59.6	59.6	59.6	59.6	59.6	59.6	59.6	59.6	59.6	59.6	59.6
2004	61.6	61.6	61.6	61.6	61.6	61.6	61.6	61.6	61.6	61.6	61.6	61.6
2005	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5
2006	65.6	65.6	65.6	65.6	65.6	65.6	65.6	65.6	65.6	65.6	65.6	65.6
2007	67.8	67.8	67.8	67.8	67.8	67.8	67.8	67.8	67.8	67.8	67.8	67.8
2008	69.9	69.9	69.9	69.9	69.9	69.9	69.9	69.9	69.9	69.9	69.9	69.9
2009	72.0	72.0	72.0	72.0	72.0	72.0	72.0	72.0	72.0	72.0	72.0	72.0
2010	74.1	74.1	74.1	74.1	74.1	74.1	74.1	74.1	74.1	74.1	74.1	74.1
2011	76.2	76.2	76.2	76.2	76.2	76.2	76.2	76.2	76.2	76.2	76.2	76.2
2012	78.4	78.4	78.4	78.4	78.4	78.4	78.4	78.4	78.4	78.4	78.4	78.4
2013	80.5	80.5	80.5	80.5	80.5	80.5	80.5	80.5	80.5	80.5	80.5	80.5
2014	82.6	82.6	82.6	82.6	82.6	82.6	82.6	82.6	82.6	82.6	82.6	82.6
2015	84.7	84.7	84.7	84.7	84.7	84.7	84.7	84.7	84.7	84.7	84.7	84.7

2016	86.8	86.8	86.8	86.8	86.8	86.8	86.8	86.8	86.8	86.8	86.8	86.8
2017	89.0	89.0	89.0	89.0	89.0	89.0	89.0	89.0	89.0	89.0	89.0	89.0
2018	91.1	91.1	91.1	91.1	91.1	91.1	91.1	91.1	91.1	91.1	91.1	91.1
2019	93.2	93.2	93.2	93.2	93.2	93.2	93.2	93.2	93.2	93.2	93.2	93.2

Industry Demands in M3/s												
year	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1987	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
1988	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
1989	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
1990	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
1991	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
1992	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
1993	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
1994	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
1995	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
1996	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2
1997	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2
1998	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2
1999	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
2000	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
2001	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
2002	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
2003	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
2004	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8
2005	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8
2006	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2
2007	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2
2008	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3
2009	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
2010	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6
2011	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
2012	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9
2013	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
2014	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2
2015	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3
2016	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4
2017	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6
2018	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7
2019	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9

Industry Used (Delivered) in M3/s												
year	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1987	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
1988	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
1989	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
1990	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
1991	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
1992	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
1993	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
1994	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
1995	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
1996	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2
1997	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2
1998	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2
1999	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
2000	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
2001	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
2002	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
2003	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
2004	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8
2005	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8
2006	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2
2007	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2
2008	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3
2009	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
2010	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6
2011	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
2012	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9
2013	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
2014	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2
2015	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3
2016	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4
2017	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6
2018	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7
2019	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9

Irrigation water Demand in M3/s												
year	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1987	391.95	561.39	727.59	402.39	532.30	716.26	771.87	659.65	470.15	647.26	674.89	515.21
1988	416.08	555.34	667.63	427.92	567.71	699.82	731.11	671.62	506.32	703.23	663.68	456.26
1989	448.11	604.84	710.28	400.42	564.13	764.40	791.80	679.57	527.36	701.45	683.69	508.72
1990	405.63	561.99	671.27	455.77	572.69	689.05	739.31	618.91	510.45	660.34	654.56	526.63
1991	407.81	558.65	678.98	436.50	551.56	637.94	706.66	664.68	514.48	655.74	613.98	497.68

1992	448.52	556.30	699.19	381.04	571.88	726.66	745.81	669.94	481.63	702.19	674.10	521.89
1993	386.01	538.62	755.88	437.19	554.59	677.07	742.29	688.17	505.70	663.96	672.13	527.27
1994	462.54	621.71	782.83	456.47	580.22	753.62	820.60	747.58	577.40	760.95	770.12	564.06
1995	459.74	580.10	672.33	437.60	558.22	716.02	698.12	562.60	439.58	663.29	625.69	417.91
1996	399.57	615.51	742.35	455.10	569.75	674.51	726.71	618.70	456.23	654.14	596.75	496.23
1997	473.27	593.45	692.41	412.29	608.80	696.71	672.69	607.52	450.61	684.42	621.77	453.29
1998	451.48	570.78	722.91	423.41	600.79	737.63	700.06	642.73	470.09	660.32	635.04	425.39
1999	427.37	581.20	707.59	434.51	545.02	689.17	710.76	621.91	459.44	608.94	646.74	508.13
2000	474.75	593.00	671.58	482.82	602.06	688.21	678.88	619.35	495.95	661.00	645.93	483.70
2001	485.90	614.71	770.12	465.67	605.09	745.37	778.35	685.42	475.92	711.33	713.57	505.62
2002	468.14	601.86	742.95	491.17	611.82	745.12	768.61	630.06	501.03	694.96	676.99	501.50
2003	439.32	635.61	740.03	472.82	589.68	698.92	744.04	645.82	508.39	709.34	643.07	498.81
2004	464.49	616.47	723.81	401.29	625.67	778.70	729.53	647.68	463.08	711.30	669.41	473.66
2005	456.90	572.43	742.90	463.43	600.90	729.37	695.92	661.99	496.21	674.52	653.96	477.96
2006	480.41	600.70	711.60	456.96	580.17	717.00	721.49	656.16	499.67	659.56	653.55	491.07
2007	491.07	611.87	715.73	463.84	647.80	779.34	765.61	659.94	512.01	731.95	667.49	488.42
2008	422.56	594.13	728.77	478.93	577.44	684.35	755.98	664.67	483.28	631.36	621.28	510.40
2009	469.61	595.88	732.90	465.52	601.95	742.20	746.58	667.18	477.38	702.06	681.22	469.22
2010	448.66	585.72	762.79	436.86	618.83	782.61	730.53	665.94	469.39	709.31	658.23	438.43
2011	446.67	622.91	774.23	462.71	598.63	772.78	783.80	656.95	463.52	657.58	670.25	502.65
2012	478.98	617.17	691.94	485.76	629.02	745.88	713.73	623.62	518.43	691.49	644.22	462.62
2013	444.15	636.88	722.94	446.73	616.82	732.99	752.81	651.35	480.51	670.63	616.07	485.18
2014	476.69	627.29	793.85	480.62	646.74	769.27	762.08	679.96	468.07	694.84	668.38	516.21
2015	479.07	613.59	746.15	490.85	630.94	703.40	710.79	669.58	505.31	665.05	627.69	499.25
2016	463.63	601.88	723.15	426.15	597.65	733.25	743.28	641.41	429.34	683.82	667.11	486.38
2017	428.36	587.60	798.58	492.76	616.01	723.57	737.48	667.82	481.36	687.74	683.10	484.81
2018	486.25	643.15	760.95	466.92	580.69	772.63	736.71	657.29	501.43	685.23	693.90	474.12
2019	486.25	643.15	760.95	466.92	580.69	772.63	736.71	657.29	501.43	685.23	693.90	474.12

Irrigation water Used (Delivered) in M3/s

year	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1987	391.95	561.39	727.59	402.39	532.30	716.26	771.87	659.65	470.15	647.26	674.89	515.21
1988	416.08	555.34	667.63	427.92	567.71	699.82	731.11	671.62	506.32	703.23	663.68	456.26
1989	448.11	604.84	710.28	400.42	564.13	764.40	791.80	679.57	527.36	701.45	683.69	508.72
1990	405.63	561.99	671.27	455.77	572.69	689.05	739.31	618.91	510.45	660.34	654.56	526.63
1991	407.81	558.65	678.98	436.50	551.56	637.94	706.66	664.68	514.48	655.74	613.98	497.68
1992	448.52	556.30	699.19	381.04	571.88	726.66	745.81	669.94	481.63	702.19	674.10	521.89
1993	386.01	538.62	755.88	437.19	554.59	677.07	742.29	688.17	505.70	663.96	672.13	527.27
1994	462.54	621.71	782.83	456.47	580.22	753.62	820.60	747.58	577.40	760.95	770.12	564.06
1995	459.74	580.10	672.33	437.60	558.22	716.02	698.12	562.60	439.58	663.29	625.69	417.91
1996	399.57	615.51	742.35	455.10	569.75	674.51	726.71	618.70	456.23	654.14	596.75	496.23
1997	473.27	593.45	692.41	412.29	608.80	696.71	672.69	607.52	450.61	684.42	621.77	453.29
1998	451.48	570.78	722.91	423.41	600.79	737.63	700.06	642.73	470.09	660.32	635.04	425.39

1999	427.37	581.20	707.59	434.51	545.02	689.17	710.76	621.91	459.44	608.94	646.74	508.13
2000	474.75	593.00	671.58	482.82	602.06	688.21	678.88	619.35	495.95	661.00	645.93	483.70
2001	485.90	614.71	770.12	465.67	605.09	745.37	778.35	685.42	475.92	711.33	713.57	505.62
2002	468.14	601.86	742.95	491.17	611.82	745.12	768.61	630.06	501.03	694.96	676.99	501.50
2003	439.32	635.61	740.03	472.82	589.68	698.92	744.04	645.82	508.39	709.34	643.07	498.81
2004	464.49	616.47	723.81	401.29	625.67	778.70	729.53	647.68	463.08	711.30	669.41	473.66
2005	456.90	572.43	742.90	463.43	600.90	729.37	695.92	661.99	496.21	674.52	653.96	477.96
2006	480.41	600.70	711.60	456.96	580.17	717.00	721.49	656.16	499.67	659.56	653.55	491.07
2007	491.07	611.87	715.73	463.84	647.80	779.34	765.61	659.94	512.01	731.95	667.49	488.42
2008	422.56	594.13	728.77	478.93	577.44	684.35	755.98	664.67	483.28	631.36	621.28	510.40
2009	469.61	595.88	732.90	465.52	601.95	742.20	746.58	667.18	477.38	702.06	681.22	469.22
2010	448.66	585.72	762.79	436.86	618.83	782.61	730.53	665.94	469.39	709.31	658.23	438.43
2011	446.67	622.91	774.23	462.71	598.63	772.78	783.80	656.95	463.52	657.58	670.25	502.65
2012	478.98	617.17	691.94	485.76	629.02	745.88	713.73	623.62	518.43	691.49	644.22	462.62
2013	444.15	636.88	722.94	446.73	616.82	732.99	752.81	651.35	480.51	670.63	616.07	485.18
2014	476.69	627.29	793.85	480.62	646.74	769.27	762.08	679.96	468.07	694.84	668.38	516.21
2015	479.07	613.59	746.15	490.85	630.94	703.40	710.79	669.58	505.31	665.05	627.69	499.25
2016	463.63	601.88	723.15	426.15	597.65	733.25	743.28	641.41	429.34	683.82	667.11	486.38
2017	428.36	587.60	798.58	492.76	616.01	723.57	737.48	667.82	481.36	687.74	683.10	484.81
2018	486.25	643.15	760.95	466.92	580.69	772.63	736.71	657.29	501.43	685.23	693.90	474.12
2019	486.25	643.15	760.95	466.92	580.69	772.63	736.71	657.29	501.43	685.23	693.90	474.12

Irrigation water Deficit in M3/s												
year	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1989	0.0	0.0	0.0	0.0	313.7	641.5	726.1	590.1	449.2	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	47.2	241.3	0.0	131.7	195.8	162.8	125.1	29.3	0.0	0.0	0.0
2000	239.4	266.5	153.5	0.0	163.7	326.4	326.9	269.6	110.6	307.0	274.1	292.5
2001	115.7	243.4	180.9	0.0	119.7	201.7	222.0	96.0	0.0	411.7	406.1	189.4
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	341.7	302.0	121.4
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	192.6	71.6	0.0
2004	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	49.4	0.0	0.0
2005	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	64.2	0.0	0.0
2006	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	19.0	0.0	0.0

2007	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	172.9	0.0	0.0
2008	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	48.7	38.6
2009	0.0	0.0	0.0	153.5	0.0	0.0	0.0	0.0	0.0	8.6	35.0	0.0
2010	0.0	0.0	0.0	0.0	0.0	35.2	0.0	0.0	0.0	314.5	221.9	0.0
2011	118.4	156.2	117.9	0.0	0.0	0.0	0.0	0.0	0.0	23.6	74.6	228.3
2012	236.5	290.5	72.2	0.0	0.0	342.4	133.6	61.8	61.6	0.0	13.1	102.7
2013	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	187.8	72.3	0.0
2014	0.0	18.1	0.0	0.0	0.0	0.0	39.6	0.0	0.0	208.4	132.4	221.5
2015	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-16.9	0.0	0.0
2016	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	187.5	11.5	9.7
2017	0.0	108.5	193.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	42.3
2018	99.4	0.0	0.0	0.0	0.0	444.8	396.3	256.1	125.7	220.2	229.1	37.0
2019	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

- Euphrates basin (covered totally from Hadeetha dam and Tharthar lake)

Municipality Demand in M3/s												
year	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1987	18.5	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1
1988	19.2	18.9	18.9	18.9	18.9	18.9	18.9	18.9	18.9	18.9	18.9	18.9
1989	19.6	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3
1990	20.3	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
1991	21.0	20.7	20.7	20.7	20.7	20.7	20.7	20.7	20.7	20.7	20.7	20.7
1992	21.5	21.3	21.3	21.3	21.3	21.3	21.3	21.3	21.3	21.3	21.3	21.3
1993	22.0	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8
1994	22.8	22.7	22.7	22.7	22.7	22.7	22.7	22.7	22.7	22.7	22.7	22.7
1995	23.4	23.4	23.4	23.4	23.4	23.4	23.4	23.4	23.4	23.4	23.4	23.4
1996	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1
1997	24.9	24.9	24.9	24.9	24.9	24.9	24.9	24.9	24.9	24.9	24.9	24.9
1998	25.4	25.4	25.4	25.4	25.4	25.4	25.4	25.4	25.4	25.4	25.4	25.4
1999	26.1	26.1	26.1	26.1	26.1	26.1	26.1	26.1	26.1	26.1	26.1	26.1
2000	26.9	26.9	26.9	26.9	26.9	26.9	26.9	26.9	26.9	26.9	26.9	26.9
2001	27.8	27.8	27.8	27.8	27.8	27.8	27.8	27.8	27.8	27.8	27.8	27.8
2002	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.4
2003	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3
2004	30.1	30.1	30.1	30.1	30.1	30.1	30.1	30.1	30.1	30.1	30.1	30.1
2005	31.1	31.1	31.1	31.1	31.1	31.1	31.1	31.1	31.1	31.1	31.1	31.1
2006	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1
2007	33.0	33.0	33.0	33.0	33.0	33.0	33.0	33.0	33.0	33.0	33.0	33.0
2008	33.6	33.6	33.6	33.6	33.6	33.6	33.6	33.6	33.6	33.6	33.6	33.6
2009	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4
2010	35.2	35.2	35.2	35.2	35.2	35.2	35.2	35.2	35.2	35.2	35.2	35.2
2011	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0

2012	36.8	36.8	36.8	36.8	36.8	36.8	36.8	36.8	36.8	36.8	36.8	36.8
2013	37.7	37.7	37.7	37.7	37.7	37.7	37.7	37.7	37.7	37.7	37.7	37.7
2014	38.5	38.5	38.5	38.5	38.5	38.5	38.5	38.5	38.5	38.5	38.5	38.5
2015	39.3	39.3	39.3	39.3	39.3	39.3	39.3	39.3	39.3	39.3	39.3	39.3
2016	40.1	40.1	40.1	40.1	40.1	40.1	40.1	40.1	40.1	40.1	40.1	40.1
2017	40.9	40.9	40.9	40.9	40.9	40.9	40.9	40.9	40.9	40.9	40.9	40.9
2018	41.8	41.8	41.8	41.8	41.8	41.8	41.8	41.8	41.8	41.8	41.8	41.8
2019	42.6	42.6	42.6	42.6	42.6	42.6	42.6	42.6	42.6	42.6	42.6	42.6

Municipality Used (Delivered) in M3/s												
year	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1987	18.5	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1
1988	19.2	18.9	18.9	18.9	18.9	18.9	18.9	18.9	18.9	18.9	18.9	18.9
1989	19.6	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3
1990	20.3	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
1991	21.0	20.7	20.7	20.7	20.7	20.7	20.7	20.7	20.7	20.7	20.7	20.7
1992	21.5	21.3	21.3	21.3	21.3	21.3	21.3	21.3	21.3	21.3	21.3	21.3
1993	22.0	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8
1994	22.8	22.7	22.7	22.7	22.7	22.7	22.7	22.7	22.7	22.7	22.7	22.7
1995	23.4	23.4	23.4	23.4	23.4	23.4	23.4	23.4	23.4	23.4	23.4	23.4
1996	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1
1997	24.9	24.9	24.9	24.9	24.9	24.9	24.9	24.9	24.9	24.9	24.9	24.9
1998	25.4	25.4	25.4	25.4	25.4	25.4	25.4	25.4	25.4	25.4	25.4	25.4
1999	26.1	26.1	26.1	26.1	26.1	26.1	26.1	26.1	26.1	26.1	26.1	26.1
2000	26.9	26.9	26.9	26.9	26.9	26.9	26.9	26.9	26.9	26.9	26.9	26.9
2001	27.8	27.8	27.8	27.8	27.8	27.8	27.8	27.8	27.8	27.8	27.8	27.8
2002	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.4
2003	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3
2004	30.1	30.1	30.1	30.1	30.1	30.1	30.1	30.1	30.1	30.1	30.1	30.1
2005	31.1	31.1	31.1	31.1	31.1	31.1	31.1	31.1	31.1	31.1	31.1	31.1
2006	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1
2007	33.0	33.0	33.0	33.0	33.0	33.0	33.0	33.0	33.0	33.0	33.0	33.0
2008	33.6	33.6	33.6	33.6	33.6	33.6	33.6	33.6	33.6	33.6	33.6	33.6
2009	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4
2010	35.2	35.2	35.2	35.2	35.2	35.2	35.2	35.2	35.2	35.2	35.2	35.2
2011	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0
2012	36.8	36.8	36.8	36.8	36.8	36.8	36.8	36.8	36.8	36.8	36.8	36.8
2013	37.7	37.7	37.7	37.7	37.7	37.7	37.7	37.7	37.7	37.7	37.7	37.7
2014	38.5	38.5	38.5	38.5	38.5	38.5	38.5	38.5	38.5	38.5	38.5	38.5
2015	39.3	39.3	39.3	39.3	39.3	39.3	39.3	39.3	39.3	39.3	39.3	39.3
2016	40.1	40.1	40.1	40.1	40.1	40.1	40.1	40.1	40.1	40.1	40.1	40.1
2017	40.9	40.9	40.9	40.9	40.9	40.9	40.9	40.9	40.9	40.9	40.9	40.9
2018	41.8	41.8	41.8	41.8	41.8	41.8	41.8	41.8	41.8	41.8	41.8	41.8

2019	42.6	42.6	42.6	42.6	42.6	42.6	42.6	42.6	42.6	42.6	42.6	42.6
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Industry Water demand in M3/s												
year	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1987	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
1988	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
1989	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
1990	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
1991	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
1992	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
1993	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
1994	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
1995	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
1996	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
1997	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
1998	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
1999	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
2000	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
2001	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
2002	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
2003	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
2004	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
2005	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
2006	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
2007	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
2008	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
2009	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
2010	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
2011	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
2012	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
2013	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
2014	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
2015	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
2016	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
2017	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
2018	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
2019	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6

Industry Used (Delivered) in M3/s												
year	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1987	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
1988	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
1989	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5

1990	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
1991	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
1992	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
1993	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
1994	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
1995	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
1996	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
1997	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
1998	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
1999	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
2000	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
2001	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
2002	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
2003	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
2004	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
2005	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
2006	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
2007	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
2008	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
2009	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
2010	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
2011	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
2012	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
2013	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
2014	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
2015	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
2016	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
2017	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
2018	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
2019	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6

Irrigation water Demand in M3/s												
year	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1987	482.56	559.51	507.74	414.56	555.24	619.91	635.19	576.87	561.32	576.71	563.76	534.32
1988	375.56	517.01	539.99	448.81	586.99	654.66	652.44	602.87	611.07	580.96	564.01	552.32
1989	411.56	523.76	604.74	443.06	562.24	567.91	585.44	592.87	583.57	594.96	566.76	560.07
1990	428.31	464.76	559.24	430.31	531.49	578.66	602.19	636.12	588.57	593.71	587.01	543.32
1991	431.31	464.76	538.74	407.56	577.24	656.91	617.19	548.87	562.32	621.71	515.76	471.32
1992	442.56	512.01	563.99	442.81	596.99	654.66	652.44	602.87	575.07	633.96	537.01	518.32
1993	400.56	503.76	569.24	417.31	582.74	671.41	650.44	607.12	613.32	622.21	523.01	530.82
1994	428.06	536.51	567.74	387.31	574.49	651.41	655.44	547.12	594.32	636.21	626.51	621.82
1995	504.06	619.26	663.74	525.81	701.74	778.41	729.44	689.12	673.82	675.96	614.51	616.07
1996	436.81	565.26	583.74	432.06	590.99	661.16	696.94	694.12	642.82	687.96	628.26	631.82

1997	484.81	637.26	667.49	496.06	613.99	711.16	712.94	673.87	665.82	674.71	633.01	637.07
1998	435.56	616.76	704.24	542.31	670.74	623.66	729.94	700.62	703.32	672.71	592.26	569.57
1999	497.06	592.76	645.49	514.06	622.99	693.41	626.94	557.62	558.82	644.46	565.76	553.32
2000	468.06	567.26	616.49	498.56	612.24	621.16	555.94	512.62	515.32	585.71	512.51	510.32
2001	467.31	580.51	625.49	492.06	609.24	617.16	566.94	516.37	524.07	565.21	532.01	508.82
2002	501.56	620.26	681.74	543.31	672.49	716.66	676.44	628.87	615.82	601.96	567.01	533.32
2003	498.81	573.26	633.74	513.31	628.74	668.41	597.94	543.87	547.82	573.21	519.01	517.82
2004	491.06	596.51	692.99	544.06	657.99	684.66	634.44	577.62	576.32	588.71	555.51	540.07
2005	507.31	604.01	656.74	539.06	649.24	696.16	658.19	586.37	582.07	605.71	548.01	551.07
2006	506.06	604.01	657.49	531.06	644.24	700.91	648.19	584.37	567.82	615.71	553.26	543.32
2007	505.56	606.51	643.24	526.81	649.74	691.16	640.44	580.12	572.07	607.96	552.01	547.07
2008	505.06	609.01	628.99	522.56	655.24	681.41	632.69	575.87	576.32	600.21	550.76	550.82
2009	486.31	577.76	625.49	501.56	619.24	637.16	572.69	521.87	525.82	593.21	523.51	524.57
2010	484.56	598.26	629.24	509.56	618.49	651.41	572.69	540.12	546.07	565.46	521.01	521.32
2011	478.56	579.26	630.24	499.81	619.74	649.66	598.44	539.62	546.32	582.21	529.51	519.32
2012	492.31	591.51	633.24	507.81	625.99	665.41	609.19	551.37	556.32	584.46	526.01	528.57
2013	489.06	585.51	639.24	511.06	604.74	673.91	619.44	556.62	560.32	589.21	531.76	527.07
2014	496.06	587.51	643.74	504.56	656.74	684.16	621.94	558.62	553.57	596.96	525.26	522.07
2015	491.06	586.76	630.74	501.31	619.24	635.41	572.19	524.62	525.57	593.71	531.26	526.82
2016	500.31	602.51	646.74	522.31	641.74	670.16	606.19	552.62	558.07	567.96	531.51	533.82
2017	493.56	601.26	650.49	520.31	639.49	673.41	605.94	551.62	553.57	598.71	550.26	540.82
2018	499.81	599.76	645.99	517.31	622.74	632.41	566.19	518.87	522.32	584.96	531.76	538.32
2019	499.81	599.76	645.99	517.31	622.74	632.41	566.19	518.87	522.32	584.96	531.76	538.32

Irrigation water Used (Delivered) in M3/s												
year	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1987	482.6	559.5	507.7	414.6	555.2	619.9	635.2	576.9	561.3	576.7	563.8	534.3
1988	375.6	517.0	540.0	448.8	587.0	654.7	652.4	602.9	611.1	581.0	564.0	552.3
1989	411.6	523.8	604.7	443.1	562.2	567.9	585.4	592.9	583.6	595.0	566.8	560.1
1990	373.2	340.6	460.6	430.3	447.6	578.7	602.2	636.1	588.6	558.6	484.6	435.6
1991	431.3	464.8	538.7	407.6	577.2	656.9	617.2	548.9	562.3	621.7	515.8	471.3
1992	286.0	282.2	467.2	405.2	377.2	654.7	652.4	602.9	575.1	634.0	537.0	390.2
1993	400.6	503.8	569.2	417.3	582.7	671.4	650.4	607.1	613.3	622.2	523.0	530.8
1994	428.1	536.5	567.7	387.3	574.5	651.4	655.4	547.1	594.3	636.2	626.5	621.8
1995	504.1	619.3	663.7	525.8	701.7	778.4	729.4	689.1	673.8	676.0	614.5	616.1
1996	436.8	565.3	583.7	432.1	591.0	661.2	696.9	694.1	642.8	688.0	628.3	631.8
1997	484.8	637.3	667.5	496.1	614.0	711.2	712.9	673.9	665.8	674.7	633.0	637.1
1998	435.6	616.8	704.2	542.3	670.7	623.7	729.9	700.6	703.3	672.7	592.3	569.6
1999	497.1	545.4	403.4	326.4	401.4	693.4	626.9	557.6	558.8	644.5	565.8	553.3
2000	194.6	342.6	398.6	358.6	320.6	418.6	427.6	512.6	419.6	485.6	425.6	345.6
2001	171.7	280.7	361.7	276.7	288.7	381.7	436.7	426.7	413.7	388.7	442.7	203.7
2002	231.0	316.0	361.0	346.0	371.0	586.0	676.4	628.9	538.0	386.0	373.0	182.0
2003	498.8	537.1	582.1	428.1	492.1	668.4	597.9	543.9	547.8	445.1	475.1	349.1

2004	254.3	404.3	693.0	544.1	658.0	684.7	634.4	577.6	576.3	588.7	555.5	519.3
2005	507.3	604.0	656.7	539.1	649.2	696.2	658.2	586.4	582.1	605.7	548.0	551.1
2006	422.3	604.0	473.3	442.3	497.3	700.9	648.2	584.4	567.8	539.3	553.3	543.3
2007	505.6	606.5	551.4	511.4	596.4	691.2	640.4	580.1	572.1	608.0	552.0	431.4
2008	305.9	359.9	629.0	522.6	633.9	651.9	568.9	573.9	551.9	372.9	450.9	411.9
2009	486.3	577.8	625.0	655.0	475.0	575.0	572.7	521.9	525.8	465.0	456.0	513.0
2010	454.2	598.3	629.2	509.6	618.5	651.4	572.7	540.1	546.1	371.2	379.2	360.2
2011	478.6	579.3	512.4	499.8	619.7	649.7	598.4	539.6	546.3	582.2	529.5	519.3
2012	323.6	307.6	405.6	291.6	285.6	434.6	609.2	551.4	512.6	584.5	526.0	528.6
2013	489.1	562.8	557.8	383.8	368.8	509.8	515.8	499.8	337.8	362.8	396.8	288.8
2014	260.9	357.9	643.7	504.6	656.7	665.9	603.9	558.6	553.6	226.9	316.9	325.9
2015	491.1	586.8	630.7	501.3	619.2	635.4	572.2	524.6	525.6	465.1	455.1	498.1
2016	324.3	602.5	569.3	479.3	507.3	670.2	606.2	552.6	558.1	568.0	531.5	498.3
2017	493.6	601.3	573.5	520.3	639.5	673.4	605.9	551.6	553.6	598.7	550.3	540.8
2018	373.7	261.7	318.7	235.7	163.7	325.7	405.7	336.7	308.7	543.7	504.7	466.7
2019	499.8	599.8	646.0	517.3	622.7	632.4	566.2	518.9	522.3	585.0	531.8	538.3

Irrigation water Deficit in M3/s												
year	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1990	55.1	124.2	98.7	0.0	83.9	0.0	0.0	0.0	0.0	35.2	102.5	107.8
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1992	156.6	229.8	96.8	37.6	219.8	0.0	0.0	0.0	0.0	0.0	0.0	128.1
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	47.4	242.1	187.7	221.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	273.5	224.7	217.9	140.0	291.6	202.6	128.3	0.0	95.7	100.1	86.9	164.7
2001	295.6	299.8	263.8	215.4	320.5	235.5	130.2	89.7	110.4	176.5	89.3	305.1
2002	270.5	304.2	320.7	197.3	301.5	130.6	0.0	0.0	77.8	215.9	194.0	351.3
2003	0.0	36.1	51.6	85.2	136.6	0.0	0.0	0.0	0.0	128.1	43.9	168.7
2004	236.7	192.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.8
2005	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2006	83.7	0.0	184.2	88.7	146.9	0.0	0.0	0.0	0.0	76.4	0.0	0.0
2007	0.0	0.0	91.8	15.4	53.3	0.0	0.0	0.0	0.0	0.0	0.0	115.6
2008	199.2	249.2	0.0	0.0	21.4	29.6	63.8	2.0	24.5	227.3	99.9	139.0
2009	0.0	0.0	0.0	0.0	144.2	62.1	0.0	0.0	0.0	128.2	67.5	11.5
2010	30.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	194.2	141.8	161.1

2011	0.0	0.0	117.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2012	168.7	283.9	227.7	216.2	340.4	230.8	0.0	0.0	43.7	0.0	0.0	0.0
2013	0.0	22.8	81.5	127.3	236.0	164.2	103.7	56.9	222.6	226.4	135.0	238.3
2014	235.1	229.6	0.0	0.0	0.0	18.2	18.0	0.0	0.0	370.0	208.3	196.1
2015	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	128.6	76.1	28.7
2016	176.0	0.0	77.4	43.0	134.4	0.0	0.0	0.0	0.0	0.0	0.0	35.5
2017	0.0	0.0	77.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2018	126.1	338.1	327.3	281.6	459.1	306.7	160.5	182.2	213.7	41.3	27.1	71.7
2019	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0