

An Analysis of zone wise water scarcity for the Ahmedabad City

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Abstract

In today's world as we all know each and every one requires basic infrastructure facilities, and the most important and required one is water. Since urbanization, the demand for water is increasing day by day and the sources of fresh water are decreasing rapidly due to Population increase, industrialization and irrigation use. While India receives annual precipitation of 4000 km³, in which about 700 km³ of water vaporizes and loses to the air, while 2,150 km³ goes into the ground whereas about 1,650 km³ stays as soil moisture while about 500 km³ run through the soil surface to water deposits under the ground. 1,150 km³ of fresh water gathered annually are retained on land surface of which a lot amount of water either gets polluted, wasted or over used and simultaneously there is huge down fall in fresh water sources, many approaches are being made throughout the world to mitigate it. Ahmedabad, Gujarat state of India is facing the issues of water stress which can convert into water scarcity in near future. This study aims to study the present condition of water infrastructure for Ahmedabad city and to analyze zone wise water supply and demand for the Ahmedabad city dwellers.

Keywords: Ahmedabad; Ground water; Water scarcity; Water Demand.

INTRODUCTION

Water is the most important need of human as well as of all the living things for sustaining the life, and use of water can be categorized into domestic, industrial, agricultural. The meaning of Human security is protection against unpredictable events that disrupt human routine and livelihoods. As an important resource, water is necessary in maintaining the life of the world's most vulnerable human beings. But water also has devastating nature. It can be turned into storms and floods.

In the whole world, 69% of water is used in agriculture, 23% for industrial purpose and 8% domestic use.[5] 71% of the earth surface is filled with water, which amounts to 1.4 billion cubic kilometers (m km³) of earth surface is contained with water, which is 70% of the total surface of earth. However, 97.5% of this is sea water which cannot be used directly in day to day life. Fresh water availability is only 35 million km³. Out of the total fresh water, 68.7% is frozen in the form of snow and glacier, 30% is stored under the ground and only 0.3% water is available on the earth surface. Out of the surface water, 87% is available in lakes, 11% in marsh and 2% in rivers. As all the sweet water is not available for use, only 1% of the total water can be used by people on earth. [4]

The main source of surface water is precipitation. The large part of surface water is found in rivers, river lets, ponds and lakes. The term underground water means to all water below the water table to

great depths. The sea has an important role in this cycle of water. The ocean store 97% of the total water on the earth; 78% of global rain fall occurs over the surface of ocean, and it is the source of 86% of evaporation in the whole world. India has many rivers. Twelve of them are major rivers with total catchment area is 0.2528 billion hectares and an average annual potential in rivers are 1.570 trillion cubic meters.

OBJECTIVES OF STUDY

- To study the present condition of water infrastructure for Ahmedabad city.
- To analyze zone wise water supply and demand for the Ahmedabad city dwellers.

ABOUT WATER SCARCITY

Water scarcity is the lack of water resources to meet water needs within an area of needy people. Water scarcity includes water shortage, water stress and water crisis. The new phenomenon of water stress is difficulty in getting sources of fresh water for use. The shortage of Water may be caused by change in climate, such as droughts or floods, increased pollution, and increased human demand and overuse of water. The term water crisis can be explained as a situation where the available potable, fresh water within a region is less than the demand of people of that region. In table 1 we can see the Ahmedabad population which is increase day by day.

Table 1 Ahmedabad zone wise population

Sr. No	Zone	Area (Km ²)	Population	
			2001	2011
1	North	41.54	623827	947749
2	West	57.53	765085	990178
3	New west	178.76	650755	922762
4	South	94.26	260545	535572
5	East	78.52	808219	1499437
6	Central	16.6	586543	738227

STUDY AREA

The sixth largest city and seventh largest metropolitan area is Ahmedabad in India. Ahmedabad is as one of the important economic and industrial hub in India. It is the second largest producer of cotton in India, and its stock exchange is the country's second oldest. Area of this city is 467.21 km². As per census 2011, The population of Ahmedabad was 7.2 million lakh. Annual average precipitation of Ahmedabad is 78.9 cm.

Ahmedabad water infrastructure

Ahmedabad city development took place along the bank of river Sabarmati for quick and easy access of water. Dharoi dam is constructed on Sabarmati River at a distance 80 km, away from Ahmedabad having 5475 sq.km of catchment area. at distance 202 km. Vasna Barrage has 10619 sq.km. Catchment area which is situated. There are 4 water treatment plants, 143 water distribution stations, 250 km long water trunk mains and 3830 km long water distribution network available in Ahmedabad.

Existing condition of water infrastructure

Sabarmati river is the main source responsible for water supply in Ahmedabad. Sabarmati river frequently dried up in the summer season, and the city becomes in dry region. However, with the execution of the Sabarmati River Front Project and Embankment, the waters from the Narmada river have been diverted to the Sabarmati to keep the river flowing throughout the year, thus solution of Ahmedabad's water problems is done. Narmada river starts from Vindhya hills, Madhyapradesh and meets to bay of Khambhat. It has length of 1312 km. & area of catchment 97410 sq.km.

In Ahmedabad, according to the analysis of CGWB (Central Ground Water Board), the present ground water table lies 90 m below ground level. In late sixties, it was in the range of 33.5 to 44.19 m

below ground level. The water table in user confined aquifers ranges from 20 m. to 50 m. below the main sea level. The groundwater tables in Ahmedabad have been falling at the rate of 2-3 meters every year. This has resulted in exploitation of deep aquifers which, has led to sharp decline in piezometric level below 60 to 80m. In figure 1 we can see that the ground water depreciation. [3]

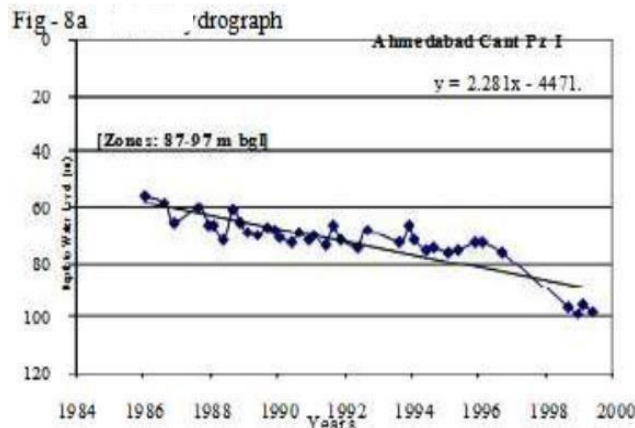


Figure 1 Underground water depletion

(source-A framework for sustainable ground water reserves in Ahmedabad)

Due to the urbanization process, the ground water pollution has made some shallow aquifers unsuitable for the domestic needs. The groundwater at shallow depths in the area show wide variation in the chemical quality. The Multi-layered aquifer system, down to 300-400m depth in Ahmedabad area has brackish to saline or high fluoride / nitrite zones at various depths.[3]

Table 2 Ahmedabad different area ground water

Area	pH	TDS (PPM)
Maninagar	6.16	798
Bopal	5.51	896
Navrangpura	5.65	763
Sarkhej	5.26	805
Naranpura	6.35	770
Ranip	5.95	770
Vastral	5.74	910
Sabarmati	6.04	819
ramol	5.34	882
sardarnagar	5.53	826

(source-Times of India)

TDS means total dissolved solids, refers to minerals and salts dissolved in water. The maximum desirable limit of TDS in water is 500 mg/l.

Pure water is neutral with a PH of 7. In ground water the acceptable pH is between 6 to 8.5. But in present pH value is less in Bopal, Navrangpura, Sarkhej, Ranip, Vastral, Ramol, Sardarnagar, also present TDS value is higher in all areas as shown in table 2.

Water supply and demand

From Ahmedabad municipal corporation (AMC) the secondary data of present water supply and demand was being collected. In Figure 2 it is very clear that there is huge variation among the different zone of water supply and demand, which is consistently increasing year after year.

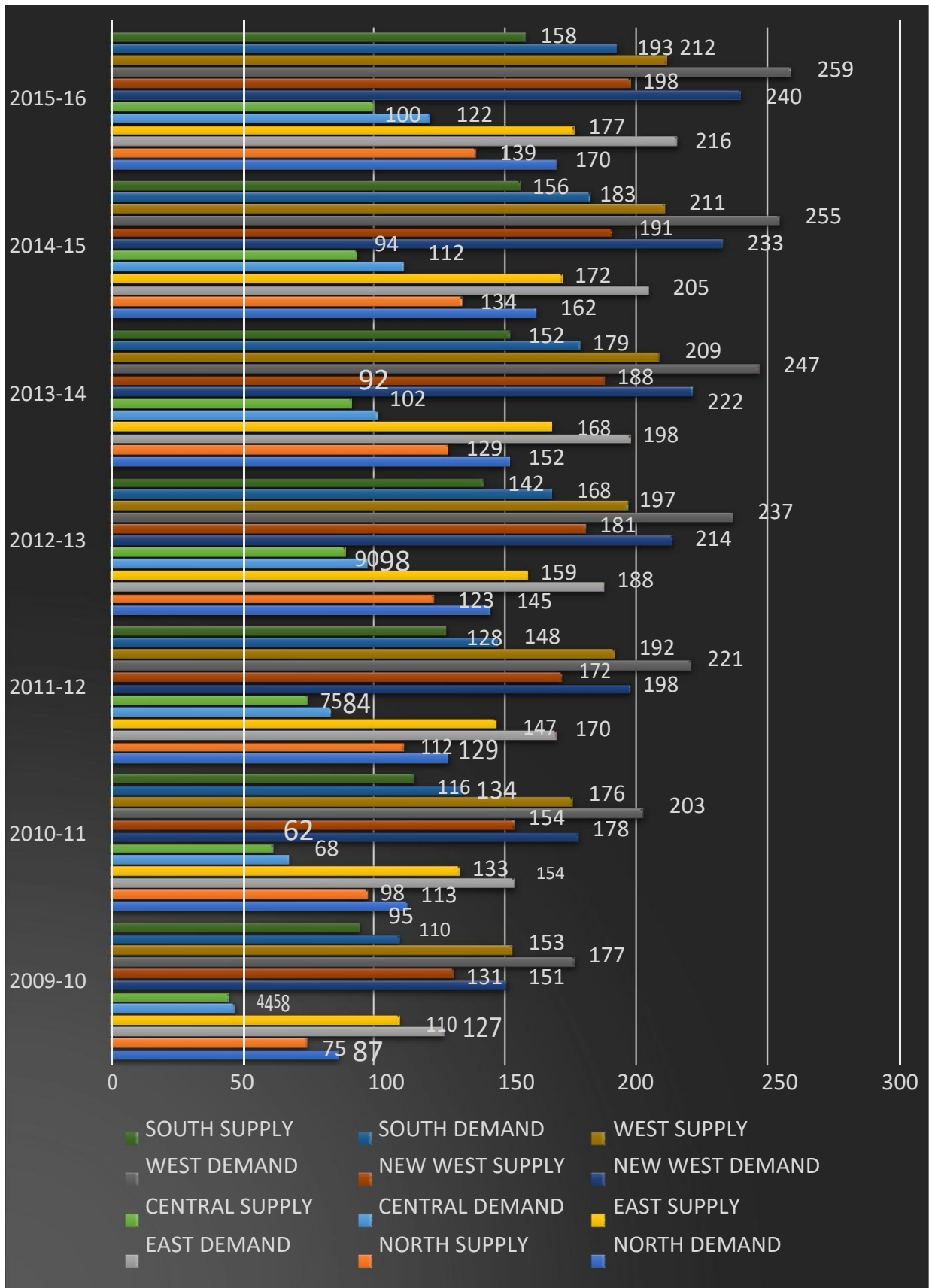


Figure 2 Zone wise water supply and demand

Selection of zone

Central, north, and east zone were selected for the further study, due to tremendous increase in population of respective area, simultaneously the demand was raised and certain consequences were found such as loss of ground water, and decrement in ground water table in certain area, which has caused for supply of water through tankers.

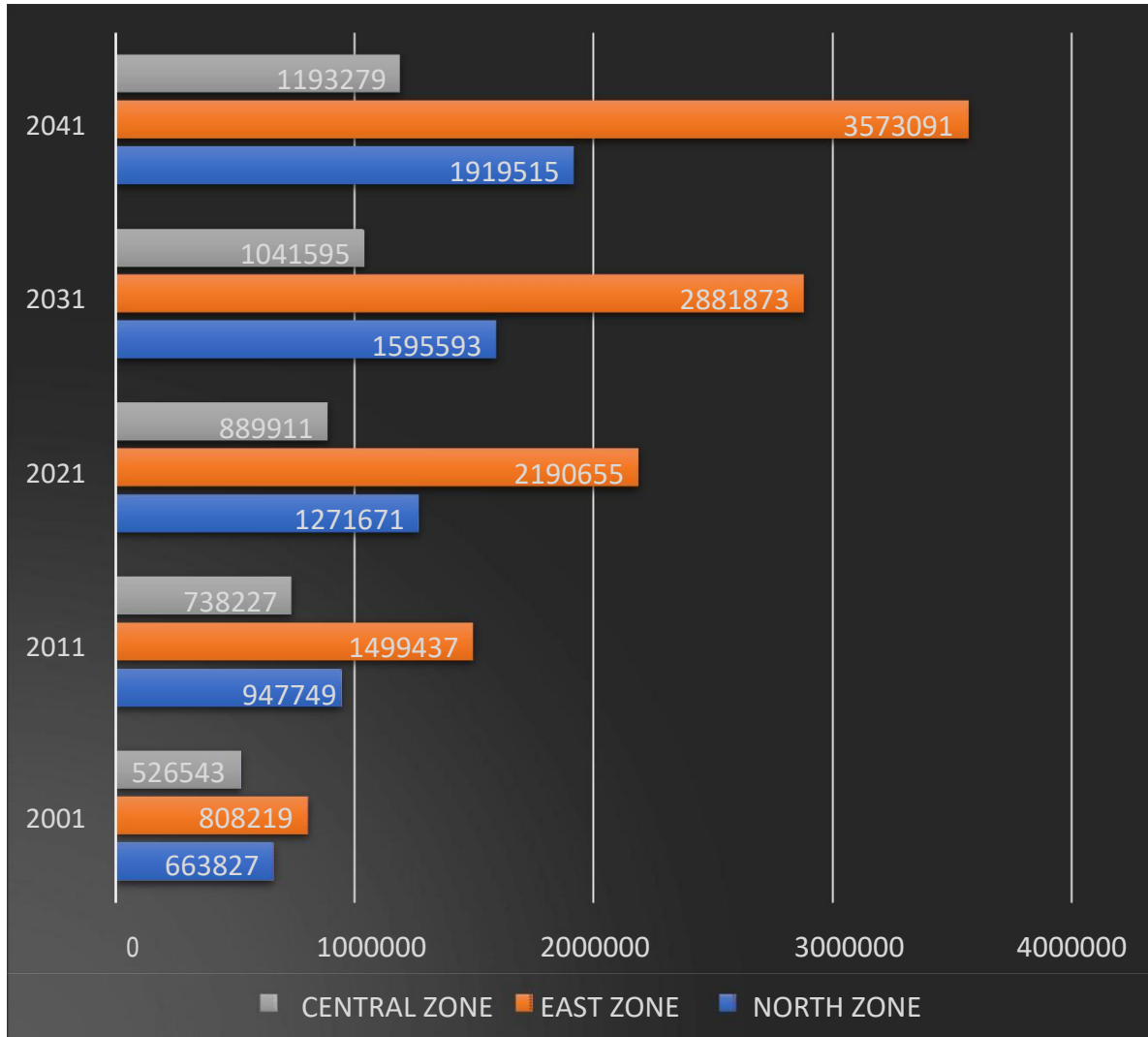


Figure 3 Zone wise population forecasting

In figure 3, we can see that the population will increase in central zone approximately by 126.6 % in 2041 with respect to the year, 2001; similarly, 189% and 342%, for north zone and east zone respectively.

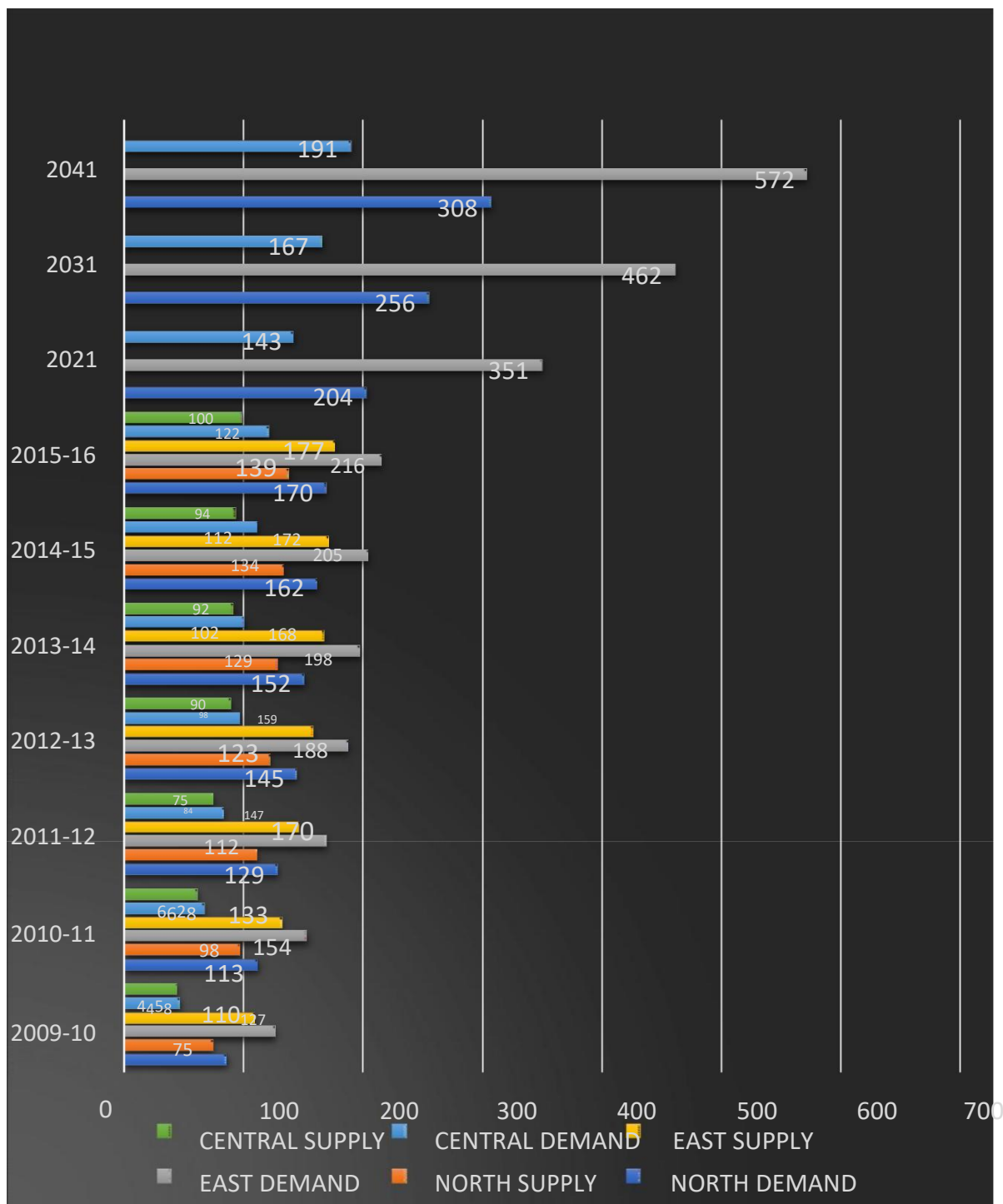


Figure 4 zone wise water demand and supply forecasting

As per the figure 4 with respect to increasing population, water demand is being increasing year by year and simultaneously the gap is increasing. For the year 2041 water demand is expected to increase by 80% for the north zone, 165% for the east zone and 68.9% for the central zone with respect to the year 2015-16.

CONCLUSION

Population has been increasing at a very rapid pace. And water is a precious resource that is decreasing simultaneously. This paper focuses on water supply demand in various zones of Ahmedabad city, which has to be found increasing day by day caused due to rapid increase in population of respective zone. And from the data analysis it has been found that the supply is not been able to meet the present demand and the gap in north, east, & central zone is 31 MLD, 49 MLD, 22 MLD respectively. The major cause identified for the lack of water supply are, increase in water pollution, loss in ground water table i.e. up to 2 – 3 meters per year, and the only major source i.e. Sabarmati river which remains frequently dry. Thus, these issues are required to be dealt now, otherwise with the rising population & demand there would be major chances of water crisis.

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