

Wastewater management to achieve Zero Liquid Discharge village

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Abstract:- In India the rivers are getting polluted due to mixing of untreated wastewater into the river directly. Due to mixing of untreated wastewater and the non-availability of proper treatment system in villages it is necessary to reuse the treated wastewater for farming and other application and it is necessary to avoid the direct discharging of untreated wastewater into the rivers. The wastewater samples were collected from nalahs, river upstream and downstream for analyzing and comparing the quality with respect to pH, COD, BOD, TDS, TSS and total coliform. Based on the analysis report it has been observed that, due to directly mixing of untreated wastewater from village into the Dudhganga river, the concentration of COD and BOD in downstream is observed to be at increased level with respect to upstream concentration. An integrated approach is needed to manage the water and wastewater treatment so that water supply is kept clean and wastewater is recycled for beneficial use in agriculture with the use of low-cost treatment like in-situ nallah treatment with use of elephant grass and canna indica. Adopting such in-situ treatment with using natural resources is important to make the Zero Liquid Discharge villages in Maharashtra as well as in India to conserve the rivers.

Keywords: Sewage water treatment, River pollution, Low-cost treatment, Village wastewater management, In-situ treatment.

1. INTRODUCTION

The state of Maharashtra which is located in the western region of India, is characterized by its diverse landscapes, rich cultural heritage, and rapid urbanization. Within this dynamic milieu, the management of wastewater poses a significant challenge, particularly in rural areas where infrastructure and resources are often limited. One such region grappling with wastewater management issues is the village of Siddhanerli situated in the district of Kolhapur.

The objective of this research paper is to comprehensively assess the wastewater management practices in Siddhanerli, evaluate the repercussions of untreated wastewater disposal into the Dudhganga river, and propose viable, low-cost treatment methods tailored to the community's needs. By undertaking this study, aimed to shed light on the critical issue of wastewater management at the grassroots level and provide actionable insights for sustainable solutions. The review of existing wastewater management practices in Siddhanerli will serve as a foundational step in understanding the current scenario. This analysis will encompass an examination of the infrastructure, policies, and community practices related to wastewater disposal and treatment. Additionally, it will highlight any gaps or inefficiencies in the existing wastewater management system that contribute to environmental degradation and public health risks. Subsequently, the evaluation of the impact of untreated wastewater disposal into the river will illuminate the ecological and social consequences of this practice. By assessing water quality parameters, ecological health indicators, and community perceptions, we aim to quantify the extent of pollution and its ramifications on both the environment and human well-being.

Drawing upon the findings from the initial assessments, the research will then focus on identifying suitable low-cost wastewater treatment methods tailored to the specific needs and constraints of the community. Emphasizing simplicity, affordability, and effectiveness, these methods will be evaluated based on their technical feasibility, scalability, and socio-economic implications.

Finally, the research endeavors to facilitate coordination with the gram panchayat, the local governing body, for the effective implementation of the wastewater management scheme. Through stakeholder engagement, capacity building, and participatory decision-making processes, we aim to foster community ownership and ensure the long-term sustainability of the proposed interventions.

In summation, this research paper seeks to address the multifaceted challenges of wastewater management in the rural context of Maharashtra, with a specific focus on Siddhanerli village located in Kolhapur district. By undertaking a holistic approach encompassing assessment, evaluation, identification, preparation, and coordination, we aspire to contribute towards the realization of a cleaner, healthier, and more sustainable environment for present and future generations.

1.1 Study area

The Siddhanerli Village of Maharashtra state is situated on the bank of Dudhganga River. The Village lies between latitude 16°32' to 16°33' and longitude 74°14' to 74°16' with an elevation of 578 m above mean sea level. The location of Siddhanerli Village *Figure* and has an area of around 430000 m². The climate of Siddhanerli is tropical and the annual rainfall of the district is 1200-1500 mm. The population under of Siddhanerli as per Census 2011 is 6152 and per capita water supply to village as per local body source is 70 LPD.

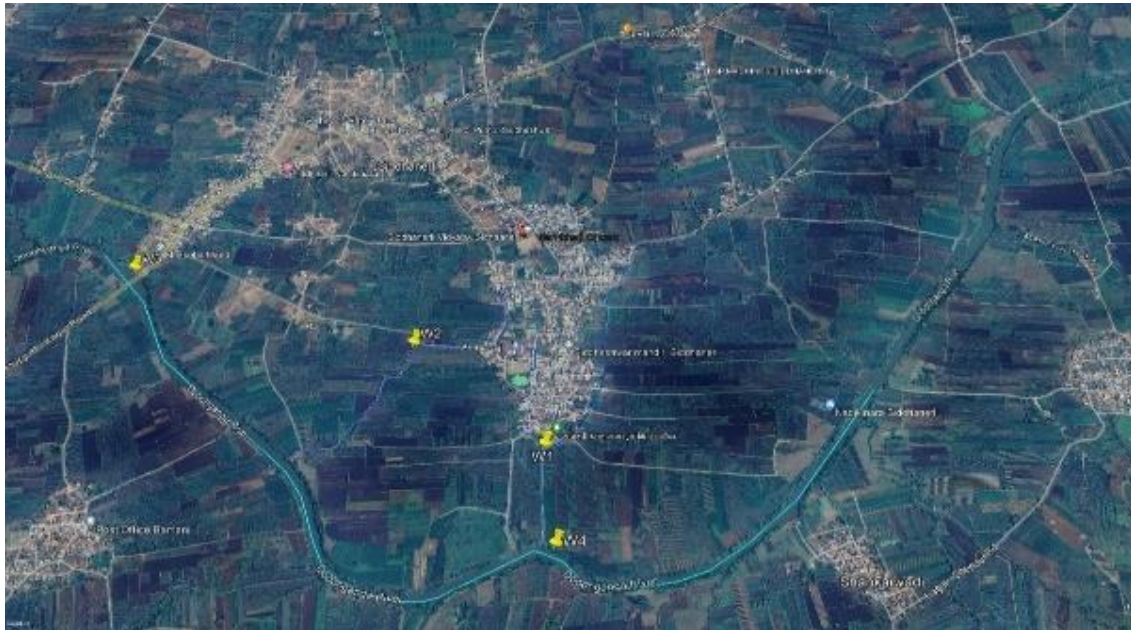


Figure 1: Sewer network of Siddhanerli village along with Dudhganga river

2. RESULT AND DISCUSSION

To understand the water quality of wastewater and river water the samples were collected from sewer lines and river upstream and downstream. The water sample from dam is also collected to evaluate the variations in water quality with distance. The analysis results are tabulated in following table.

Table:- Results of wastewater analysis

Parameters	W1 Near Gavpath	W2 Ambe galli	Standard discharge limit as per NGT order dated 30.04.2019	W3 River upstream	W4 River downstream	Radhanagari dam water Quality
pH	7.08	6.98	5.5 to 9.0	7.23	7.37	7.14
COD (mg/L)	57	73	50	24.2	40.4	8.2
BOD (mg/L)	18.3	26	10	8	11.6	2.2
TDS (mg/L)	390	380	-	130	115	30
TSS (mg/L)	55	125	20	10	34	13
Oil & Grease (mg/L)	<1.0	4	-	<1	<1	<1
E-Coli cfu/100ml	7.6 x 10 ³	6.4 x 10 ³	-	<1	<1	<1

The pH was 6.98-7.37 observed within range as prescribed in NGT order dated 30.04.2019.

However, as per the NGT order dated 30.04.2019 the village is exceeding the standard discharge limit of COD, BOD and TSS. As per the water quality standard there should not be the presence of COD and BOD in drinking water but due to

directly mixing of untreated wastewater in river, day by day there is increasing the concentration of BOD and COD in river water. As per the analysis report of dam water the presence of COD and BOD in dam water is very less as compared to the concentration of COD and BOD in Dudhganga river at Siddhanerli. Considering this increasing concentration of BOD and COD in river water it is necessary to take required action like Zero Liquid Discharge of wastewater from villages in river body.

3. CASE STUDY

To evaluate the impact of use of elephant grass for in situ treatment of sewage water, the natural nalah of ambi galli area is selected for case study. With the help of local farmer the plantation of elephant grass along the 200 m road side of the nalah has been carried out. Based on nalah water the growth of elephant grass has been carried out. After 3 months of plantation the plant has been observed to be fully grown. To check the impact of elephant grass on reduction of contamination of wastewater, the sample at inlet and outlet of nalah has been collected for analysis of COD and BOD. Based on the analysis report it has been observed that around 39% reduction in BOD concentration and 32% reduction in COD concentration has been observed.

The results obtained from the analysis are presented in the following Table.

Parameters	At the inlet of nalah	At the outlet of nalah	Reduction in percentage
COD (mg/L)	78	53	32%
BOD (mg/L)	28	17	39%

4. Conclusion

Based on the case study and analysis, it has been observed that the river water quality is deteriorating day by day due to mixing of untreated wastewater from village. Considering the non-feasibility for providing of wastewater treatment plant in village areas, it is necessary to find low-cost treatment options for Zero Liquid Discharge of sewage water in rivers. With using the technologies such as in-situ nallah treatment, it will provide the reduction of contamination without any major capital expenditures (CAPEX) and operational expenditures (OPEX). Plantation such as Canna Indica along the road of nallah will help for providing aesthetical look to roads as well as for reduction of wastewater contamination and plantation of Elephant grass will help farmers for growing of grass for cattle's and reduction of river contamination. By providing of such plants along the nallah of all area for wastewater treatment through in-situ nallah treatment can be directly utilized in farms for growing of sugarcane, rice, flowers etc. This type of practice will also reduce the load on river in summer seasons and we can be able to achieve Zero Liquid Discharge (ZLD) village.

5. REFERENCES

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