

DETERMINING THE 2050 DOMESTIC WATER DEMAND OF GAZIANTEP CITY

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ABSTRACT

This study aims to determine the future domestic water requirement and the potential sources for the city of Gaziantep. The population of Gaziantep is calculated to be about 3 million in 2050, thus the total amount of water needed to be supplied to the city is anticipated to be around 306million m³ for year 2050. In Gaziantep, need for drinking and household water increases day by day in parallel with the increasing population, civic improvement and development in the area of industry. In addition to the available household and drinking water resources, more water reserves are needed.

Keywords: Domestic Water Requirement, Drinking Water, Gaziantep City, Reservoir Capacity, Göksu Basin

1. INTRODUCTION

Water is the most basic need of all living things. It is a substance that sustains all biological life from the smallest to the biggest living organism and human activities. The persistence of social and economic activities generally depend on having clean and adequate water supply (Istanbulluoglu et al., 2007). The city of Gaziantep, which is located in southeastern region of Anatolia, is developed rapidly in terms of industrialization and urbanization. The city is expected to experience water shortages in the future (Istanbulluoglu et al., 2002). Drinking and household water is a growing problem in Gaziantep due to mismanagement and inadequate resources. Climate changes could be another reason the shortage and the quality of water resources (Panagopoulos et al., 2006). In Gaziantep, the need for drinking and household water increases in parallel with the increase in population. The existing resources cannot supply sufficient water to the city for the very near future, thus new water sources need to be determined domestic water requirements (Istanbulluoglu et al., 2007).

Local water usage is a complex element of social and physical characteristics, urban planning strategies, groundworks and public water policies (Panagopoulos et al., 2012). The international panel on climate change IPCC predicts that the global surface temperature has risen by 0.74°C for the last 100 years. Water resources in the Mediterranean region are anticipated to be effected significantly from a warmer climate (IPCC 2007). The mishandling of domestic water and its resources in Gaziantep may lead to further problems of drinking water in drought periods. Many cities in the southeast of Turkey are already facing serious issues concerning water planning and efficient consumption (IPCC 2007). The water management is a necessity in determination of the present and prediction of the future local water demands. Furthermore, urban water demands and the construction of the water supply and distribution system are necessary in city planning (Cihakova, 2006).

2. STUDY AREA

The city of Gaziantep is located between $36^{\circ} 28'$ and $38^{\circ} 01'$ eastern longitudes and $36^{\circ} 38'$ and $37^{\circ} 32'$ northern latitudes. The city has a total area of 6222km^2 , corresponding to 1% of Turkey (Figure 1). The city is dominated by rolling and rugged land. The Nur Mountains, which forms the borders of Hatay and Osmaniye, are located on the South of the city. Sof Mountain, which is in the east of Islahiye with a height of 1496 metres, is the peak of the city. The most important plains, which constitute $\frac{1}{4}$ of the city terrain, are Islahiye, Barak, Oguzeli, Araban and Yavuzeli. The Euphrates is the most significant river near the city (TUIK, 2013).

The climate of the study area is characterized as arid Mediterranean. Annual mean temperature is about 15.2°C . According to the data of 36 years the maximum mean temperature is measured to be about 27.9°C and the minimum mean temperature is noted to be 3.3°C . The average annual rainfall is about 551.6 mm (TUIK, 2013).



Figure1 Location of Gaziantep City

3. POTENTIAL WATER SOURCES

The current domestic water of the city of Gaziantep is supplied from three sources, namely, Kartalkaya dam, Mizmilli deep Wells and a number of deep wells located within the city. These water resources are under stress in order to provide the drinking water demand of the city. In order to meet the water demand of the city, in addition to the existing drinking water sources, there is a need for new water resources (Yuce et al., 2009).

4. THE ESTIMATION OF POPULATION AND WATER DEMAND

The future population of the city was estimated by using five different methods. They are arithmetic method, exponential method, geometric (logarithmic) method, compound interest method and Ilbank method. Ilbank is a national development and investment bank in Turkey, which supports the local authorities to develop sustainable urban projects. The population projections are conducted for year 2050. The population of the city from year 1960 to 2014 is given in Table 1, while the future predictions by the above stated methods are presented in Table 2 and Figure 3.

The prediction made by several methods has produced a population ranging between 3 million to 10 million, which is a significant difference. The arithmetic and the Ilbank methods seem to have predicted reasonable results for the city. However the other three methods were noted to have over-predicted the population. The current population of Turkey is around 78 million, the statistical agency of Turkey (TUIK) expects that the population of the country is going to be around 93.5 million in 2050 and then start decreasing. The increase in the population of the country is presumed to be around 20% in 35 years. Taking the economical growth of the country in general and the increased living standards as well into account, the population of Gaziantep city is expected to be around 3 million in 2050.

The domestic water demand is generally calculated by multiplying the requirement per capita with the population of a city and adding the amount needed by the industry, animals and fire requirements. The codes regarding the drinking and household water, in Turkey, are set by Ilbank regulations. These regulations mandate that in cities with a population of more than 500,000, the water demand per capita should be taken as 225 l/day. Under these conditions the total household water requirement for Gaziantep in 2050 is projected to be around 246 million m³/year.

Table 1 Population of Gaziantep from 1960 to 2014

Years	Population
1960	124097
1965	160012
1970	227652
1975	300882
1980	374290
1985	473635
1990	689848
1995	832703
2000	949559
2005	1155498
2007	1190763
2008	1256384
2009	1299143
2010	1370598
2011	1397313
2012	1442059
2013	1501556
2014	1556381

Table 2 Estimation of the population of Gaziantep for year 2050

Year	Aritmetik Method	İlbank Method	Geometrik Method	Compound Interest Method	Explanatıon Method
2050	3217719	4836732	8242805	9185779	10084698

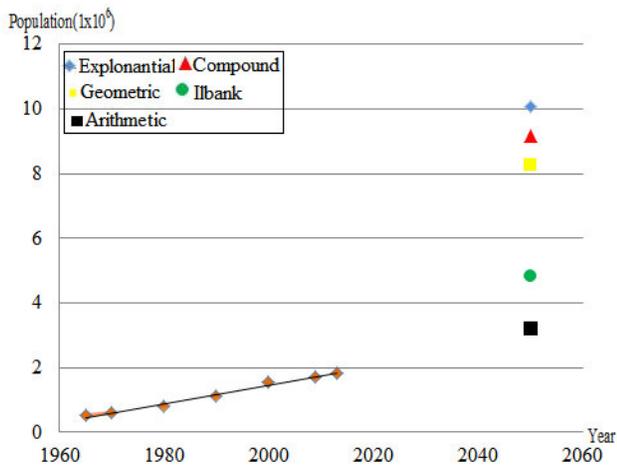


Figure 3 Future Population Prediction of Gaziantep

7. CONCLUSIONS

The drinking and household water of the city of Gaziantep is supplied from three sources, namely, Kartalkaya Dam, Mizmilli deep Wells and a number of deep wells located within the city. These water resources are under stress in order to provide the water demand of the city. The population of Gaziantep is estimated to be around 3 million in 2050, thus the drinking water need of the city is estimated to be around 246 375 000 m³/year. It is necessary to search for new resources to meet the future water demand of the city. Çetintepe, Düzbağ and Birecik Dams are the potential sources need to be examined. In order to choosing of right dam for supplying water, Gaziantep water need problem will be solved until 2050.

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