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FUTURE LAND USE PATTERN & WATER SUPPLY PROPOSAL FOR SILVASSA TOWN

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Abstract - From the past few years source of pure water supply in union territory of Dadra and Nagar Haveli is going down due to growth of population and industries. The population of workers is increasing due to nearby villages which are attracted towards industries of the Silvassa town. As the population is increasing, the day by day demand of drinking water is also increasing. During the present study, household survey has been conducted to assess the current situation of water supply of Silvassa town. The different income groups have the varying water supply requirement. It has been observed that due to little awareness, people are using much more water than it is needed. In this study, the future demand of water has been calculated according to the population forecasted according to various water supply norms. The requirement of land for various activities is needed. So the land use proposal is given as per UDPFI guidelines.

Keywords -Land use, Silvassa Town, Water supply Proposal, growth of population, demand of drinking water.

I. INTRODUCTION

A number of interests are dictating the growth and development of Silvassa town envisions an idealistic development to provide a growth for other rapidly developing areas in Dadra & Nagar Haveli., the Silvassa town replete with industrial activity and housing to supplement the requirements of the whole territory. Lastly, private developers are competing with each other to buy out every inch of land in Silvassa to provide high-end accommodation and private townships to an anticipated demand. This study illustrates requirement of infrastructure facilities like water supply to fulfil the future demand. The infrastructure gap according to the existing condition has been computed with respect to standard guidelines. The future demand is of water supply is projected for 1.85 Lac populations with 17.22 Sq. km. area. This study analyzes the current situation of the area and to prepare respective proposals.

II. OBJECTIVES AND SCOPE

The objective of this study is to assess the present situation of water supply infrastructure development in Silvassa town and to provide future proposals.

The scope of study includes the other infrastructure facilities fire facility, police station, etc. and also the tourism development could be taken into account. Scope of study is limited up to future demand of infrastructures.

III. STUDY AREA PROFILE

Silvassa with the coordinates 20.2700° N, 73.0200°E is the capital of Dadra and Nagar Haveli having area 17.22 Sq. km. and population 98,265 as per census 2011. The town has 15 numbers of wards. The current population of Silvassa town is having lack of water supply facilities for their livelihoods. It is generally known for industries like, plastics and chemicals, which earns a lot of revenue for the Government. Due to, four industrial estates people attracted from different regions to settle in Silvassa.

Figure.1 Silvassa Town

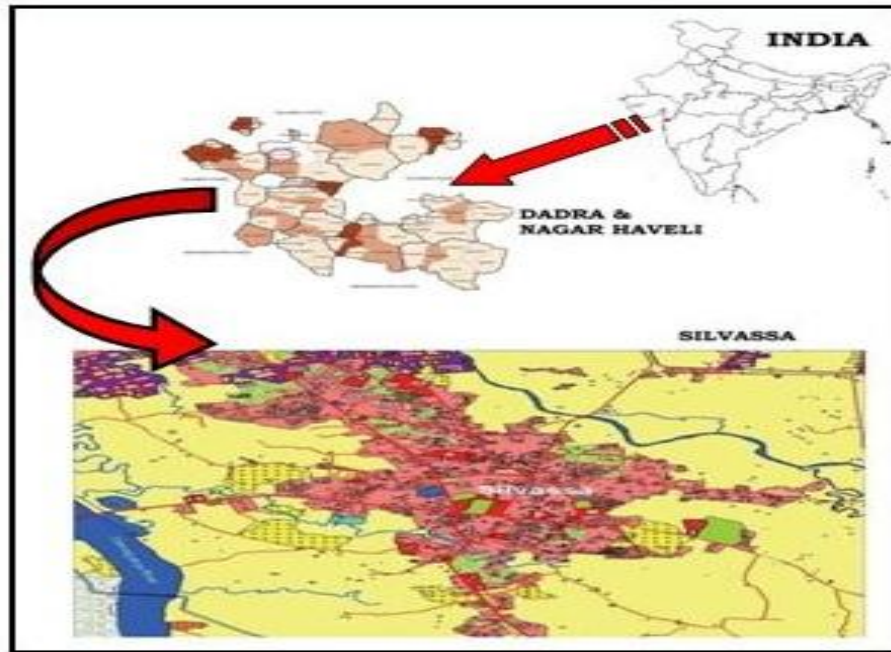


TABLE: 1- DEMOGRAPHY DATA

| SR.No | Discription | Year 2011 |
|-------|--------------------|-----------|
| 1 | Population (Lakhs) | 1,52,256 |
| 2 | Male | 89,580 |
| 3 | Female | 65,348 |

Source: - Town & County Planning Department, Silvassa. (Source: Census of India, 2011)

TABLE: 2 - EXISTING LAND USE PATTERN

| SN. | Type of land | Land Use (Sq. Km.) | %, Land Use |
|-------|------------------------|--------------------|-------------|
| 1 | Residential | 5.08 | 29.5 |
| 2 | Commercial | 0.26 | 1.5 |
| 3 | Industrial | 0.34 | 2 |
| 4 | Recreational | 0.34 | 2 |
| 5 | Public and semi public | 1.03 | 6 |
| 6 | Transportation | 1.89 | 11 |
| 7 | Vacant land | 1.21 | 7 |
| 8 | Agricultural land | 6.03 | 35 |
| 9 | Water bodies | 1.03 | 6 |
| Total | | 17.22 | 100 |

IV. METHODOLOGY

The methodology adopted for future infrastructure forecasting is consisting of six stages; the first stage is selection of study area with aim, objectives. In second stage literature review has been done. Third stage followed with collection of inventory and field data. Fourth stage consists of analysis and calculation for future requirements. In fifth stage proposals has been given for various infrastructures.

V. FUTURE PROJECTIONS

Future demand projections are done by using various forecasting methods and standard guidelines.

5.1 POPULATION PROJECTION (2031)

The future population is calculated by considering base year 2011 census. The demand of basic parameters of the city or town such as, land use and infrastructure facilities are required according to the increasing population. So, the population is calculated up to the year 2031 for the Silvassa town.

TABLE: 3- PROJECTED POPULATION FOR SILVASSA TOWN

| Name of Town | Year wise Population | | |
|--------------|----------------------|----------|----------|
| | 2011 | 2021 | 2031 |
| Silvassa | 98,265 | 1,41,535 | 1,84,805 |

Source: Calculated Data

Population of Silvassa town is forecasted as following:

5.1.1 ARITHMETIC INCREASE METHOD

Now,

$$P_n = P_0 + n \cdot x$$

Population after 1- decade beyond 2011,

$$= P_{2021} = P_{2011} + 1 \cdot x$$

$$= 98,265 + 1 \times 43,270$$

$$= \mathbf{1,41,535}$$
 (for 2021)

Population after 2- decades beyond 2011,

$$= P_{2031} = P_{2011} + 2 \cdot x$$

$$= 98,265 + 2 \times 43,270$$

$$= \mathbf{1,84,805}$$
 (for 2031)

TABLE: 4- ARITHMETIC INCREASE METHOD

| Year | Population | Increase in Population |
|-------|------------|------------------------|
| 1991 | 11,725 | - |
| 2001 | 50,463 | 38,738 |
| 2011 | 98,265 | 47,802 |
| Total | | 86540 |

| | |
|-----------------------------|-----------------------|
| Average increase per decade | x= 86540/2 = 43270 |
|-----------------------------|-----------------------|

Note: Above table indicate calculation of future population by Arithmetic increase method.

5.1.2 INCREMENTAL INCREASE METHOD

TABLE: 6- INCREMENTAL INCREASE METHOD

| Year | Population | Increment per decade | Incremental increase |
|-----------------------------|------------|------------------------|------------------------|
| 1991 | 11,725 | | - |
| 2001 | 50,463 | 38,738 | - |
| 2011 | 98,265 | 47,802 | 38,738 |
| Average increase per decade | | X= 86540/2 = 43,270 | Y= 38738/1 = 38,738 |

Note: Above table indicate calculation of future population by Incremental increase method.

The future population,

$$P_n = P_0 + n.x + n. (n+1)/2 .y$$

Therefore

$$P_{2021} = P_{2011} + 1.x + 1(1+1)/2 .y$$

$$= 98,265 + (1 \times 43,270) + 1(2/2) \times 38,738$$

$$= \mathbf{1, 80,273} \text{ (for 2021)}$$

$$P_n = P_0 + n.x + n. (n+1)/2 .y$$

$$P_{2031} = P_{2011} + 2. x + 2 \times ((2+1)/2) \times 38,738$$

$$= 142600 + (2 \times 43,270) + 2 \times ((2+1)/2) \times 38,738$$

$$= \mathbf{2, 62,281} \text{ (for 2031)}$$

VI. LAND USE PROPOSAL

Land use proposal is made for vision year 2031 for Silvassa town considering existing land use, existing growth of whole area and the potential of area for future development.

TABLE: 9 - PROPOSED LAND USE PATTERN, 2031

| SN. | Type of land | Land Use (Sq. Km.) | %, Land Use |
|-----|--------------|--------------------|-------------|
| 1 | Residential | 5.08 | 29.5 |
| 2 | Commercial | 0.26 | 1.5 |
| 3 | Industrial | 0.34 | 2 |

| | | | |
|-------|------------------------|-------|-----|
| 4 | Recreational | 0.34 | 2 |
| 5 | Public and semi public | 1.03 | 6 |
| 6 | Transportation | 1.89 | 11 |
| 7 | Vacant land | 1.21 | 7 |
| 8 | Agricultural land | 6.03 | 35 |
| 9 | Water bodies | 1.03 | 6 |
| Total | | 17.22 | 100 |

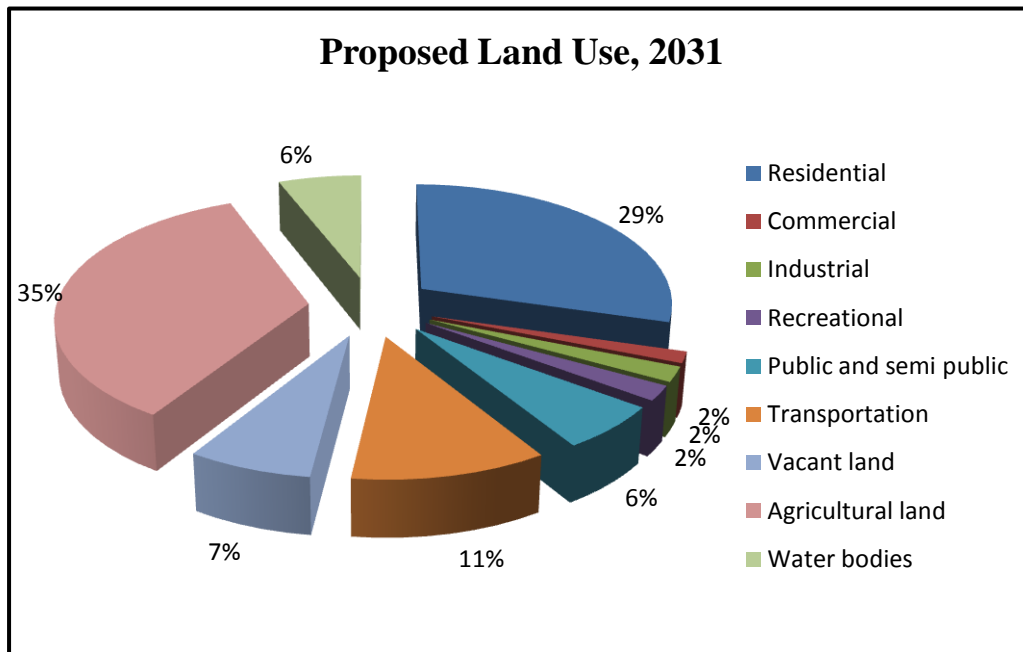


TABLE: 10- LAND USE COMPARISON OF SILVASSA TOWN ACCORDING TO UDPFI GUIDELINES

| SN. | Type of land | Existing Land Use % | Proposed Land Use% | UDPFI Guidelines |
|-----|------------------------|---------------------|--------------------|------------------|
| 1 | Residential | 23.81 | 29.5 | 45-50 |
| 2 | Commercial | 0.87 | 1.5 | 2-3 |
| 3 | Industrial | 7.26 | 2 | 8-10 |
| 4 | Recreational | 0.52 | 2 | 12-14 |
| 5 | Public and semi public | 1.57 | 6 | 6-10 |
| 6 | Transportation | 6.5 | 11 | 12-14 |
| 7 | Vacant land | 9.58 | 7 | - |
| 8 | Agricultural land | 44.83 | 35 | Balance |
| 9 | Water bodies | 5.05 | 6 | Balance |

| | | | |
|-------|--------|--------|-----|
| Total | 100.00 | 100.00 | 100 |
|-------|--------|--------|-----|

1. After the comparative study and analysis of the Silvassa town, it is developed with various industries. The majority people are engaged in the trade and commerce and the main work areas are industrial estates such as Pipariya, Amla, Mashat etc.
2. The industries are located at several places in the town. The major industrial pockets are at North-West, West and Southern parts Silvassa town. The North-Western pocket is at Pipariya near the Pipariya River. The industrial area in the southern part of town is Mashat estate. Most of the industrial pockets comprises of light and heavy industries like paper mill, chemical industry etc.
3. The residential societies are to spring up in the outer area of Silvassa town due to availability of cheap land and healthy environments. Also private housing is rising at the outer part of the town.

6.1 SALIENT FEATURES OF LAND USE PROPOSAL FOR SILVASSA TOWN

- ❖ The major commercial area is proposed along major road Vapi – Silvassa road, and Bhilad – Naroli Road, in which covers the major villages like Dadra and Naroli.
- ❖ The major industrial area is proposed for Naroli Village which is at eastern side of the Silvassa town.
- ❖ The major recreational area is proposed near water bodies i.e. river and ponds. Along Damanganga River, special recreational area is proposed on both side of river.
- ❖ Residential areas are proposed at different locations such as near lion’s school, sayali road.
- ❖ Agricultural areas protected on outer periphery of Silvassa town.

2 GAP ANALYSIS OF WATER SUPPLY

The gap analysis is done on the basis of standard guidelines, considering current scenario and future demand of the town for next 20 years.

Calculation of gap

$$P = N - M$$

Where,
 P = Water supply gap.
 M = Existing water supply.
 N = Required water supply.

TABLE: 11- WATER DEMAND SUPPLY ANALYSIS

| Guidelines | Water Supply Demand, (Lpcd) | | Gap, (Lpcd) |
|---------------------|-----------------------------|--------------|-------------|
| | Existing (M) | Required (N) | (N-M) |
| TCPO | 140 | 180 | 40 |
| CPHEEO | 140 | 150 | 10 |
| Small Town Criteria | 140 | 175 | 35 |

Future water supply is designed for projected population of 20 years:

6.2.2 WATER SUPPLY DEMAND OF SILVASSA TOWN FOR FUTURE

POPULATION

From the above methods of forecasting, the values are taken which is having more population, in order to furnish the future demand of water supply.

Table: 12- POPULATION FORECASTS

| Year | Arithmetic Mean Method | Incremental Increase method |
|------|------------------------|-----------------------------|
| 1991 | 11,725 | 11,725 |
| 2001 | 50,463 | 50,463 |
| 2011 | 98,265 | 98265 |
| 2021 | 141535 | 180273 |
| 2031 | 184805 | 262281 |

Now, the water demand per person =140 lit

For 2011 ---population 98,265

Therefore 98,265x 140

=13757100 Litres.

= **13.75 MLD**

Therefore,

Daily requirement of water for Silvassa & Amli town =**137.5** Lac lit. (For 2011)

For 2021 requirement of water:

= **180273**x 140

= 25238220 Litres

= **25.23 MLD**

For 2031 requirement of water:

= **262281**x 140

= 36719340 Litres.

= **36.71 MLD**

6.2.3 FUTURE REQUIREMENT OF WATER SUPPLY FOR SILVASSA TOWN

As water demand calculated above for the future population, following table shows the water supply requirement of Silvassa town for next 20 years.

TABLE: 13- FUTURE WATER DEMAND FOR SILVASSA TOWN

| Year | Population | Water demand MLD |
|------|-----------------|------------------|
| 1991 | 11,725 | - |
| 2001 | 50,463 | 7.06 |
| 2011 | 98,265 | 13.76 |
| 2021 | 1,80,273 | 25.24 |
| 2031 | 2,62,281 | 36.72 |

Suggestion: Above table indicate population and water requirement of 2011 and in 2021 & 2031 of Silvassa town. In 2031 water requirement is **36.72 MLD**.

VII. CONCLUSIONS

The main objective of the study was to assess the existing condition of physical infrastructures i.e. water supply as per the standard guidelines. Survey has been conducted for the study area with quality and quantity of water supply was at satisfactory level.

- ❖ The outer development of Silvassa town is unplanned and in haphazard manner.
- ❖ Water supply scenario is poor in Tokarkhada as compared to other areas of Silvassa town.
- ❖ Most of the private residential societies are growing towards outer periphery of the Silvassa town i.e. towards Dadra and Mashat.
- ❖ Surface water is the only source for the residents of the study area at present.
- ❖ Sub surface water quality is degrading due to increased industrialization and quantity is also decreasing because drawing large amount of water by increased population and industries.
- ❖ Road network connectivity in the Silvassa town and major villages is sufficient.
- ❖ So, the land use proposal has been provided as per the comparative study with UDPFI guidelines as revised **residential land use as 29.50 % , agricultural 35.00 % , Road network 11.00 %** and also increasing the land **for public & semi-public activities** as 6.00 %.
- ❖ The water demand for Silvassa town is proposed for the year 2031 is provided as **36.72 MLD**.

REFERENCES

- [1]. 20-Year Perspective Plan for Dadra & Nagar Haveli (December 2002), “Report on Development Charges”
- [2]. Report on Development Charges (To be levied under Section 22 of Dadra and Nagar Haveli Town & Country Planning Act, 1984)
- [3]. Industrial Policy of Union Territories– Dadra Nagar Haveli
- [4]. Padma Sunder Joshi, Kabita Bade Shrestha, Pushkar L Shrestha (December 2003), Household Water Use Survey and Research in Urban Kathmandu Valley, Centre For Integrated Urban Development, Anamnagar, Kathmandu.
- [5]. Abdul Shaban, (2008) Water Poverty in Urban India: A Study of Major Cities, Tata Institute of Social Science, Mumbai
- [6]. Jethoo, A. S. and Poonia, M.P (April 2011), Water Consumption Pattern of Jaipur City (India), International Journal of Environmental Science and Development, Vol. 2, No. 2, April 2011.
- [7]. Yao Li, M.C.R.P (2013), Analysis of Urban Water Use and Urban Consumptive Water Use In Nebraska – Case Study in the City of Lincoln, Grand Island And Sidney, University of Nebraska.