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THE POSSIBLE IMPACT OF ERMENEK DAM ON REGIONAL CLIMATE AND SOCIO-ECONOMİC STRUCTURE

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ABSTRACT

Ecological impacts of reservoir have been reported from various aspects such as barrier for migratory animals, eutrophication of reservoirs by plankton blooming, decreasing flow volumes in tail waters, stabilization of flow regimes by flood peak cut, changes in thermal regimes of river water. Dam lakes also effects climatic specifications as temperature and humidity on region. Altough unfavorable effects, dams have a potential as recreation fields, energy, turistic activities etc. It is possible to happen changes in Ermenek region as what kind of effects has seen in area of huge dam lakes. The study tries to determine the climatic effects of Keban Dam, Atatürk Dams and Ermenek Dam by using the data extracted from near meteorology stations.

Although there was no statistically significant change on climatic characteristics, the dams caused a partial alteration in humidity and temperature values. Relative humidity has increased in all months and years afther the dam in Ermenek. While the yearly average relative humidity was 47,5% before the dam (average min. %33,4 in July, max. %60,3 December), it has reached to 62,9% by rising each month and year after the impoundment. The increase in humidity will likely reduce the frost damage in terms of frost frequency, intensity and time.

30 hectares of 34.5 hectares irrigated land remained underwater and was expropriated for the Ermenek Dam. If the benefit created by the Turquoise lake will evaluate, economic losses can be compensable.

Keywords: Ecological impacts, realfeel humidity, reservoir, Ermenek dam.

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1. INTRODUCTION

Dam construction for energy and agricultural needs gained momentum after 1960's. Turkey is the second country with the highest annual hydropower production potential in Europe after Norway with regard to the numerous of dams and hydroelectric power plants. Because of construction of dams, some farmers may remains landless. People may be sufferfrom this situationsocio- economically. Ermenek dam is one of Turkey's leading dam in terms of its height, reservoir volume and energy production capacity. A significant reservoir formed around Ermenek considering Gezende Dam, Tekeçatı Dam and Kayraktepe Dam that are located very close to Ermenek dam. Reservoirs create a favorable environment for recreation activity, relaxation and aquaculture. However, the unprotection of natural and historical presence in the region causes the loss of cultural values from time to time (Baxter, 1977). Due to the higher width ofreservoirs as compared to the river,the evaporation of water from a reservoir surfaceincreases. As a result, lakes improve the moisture content of the air throughout the year (Great Lakes Atlas,1995).For example, the Aral Sea (the fourth-largest lake on the planet), climate changed sharply when it dropped to one third of the volume in 1960. In 1990's the moisture in the air were estimated to have decreased by about 10% compared to 1960 (Delany, 2005). In the areas that are affected by the lake, the average winter temperature is 1-3 C^0 warmer and 1 C^0 cooler in summer than the areas that are not affected by the lake (Ackerman and Knox, 2003). On the other hand, it is reported that the extinction of Sturgeon and Trout species has been causedbecause of sets or insufficient measures and the lack of passages in dams (October et al., 2000). The effects of lakes and dams with a large surface on local climate chamber is determined by examining meteorological data based on long years (Güldal and Ağıralioğlu 1994).

In this study, the possible effects of Ermenek Dam (Turquoise lake) on environment (in terms of climate and tourism) have been researched using the results Obtained from previous scientific study and meteorological data. The effect of Keban, Atatürk and Karakaya reservoirs (among 1963-2010 years) was investigated using meteorological data belonging to the periods before the dam was built and afther the dam was made.

2. MATERIAL AND METHOD

Long-term (1963-2010) research results obtained from the meteorological station data closest to the Atatürk, Keban and Ermenek dams have been fundamental in this study. For this purpose, selected climatic variables (maximum temperature, minimum temperature, average temperature, rainfall and relative / relative humidity) were evaluated by comparing the results of before and

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after periods of Ataturk and Keban Dams. Meteorological data were obtained from the Turkish State Meteorological Service.

211 hectares of 1103 total hectaresarea is arable land. 779 hectares is forest and 30 hectares of 34.5 ha irrigated land remained underwater and was expropriated in Ermenek. Although there is not cultivation of vegetables and field crops in large quantities for commercial purposes in the district, local needs are met. In Ermenek region, mainly products are apples, cherries, walnut, pomegranate, fig and vegetables. Olive cultuvation is rapidly increasing on the slopes of land located in the Goksu valley in recent years. Livestock and aquaculture (trout farm) are also available. Dam site's location is shown in figure 1.

Figure 1. Location of Ermenek dam (adapted from Google Earth)

The dam site is located 15 km southeast of Ermenek district. Powerhouse (302.4 MW) is located 8 km downstream of the dam. Although the terrain is hilly, there are access roads to the dam and power plant. The project is planned for energy purposes. The dam is located on Ermenek river which is the tributary of the river Goksu. The construction of Ermenek Dam was began in 2002 and it began to keep the water in 2009. Turquoise lake covers 61.45 km^2 area and keep 4.5 billion m^3 of water (Ermenek Dam HEPP, 2010). It is the Europe's 6. and the world's 21. highest dam.

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Figure 2. Some view of Ermenek Dam

Turquoise lake and swimming pool

Canyon in Turquoıse Lake

Zeyve bazaar

3. FINDINGS

3.1. Climatic findings

Analysis of the Ermenek meteorological stations' annual average temperature and precipitation data from 1960 to 2004are given in table 1. The data related to the period after the impoundment of Ermenek dam are given in Table 2, and the summary of meteorological data (temprature and frost) from Keban, Palu, Siverek and Hilvan meteorology stations near Keban and Atatürk Dams

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are given in Table 3. Summaries evaporation, rainfall and humidity data obtained from the meteorological stations around the Atatürk and Keban Dam are given in Table 4.

Table 1. Average Temperature (C^0), Precipitation (mm) and Humidity (%) in Ermenek (1960-2004)

	january	Feb.	March	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	average
Temperature	3,6	3,6	6,3	10,9	14,9	19,8	22,9	22,7	19,8	14,6	8,2	5,1	12,7
Precipitation	76,3	51,7	55,5	33,7	30,8	18,6	11,5	7,1	7,7	38,5	70,9	93,0	495,3
Humidity	60,2	58,7	53,5	48,4	44,3	39,8	33,4	33,6	38,8	44,7	54,7	60,3	47,5

Table2. Climate data after 2012 (under the influence of reservoir)

Years	january	Feb.	March	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
PRECIPITATION mm													
2012	71,0	52,6	61,8	45,8	59,6	11,6	2,0	14,0	4,4	112,6	100,8	285,2	821,4
2013	60,8	59,8	28,8	81,0	94,4	2,8	1,4	2,2	8,0	61,2	27,4	42,0	469,8
2015	79,6	32,4	100,0	3,2	49,8	61,8	29,0	32,6	12,2	62,6	15,6	8,0	486,8
RELATIVE HUMIDITY													
2011	80,4	73,5	64,6	73,5	71,1	70,2							
2012	85,2	72,0	70,6	61,3	68,8	46,3	40,1	41,8	42,7	71,3	77,1	82,2	
2013	85,3	80,4	61,5	66,3	59,7	45,0	39,0	37,4	49,8	46,2	70,8	62,1	
2014	73,0	64,3	66,5	66,5	66,5	72,9	41,5					71,9	
2015	82,6	87,3	81,0	68,4	62,4	71,2	46,6	54,3	50,7	70,6	60,1	58,2	
2016	83,2	78,7	69,4										
	81,6	76,0	68,9	67,2	65,7	61,1	41,8	44,5	47,7	62,7	69,3	68,6	62,9

MINIMUM, MAXIMUM AND MEAN TEMPERATURES													
Years	january	Feb.	March	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
2011	-2,7 +13,3 +3,8	-6,6 +15,5 +4,8	-5,3 +23,3 +8,3	-1,2 +26,0 +10,9	-3,4 +28,5 +15,1	+9,2 +32,2 +19,1							
2012	-18,6 +6,8 -3,0	-16,9 +8,3 -3,4	-11,7 +11,5 -0,04	-2,4 +21,1 +8,5	-0,5 +21,7 +11,4	+6,0 +31,7 +18,9	+7,5 +36,3 +21,6	+10,2 +32,1 +20,0	+7,4 +30,9 +17,7	+2,6 +25,1 +11,6	-3,5 +20,6 +6,2	-7,4 +16,1 +2,08	
2013	-12,2 +9,9 -0,8	-6,6 +14,9 +2,0	-6,3 +16,1 +4,4	+0,8 +22,4 +8,7	+2,0 +25,1 +14,0	+4,3 +30,4 +17,5	+8,0 +31,1 +19,9	+10,5 +31,1 +20,3	+4,0 +30,2 +15,6	-2,9 +24,6 +9,1	-3,6 +18,5 +6,9	-13,7 +15,3 -0,6	
2014	-5,8 +13,2 +2,1	-10,2 +17,5 +2,4	-6,8 +16,5 +4,7	-7 +16,3 +4,7	+1,9 +22 +12	+3,9 +29,6 16,0	+10,2 +28,8 +20,7					-5,1 +30,8 +9,4	
2015	-16,2 +12,9 -1,0	-13,0 +10,9 -0,79	-6,2 +3,2 +3,1	-4,7 +20,8 +5,8	+0,9 +25,2 +12,8	+4,7 +25,3 +15,1	+8,7 +30,3 +20,1	+11,1 +30,6 +20,7	+7,8 +31,3 +18,8	+0,9 +23,7 +11,9	-2,6 +17,9 +6,5	-11,9 +15,5 +1,5	
2016	-16 +10,4	-9 +17,7	-6,5 +17,1										

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	-2,1	+3,8	+4,2										

Table 3. Data summaries of the meteorological stations around the Atatürk and Keban Dam.

meteorology station	Period	Min.Temp.C^0 ,Month	maximum temp. (C^0) ,Month	The number of late spring frost in the period, Month which frost occurred and Min. (C^0)	The number of early frost in the period, Month which frost occurred and Min. (C^0)	The average temperature in the coldest and hottest month (C^0)
	Keban dam					
Keban meteorology station	1963-1975	-26,6 in Jen.	42,6in July	2 times in April (-3,8 C^0)	1 times October (-2) 7 times November (range of -0,4-7,6)	-0,4 in Jenuary +29,1 in July
	1976-2010	-12,6 in Febr.	43,6 inJuly	4 times in April (-3 C^0)	17 times November (range of -0,5 -9,4)	+1,7 in Jenuary +29,1 in July
Palu meteorology station	1965-1975	-26,8 in Jen.	42,2 in August	2 times in April (-3,2 C^0)	3 times October (-2 C^0)	-1,1 in Jenuary +27,8 in July
	1976-2010	-20,8 in Febr.	43,8 in July	8 times in April (-4,9 C^0)	3 times October (-2,6C^0)	-0,6 in Jenuary +28,0in July
	Atatürk Dam					
Siverek meteorology station.	1964-1992	-14,3 in Jen.		2 times in April (-3,5 C^0)	11 times in November (-5,6C^0)	+2,9 in Jenuary 30,2 in July
	1993-2010	-9,8 in Febr.		1 times in April (-2,8 C^0)	6 times in November (-3C^0)	+3,85 in Jenuary +31 in July
Hilvan meteorology station	1967-1986	-21,4 in Jen.	43,5 in July	3- in April (-2 C^0)	5 times in October (-2,7C^0)	-
	1998-2010	-11,5 in Febr.	45 in July	2 times in April (-5 C^0)	10 times in November (-6,2C^0)	-

Meteorology station	Period	Evaporation (mm) (Total / Max./ min./ Month wich occured)	Rainfall -Total Average / max. and min. İn period -mm	% Humidity Average/ max. and min. in period
Keban Dam				
Keban meteorology station	1963-1975	1797,8 / 352,3 in July / 104,6 in November (Among Nov.-March are zero)	415,3/656,9/241,6	51,9/70,6 in Jenuary/ 31,9 in July
Keban meteorology station	1963-1975	1797,8 / 352,3 in July / 104,6 in November (Among Nov.and March are zero)	415,3/656,9/241,6	51,9/70,6 in Jenuary/ 31,9 in July
	1976-2010	1814,8 / 387,2 in July / 33,3 in December	378,8/547,2/220,1	51,7/68,5 in December/ 32,9 in July
Palu meteorology station	1965-1975		599,6/694,7/337,2	56,7/ 72,6 in December/35,9 in July

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	1976-2010		545,7/783,3/383,5	51,8/ 70,0 in December/ 32,0 in July
Atatürk Dam				
Siverek Meteorology station	1972-1992	2179,5 / 417 in july / 39,9 in December	557,7/871,2/227	50,7/ 70,2 in December/ 26,4- in July
	1993-2010	1997,2 mm	583,3/873,5/341,6	57,4/ 74,9 -December/ 35,8- July
Hilvan Meteorology station	1967-1986		445,4/763,5/240,3	52,8/ 70,5 –Jenuary/ 28,6- July
	1998-2010		440,4/512,5/265,9	55,3/ 67,5 December/ 38,2 -July

3.1.1.1. Keban Dam Keban Meteorological Station

In the previous period before the impoundment In the prior period from dam construction (1963-1975), the lowest and the highest temperatures were recorded as -26.6 C^0 in January and +42.6 C^0 in july respectively. In the subsequent period (1976-2010) from dam, the lowest and the highest temperatures were recorded as -12.6 C^0 in February and +43.6 C^0 in July respectively. As a result, it can be said that the reservoir has increased the highest temperature by 1.0 C^0, softened the lowest temperature by 14 C^0 and decreased the severity of frost.

In the prior period before dam construction, late spring frosts occured 2 times in April (minimum -3,8 C^0), early autumn frosts 1 time in October (minimum -2,0 C^0) and 7 times in November (minimum -7,6 C^0). In the subsequent period from dam, during the 34-year, late spring frosts occured 4 times in April (minimum -3 C^0), early autumn frosts occured 15 times in November (minimum -9,4 C^0). Reduction in the number and severity of early spring frost has observed and delay has observed on early autumn frost.

3.1.1.2. Keban dam, Palu Station Data

In the prior ten years period before dam construction (1965-1975), the lowest and the highest temperatures were recorded as -26.8 C^0 in January and +42.2 C^0 in july respectively. In the subsequent period (1976-2010) from dam, the lowest and the highest temperatures were recorded as -20.8 C^0 in February and +43.8 C^0 in July respectively. It can be seen that reservoir has increased the highest temperature by1.6 C^0, softened the lowest temperature by 6 C and decreased the severity of frost.

In the prior 10 years period before the impoundment, frosts occured 2 times in April (minimum -3,2 C^0), 9 times in March (minimum -12,2 C^0), 3 times in October (minimum -2, C^0) and 8 times in November (minimum -15,2 C^0), and the lowest temperature of the year occured -26,8 C^0 in January. During the 34-year period after the impoundment, it occured 8 times in April (minimum

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-2,6 C^0), 33 times in March (minimum -21,2 C^0), 3 times in October (minimum -2,6 C^0) and 33 times in November (minimum -19 C^0), and the lowest temperature of the year occured as -20,8 C^0 in February.

3.1.1.3. Atatürk Dam Hilvan Meteorological Station

In the prior period before the impoundment (1966-1986), the lowest and the highest temperatures were recorded as -21.4 C^0 in January and +43.5 C^0 in july respectively. In the subsequent period (1999-2010) from dam, the lowest and the highest temperatures were recorded as -11.5 C^0 in February and +45.0 C^0 in July respectively. The lowest increase was in November while the highest increase was in August. It can be said that reservoir has increased the lowest temperature by 9.9 C^0 and decreased the severity of frost.

In the previous 9 years period before the impoundment frosts occured 3 times in April (minimum -2 C^0), 9 times in March (minimum -10,6 C^0), 3 times in October (minimum -2,7 C^0) and 9 times in November (minimum -6,6 C^0), and the lowest temperature of the year occured -21,4 C^0 in January. During 13 year period after the the impoundment frosts occured 2 times in April (minimum -0,3 and 0,5 C^0), 10 times in March (minimum -6 C^0), 0 time in October and 10 times in November (minimum -3,1 C^0), and the lowest temperature of the year occured as -11,5 C^0 in February. Reduction in the number and severity of early spring frost and delays with the early autumn frost were observed.

3.1.1.4. Atatürk dam Siverek Station

In the previous 29 years period before the impoundment (1963-1992), the lowest and the highest temperatures were recorded as -14.3 C^0 in January and +43.4 C^0 in july respectively. In the subsequent 14 years period after the impoundment (1993-2007), the lowest and the highest temperatures were recorded as -9.8 C^0 in February and +45 C^0 in July respectively. It can be said that reservoir has increased the lowest temperature by 4.5 C^0 and decreased the severity of frost. The highest temperature has increased by 1.6 C^0.

In the previous 29 years period before the impoundment, frosts occured 2 times in April (minimum -3,5 C^0), 21 times in March (minimum -12,2 C^0), zero time in October and 11 times in November (minimum -5,2 C^0), and the lowest temperature of the year occured -14,3 C in January. During 18 year period after the impoundment, it has occured 1 time in April (minimum -2,8 C^0), 8 times in March (minimum -5,4 C^0), zero time in October and 6 times in November (minimum -3,1 C^0), and the lowest temperature of the year occured as -9,8 C in February. Reduction in the number and severity of early spring frost and delays with the early autumn frost have been observed.

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3.1.2. Evaporation, Rainfall and Humidity.

Table 4. Summaries evaporation, rainfall and humidity data obtained from the meteorological stations around the Atatürk and Keban Dam.

Meteorology station	Period	Evaporation (mm) Total ev. /Max. Ev./ min. Ev.	Mean Rainfall İn period (mm) / max. / min.	% Humidity in period Average/ max. / min.
Keban Dam				
Keban meteorology station	1963-1975	1797,8 / 352,3 in July/ 104,6 in November (Among Nov.-March are zero)	415,3 / 656,9 / 241,6	51,9 / 70,6 in Jenuary / 31,9 in July
	1976-2010	1814,8 / 387,2 in July / 33,3 in December	378,8 / 547,2 / 220,1	51,7 / 68,5 in December / 32,9 in July
Palu meteorology station	1965-1975		599,6 / 694,7 / 337,2	56,7 / 72,6 in December / 35,9 in July
	1976-2010		545,7 / 783,3 / 383,5	51,8 / 70,0 in December / 32,0 in July
Atatürk Dam				
Siverek Meteorology station	1972-1992	2179,5 / 417 in july / 39,9 in December	557,7 / 871,2 / 227	50,7 / 70,2 in December / 26,4 in July
	1993-2010	1997,2 mm	583,3 / 873,5 / 341,6	57,4 / 74,9 in December / 35,8 July
Hilvan Meteorology station	1967-1986		445,4 / 763,5 / 240,3	52,8/ 70,5 in Jenuary/ 28,6- July
	1998-2010		440,4 / 512,5 / 265,9	55,3 / 67,5 in December / 38,2 in July

3.1.2.1 Humidity (%), Keban Dam, Keban Station

Annual average humidity decreased by 0,23. Relative humidity decreased (in the range of 1,1 to 3,1) between December-April and increased between May-November (in the range of 0.1 to 1.2).

3.1.2.2. Humidity (%), Keban Dam, Palu Station

Humidity values decreased in the range of 2,5 (October) to 8,5 (February) throughout the year.

3.1.2.3. Atatürk Dam, Siverek Station

The average humidity was 50.74% and 57.45% between 1963-1992 and between 1992-2010 (6,71 point increased because of the reservoir) respectively. Humidity increased in the range of 3,3 (February) to 11,0 (October) in all months of the year because of the reservoir.

3.1.2.4. Atatürk Dam, Hilvan Station

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The average humidity was 52.82% and 55.27% between 1963-1986 and between 1992-2010 respectively (2,45 increase). Humidity percent has decreased in the range of 2,4 (November) to 4,0 (February) between November-March and it has increased in the range of 0,2 (April) to 13,2 (August) in other months. Relative humidity has increased throughout the year after the reservoir.

3.1.3. Evaporatin (mm)

3.1.3.1. Keban Dam, Keban Station

While the annual evaporation was 1797,75 mm before the reservoir, it has reached to 1814,84 mm after the reservoir. Evaporation increased in all the months between April and December.

3.1.3.2. Atatürk Dam, Siverek Station

While the annual evaporation was 2179,47mm before the reservoir, it has dropped to 1997,23 mm (182,24 mm reduction) after the reservoir. Evaporation has increased in March, April and December but decreased in other months.

3.1.4. Average monthly temperature (C^0),

3.1.4.1. Keban Dam, Keban Station

The average temperature was +14,5 C^0 between 1963-1975 and was +15,0 C^0 between 1975-2010. Monthly average temperature remained the same in April, June and July, decreased 0,3 C^0 in May and 0,1 C^0 in March, and increased in the range of 0.1 (October) to 1,8 C^0 (February) in other months.

3.1. 4.2. Keban Dam, Palu Station

The average temperature was 13,4 C between 1963-1975 and was 13,7 C^0 between 1975-2010. Monthly average temperature increased in the range of 0.1 (May) to 1,3 ^{0} (February) except April, October and November.

3.1.4.3. Atatürk Dam, Siverek Station

The average temperature was 16,2 C^0 and 16,6 C^0 between 1963-1975 and between 1975-2010 respectively. Monthly average temperature decreased 0,1 in September, 0.3 in November, remained the same in October and March and increased in the range of 0.1 (December) to 0,9 C^0 (January).

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3.1.5. Precipitation data (mm).

3.1.5.1. Keban Dam

Palu Station Precipitation mm	Jenuary	Febr.	March	April	May	June	Average Total	Minimum-Maximum
1965-75	83,7	54,5	83,3	87,8	59,4	13,7		
1976-2010	57,7	66,3	74,0	82,7	50,0	15,2		
	July	Aug.	Sept.	Oct.	Nov.	Dec.		
1963-75	4,6	4,5	10,5	42,8	76,0	78,9	599,6	337,2-694,7
1976-2010	4,3	6,3	8,6	56,8	59,0	64,8	545,7	383,5-783,3
Keban Station Precipitation mm	Jenuary	Febr.	March	April	May	June	Average Total	Minimum-Maximum
1963-75	49,9	43,8	55,5	62,8	56,3	18,9		
1976-2010	37,8	36,0	45,2	54,1	47,8	17,6		
	July	Aug.	Sept.	Oct.	Nov.	Dec.		
1963-75	3,5	3,5	9,4	34,1	38,8	38,9	415,3	241,6-656,9
1976-2010	4,6	4,0	8,1	38,5	43,4	41, 8	378,8	220,1-547,2

3.1.5.2. Atatürk Dam

Siverek Station Precipitation mm	Jenuary	Febr.	March	April	May	June	Average Total	Minimum-Maximum
1964-92	77,2	79,1	84,5	61,3	44,6	10,3		
1992-2010	93,2	79,2	85,8	60,3	35,6	13,5		
	July	Aug.	Sept.	Oct.	Nov.	Dec.		
1964-92	0,9	2,2	2,4	45,3	65,1	86,9	557,7	227-871,2
1993-2010	3,3	3,7	13,7	48,9	64,5	81,6	583,3	341,6-873,5
Hilvan Station Precipitation mm	Jenuary	Febr.	March	April	May	June	Average Total	Minimum-Maximum
1966-86	57,5	60,2	67,9	48,2	33,1	5,0		
1998-2010	71,6	66,2	55,1	52,2	21,3	5,9		
	July	Aug.	Sept.	Oct.	Nov.	Dec.		
1966-86	3,8	2,0	6,4	37,9	49,5	73,8	445,4	240,3-763,5
1998-2010	2,0	3,5	14,8	38,1	45,9	63,8	440,3	265,9-512,5

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4. RESULTS AND DISCUSSION

Due to the the fact that the reservoirs' surface is wider than the rivers', reservoirs affect the environmental climate. By this way, humidity increases and temperature, rainfall, wind events undergo a change. In this case the natural vegetation in the region, agricultural crops, terrestrial aquatic animals experience an abrupt change and species that can adapt can maintain their life (Ludwig, 1982., Sadler, 1986). Stable humidity caused by the huge mass of water, changes in temperature and air movement differentiates the small zone climate. Depending on the topography of the region regional-scale climate changes can be observed(Yesilata and ark, 2004., Tahmiscioğlu et al, 2007). These changes may not be seen harmful to human health but it is important for animals and plants. Their results also affect human being indirectly (Tahmiscioğlu et al, 2007). Although some land was under water because of the dams, the transition to irrigated agriculture and power generation provides an important economic contribution. In addition, in the event of the lake area evaluation has a significant tourist potential.

Atatürk Reservoir was built in the province of Adiyaman and Sanlıurfa, about 62 km northwestern of Şanlıurfa, 35 km to the south of Adıyaman, on the Euphrates. Atatürk Reservoir is Turkey's 3rd largest lake with its 180 km long, 48.7 km^3 volume and surface area of 817 km^2. In the determination of Atatürk Reservoir's impact on climate, meteorological data in the previous 15 year period before the impoundment (1972-1986) and the subsequent 15-year period (1987-2001) were evaluated. After the reservoir it has been observed that there has been an increase for both of the provinces in both temperature and humidity for most of the year. Trend analysis shows that these increases can not be underestimated for relative humidity and high temperatures and the reservoir-the local climate relationship is still continuing in a dynamic way (Yesilata et al, 2004). Tonbul (1986) examined the effects of Keban Dam on the local climate and has determined reduced evaporation, a slight increase in relative humidity, a very small reduction in temperatures and an increase in the number of snow days. Kadıoglu and Sen (1994) examined the environmental impact of large water reservoir and made the fractal analysis of the environmental climate before and after Keban Dam. Again (Güldal vd.1994) has examined the scope of the environmental impact of Keban reservoir and stated an increase in temperature in winter and also an increase in humidity in summer (Şengün, 2007). Based on 60 years of data from meteorological station of Elazığ, it is stated that significant differences have not emerge with the climate between the period of before and after 1975 with the construction of Keban Dam (there has been some small differences in extreme values but these differences have not result in any significant changes in local climate), at the same time there has been a slightly softening especially in winter (depending on changes in the highest and lowest temperature) with the local climate that is under the influence of pre-eastern Anatolia continental climate.

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In Atatürk and Keban region; reduction in the severity of the winter frosts, reduction with the number and the severity of spring frost, delay and reduction in the severity of early autumn frost was observed. Changes in winter values are parallel (Ackerman and Knox, 2003), changes in summer values are in opposite directions. While an increase was observed on the average temperature by 0,4-0,5 C^0 in the region of Atatürk and Keban after the dam construction, the average temperature decreased by 2,8 C^0 in summer in Ermenek. Results of Ermenek are aligned with (Ackerman and Knox, 2003). The possible reason is considered to be that Ermenek dam is much below from the meteorology sations compare to the Atatürk and Keban Dams. In the next period after the dam, the maximum temperature level and the average temperature (0.4 C^0 Ataturk Dam, 0.5 C^0 Keban Dam) increased. This issue could not be assessed because pre-dam maximum and minimum temperature data could not be obtained in Ermenek. Relative humidity values decreased in the region of Keban dam station, increased in stations Ataturk Dam. Annual evaporation increased by 17.09 mm in the region of Keban Dam, and decreased by 182.24 mm in Ataürk Dam (Siverek station).

Relative Humidity (%) rised in Atatürk Dam between 2,45 (in Hilvan st.) and 6,71 (in Siverek st.). In Keban dam, yearly average humidity decreased between 0,2 (in Keban st.) and 4,9 (Palu st.). In Atatürk Dam, % humidity rised from 26,4 and 28,6 to 35,8 and 38,2 in Siverek and Hilvan station in July respectively. In Keban Dam, % humidity rised from % 31,9 to 32,9 (in Keban st.) and decreased from 35,9 to 32,0(in Palu st.) in July. In Ermenek, relative humidity has rised in all months and years. While the average yearly relative humidity was 47,5% before the impoundment (average min. %33,4 in July, max. % 60,3 December), it has reached to 62,9% by rising each month and year after the impoundment. Results are parallel with Great Lakes Atlas, (1995), Güldal vd.1994 and Delany, (2005).

Reservoirs create good environment for fun and relaxation and they are good sources for aquaculture. However, the unprotection of natural and historical presence in the region causes the loss of cultural values from time to time (Baxter, 1977). Similarly, Görmeli bridge from Seljuk period has also remained under water because of Ermenek dam.

Meteorological data for the next 5 years after the impoundment of Ermenek dam is insufficient to get results. But the relative humidity has increased in all months and years. While the yearly average relative humidity was 47,5% before impoundment (average min. %33,4 in July, max. %60,3 December), it has reached to 62,9% by rising each month and year after the dam. A significant alteration is not observed in annual precipitation due to the Ermenek dam. The increase in humidity will likely reduce the frost damage in terms of frost frequency, intensity and time. Overall results are parallels with Şengün (2007) in terms of impact of Atatürk and Keban

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dam. However, we should wait for many years to ensure sufficient climatic data for a definitive conviction.

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