# URBAN WATER MANAGEMENT- A CASE STUDY IN BRAHMAPUR TOWN, GANJAM DIST. ORISSA

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## ABSTRACT

Owing to its location for away from river course, Brahmapur Town faces water scarcity. Though water is being supplied from two sources, in summer, the situation becomes worse. Due to increase in population density, high standard of living, total water supply demand also increasing. So to mitigate such problems, additional source of water supply is very much essential for Brahmapur Town. Infact, the surrounding area of Brahmapur Town is rich in groundwater potential which can be exploited through proper structures. In addition to this, an irrigation project can be constructed which will supply sufficient water to the town. Besides to have a constant & continuous yield of domestic tube well, the water harvesting structure be maintained properly which will recharge the groundwater table.

## 1.0 INTRODUCTION

Brahmapur Town (84° 4.7' 4.6" E logni – 19° 18' 4.2" N lat) of Ganjam District is one of the important towns in the Southern Orissa. (Fig1) Extending over 12.55 sq. mile area, it comprises of 34 revenue villages which have divided into 27 wards (Fig 2). Dating back to the origin of Brahmapur Town, it has a different story contrary to all major townships flourishing by river banks. Infact in the early part of 19$^{th}$ century due to the outbreak of plague, the township has been shifted from Ganjam, situated by the bank of Rushikulya River to Brahmapur which is 25 miles in land. Due to the absence of river nearby, water scarsity has been a part and parcel of the township from its very inception causing a perennial problem.

For this reason, a case study has been undertaken for the management of urban water.

## 2.0 STUDY AREA

The study area includes Brahmapur and its surrounding extending between the latitudes 19° 17' 07" and 19° 29' 48" North and the longitudes 84° 44' 52" and 85°

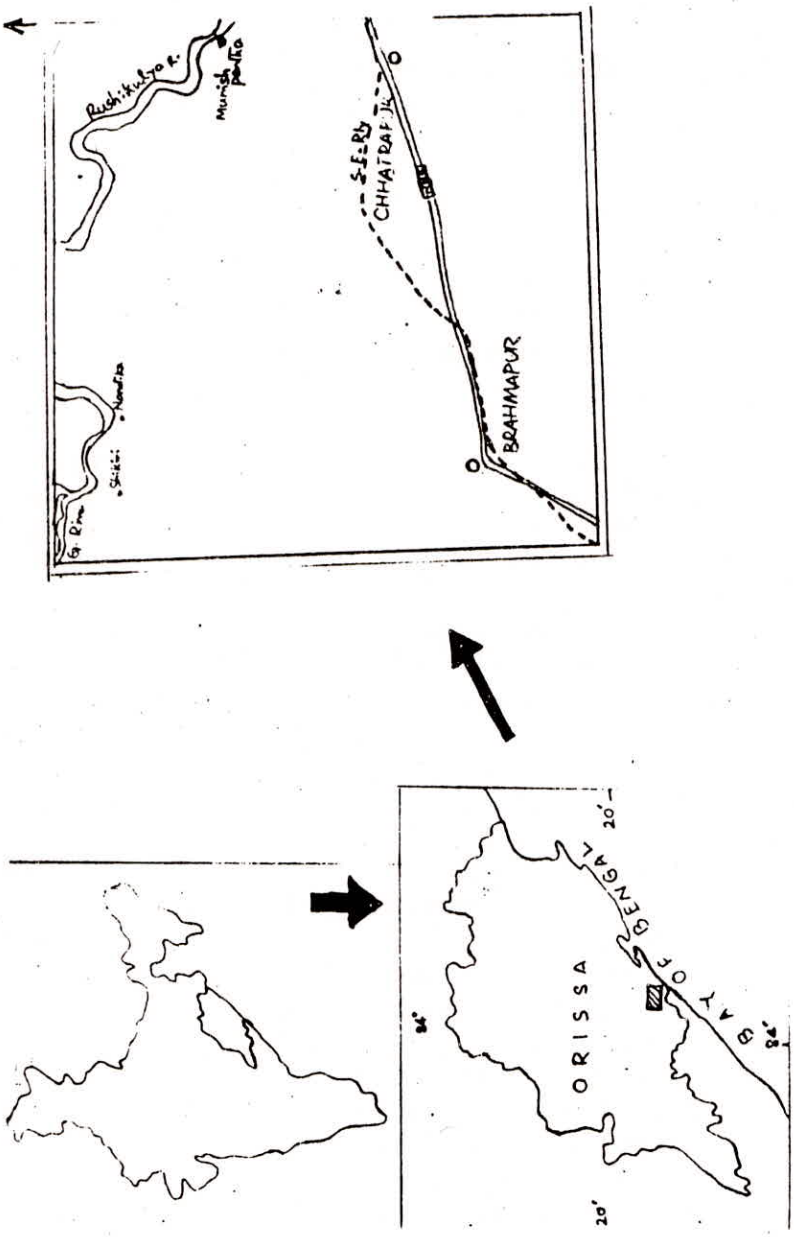


*Fig. 1 : Location Map of Study Area*

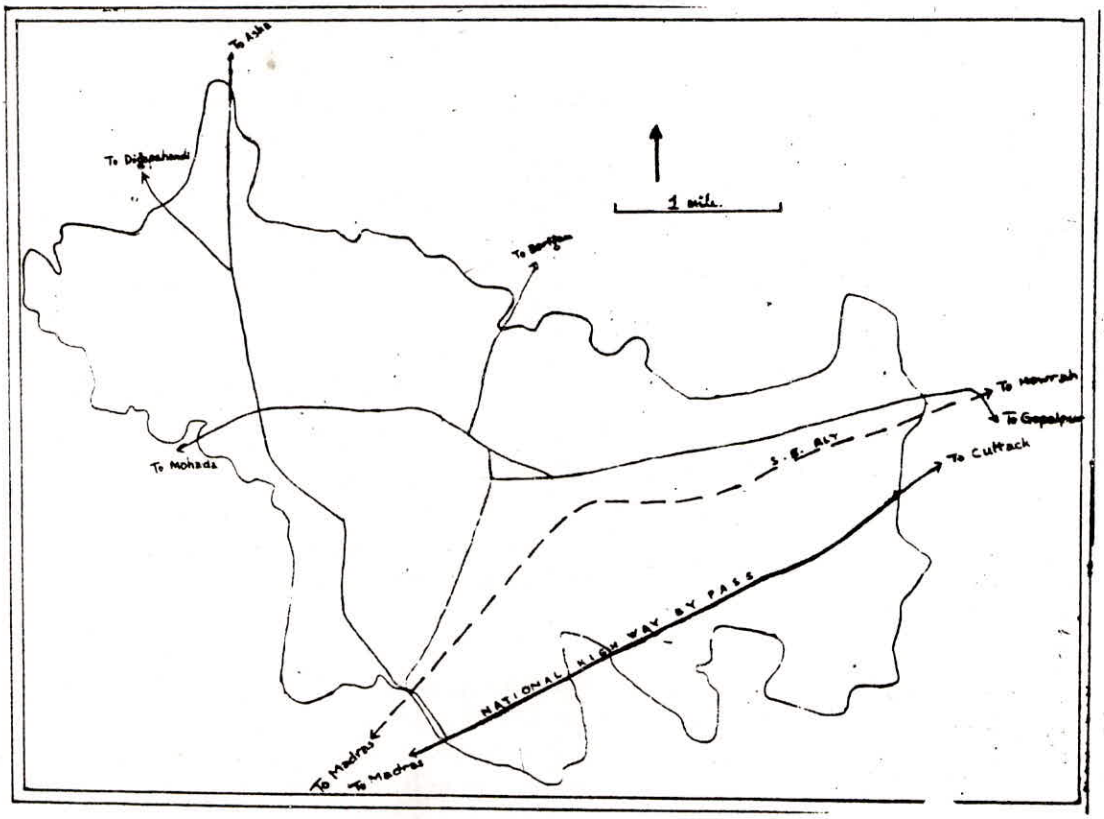


*Fig. 2 : Map showing Brahmapur Municipal Area*

01' 08" East and is covered by Survey India Toposheets No. 74A/11, 74A/15 and 74E/3. Geomorphologically it is located within the Indravati catchment. In the watershed Atlas of India a number '4F2' has been assigned to the catchment (AIS & LUS, 1988). Rushikulya River and its tributaries are the main drainage which caters to the need of the Brahmapur township. The study area falls under AW type of climatic classification of Koppen (as in Strahler 1971) and experiences a mean monthly maximum temperature of 33°C and mean monthly minimum temp. of 16°C. The average rainfall of the area is around 1272 mm.

## 3.0 DATA USED AND METHODOLOGY

For the preparation of base map survey of India topsheet 74A/11, 74A/15 and 74E/3 on scale 1: 50,000 are referred. Remotely sensed data from IRS IB LISS II (FCC) on 1: 50,000 scale are visually interpreted and the variables in image characteristics are used to identify various hydrogeomonphic units. The information thus obtained are transferred to base map. Data regarding the numbers and location of both medium and minor irrigation projects that are constructed across the Rushikulya and its tributaries are collected from Medium Irrigation Division, Govt. of Orissa, Brahmapur, borehole data to delineate groundwater condition, aquifer characteristics are collected from Orissa Lift Irrigation Corporation (Mechanical Division), Brahmapur. Data on population, aerial extension etc. are collected from Municipality Office, Brahmapur. The thematic and related information are integrated and used for the planning of drinking water management of Brahmapur Town.

## 4.0 RESULTS

According to the 1991 census, the population of Brahmapur was 210418 and the estimated population in 2001 will be a little more than 300000. For such a vast population the daily requirement of drinking water will be 120 lakh gallons. But what ever water is being supplied to the town is less than 50% of the required amount. Infact from the following three sources water is being supplied totalling to 50 lakh gallons per day.

- Through canal system, water from the Soroda Reservoir (Fig 3) which has been built across the river Rushikulya near Soroda village (84° 25' 57" E longi - 19° 45' 23" N lat.) is supplied to Dakshinpur reservoir (84° 00' 00" E longi - 19° 20' 42" N lat.) and from this reservoir through pipe lines, daily 30 lakh gallons water is being supplied to some parts of the Brahmapur Town.

- From Rushikulya river near Madhapur (84° 58' 57" E longi - 19° 26' 00" N lat.) daily around 15 lakh gallons water is being supplied to the Brahmapur Town through pipe lines.

- The tube wells within the town caters to around 5 lakh gallons water daily.

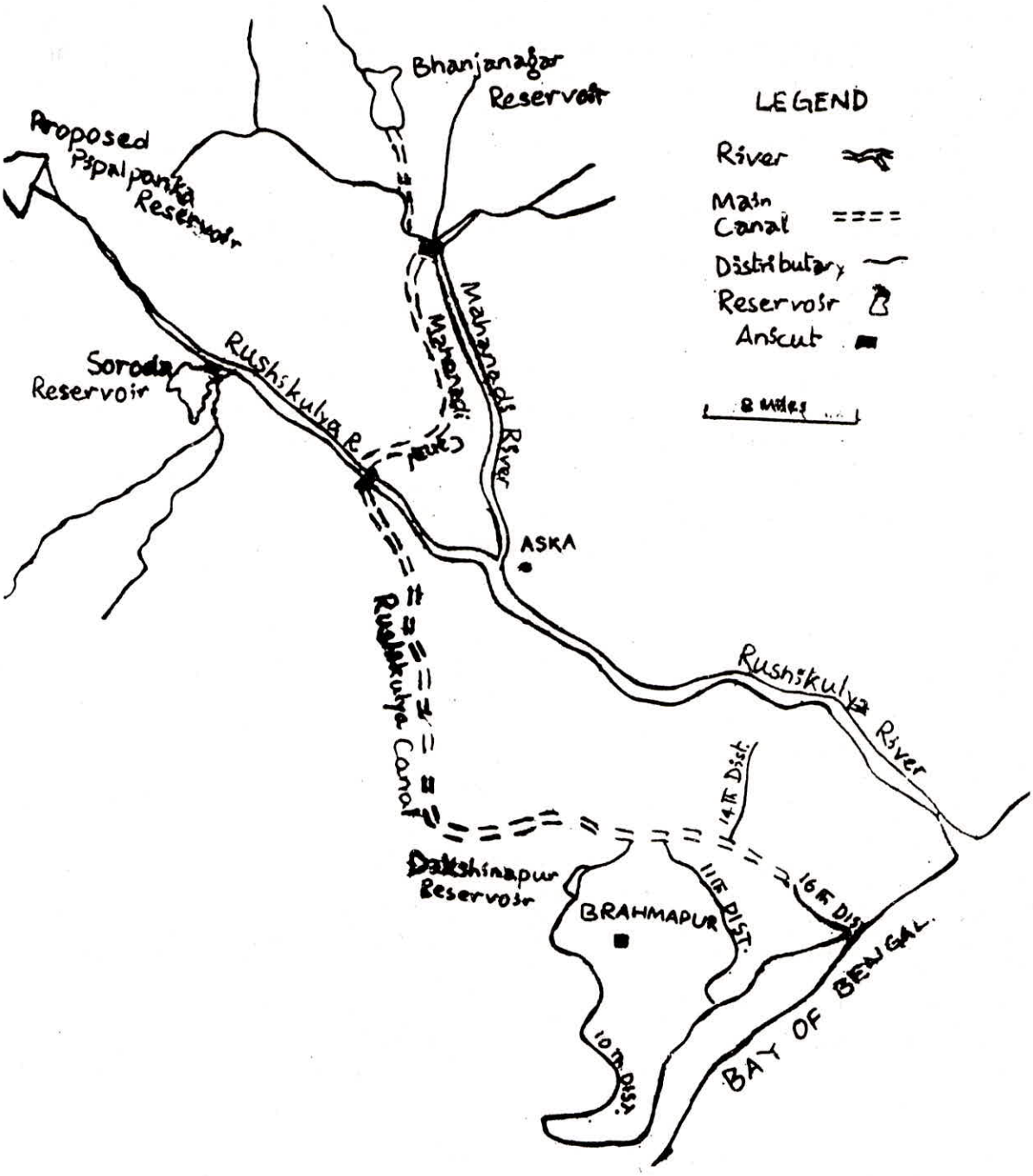


*Fig. 3: Map Showing Reservoirs & Canal Systems of Rushakulya*

So with these meagre amount of water, the city dwellers are somehow managing for the last few years. It becomes gradually more difficult due to the rise of standard of living and increasing population and ill maintenance of pipe lines. But the situation becomes grave every year during summer due to lowering of ground water level and reduction of water supply from Dakhnipur and Rushikulya as well. However, during this summer, the situation become further worse due to the scanty rainfall and other factors mentioned above. To alleviate this problem, water is being supplied by tankers brought by trains from Vishakhapatnam which is almost 152 miles away from Brahmapur. But this is not the permanent solution to mitigate severe water scarsity. For this purpose suitable alternatives are to be sought. Keeping in view the vast agricultural resources, it is not possible to supply more water to the town with the existing medium and minor irrigation projects. For this purpose, more irrigation projects should be made. But in the present scenario, that proposed project will not be able to supply sufficient water. So the only alternative that is left is to explore the vast ground water resources. Infact, the results by survey so far carried out the Central Ground Water Board and drilling activities by different organisations like Orissa Lift Irrigation Corporation, Dandia etc. have indicated a vast scope for groundwater development through suitable structures. (CGWB Technical Report, 1995). Also the hydrogeomonphology, drill hole data confirm this fact.

From the visual interpretation of the IRS IB LISS 11 (FCC), within the study area, broadly three hydrogeomonphological units have been delineated. (Fig 4) They are as follows:

**Denudational Hill ($DH_2$) :** These are massive hill ranges situated at the western side of study area. Groundwater potential is nil within these units. However these hills act as run off zone.

**Burried Pediplains ($BPP_2$) :** These are gently undulating plains with shallow to deep weathering and are underlain by highly weathered bedrock. Brahmapur Town and the surrounding area are situated on Burried Pediplain Groundwater Potential and deeper aquifers are governed by structurally weak zones. Infact within this unit, 4 palaeo-channels are located near Bagahala (84° 55' 49" E longi - 19° 26' 00" N lat.) Palyama (84° 56' 49" E longi - 19° 26' 10" N lat.) Mahanadapur (84° 56' 35" E longi - 19° 25' 55" N lat.) Singapur (84° 56' 58" E longi - 19° 26' 10" N lat.) and these are the promising groundwater zones.

**Flood Plain ($FP_1$) :** In the north and eastern side of the study area, the flood plains of Ghodahada River and Rushikulya River are present. These are narrow stretches of alluvium consisting chiefly of sand, silt and clay. Groundwater potential is good to very good.

The drill hole data of Orissa Lift Irrigation Corporation of some borewells within the study area (particularly within Burried pediplain & Flood Plain) also confirm the fact that groundwater potential is very good. The data are as follows:

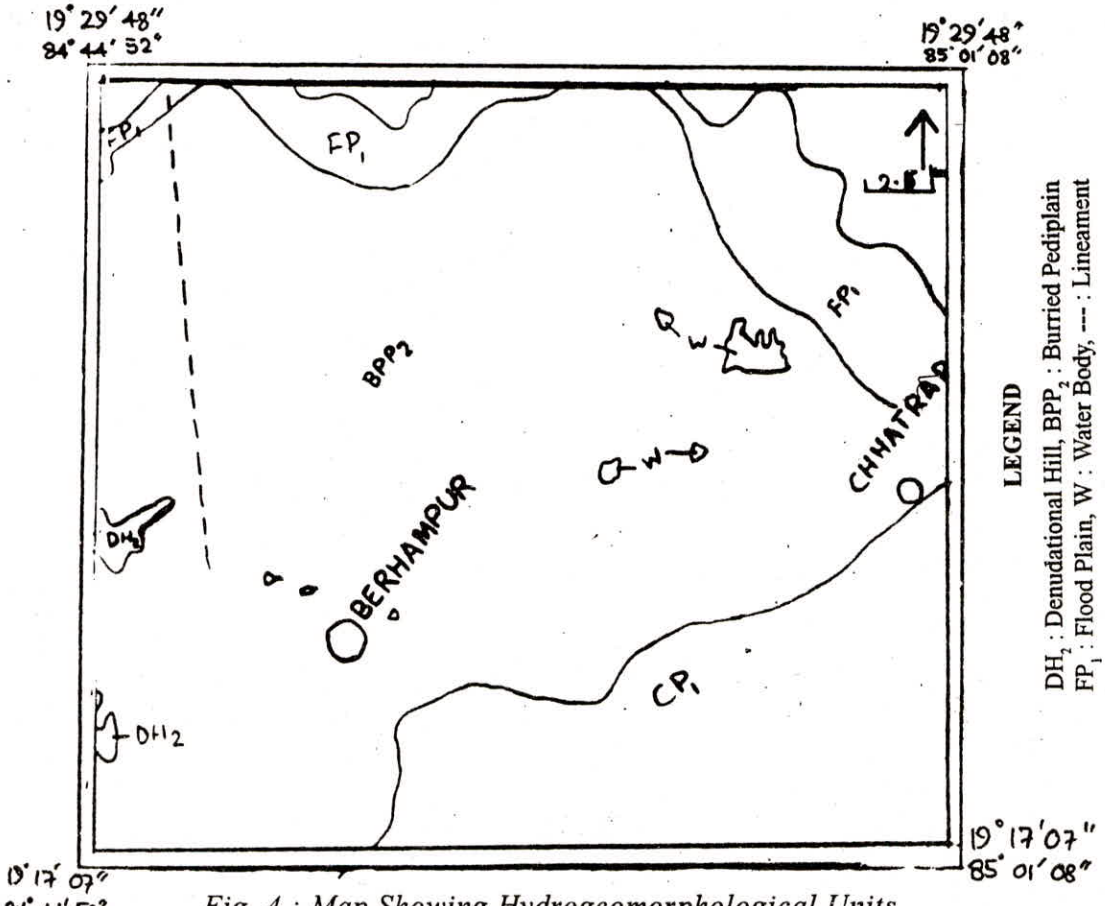


*Fig. 4 : Map Showing Hydrogeomorphological Units*

The chemical quality of the water of the study area is good enough to use for drinking purpose (CGWB, Tech. Report, 1995) as it is free from contamination with industrial and urban disposal.

Moreover, the geomonphology of the study area also helps in maintaining a favourable groundwater zone. In the eastern part of the study area, Rushikulya River has cut through a gorge near Munishipentha (84° 59' 51" E longi – 19° 26' 03" N lat.). The water table contour map (CGWB Tech, Report 1995) indicates a general trend of the groundwater flow towards south east. So the hill through which Rushikulya has cut through acts a subsurface barries for the downflow of the groundwater making the area a richer ground water potential zone.

*Table 1: Hydrogeological Data of Exploratory Bore Holes*

| Sl. No. | Location | Depth of Fractured Zones (in ft) | S.W.L (in ft) | Draw drawn (in ft) | Compressor Discharge (in gph) |
|---|---|---|---|---|---|
| 1. | Sikiri<br>84° 46' 41" E longi<br>19° 28' 37" N lat | 49-71 | 24 | 11 | 12,600 |
| 2. | Nandika<br>84° 48' 54" E longi<br>19° 28' 37" N lat | 50-54 | 12 | 12 | 10,250 |
| 3. | Hindula<br>84° 55' 58" E longi<br>19° 28' 47" N lat | 45-68 | 10 | 12 | 10,800 |
| 4. | Rajanapalli | 76-96 | 8.3 | 10 | 12,500 |
| 5. | Ralaba<br>84° 48' 07" E longi<br>19° 28' 32" N lat | 50-73 | 18 | 16 | 9,600 |
| 6. | Baranga<br>84° 58' 00" E longi<br>19° 26' 30" N lat | 65-93 | 42 | | 9000 |
| 7. | Kharida<br>84° 45' 47" E longi<br>19° 29' 48" N lat | 60-85 | 30 | | 9,200 |
| 8. | Karalati<br>84° 57' 31" E longi<br>19° 24' 30" N lat | 40-66 | 14.6 | 13 | 10,200 |
| 9. | Korapara<br>85° 01' 08" E longi<br>19° 24' 22" N lat | 95-125 | 15 | | 18,500 |

Besides, within the study area, particularly in and around Brahmapur town a good number of water harvesting structures are present which if maintained properly can act as groundwater recharge zones.

**Discussion:** So far irrigation projects are concerned only medium irrigation projects can supply sufficient water. Infact such a project can be constructed across river Rushikulya and Adangi near the village Piplapanka (84° 20' 19" E longi – 19° 49' 35" N lat.). The water of this reservoir through canal systems can brought and stored either in Soroda Reservior or Bhanjanagar reservior (84° 35' 00" E longi – 19° 55' 54" N lat.). From the aforesaid reservoirs the water in turn can be supplied to Dakhinapur Reservoir – the major supplier of drinking water to Brahmapur Town.

But keeping in view the fact that, in the coming 10 years, the population of Brahmapur Town will be more than 4 lakhs, it is necessary to sought for more source of drinking water. Within the study area, the northern and north eastern side of Brahmapur Town are potential groundwater zones. The discharge of bore wells drilled there, varies from 8000 gph to 18000 gph – average 13,000 gph. Normally 3-5 H.P pumps can be installed which may sustain daily eight hours pumping – thus from a single bore well 104000 gallons water can be drawn daily and depending upon the demand, we can go for 10-20 numbers of bore wells exploitation. From the bore wells, water can be supplied through pipelines to suitable water storage structure (both under ground tanks and high level tanks) in the Brahmapur Town.

If the water harvesting structures in and around Brahmapur Town are maintained properly, can recharge the water table. As a result, in the summer, the domestic tubewells can caters to the need without much lowering of the water table. Again within the municipality area, such water harvesting structures are now given lease for the construction of houses. Such practices be stopped.

Due to ill maintenance of pipe lines, a good amount of water is also wasted. At some places, people deliberately make holes in the pipelines and divert water to the nearby agricultural field. So the pipelines should be constructed below ground level.

## 5.0 CONCLUSION

The study reveals that the water scarcity problem which is perennial for Brahmapur Town can be alleviated by constructing new irrigation project, development of the available groundwater resources through suitable structures and maintenance of water harvesting structure located in and around the town.

## ACKNOWLEDGEMENT

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