SUSTAINABILITY OF TERA VILLAGE LAKE

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Introduction:

Tera *[Lat. 23°17' North & Long 68°56'06" East]* is a historic village (500 years old) in Abdasa taluka (13 km) of Kutch district (84 km from Bhuj) in Gujarat State. It lays on the banks of Tretara (Three lakes) namely Chattasar, Sumrasar and Chatasar. There are three ancient man-made lakes adjacent to each other in vicinity of village, which provides water for village needs and are interlinked through underground channels. The interlinking of these three manmade lakes is a fascinating work of engineering and water management. It is a remarkable example of traditional knowledge of water conservation and management. (Wikipedia)

According to a study "Reviving a Water Heritage: Economic and Environmental Performances of Traditional Water Harvesting Systems in Western India" reveals that Rukmavati River traverses south east to North West and cross village Tera in the north. The river is ephemeral in nature and flows for few days in monsoon season only. (Keshab Das, 2002)

The talavs are reservoirs connected with each other in such a way that the overflow of first talavs fills the second talav and overflow of the second talav falls in the third talav. Overflow of the third talav spills over to the river. The talavs are dug from ground level to levels below ground level to depths (-) 6-8m bgl. The soil, which is obtained on digging, is used for raising embankments on the side. In the present study the focus was mainly on Sumrasar talav (spread area: 6000 m^2, average volume: 20,190 m^3) which is used for drinking water purpose.

Origin of Research problems:

Socio-economic: A narrative and detailed Questionnaire Method was adopted to obtain information during field visit to reach total of 165 respondents. As far as medical and health issues are concerned 6% of the total expenditure is utilized by respondents per year and they are unsatisfied with the facilities available. The health issues affecting the villagers are mostly diabetes, arthritis, blood pressure, skin ailments, paralysis, fever, waterborne diseases etc.

The current water supply is managed by other system which has low water quality. The annual rainfall averages 30 inches. The survey shows water deficiency for the households at 37 percent. (Chandra, 2014 survey)

Rationale:

From the observations and interpretations of the result obtained, the need for continuous study of lake water was essential because of dependency of people on these talavs for daily requirements. Since this place can develop into a tourist spot in near future due to its unique features of architecture, history and culture. In order to protect the place from the negative impacts this may arise due to increase in population, development of tourism or desertification.

Objective:

The objective was to study the possible water quality parameters of the talav Sumrasar for its potability with the constraints.

Methodology:

Water samples were collected in Jan, 2014 at the lake site in Tera village by new brand 300ml amber colour labeled plastic bottles (2 nos.) which were purchased already and sterilized before going for sampling. Since the samples were to be given to Geo tech Testing Lab, Bhuj and R. K. T. College, Ulhasnagar. The samples were collected near the edge of lakes where people collect water routinely by rinsing the bottles several times. Then water was collected ensuring the bottles are completely filled upto brim and air tight.

Physical Parameter: pH, Conductivity, Total Dissolved Solids were analysed. (Ref: Standard Methods for the Examination of Water and Wastewater; APHA, AWWA, and WEF, 21st Edition, 2005)
Chemical Parameters: Hardness, Carbonates, Bicarbonates, Chlorides and Organic Carbon were studied. (Ref: APHA, Standard Methods for the Examination of Water and Wastewater; 2005) (Ref: Trivedi R.K and Goel P.K, Chemical and Biological Methods for Water Pollution Studies, Environmental Publication, India 1986)

Microbiological: MPN, Total Microbial Count were studied. (Ref: Geo tech Testing Lab, Bhuj)

RESULT & DISCUSSION:

The chemical analysis of lake waters indicates hardness high above the limits mentioned. In the village survey also people have complaints about lake water to be hard and not advisable to drink. Since the geological record shows limestone and sandstone in abundance in soil and rocks of these regions, there could be possibility of increase in hardness (Krishnan, 1982).

Table no. 1: Microbiological test of Sumrasar talav:

Sr. No.	Test Standard	Specification Requirement as per (I.S 10500 - 1991)		
		Microbiological Test on 31/01/2014 of Sumrasar Talav		
1	Total Coliform Organisms (MPN)		2.00	
2	E Coli, No./100ml	APHA 9221 C, SM 22nd Edi.	Not detected	No Sample Should Contain E. Coli in 100 ml

Source: Geo tech Testing Lab, Bhuj (Jan,2014)

Table no. 2:Chemical Analysis of Sumrasar lake:

Parameters	Result
pH	7.9
Total hardness (mg /lit)	160
Carbonate (CO3) (mg/lit)	225
Bicarbonate (HCO3) (mg/lit)	457
Organic Carbon (%)	0.7
Chloride (Cl) (mg/lit)	49

Source: RKT College, Ulhasnagar (Feb, 2014)

The average rainfall is about 380 mm ranging from 440 mm in southern Kutch to 338 mm in western Kutch (Raju 1995). The rainfall ranged between 78–888 mm during 2000–2010. It only rains a few days per year in Kutch (15 days on average) and is considered to be a drought prone district as droughts are a recurring phenomenon (Mehta 2001, Lamba and Kapoor 2006, Joshi et al. 2009).

It is reported by the villagers that one spell of 150mm rainfall at the catchment Bhavanipar is sufficient to fill all the three talavs. (Keshab Das et al, 2002)

Interpretation of chemical analysis:

1. Hardness in water is caused mostly by dissolved calcium and magnesium, primarily the end product of dissolving limestone and dolomite from soil and rock materials. Hard water is beneficial to health. However, high hardness can cause lime buildup (scaling) in pipes and water heaters. It also reacts with soap to form a "scum" which decreases soap's cleaning ability, increases bathtub ring and turns white laundry grey. Acceptable value is near 150 mg/L are ideal from an aesthetic viewpoint.

2. Alkalinity is a measure of water's ability to neutralize acids, and so is related to pH. It results primarily from carbonate minerals, such as those found in limestone, dissolving in the aquifer. In the table it shows almost double the acceptable value which is 150 mg/l.

3. Chlorides are five times high which may be the result of soil salt, fertilizer, animal or other wastes which accumulates in first talav and subsequently draws into second, acceptable values is less than 10 mg/L.

4. Organic Carbon indicates some amount of impurities. Since there is no specific limits defined for it, interpretation about its compliance cannot be done.

5. In the microbiological studies the presence of E. coli has not been indicated in 100ml sample but the MPN shows 2 for Coliform which reveals that water is not suitable for drinking as per the standards. The diseases associated with this have also been reported during survey conducted.

6. As per the Indian Standards for drinking water goes, the lake water seems to be having high values than the range, due to human interference. Even the villagers expressed that talav water is heavy.

7. It was observed that in the periphery of lakes large spread of algae existed, which denotes that lakes are in the verge of eutrophication due to increased levels of salts.

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