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Shortage of Domestic Water in Jorhat Town, Assam, India

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Abstract

The existing water supplies in urban areas in different parts of the world are inadequate and inefficient for growing population. The problem of water shortage occurring in many urban centres of the world and Jorhat town is no exception to it. Therefore, the present study employs 'Shortage of Domestic Water in Jorhat Town of Assam'. The main objectives of this study are to highlight present sources of supply of domestic water and to investigate gap between demand and supply of domestic water in the town. The data base of this study consists of both primary and secondary sources. The result pertains that all the municipal wards are not covered by the piped water connections and thus people still collecting water from other sources which are not safe for domestic consumption, fully contaminated.

Keywords: Domestic consumption, water demand, water shortage, water supply.

Introduction

Water - the most vital element for life – is becoming scarce with every passing day. The demand for water has been increasing in urban areas as a consequence of rapid population growth and increase in per capita consumption. Most of the urban centres, despite having domestic water supply, face the problem of water scarcity and poor quality. It is now widely accepted that for many people, access to clean and safe water in sufficient quantities is the most serious challenge of survival in the twenty first century. The existing water supplies in urban areas in different parts of the world are inadequate and inefficient for growing population[1]. There are enormous numbers of people still not properly provided by water services, a challenge for the Millennium Development Goals (MDGs) as outlined at the World Summit on Sustainable Development in Johannesburg. This is the evidence of poor knowledge, policy failure and lack of infrastructure and mismanagement in context of sources and supply of water. The problem of water shortage occurring in many urban centres of the world and Jorhat town is no exception to it. Therefore, the present study employs 'Shortage of Domestic Water in Jorhat Town of Assam'. The main objectives of this study are to highlight present sources of supply of domestic water and to investigate gap between demand and supply of domestic water in the town to find out shortage of domestic water.

Study Area: Jorhat town (94°11´0´´ East Longitude and 26°44´30´´ North Latitude) It is bounded by Sarbaibandha in the north, Barpool, A.T. Road in the east, Kansaikia Jan in the west and Bongal Pukhuri in the south. Administratively Jorhat town is divided into 19 (nineteen) municipal wards having an area of 9.20 sq km. The main river is Bhogdoi that passes through the town along with other streams like Tocklai, Tarajan, and Jahkharijan etc. is situated between the plains of Brahmaputra River in the north and piedmont of the Karbi Anglong Hills in the south, while in the east and west there are Brahmaputra plains. Besides, the town is dotted with a number of ponds. The average annual rainfall is 2045 mm.

Methodology

This study is based on both primary and secondary data. The primary data has been collected through household survey in 2010 with the help of a structured schedule, which was canvassed in 5% households from each of the municipal ward of Jorhat Town, nearing about 600 households. The selection of households was taken by simple random sampling method. Whereas the secondary data was collected from Jorhat Municipal Board, Assam Urban Water Supply and Sewerage Board, Jorhat Public Health Engineering Department, Swajaldhara Scheme, Marwari Thakurbari Committee, and Town and Country Planning Department, Jorhat. Besides, data has been collected from various published and unpublished literature including journals, books, reports etc. Both primary and secondary data were compiled, tabulated and analyzed in MS Excel and depicted through diagrams and maps. Maps are prepared in Google Earth (open source software) and Arc GIS 9.3 Software. The both high level of population density and low level of water availability are leads to water shortage problem in Jorhat town. Water shortage occurs when the demand for water exceeds the available amount during a certain period of time and the calculation of water shortage done on the basis of two respective indicators i.e. water supply and water demand.

Results and Discussion

Discussion on present water supply infrastructure, Gap between Water Demand and Supply in Jorhat town and its analysis helped to demarcate water shortage areas in the Town. Detailed analysis is given in following lines.

Present Water Supply Infrastructure: There are two major sources of water for domestic consumption, viz., surface water and ground water in Jorhat town. Both the sources are important from the early period of availability of domestic water in different seasons and areas. Different sources of domestic water include piped water supply, rivers, ponds, and groundwater. The water supply systems harness both surface and groundwater for public distribution. Water supply is managed by four organizations, viz., Jorhat Municipal Board, Assam Urban Water Supply and Sewerage Board, Jorhat, Swajaldhara Scheme and Marwari Thakurbari Scheme. Jorhat Municipal Board has been providing water supply to its consumers since 1951, Assam Urban Water Supply and Sewerage Board, Jorhat started in 1998, where the Swajaldhara scheme begun in 2007, whereas, Marwari Thakurbari scheme started in 1970.

Water Supply Scheme of Jorhat Municipal Board: Jorhat Municipal Board provides water to a section of the people residing in almost all the municipal wards except ward number 19. This water supply scheme is divided into four zones. Table-1 clearly shows that all the water supply projects depend on groundwater except the Bhogdoi Water Supply Project whose intake is from the Bhogdoi River. All other water supply projects are situated far from the river hence depends on groundwater. Water supply scheme of Jorhat Municipal Board serves 22.60 per cent households of the town (table-2). Ward number VIII has the highest number of household connection that's comes 75.50 per cent of the households which is covered by Bhogdoi Water Supply Project, while the lowest is only 0.16 per cent pertaining to ward number XVII covered by Sonari Gaon Water Supply Project. Because, Sonari Gaon Water Supply Project is located in ward number XV, which is far from ward number XVII. Bhogdoi Water Supply Project is located in ward number III and nearer to number VIII, therefore, the household connection in ward number VIII is the highest. Besides these water supply projects, there are about 250 street hydrants located in different wards of Jorhat town. The distribution lines connected with each of the schemes are very old and due to other development activities of the town, viz. development and widening of the roads, construction of roads, drains and footpaths etc., there are plenty of many breakages and leakages in the lines.

Table-1
Water Treatment Plants of Jorhat Municipal Board

Sl. No.	Water Treatment Plant	Commission	Sources of water	Daily production	Location (in municipal ward)	Municipal ward covers
1.	Bhogdoi	1951	Surface water from river Bhogdoi	7,20,000	III	II, III, IV, V, VI, VII, VIII, IX and part of X and XVIII
2.	Nehru Park	1984	Groundwater	1,80,000	XII	XII, XIII and part of X
3.	Sonari Gaon	1984	Groundwater	1,80,000	XV	XV, XVII, XVI and part of XI
4.	Macharhat	1979	Groundwater	1,35,000	I	I, XIV and part of V

(Source**:** Jorhat Municipal Board, 2008)

Table-2
Households Water Connection by Jorhat Municipal Board

Sl. No.	Municipal Wards	Total Households	Households Water Connection	Percentage of water connection with respect to total households
1.	I	1063	172	16.1
2.	II	944	159	16.8
3.	III	1039	164	15.7
4.	IV	776	91	11.7
5.	V	655	129	19.6
6.	VI	428	211	49.2
7.	VII	810	230	28.3
8.	VIII	352	266	75.5
9.	IX	632	241	38.1
10.	X	647	276	42.6
11.	XI	347	92	26.5
12.	XII	566	272	48
13.	XIII	859	197	22.93
14.	XIV	868	247	28.4
15.	XV	1178	385	32.6
16.	XVI	789	116	14.7
17.	XVII	1246	2	0.16
18.	XVIII	176	29	16.4
19.	XIX	1133	0	0

(Source: Jorhat Municipal Board, 2008)

Table-3
Water Treatment Plants of Assam Urban Water Supply and Sewerage Board

Zone Number	T.P. Capacity in MLD	E.S.R. Capacity in liter	Length of Distribution Lines in m.	Source of water	Municipal Ward covered
I Nehru Park	4.081	1050000	33600	Groundwater through a DTW	10, 12 and 13
III and IV (Combined) Bhogdoi and Na-ali	5.867	1050000 (Zone–III) 1410000 (Zone–IV)	17700 (Zone-III) 25400 (Zone – IV)	River Water through floating barge	7, 8 and 9 in Zone-III and 7,3,6 and 18 in Zone-IV
VI Rajamaidam	3.427	1480000	13680	Groundwater through a DTW	1,2,5 and 12
VII Dhenususa	1.502	720000	13270	Groundwater through a DTW	19
Zone – II Sonari Gaon	Except one Deep Tube Well and piling works for the elevated service reservoir, no other works of the scheme are executed for this Zone.				
Zone – V Macharhat	For this Zone also, except one Deep Tube Well and piling works for the elevated service reservoir, no other works of the scheme are executed.				

Source: Assam Urban Water Supply and Sewerage Board, 2008

Water Supply Scheme of Assam Urban Water Supply and Sewerage Board, Jorhat: AUWS and SB, Jorhat has constructed another water supply scheme for the town. Under this scheme, the whole town has been divided into seven water supply zones, but only five zones have been covered until now. The combined Bhogdoi and Na-Ali zone use water from the Bhogdoi River (table-3). Groundwater is tapped for Nehru Park, Rajamaidam and Dhenususa zones. Water Supply scheme of the AUWS and SB has been able to cover 57.80 percent of the household's up till now. This board does not have water distribution lines in ward numbers IV, X, XIV and XVII. The daily production of Na-Ali and Rajamaidam zones is the highest than other zones because it covers more wards than the others. Ward number XIX is covered by AUWS and SB (table-3). As the various system components of all the zonal water supply schemes of AUWS and SB are only 8-10 years old, they have not completed their intermediate design stage of 15 years and are in fairly good condition.

Water Supply Scheme of Swajaldhara: The Swajaldhara Water Supply Scheme is situated in Hem Baruah Road, Tarajan, Jorhat, which serves above 3000 people living in 250 (4.43%) households spread over the ward numbers X, XI and XV. It supplies 80,000 litre (160000 litres in two times) water and the main water source is from ground. The depth of its deep tube well is 284 m. It started since 1st June, 2007, and maintained by a local committee. It is a Central Government scheme. Households get a maximum quantity of 400 litre water from the Scheme through morning (6.30-7.30 am) and evening (4.00-5.00 pm) supplies at a monthly charge of Rs. 150 from each household (Swajaldhara Project Committee, 2010).

Water Supply Scheme of Marwari Thakurbari: It is a non-governmental community based water supply scheme, which started from 1970. It is situated along A.T. Road and maintained by the Marwari people. The main source of this project is groundwater and it has two deep tube wells at a depth of 121.921 m and 60.96 m. There are two tanks with a total capacity of 7, 50,000 litres. Water supply is twice a day, the 1st supply of water is from 7.00 am to 2.00 pm and the 2nd supply is from 4.00 pm to 7.00 pm (Marwari Thakurbari Committee, 2010).

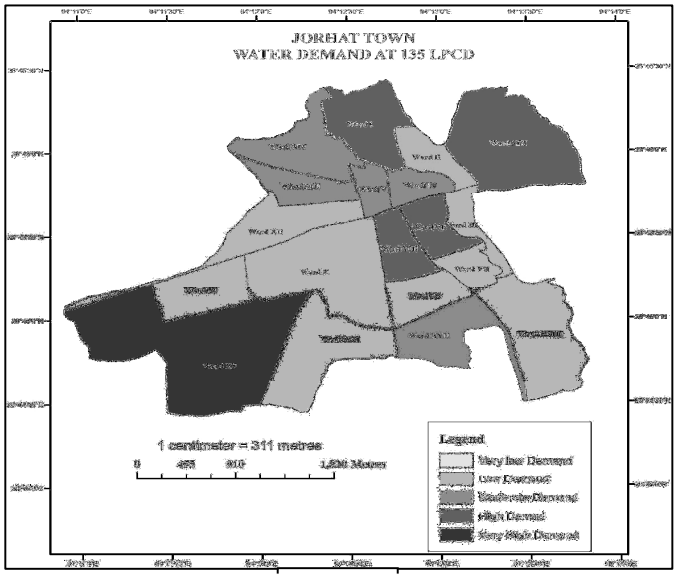

Figure-1
Jorhat Town Water Demand at 135 LPCD

Water Demand: The extensive urbanization, industrialization and the rise in the standard of living are as determinants of high demand of water[2]. The domestic water use/demand is a complex function of socio-economic characteristics, climatic factors and public water policies and strategies[3]. Presently 135 lpcd (litres per capita per day) of water is needed for an urban resident as per Government of India's norms, accordingly 1,99,32,885 lpcd

of water is required in Jorhat Town. Figure-1 provides the water demand at 135 lpcd in Jorhat Town and it reveals that the very high demanding areas comprise of ward number XV due to the increase of population and low coverage of piped water supply. The moderate water demanding areas covers ward number IV, V, XIII, XIV and XVII. The remaining wards fall under the category of low water demanding area (table 4).

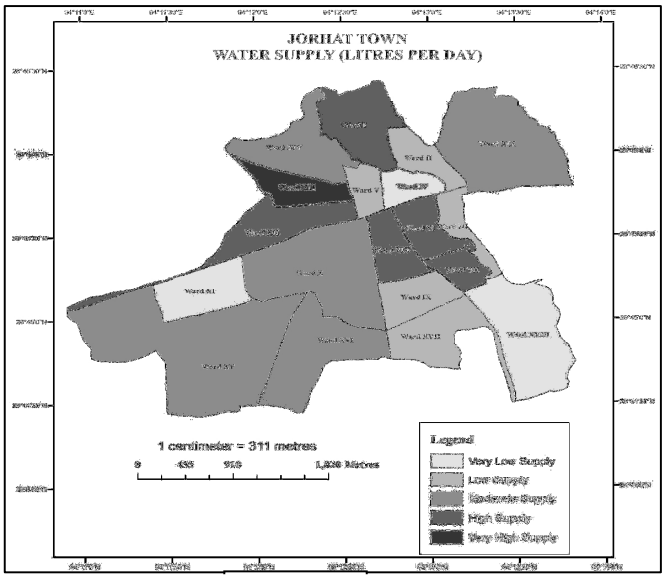

Figure-2
Jorhat Town Water Supply (Liters Per Day)

Water Supply: The welfare state has the responsibility for the supply of basic resources as water, while the life style, comfort and social welfare depend on the efficient and sufficient supply of this resource[4]. The four water supply systems have failed to provide sufficient water to the consumers; hence water supply is grossly inadequate and very far from civic norms. The sampled survey data (2010) reveals that the total demand of water from all the municipal wards is 3,47,490 lpcd, whereas total supply from the four water supply systems is 1,40,190 lpcd, therefore 2,07,300 lpcd is found to be deficit in Jorhat town. It has led to a serious water shortage condition in the Town. Figure-2 provides water supply coverage of Jorhat town and it reveals that the very high supply categories comprise of ward number XIII, due to the coverage of both piped water service providers of Jorhat Municipal Board and Assam Urban Water Supply and Sewerage Board, Jorhat. Beside this, Ward Number X, XIV, XV, XVI and XIX fall under the category of moderate water supply coverage. Ward number IV, XI and XVIII are experiencing very low water supply coverage, because of lack of proper planning, lack of infrastructure in water treatment plants covering these areas (table-4).

Gap between Water Demand and Water Supply: The population of Jorhat town is increasing at a faster rate. The population is ever increasing many times but the supply has not increased considerably.

Table-4
Gap between Water Supply and Water Demand

Ward Number	Water Demand at 135 lpcd	Water Supply (litres per day)	Gap between water supply and demand (in %)
I	22005	9098	6.23
II	16470	4522	5.76
III	15525	4928	5.11
IV	21195	3436	8.57
V	19845	5488	6.93
VI	22680	11350	5.47
VII	17010	9137	3.80
VIII	22410	9092	6.42
IX	14580	4627	4.80
X	11340	7160	2.02
XI	6345	3634	1.31
XII	16875	11818	2.44
XIII	20250	20440	-0.09
XIV	21195	7190	6.76
XV	35505	7160	13.67
XVI	10665	6800	1.86
XVII	19305	4530	7.13
XVIII	8235	3000	2.53
XIX	26055	6780	9.30
Total	347490	140190	100

(Source: Household Survey, 2010)

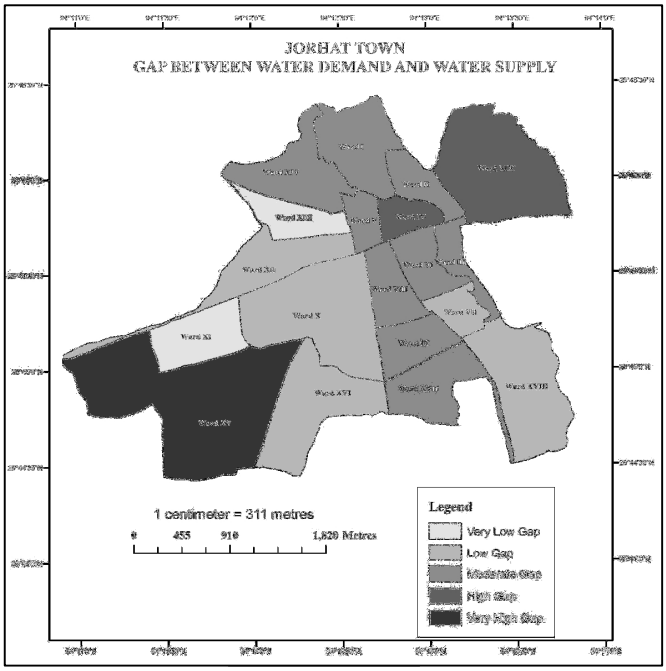

Figure-3
Jorhat Town Gap Between Water Deamnd and Water Supply

The supply of water from four present piped water systems is very less than the present demand, so, the rate of water supply is grossly inadequate and far from civic norms. The increasing demand on one hand, and the deteriorating condition of supply, on the other, increases the gap between supply and demand and thus the intensity of shortage goes on increasing at a faster rate. Figure-3 pertains to the categories of gap between water supply and water demand of Jorhat town and it reveals that the very high gap category comprise of ward number XV, where water demand is very high compared to water supply. On the other hand, very low gap category falls in the ward number XI and XIII, where supply of water is sufficient for domestic purposes (table- 4).

The people who do not have piped water connection depend on other sources of water such as Bhogdoi river, ponds (public as well as private) and dug well etc. which are not safe for health. However, many of them have been using water directly from the Bhogdoi River, which is not suitable for drinking purposes. Almost all the water bodies of Jorhat town have been polluted from different sources[5]. In respect of water quality in Jorhat town, Escherichia coli (E. coli) was found to be present in considerable proportion of three water sources, i.e., surface, supply and ground from which water is drawn for domestic purposes. Water from shallow surface sources as well as some of the supply sources contains high proportion of E. coli as compared to the groundwater sources[6]. It is interesting to note that for a long time in Jorhat town, there exist a parallel water supply system run by the "Water Vendors" who collect water daily in wheeled barrels mainly from the public ponds and water is often bacterial contaminated[7]. The piped water schemes are depending on Assam State Electricity Board (ASEB) for power. Total Electrical Power Requirement for operating the schemes under JMB is 275 KW and 550 KW for the schemes operated by AUWS and SB[8]. But due to inadequate rainfall, hydal power projects have not been able to generate enough power. So, piped water supply systems have failed to provide adequate water to the citizens of Jorhat Town.

Conclusion

From the above discussion, it is clear that the distribution of piped water is not equitable; as a result, some areas are suffering chronically from scanty supply. JMB does not have their distribution lines in ward number XVII and XIX while AUWS and SB does not cover the ward number IV, X, XIV and XVII. The distribution lines connected with each of the schemes are very old, and due to other development activities, viz., development, widening and construction of roads, drains and footpaths etc., there are so many breakage and leakage in the lines. All the schemes of JMB have crossed its intermediate stage since commissioning and condition of all the system components have already outlived their life. All the piped water schemes are highly depends on ASEB for power. But ASEB has been facing the problem of power shortage of itself and depending on other sources. There is a wide gap between demand and supply of domestic water in Jorhat town, thus the intensity of shortage increasing at a faster rate. The population of Jorhat town is increasing at a faster rate.

This faster growth sets the urgency for the exploration of the potential resource base which could not be done so far and thus shortage arises. People who do not have piped water supply, depending on other sources like pond, dug well, hand pump etc. which are not safe for health and suffering water borne diseases like diarrhoea, jaundice etc. The water consumption (lpcd) of every household of all the wards is very less than the present norms at 135 lpcd, thus water shortage increasing at a faster rate.

References

1. Jury W.A. and Vaux H., The Role of Science in Solving the World's emerging Water Problems, *PNA* **102(44),**15715-15720 **(2005)**

2. Yoo S.H. and Yang C.Y., Role of Water Utility in the Korean National Economy, *International Journal of Water Resource Development* **15,** 527–541 **(1999)**

3. Loukas A. and Mylopoulos N., Effects of Hydro technical Works Development and Water Resources Management on the Availability of Water Resources of Pinios river basin; In Moutzouris, C., Christodoulatos, C., Dermatas, D., Koutsospyros, A.D., Skanavis, C. and Stamou, A. (eds.) *Protection and restoration of the environment VII*. Mykonos Island, Greece **(2004)**

4. Basu S.R. and Main H.A.C., Calcutta's Water Supply: Demand, Governance and Environmental Change, *Applied Geography,* **21(1),** 23- 44 **(2001)**

5. Bordoloi R., Environmental Geochemistry around Jorhat-A Case Study, Unpublished Ph. D Thesis, Department of Chemistry, Dibrugarh University, Dibrugarh **(2003)**

6. Thakur R.S., Bhuyan K. and Burua R., Potability of Water of Jorhat City in terms of Bacteriological Quality, *Indian J. Environ. and Ecoplan,* **7(1),** 83-86 **(2003)**

7. Paul A.B., Quest for Drinking Water from British Raj to Swaraj; In Sabhapandit, P.C. (ed.) Jorhat 200. Jorhat Town 200 year's Celebration Committee, Jorhat, Assam, 200-201 **(1997)**

8. Anonymous, Proposal for improvement of Water Supply schemes for Jorhat town under Jorhat Municipal Board and Urban Water supply and Sewerage Boar, Executive Engineer, Urban Water Supply and Sewerage Board, Jorhat Division, Vice Chairman, Jorhat Municipal Board, Jorhat, Chairman, Jorhat Municipal Board, Jorhat, Assam **(1998)**