ABSTRACT

Statement of the Problem

Guwahati is a fast growing major capital city of North east India covering an area of 216 sq. km and having a population of 8,09,895 according to 2001 census. However, in reality the present population may be above 12 lakhs. The main source of drinking water for the inhabitants of the city is ground water obtained from dug well, hand tubewell and deep tubewell set up by public on their own for drinking and other domestic requirements. Although the Brahmaputra river flows along the northern boundary of the city, still the Guwahati Municipal Corporation (GMC), other statutory bodies and various government departments fail to provide piped water to a large section of the city dwellers due to nonexistence of necessary infrastructure. The existing dug well, hand tubewell and deep tubewell together with the supplied water are not sufficient to meet the present requirement of drinking water due to rapid growth of population and depletion of the ground water level during the winter season i.e. from October to March. While implementing the urban water supply schemes for providing potable drinking water to the urban population, the Central Public Health and Environmental Engineering Organisation follows the norm of 135 litres per capita per day. In addition, adequate provision needs to be made in urban areas where water is provided through public stand posts at the rate of 40 litres per capita per day. For institutions, minor industries and commercial establishments, requirements of water should be assessed separately with proper justification (Manual of Water Supply and Treatment, Central Public Health and Environmental Engineering Organisation, Ministry of Urban Development, New Delhi, May, 1999). There is definitely and urgent need to examine the existing pattern of drinking water availability and use in this rapidly growing urban centre and to formulate sustainable water supply schemes based primarily on the vast, perennial source of the
Brahmaputra supplemented with other methods like rainwater harvesting, groundwater recharging etc. Hence, an attempt is made in this study.

Objectives of the Study

The major objectives of the study are as follows:

- To assess the water resources (surface and groundwater) in the study area to understand the water availability and scarcity problems.
- To examine the pattern of domestic water use in the study area and to identify the factors responsible for the existing situation.
- To evaluate the dwindling quantity and deteriorating quality of water resource in the study area.
- To delineate the ground water potential zones in the city using satellite based as well as conventional data available with various government departments and other organizations.
- To examine the existing water demand in the city and to suggest possible measures for improvement of water supply.
- To suggest appropriate measures for rational utilization of available surface water in the city.
- To study the environmental status, human interference and geo-environmental condition of water in the city.
- To examine the water management policy currently being followed in the city.
- To formulate a perspective plan for consumptive use of both surface and groundwater in the metropolitan area with greater emphasis on the use of Brahmaputra waters based on scientific study of the existing humanized environment and its current trends.
• To suggest water harvesting and other local solutions for a sustainable water supply in the area.

**Database and Methodology**

To fulfill the objectives and test the hypotheses of the study, the data have been collected from both primary and secondary sources. The collected data are analysed using GIS and other appropriate computer assisted analytical procedures. The analysed data are presented with in the form of a series of maps, tables, charts and graphs using appropriate cartographic techniques. Remote sensing techniques are also used in the study to achieve the chosen objectives. Database for the study comprised both primary and secondary sources. The primary data were collected through sample survey covering selected households in each ward for achieving the objectives and testing the hypotheses. The secondary data have been collected from official sources, published documents, Government and other agency reports.

The primary data comprise household information pertaining to water use and related socio-economic parameters collected using a structured questionnaire specially prepared for the purpose based on stratified random sampling technique.

**Chapterisation and Salient Results of the Study**

In seeking answers to the entire gamut of issues being addressed in the study, the work is divided in to six chapters. The first chapter presents a general introduction to the theme of present research providing a review of available literature, reports and monographs together with a historical perspective on the drinking water supply scenario in Guwahati city.

In the second chapter, the objectives identified for the study are formulated and the methodology to be adopted for achieving these objectives are discussed. Both the primary and secondary data sources are identified. An elaborate household survey based
on questionnaires have been designed. Besides, computer-based data management system and GIS techniques have been used for data processing, analysis and integration. Satellite remote sensing data are also used for deriving spatial information and their interpretation under GIS environment.

The third Chapter describes the geoenvironmental, socio-economic and environmental frameworks of the study area that have bearing on different aspects of water availability, supply and use in the city and the potentials as well as constraints for development of drinking water system.

The fourth chapter describes the present scenario of drinking water in the city in the context of availability, status of water adequacy and water quality. Water, the life sustaining system, is directly or indirectly related to human health and well being. With the rapid growth of the city, though a relatively smaller segment of the population obtain regulated safe drinking water, a large proportion still face the problem of lack of access to safe and adequate water. It was found that 60% of the surveyed households in the city have, to some extent, the required amount of water for domestic uses, while about 40% of the households face inadequacy at different levels. Out of the 40% deficient-water households, 20% faces inadequacy due to drying up of sources during the winter months, about 13.2% faces erratic supply, 3.1% do not have access to supply water and 3.7 % have water of undrinkable quality. In terms of water adequacy, it was found that only 9 wards have water adequacy, 34 wards are identified as inadequate and 17 wards fall under the category of highly inadequate. The large-scale withdrawal of ground water to meet the increasing demands of the exploding city population has already resulted in scarcity of drinking water in several parts of the city during the lean season.

The fourth chapter deals with quality of the piped water. It is found from microbiological analysis that the piped water is largely contaminated with faecal
coliform. As regards concentration of heavy metals in drinking water, the study reveals that copper concentration is high in some places during summer. Lead concentration is also found beyond permissible limit in the city. Zinc concentration is high in the summer season. Similarly, cadmium and selenium concentrations are observed to be high. There is no chromium content in the drinking water in the city. Due to excessive withdrawal of ground water, which constitutes the dominant source of drinking water in a large part of the city, occurrence of high fluoride concentration resulting in incidence of flurosis has been observed in certain parts of the city located mostly in frinze areas.

The fifth chapter describes mainly the pattern of use of drinking water in different wards of the city. The availability of drinking water from different sources is assessed and the pattern of use is discussed based on the surveyed data on households at ward level. This survey has revealed that 58 percent of the population depends on ground water or, in other words, they obtain their drinking water from wells, tubewells, deep tubewells etc. The position of piped water supply is miserably inadequate. It is surprising to note that the municipality and other statutory water supply agencies at the present juncture can not meet the need of piped water for a large section of urban citizens. This is primarily due to the absence of proper planning and coordination on the part of the supply agencies concerned and gross apathy and negligence of the government. Under the provision of the municipality law, supply of safe drinking water is a statutory responsibility of the municipality. Unfortunately, both the concerned organisations and the government have failed miserably in these aspects. In this chapter adequate emphasis has been given on these aspects, whereby inadequacy of urban water supply and pattern of scarcity have been highlighted. It is observed that both financial and maintenance aspects receive scant attention from the agencies and the government. It is also noted that availability of potable water is directly related to the physical layout of the ground, intensity as well as distribution of rainfall in and around the city, and increasing demand of ever growing
number of users. Another important aspect which is generally overlooked by the management is that slowly and steadily the available recharge and catchment areas of water sources have been depleted and degraded. This is one of the major impacts of the lack or deficiency in ground water conservation in most parts of the city area. The pattern of various uses of water at household level has been assessed and attempts made to relate it to the selected socio-economic and environmental determinants. The results obtained through household survey indicate that the pattern of use of water is determined directly by the socio-economic background of the users and, to some extent, by the geoenvironmental setting of the locality.

The sixth chapter deals with the issues of drinking water sustainability and supply in the city emphasizing the need for proper utilization of the perennially abundant source provided by the Brahmaputra river that flows along the northern margin of the city, and the topographic advantage of the area with scattered hillocks that provide suitable locations for siting several large-size water supply reservoirs to serve different parts of the urban area. Besides the modern, centralized type of large scale water management system based on the Brahmaputra, the study also suggests judicious use of time-tested, decentralized systems based on water harvesting and conservation through groundwater recharge, injection wells, percolation tanks (and beels), watershed management etc.

It is expected that the findings of this study will benefit the planners and decision makers in designing an efficient water supply system and formulating appropriate policies for supply and distribution of drinking water in the city on a sustainable basis.