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Analyzing Capacity of Existing Sewage Treatment Plants, Surat City

Abhishek Batliwala[1], Rohan Kania[2]

[1]Urban Planner, Padarrpan Architects, 107, 108/2nd Floor, Excellus Business Hub, AlthanBhimrad Road, Surat-395.17, Gujarat, India

[2]Urban Planner, Facile Maven, A-7002 Ascon Plaza Office Complex, B/h. BhulkaBhavan School, Adajan, Surat-395009, Gujarat, India

Abstract: ***Disposing off sewage in any natural water bodies or in open land without being treated can causehazardous effect on environment.This can even endanger human life. Sewage is water that emerges after utilization of fresh water by individual for domestic, commercial and industrial purpose. Sewage must be treated before discharging into natural drains. Surat city in Gujarat state of India with area about 326.515 sq. km. is selected for the research. Surat Municipal Corporation (SMC) is regulatory body in Surat city. Aim of this study is to carry out Gap analysis of the Sewage Treatment Plants of Surat city by analyzing current and future scenario.In this document existing 11 Sewage Treatment Plants (STP) of Surat cityare studied with catchment areas. Growing water demandand sewage generation is considered according to CPHEEO (Central Public Health and Environmental Engineering Organization) guidelines. Sewage gap indicates difference between Projected Sewage treatment limits (according to SMC) and Projected Sewage generation (according to future water demand).***

Keywords: Infrastructure; Sewerage; Sewage generation; Sewage treatment; Sewage generation Gap

1. Introduction

Rapid rate of urbanization, industrialization, and concentration of population towards cities ultimately reflect on higher demand of water for potable and non-potable use.Surat city has a comprehensive sewerage system to serve not only the domestic and commercial but also the industrial developments.As the City grew the City managers tried to provide infrastructures matching the growth (Paliwal, 2017). The city is divided into six drainage zones with a total length of 1776 km of sewerage network, 50 nos. of sewage pumping stations and 11 existing sewage treatment plants working under administration of SMC drainage department. Till 2006, Surat city area of 112.27 sq.km, 92.19 % area and 97.10% of the present population have been covered with sewerage systems. With the increase in the SMC limits from 112.274 Sq.km to 326.515 Sq.km in 2006 the coverage of sewerage has gone down from 92% to 47%.

Table 1: Existing Sewage scenario in Surat city

Coverage	149 sq.km. 74.00 %
Length Of Sewer Network	1776 km.
Existing Sewage Treatment Plants	11
Existing Sewage Pumping Stations	56

Main aim of this study is to carry out Gap analysis of the Sewage Treatment Plants of Surat city by analyzing current and future scenario of Sewage generation.

Objectives to accomplish goal are to analyze existing Sewage treatment scenario of Surat city. Second objective is Gap analysis between current and future demand of sewage treatment.

2. Methodology

Study is started with identification of infrastructural problems in Surat city, in which treatment of future waste water generation is major problem in Surat city. After identifying of problem, aim of the study and objectives for achieving that Aim are framed. Work was started with collecting geographical conditions and existing sewage scenario in city. Primary and secondary data collected from several sources. Study is concluded with finding and analyzing Sewage generation gap from collected data.

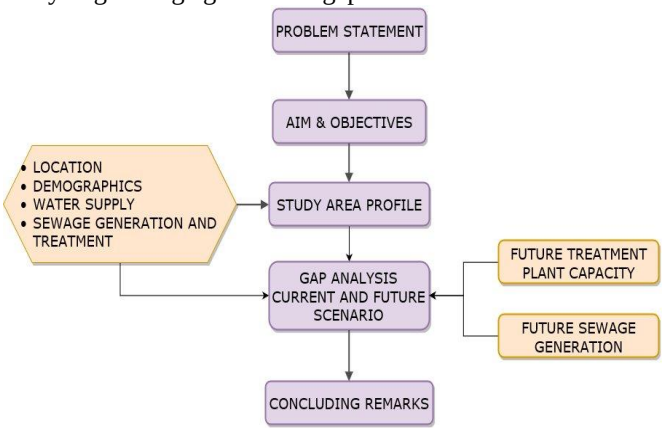

Figure 1: Research Methodology

3. Study Area

Surat is a fastest growing city in Asia and also a good initiative in "Swacch Bharat" scheme in recent years. To achieve good rank in scheme, Surat Municipal Corporation (SMC) has to take initiative to provide 100% treatment of waste water.Surat city is selected as study area to meet the demand of Sewage treatment. Existing coverage of sewage treatment is only 74%. This study will give opportunity to reach future demand for waste water treatment as well as provide healthy environment.Surat city is situated at latitude 21°12'N and longitude 72°52'E on bank of river Tapi having coastline of Arabian Sea on its West.

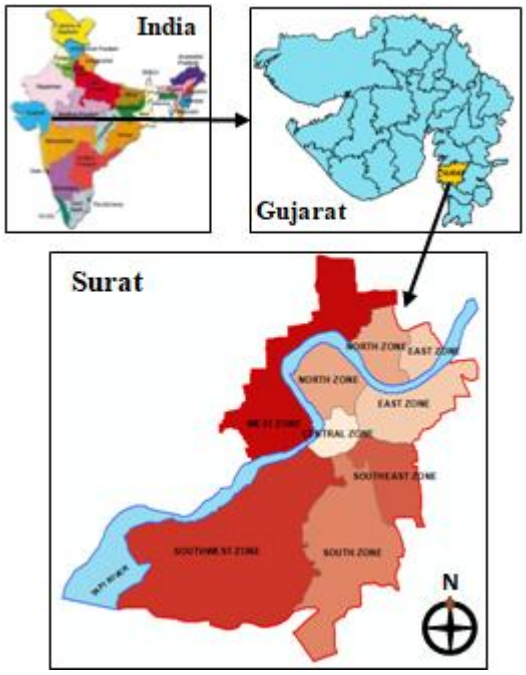

Figure 2: Study area location map

Demographic Data

In this study secondary data sources are major part in data collection. Data collection is carried out by collecting secondary information in which city's demographic data collected from (Census 2011) and other secondary data from Drainage department are collected. Population of Surat city in 2011 is about 4466826 and growth rate of last decade (viz. 2001-11) is 55.29%, and average annual growth rate is around 4.5%.

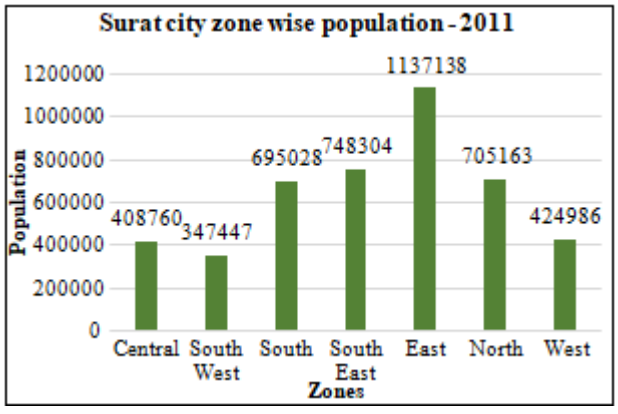

Figure 2: Surat City Population

Water Supply

In the year 2006, city limit was being expanded in two phases by State Government notification, about 27 Gram panchayats and 8 Nagar palikas merged into Surat city. Due to expanded area and population, the master plan was prepared to satisfy the water demand for the projected population growth. Future water demand is calculated as per CPCB standards (183 lpcd). Preparation of revised Master Plan is in progress at present by "Multimedia Consulting Engineers (Pvt.) Ltd.", Ahmedabad.

Figure 3: Water Demand

Sewage generation and Treatment

According to CPHEEO guidelines 80% of freshwater utilization will be discharged in sewers after treatment. Sewage generation is increasing due to population growth. In the year 2011 total sewage generation of Surat city was 653.94 MLD. And in year 2015 generation is 800 MLD.

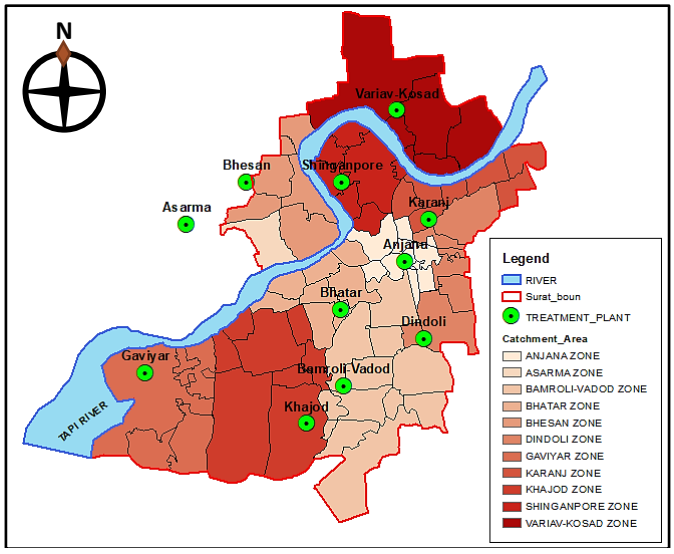

Figure 4: Treatment plant Map

The waste division of the Surat Municipal Corporation gives the important foundation to convey the sewerage from household and mechanical foundations of the city to the treatment plants, treating it and after that arranging it suitably. At present total 11 Sewage Treatment Plants are working under administration of SMC, which has treatment capacity about 1032.5 MLD. This all 11 Treatment Plants covers city area (i.e. 326.515 sq. km.).

4. Sewage Generation Gap Analysis

The study will based on future water supply and sewage generation. For that 2031 taken as projected year. Water demand and sewage generation is calculated for overall Surat city as per projected population in 2031.

4.1 Population forecasting

Existing population of Surat city in the year 2011 is 44,66,826 as per Census 2011. Population for year 2031 is estimate by average growth rate method. Surat city has decennial population growth rate between year 2001-2011 is

55.29%, and average annual growth rate is around 4.5%. Estimated population for the year 2021 and 2031 is 69,36,534 and 1,07,71,744 respectively as per.

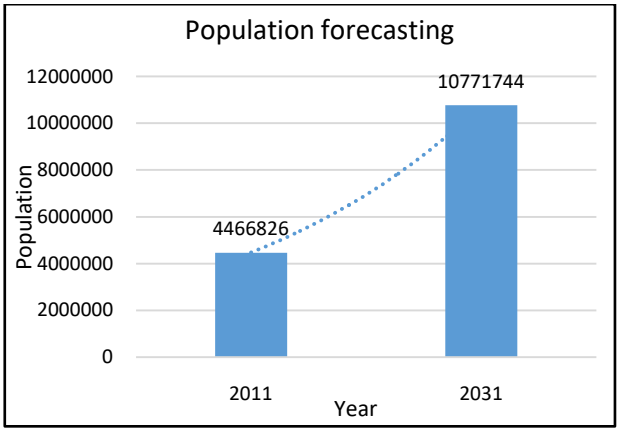

Figure 5 Population projection

4.2 Future Water Demand

Water demand for the year 2031 is calculated as per future population of the year 2031. Existing water supply of the city in year 2015 is 1000 MLD while Per capita water supply is taken as 183 lpcd (as per CPCB guidelines). As per projected population we can see in **Error! Reference source not found.Error! Reference source not found.** water demand for the projected year 2021 and 2031 is about 817 and 1971 MLD respectively.

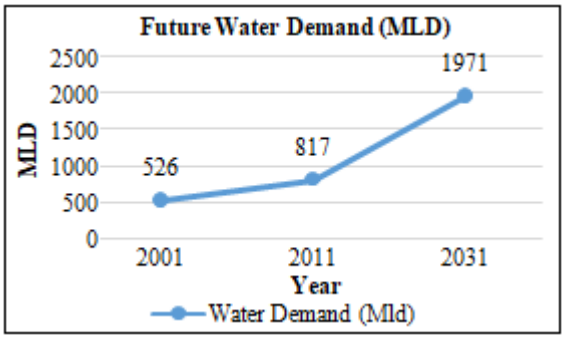

Figure 6: Future Water Demand

4.3 Future Sewage Generation

Future sewage generation for the year 2031 is calculated from 80% potable water demand for same year. Existing sewage generation of Surat city in year 2015 is 800 MLD. Projected sewage generation in year 2021 will be 1015.51 MLD and 1576.98 MLD in year 2031.

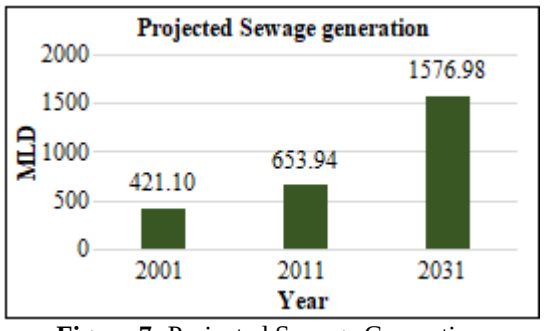

Figure 7: Projected Sewage Generation

4.4 Sewage Generation Gap

Sewage Generation Gap of Surat city is calculated bytaking difference between Projected Sewage treatment capacity of SMC and Projected Sewage generation of city.

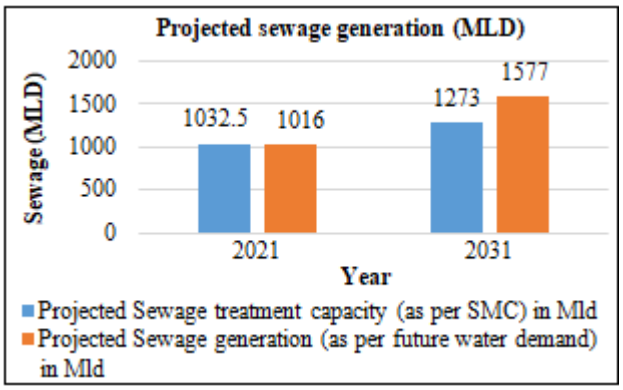

Figure 8: Projected Sewage Generation Gap

Treatment capacity of Surat city in the year 2021 is about 1032.5 MLD. After augmentation and upgradation of all the three plants capacity will be 1273 MLD. Future sewage generation in the year 2031 is 1577 MLD. Year 2021 sewage treatment capacity will exceed from future sewage generation. In the year 2031 difference between sewage treatment and sewage generation is about 304 MLD. Alteration of Sewage generation of the year 2021 and 2031 is shown in**Error! Reference source not found.**.

Table 2: Sewage Generation Gap

Year	*Projected Sewage treatment capacity (as per SMC) in MLD*	*Projected Sewage generation (as per future water demand) in MLD*	*Sewage generation gap in MLD*
2015	845.5	800	-
2021	1032.5	1016	-
2031	**1273**	**1577**	**304**

5. Concluding Remarks

Sewage issues in the city is increased due to expanded boundaries and increased population which lead to environmental pollution. Growing population leads to increase in water demand which results into higher sewage generation. Ifwe see, the water supply scenario of Surat city for the year 2015-16 is 1000 MLD and the sewage generation of the city is 800 MLD. At present,treatment plants are distributed all over the cities which is sufficient to treat the current sewage generated by the city till the year 2021. Gap analysis was carried out to identify whether the existing treatment plants of the city cater the requirement of existing as well as future sewage generated by the city. It is analyzed from study that Surat city will have higher generation of waste water in future years (viz. 2031), and hence moreinfrastructure facilities are required to treat future waste water generation.

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