



## EMPIRICAL ANALYSIS OF PIPED WATER CONSUMPTION, DEMAND AND SUPPLY AMONG URBAN LOCALITIES OF KERALA

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### **Abstract**

*Due to rapid urbanization, increased economic activity, population explosion, changes in land use pattern and higher standards of living, the gap between the demand and supply of water has been widening. In urban areas of Kerala despite having extensive piped network, drinking water supply is spasmodic, of low pressure and frequently not potable. There is limited hours of supply of piped water. Sometimes the water is not suitable for drinking because of excess chlorine smell. There exists big demand consumption gap and demand supply gap in urban drinking water supply in Kollam District of Kerala. The present study aims at analyzing the water demand and supply of urban drinking water, the gap between the demand for and supply of water and demand consumption gap in Kollam District of Kerala .The study makes use of descriptive statistics to analyze the data and tables and figures were used to present the data.*

### **Introduction**

One of the obligatory functions of local bodies is to provide drinking water supply to the residents. Although this function has been taken over by city level boards in many urban centres, providing safe water to the entire population remains the duty of the concerned public authority. However, covering the entire population by water supply requires continuous investment in expanding and improving the water supply system. Due to rapid urbanization, increased economic activity, population explosion, changes in land use pattern and higher standards of living, the gap between the demand and supply of water has been widening (Kerala Economic Review 2012). About 30 percent of the urban households do not obtain water from their Municipality or government. Even those households who do have some access to water from the government have to share it with their neighbors. Almost 59 percent of the households either share water with their neighbors. The coverage of population by water supply has improved over the years; however, 100 per cent coverage of urban population will take some time to achieve. The demand for water is increasing day by day but the supply is not increasing in accordance with the demand. To meet this demand, augmentation of existing water resources by development of additional sources of water or conservation of the existing resources through impounding more water in the existing water bodies and its conjunctive use is required.

The demand for water in urban areas of Kollam District is determined by many factors like number of members in a family, type of houses, income of the consumers etc. The supply of water in the urban area is determined by the availability of water in the main sources of water like the Sasthamkotta Lake, Kallada River, Achankovil River and tube wells in the locality and other factors like distribution leakage. The Sasthamkotta Lake is slowly dying due to many reasons, which include alarming decrease in water level and pollution of the lake water which has put the biggest fresh water lake in Kerala at risk. 8 wards were considered for realising the objectives set for the study. Data regarding demand, consumption and supply of water were collected and analysed. Demand for water and actual consumption are collected from the primary survey and the supply of water is collected from the officials from the concerned water authority offices.



## Objectives of the Study

1. To examine the demand consumption gap among different consumption slab categories
2. To examine the demand consumption gap in different urban divisions of the district
3. To examine the demand and supply Gap in water in different urban divisions of the district

## Methodology

Out of the total urban connections of 41937 consumers, 600 water consumers were selected by simple random sampling method. The number of samples from each Corporation/Municipality was fixed with probability proportional to sample size. That is proportional to the total connections in each Corporation/Municipality. It was also decided to select households from a minimum of two wards from each Corporation/Municipality. As the sample size to be selected from Kollam Corporation is high sample households was selected from eight wards of Kollam Corporation. Thus 600 beneficiaries were selected for examining the demand consumption gap among different consumption slab categories, the demand consumption gap in different urban divisions of the district and the demand supply Gap in water in different urban divisions of the district. The details regarding the connected water consumers were collected from the Water Connection Register from the concerned water authority offices. Descriptive statistics is used to analyse the data and tables and figures were used to present the data. The urban water supply schemes includes urban water supply schemes in Kollam Corporation and Punalur, Paravur and Karunagappally Municipalities.

### I. Urban Water Supply System in Kollam Corporation.

Since Kollam Corporation is bounded by Arabian Sea and Ashtamudi Lake open wells are not feasible in most of the places, especially along coastal belt due to the presence of salinity. For the day to day needs, inhabitants of the Kollam Corporation depend on piped water supply provided by Kerala Water Authority through Quilon Water Supply Scheme. Quilon Water Supply Scheme (QWSS) is a Comprehensive Water Supply Scheme commissioned during 1958 with Norwegian aid and was augmented during 1997 with World Bank aid. The scheme has its source in fresh water lake at Sasthamcottah located nearly 26 km away from Corporation limit. Raw water from the lake is pumped into the water treatment plant located at Sasthamcottah itself and the water treated in the plant is then conveyed to Kollam Corporation through 750mm dia cast iron pipes laid for a length of about 26km. Water thus reaching Kollam Corporation is collected in a 20 lakhs liters capacity sump located at Ananthavalleeswaram in Corporation limits. From this sump water is pumped to 10 Over Head Service Reservoirs located at various parts of the Corporation for distribution. Even though the installed capacity of water treatment plant at Sasthamcottah is 37.5 million litres per day (mld), only around 28 - 30 mld is being produced at present. Out of these quantities produced, only around 13 mld is reaching Kollam Corporation while the balance is being spared for the way side beneficiary panchayaths. Apart from the 13 mld of water receiving from Sasthamcottah, another 5 mld is being extracted from 35 tube wells located at various places within the Corporation. Thus 18 mld of water is being distributed to Kollam Corporation through QWSS at an average of 47 lpcd (litres per capita per day) (Vikasana Rekha 2013 Kollam Jilla Panchayat).

### II. Urban Water Supply System in Punalur Municipality

Punalur is a town in Kollam District. It is situated at about 4-5 km north east of Kollam. Punalur is now under municipal administration. Kallada River which flows through the heart of the city is the lifeline of Punalur. Currently Punalur Municipality is running on the piped water supply scheme "UWSS to Punalur Municipality" commissioned in 1980. The source of the existing scheme is Kallada river which has been a place of haven for many other water supply schemes of Kerala



Water Authority. The source drawal point is the 6m diameter well cum pump house at Nellippally. The raw water is conveyed through 600 m of 400 mm cast iron pipes from pumping main to the treatment plant. The raw water is treated at then water treatment plant situated at Valacodu. The treated water is distributed throughout the municipal area with the help of three booster pump houses and overhead reservoirs situated at the high level areas of Musavarikunnu, Thumpode and Arampunna. Though this water supply system provides some relief to the scarcity of drinking water in some areas it is not sufficient to meet the present and future requirements of the entire township due to many handicaps of the system.A tank has been erected with a capacity of 30,0000 litres. Water is collected at Musavari sump and supplied to the two divisions of Kanhiramala and Paravattom. As far as Paravattom is concerned public taps are used more and both divisions together have 120 connections and there is no coverage at the top areas of Paravattom and no connections are laid. The people face severe drinking water problem in the elevated areas. Water is supplied at an interval of 3 days in the divisions (Vikasana Rekha,Punalur Municipality).

### III.Urban Water Supply System in Paravur Municipality

In Paravur Municipality the Kerala Water Authority uses an open well and seven tube wells for water distribution. From five tube wells water is pumped directly without collecting in overhead tanks. From tube well at Koonayil water is pumped into the overhead tank within the Poothakulam panchayat limit and the water from tube well at Pookulam is collected at the overhead tank at Moolavattom and is distributed through pipe lines. About 25 lakhs litres of water is distributed per day by the Water Authority but about 48 lakh litres of water is required per day. Majority of wards in Paravur faces acute water shortage during the four months from February to May. Now water is supplied to the Municipal area and 13 Panchayats in Paravur through the Meenad Water Supply Project introduced with the help of JICA (Japan International Co-Operation Agency) ( Vikasana Rekha -2021 Paravur Municipality).

### IV. Urban Water Supply System in Karunagappally Municipality

Every areas of Karunagappally Municipality lie 20 metres below the sea level. It is a coastal belt which lies slanting from north east to south west. Canals flow from north to south and from south towards the west. Main water sources are canals and ponds. Now the drinking water supply by the water authority includes the water from Achenkovil River and three tube wells. Raw water is pumped from the river to the pump house at Kandiyoorakonam in Mavelikkara and from here water is taken to the treatment plant at Memana in Oachira and from here water is collected in the ground level sump at Thachayil Mukku at Karunagappally. From here water is collected in the overhead tank and distributed from here. But it is not enough to cover the entire population and hence water authority is planning to expand the network by laying pipes. The low-lying areas of Karunagappally are experiencing water shortage as the well water is not suitable for drinking because of the intrusion of sea water.

TABLE 1.1

#### Demand Consumption Gap among Different Slab Categories

Slab	N	Demand (in Litres)		Consumption (in Litres)		Additional quantity required (in Litres)	
		Mean	SE	Mean	SE	Mean	SE
BPL#	66	351.48	20.74	195.08	11.75	156.41	12.36
0-5	23	275.17	37.86	150.35	20.01	124.83	22.23



5-10	254	371.69	15.04	209.93	8.46	161.77	9.18
10-20	210	370.80	17.37	227.90	12.36	142.90	9.30
20-30	31	402.13	41.83	214.94	25.30	187.19	25.73
30-40	11	455.45	70.63	266.45	35.38	189.00	52.66
40-50	2	278.50	38.50	191.00	49.00	87.50	87.50
Above 50	3	780.67	719.69	546.67	486.70	234.00	233.00
Total	600	370.30	10.08	215.22	6.41	155.09	5.66

Source: Analysis of Primary Data

The perusal of data in table 1.1 reveals that the mean difference between demand and consumption is the highest among the slab category of 30-40. The mean difference between demand for water and actual consumption of water is the least in the case of those belonging to 40-50 slab. There is no much difference in the demand and consumption of water among the consumers belonging to this slab.

### 1.2 Demand Consumption Gap in Different Divisions

The demand consumption gap among consumers belonging to different divisions in the Corporation and Municipal areas is analysed and is presented in table 1.2

**Table 1.2, Demand Consumption Gap in Different Divisions**

Division	N	Demand (in Litres)		Consumption (in Litres)		Additional quantity required (in Litres)	
		Mean	SE	Mean	SE	Mean	SE
Kadappakkada	54	508.44	58.52	286.49	30.78	221.94	34.33
Kachery	54	405.54	23.48	204.69	11.41	200.85	15.84
Thevally	55	508.85	53.70	274.29	35.35	234.56	30.14
Port	54	330.24	21.50	173.02	13.23	157.22	13.52
Pallithottam	54	341.31	25.38	197.20	16.30	144.11	14.13
Thankassery	55	321.76	16.72	179.18	11.69	142.58	11.34
Kaikulangara	53	338.66	27.01	193.25	20.71	145.42	13.81
College division	52	344.69	27.77	216.52	19.74	128.17	15.20
Karunagappally- Ayanivelikkulangara North and West Divisions	74	280.00	12.63	185.00	10.54	95.00	7.66
Punalur-Kanhiramala and Paravattam	61	363.61	29.78	228.46	23.40	135.15	10.54
Paravur- Kurumandal, Krishibhavan	34	356.01	33.73	251.34	24.89	104.68	14.92
Total	600	370.30	10.08	215.22	6.41	155.09	5.66

Source: Analysis of Primary data



The perusal of data in table 1.2 reveals that the demand consumption gap is highest in the Thevally division of the Kollam Corporation and lowest in College division of the Corporation area. In the Municipal area the gap is highest in Kanhiramala and Paravattom divisions of Punalur Municipality followed by Kurumandal and Krishibhavan divisions of the Paravur Municipality. However the gap is the least in the divisions of Karunagappally Municipality.

### 1.3 Demand and Supply Gap in Litres in Different Divisions

Demand for water in different selected wards is collected from the primary survey. Water is supplied on alternative days by water authority in the wards of Kollam Corporation and in Punalur Municipality. The sources of water, the demand for water and supply from different sources is presented in table 1.3,

**Table 1.3, Demand and Supply Gap in Litres in Different Divisions**

Division	Main source of water	Demand (in Litres)	Actual Supply (in Litres)	Gap (Demand– supply) (in Litres)
Kadappakkada	Sasthamkotta Lake	145412.47	125000.0	20412.47
Kachery, Thevally, Kaikulangara, Thangassery	Sasthamkotta Lake	937323.13	200000.0	737323.13
Pallithottam, Port	Sasthamkotta Lake, Tube well	406994.69	250000.0	156994.69
College division	Sasthamkotta Lake, Tube wells	71696.00	14500.0	57196.00
Karunagappally- Ayanivelikkulangara North and West Divisions	Achankovil River	61040.00	22320.0	38720.00
Punalur-Kanhiramala and Paravattam	Kallada river	43632.79	37500.0	6132.79
Paravur- Kurumandal, Krishibhavan	Kallada River	193211.76	175000.0	18211.76
Total		1859310.84	824320.00	1034990.84

Source: Compiled from Field Survey &KWA

Analysis of data in table 1.3 reveals that among the divisions in Kollam Corporation Kadappakkada division receive water from a tank situated in the Kerala Water Authority office compound with a capacity of 1.1 mld. About 2.5 lakh litres of water is supplied to a population of 286 households on alternative days. Combining Kachery, Thevally, Kaikulangara and Thangassery the total supply comes to about 4 lakh litres and the tank capacity is 3.77mld for a total connected households of 1851. Pallithottam and Port has a supply of 1.5 lakh litres from a tank with a capacity of 1.2 mld supplying water to 1207 connected households. The tanks are never filled to their capacity. College division has 208 water connections and has a supply of 0.029 mld per day. Water is supplied only in alternate days. There is no supply from Sasthamkotta and supply from tube well is also low as the ground water level is very low. In Municipality area of Punalur water is supplied on alternate days. In Paravur municipality water is daily supplied and the number of connections in the selected wards of Koonayil

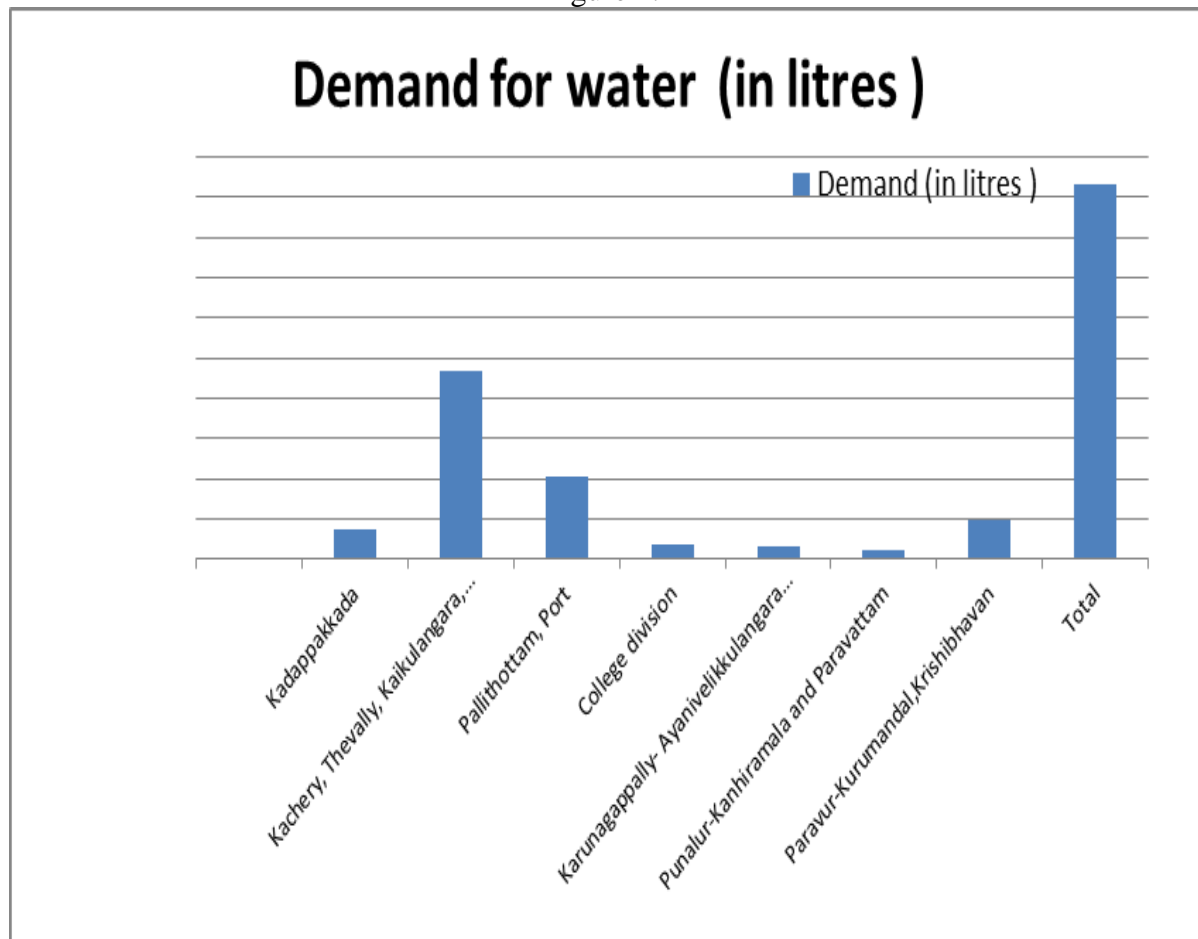


and Krishibhavan areas has a connection of 317 households. Since the JICA project is under operation water is supplied daily. In Karunagapilly the selected wards of Ayanivelikkulangara North and West Divisions have a supply of 0.03 lakh litres per month.

#### 1.4 The Water Demand

The present water demand is estimated by multiplying the demand for water per household with the number of connections in a particular ward. The water demand in the different wards in Kollam Corporation and Municipalities is represented in figure 1.1

Figure 1.1



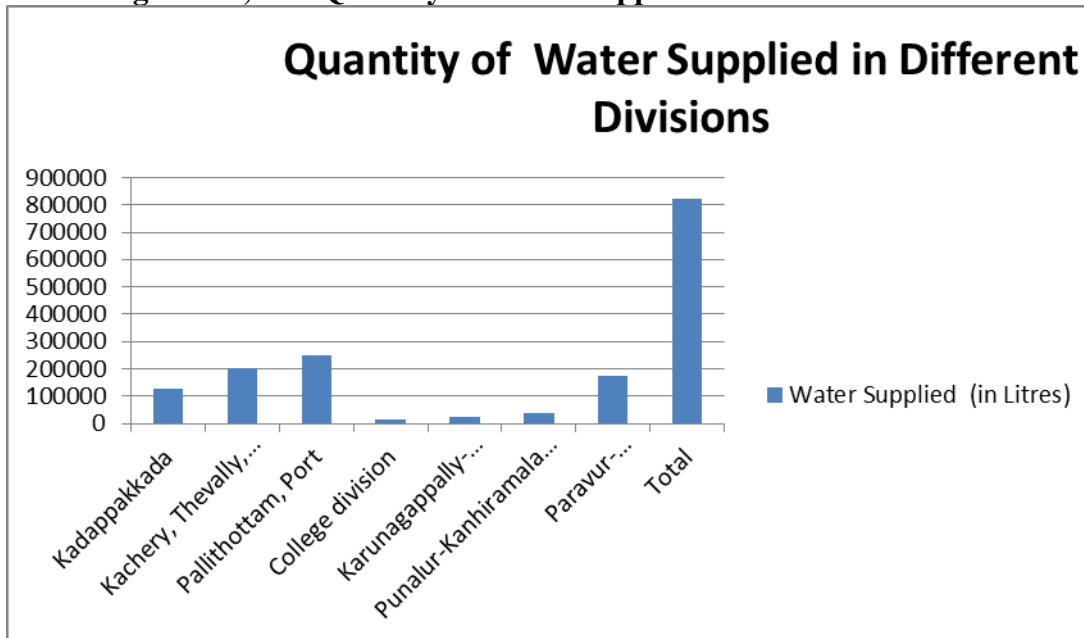
Source: Compiled from Field Survey

#### 1.5 The Water Supply

The water supply of each wards were collected from the officials of concerned water authority offices. The quantity of water supplied was estimated on the basis of the capacity of the tanks from which water is supplied and the pump capacity. The supply of water from the municipality and Corporation were collected ward wise. Some of the wards had common source of water. The water supplied to different wards of Kollam Corporation and Municipalities are from different sources like Kallada River, Achankovil River, Sasthamkotta Lake and tube wells in different wards of the Corporation and Municipalities.



**Figure 1.2, The Quantity of Water Supplied in Different Divisions**

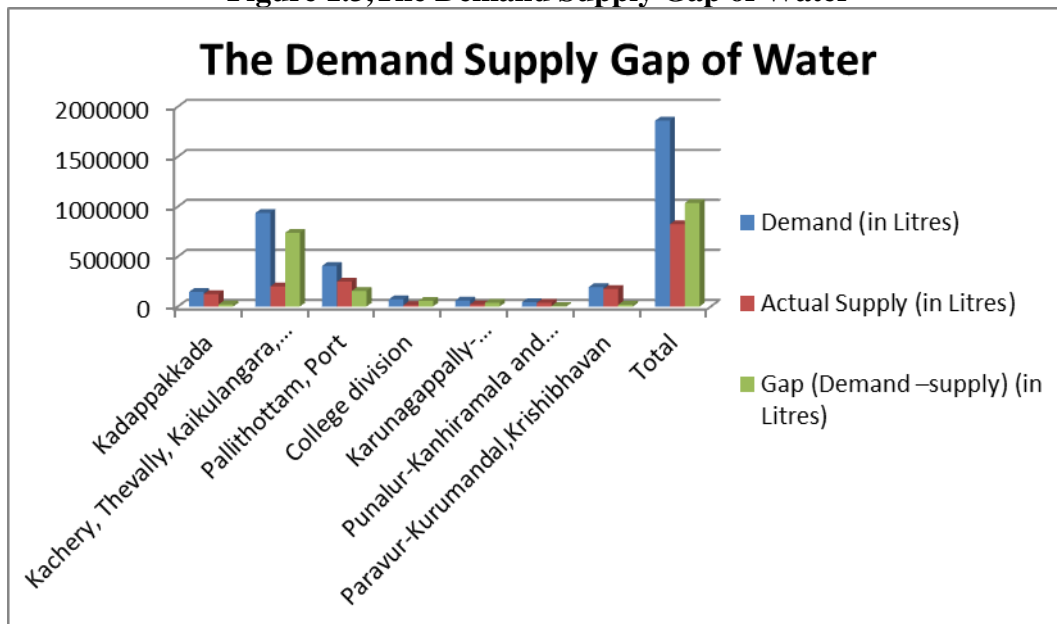


Source: Kerala Water Authority

### 1.6 The Demand Supply Gap in Water

The demand supply gap in different divisions in Kollam Corporation and Municipalities reveals that there is a huge gap in almost all divisions except some divisions where the gap is small as compared to other wards. However this gap between the demand for and supply of water demands urgent need for interference from the part of the government for finding out new sources and augmenting the supply. The gap between the demand for and supply of water is presented in figure 1.3

**Figure 1.3, The Demand Supply Gap of Water**



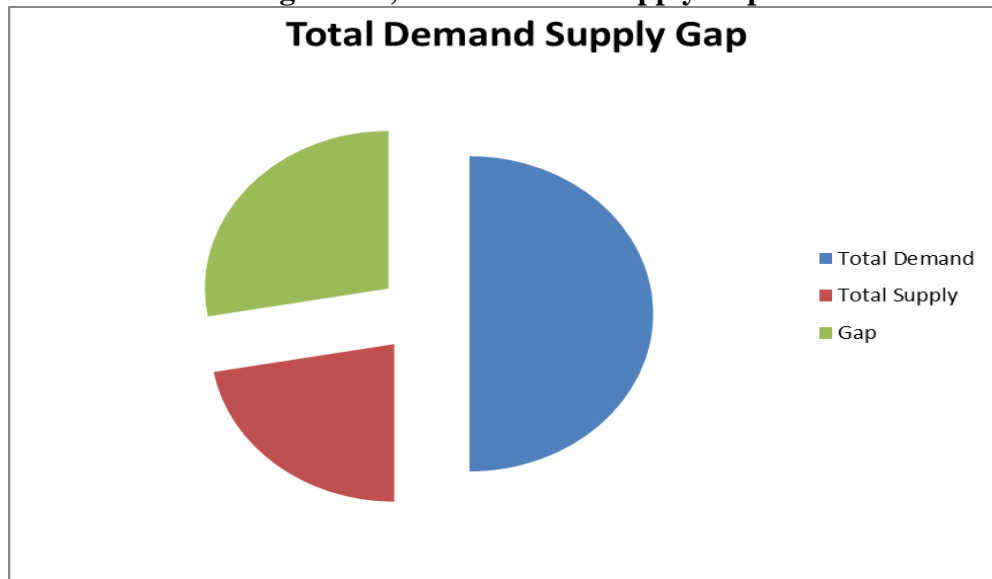
Source: Analysis of Primary Data and KWA



### 1.7 Total Demand Supply Gap

The total demand supply gap in all the wards in both Corporation and Municipalities is depicted in figure 1.4. The total demand in all the wards combined together is 1859310.84 litres. The total supply comes to about 824320.00 litres and the gap is 1034990.84 litres.

**Figure 4.4, Total Demand Supply Gap**



Source: Analysis of Primary Data & KWA

Analysis of data in figure 1.6 reveals that there exists demand supply gap in different divisions of the Corporation and Municipalities. There is a need for urgent augmentation of the water availability and supply so as to meet the present requirements as well as the future requirements for water of the growing population in the study area.

### Conclusion

The urban area as a whole suffers from demand consumption gap in water supply and also there exists wide gap in demand for and supply of urban water in Kollam district. However, this gap between the demand for and supply of water demands urgent need for interference from the part of the government for finding out new sources and augmenting the supply. There is a need for urgent augmentation of the water availability and supply so as to meet the present requirements as well as the future requirements for water of the growing population in the study area.

### References

1. Economic Review 2012, Kerala State Planning Board, Thiruvananthapuram, P.P-262-271.
2. Vikasana Rekha, Punalur Municipality.
3. Vikasana Rekha 2013, Kollam Jilla Panchayat, P.P-36-37.
4. M.P Veerendrakumar, Mathrubhumi Daily, Wednesday, May 15, 2013.
5. M.P Veerendrakumar, Mathrubhumi Daily, Friday, May 17, 2013.
6. M.P Veerendrakumar, Mathrubhumi Daily, Thursday, May 16, 2013.
7. A Lake's Last Sigh: R. Krishnakumar, Frontline Vol 27 – Issue 11 : May 22-June 4 2010
8. Desabhimani Aksharamuttam, March 6, 2013.
9. Report of the Working group on Drinking Water, 2002-2007,





10. State Planning Board, Thiruvananthapuram,P.P-Nil.
11. K.V .Mohanana ,Water Availability Demand Viability,Kerala Calling May 2006 P.P-6-9
12. Kerala Development Report, Planning Commission, Govt of India, 2008, P.P -224-225.
13. Krejcie,R.V & Morgan,D.W(1970), Determining Sample Size for Research Activities, Educational and Psychological Measurement,30,P.P 607-610.
14. The Hindu Daily, April 9 ,2013.
15. Panchayat Level Statistics 2006, Kollam District, Dept of Economics and Statistics, Thiruvananthapuram,P.P-6-11 ,
16. Department of Economics and Statistics,Govt of Kerala.
17. Water Resources of Kerala,PWD,Govt.of .Kerala ,June 1974,P.P-12-14 .
18. Vikasana Rekha -2021 Paravur Municipality P.P-1-16.
19. Master Plan ,Kollam Water Supply,Kerala Sustainable Urban Development project ,CES Consortium ,October 2010.
20. Proposal for Water Supply Arrangements to Kollam Corporation May 2013 ,Kerala Water Authority ,Project Division ,Kollam,P.P-Nil.
21. Malayala Manorama Sahayi 2006.
22. L.Suprabha, Economics Of Urban Water Supply System: A Case Study Of Public Water Supply In Kollam District, , PhD thesis,MG University August 2017.
23. [www.kollam.nic.in](http://www.kollam.nic.in).
24. [Lsgkerala.gov.in](http://Lsgkerala.gov.in).
25. [www.kwa.kerala.gov.in](http://www.kwa.kerala.gov.in).