



Full Length Research Article

WASTEWATER TREATMENT AND MANAGEMENT IN RURAL AREAS - A CASE STUDY OF RAJOURI DISTRICT, JAMMU AND KASHMIR, INDIA

Yawar Mushtaq Raina and *Pervez Alam

COET, Department of Civil Engineering, BGSB University, 185131

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ABSTRACT

The study area where the wastewater treatment is proposed is Rajouri in Jammu And Kashmir State. The growth of population at a faster rate, lack of education, poverty especially in rural areas has polluted the environment to a great extent. Here the paper gives the details about the population of the area, the drainage details, the water supply details and the ground water quality. In this paper it has been tried to explain as how we can treat wastewater in rural areas by proposing a wastewater treatment process. Once treated wastewater can be used for number of purposes like growing plants, vegetables etc.

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INTRODUCTION

Water is the natural resource which is extremely useful for all the living beings on earth, uses of water includes agricultural, industrial, household and environmental activities. Since water resource is developing at a rapid pace all over the world, so the water resources available in a particular area should be protected from pollution and only then it should be used for various purposes. Surface water is an important source of water; it becomes useless when pollutants of wastewater get mixed with it. As a result of this several health related issues are caused. Disease like jaundice common in human beings is prime example of water borne diseases which occurs when humans drink the polluted water. In villages and towns sewage is discharged into rivers, canals etc and hence water quality of surface water is affected which ultimately causes health related problems to public. This happens only due to improper management of wastewater. Therefore surface water should be protected from the wastewater pollution for betterment of public and hence development of country. The population in rural areas is growing at a faster rate. Lack of education and backwardness may be held responsible for this. Sometimes lack of infrastructure also creates unhealthy environment.

A small town is growing with daily average addition of 300 persons. Due to increase of population at such faster rate it becomes difficult to supply large quantity of clean water. The fresh water is getting polluted due to sewage getting discharged into it. The best solution to overcome this problem is reuse of wastewater by properly managing it.

Study Area

Rajouri used to be part of Poonch district but on 22 September 1967 it was separated from Poonch district and on 1st January 1968 it was officially declared as the separate district covering an area equal to about 2630 sq km. Rajouri is also known as Rajapuri or the land of kings. As per survey of India Rajouri lies between latitudes 330⁰⁰'00" & 330⁰³⁵'20" North and longitudes 740⁰⁸'00" & 740⁰⁴²'30" East. It is located at an elevation of about 562-4800m above mean sea level and is surrounded by famous Pir-Panjal hills. Rajouri town is the head quarter of the Rajouri district. Rajouri district is located in the south western part of state of Jammu and Kashmir. Rajouri town is located on the Jammu Poonch highway, 154km away from Jammu and about 85 km away from Poonch district. Rajouri is bordered by Poonch, Mirpur (Pakistan occupied Kashmir), Udhampur and Jammu districts. The district is facilitated by various government and private

***Corresponding author: Pervez Alam**

COET, Department of Civil Engineering, BGSB University, 185131

Schools, Degree colleges and a University, as a result of which the literacy rate has grown at a faster rate in the last one decade. University established in 2005 is named after great Sufi saint Baba Ghulam shah Badshah. The Baba Ghulam shah Badshah University is located in Dhanore area which is about 5 km away from Rajouri town. Students from all over the state are pursuing education in various courses in the university.

The climate in southern part of the Rajouri district which includes areas of Nowshera, Sunderbani and Kalakote is semi tropical and receives regular rainfall as compare to northern part where it is temperate. The northern part of the district includes Rajouri town, Thannamandi and Koteranka, Darhal. This part experiences excessive rainfall and in winters snow fall also especially in Thana Mandi, Darhal and Koteranka Tehsils. Rajouri town also experiences snow fall in Dec 2012 Temperature on the average varies from 7 degree Celsius to 40 degree Celsius. The average annual rainfall is 769 mm. The river flowing through Rajouri town comes from Darhal and Thanamandi, meeting each other near Darhali Bridge at Kheora

kilometer. Population had grown at the rate of 28.14% over the last decade that is from 2001-2011. The sex ratio of the population in the district is 863 females for every 1000 males as per the 2012 census. Water demands and use of water depends mainly upon population of an area. If population of a particular area increases as is the case here the main effect of increased population will be that water demand, water use and waste water disposal will increase. The population of the district Rajouri at the end of year 2021 is calculated as under

S.No.	Method	Population
1.	Geometric increase method	854411
2	Arithmetic mean method	801546
3	Incremental increase method	960677

Present Water Supply Status

As for as water supply of the area is concerned it is not very good and people in the area suffers a lot due to present water supply processes. In Rajouri town water is supplied from rivers and springs to the areas mostly from Darhal and to some extent from Danidhar area.

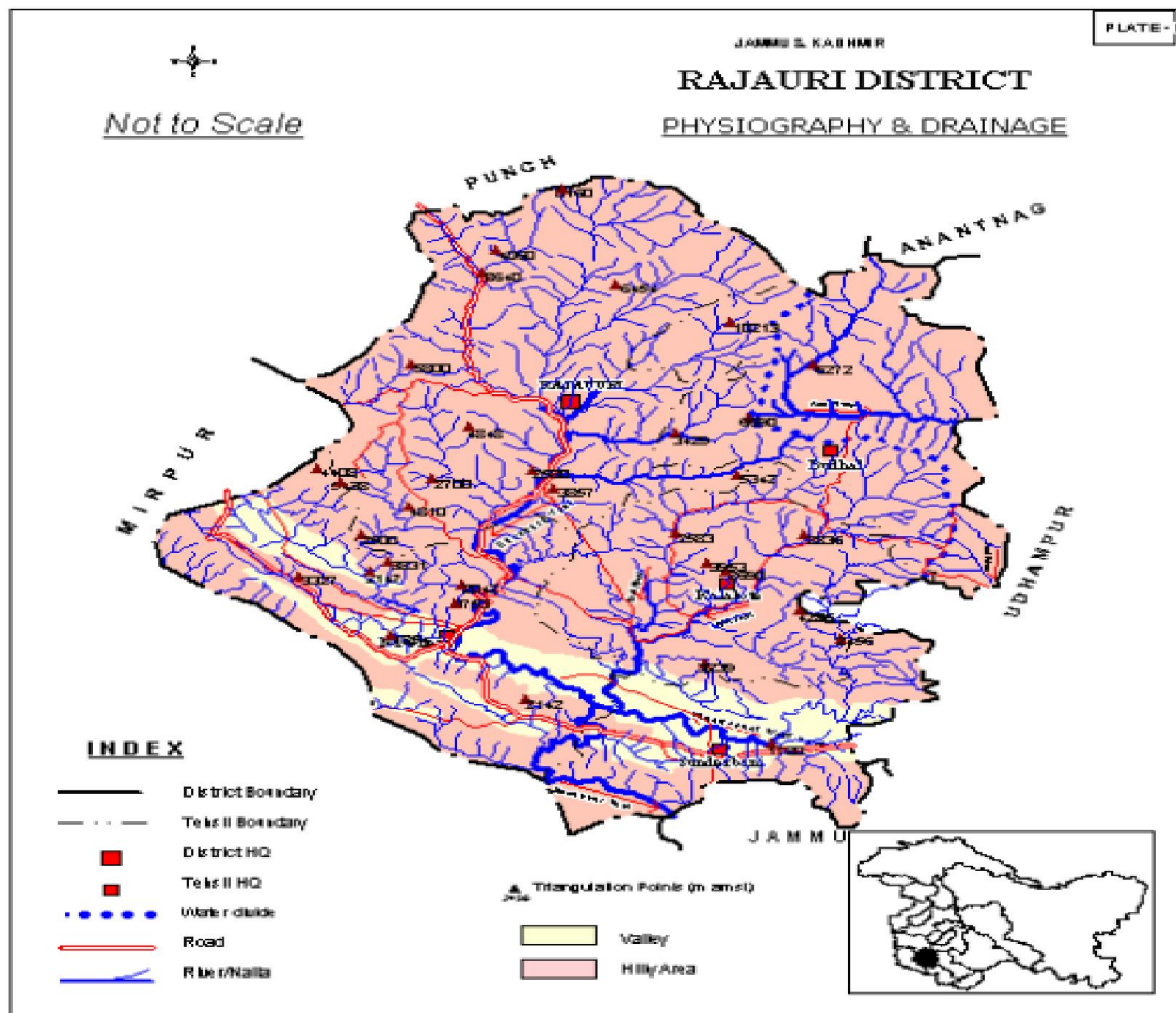


Figure 1. Showing physiography and drainage of the Rajouri district

Population Growth

Population of the district as per census of 2012 is 642,415 males with population density of 235 inhabitants per square

It is pumped to main water tank located in Rajouri main market and from there it is supplied to people in the town. In villages and other areas water is mostly supplied through tankers but things are improving and few small water supply plants have

been established in some areas where water is pumped to nearby areas. Water in this area is also supplied through wells like from four tube wells in now shera division having discharge ranging from 2500gph to 20000 gph and also from Rajouri Division having discharge ranging from 2500 gph to 4000 gph, a number of dugwells have also been constructed by PHE department in Nowshera Division having discharge ranging between 2500gph – 100000 gph. But sometimes due to poor drainage system and flooding problems in rainy season's pipes get washed away in rivers and also it becomes unfit for any use and water supply gets affected. At an average water supply of the area is about 50MLd. Per capita supply of the area is about 59 lpcd.

Drainage System Details

The drainage system of rajouri district overall is poor. The district and the rajouri town is drained by a number of nallas, perennial rivers and streams. The nallas and streams remain dry in summer but create lot of problems in monsoons and rainy seasons due to flash flood and also by carrying huge load of boulders, pebbles, sand and silt during monsoon season or during heavy rainfall.



Figure 2. A typical view of drainage problems in Rajouri, J & K

The northern, southern and western part of district Rajouri is drained by the Munawwar Tawi which originates from Thannamandi about 22 km away from Rajouri town and tributaries of Munawwar Tawi named as Nowshera Tawi in Nowshera, Neari Tawi, and Thandepaniwali Tawi and the eastern side is drained by Ans River in Budhal. Both the rivers fall in Chenab sub basin. The district in the northern part follows dendritic to sub dendritic drainage pattern controlled by the natural topography of the area and geological structures.

Wastewater Generation

Collection and treatment of wastewater is a big problem not only in rajouri district but all over the country. As for as Rajouri district on a whole is concerned there is no proper sewerage treatment plant for managing the wastewater. On a whole Rajouri district generates around 23 MLd of waste water but for proper management there is no treatment plant. So a treatment plant is needed here to overcome the problem.

Pollution control laws

Pollution has many ill effects on the environment. Whatever effluent is discharged into rivers or lands it should be within the permissible limit specified by the pollution control board agencies. Wastewater is treated by capital investment and running cost by industries and disposing it in rivers streams and then it is used by someone else. To meet the quality standards of water and reuse it one way is to renovate the treated wastewater. All over India and world practice of reuse of treatment of wastewater for agricultural and industrial purposes is followed.

Groundwater Quality Analysis

The chemical characteristics of ground water in the district have been analysed by the Central Ground Water Board (CGWB) from time to time.

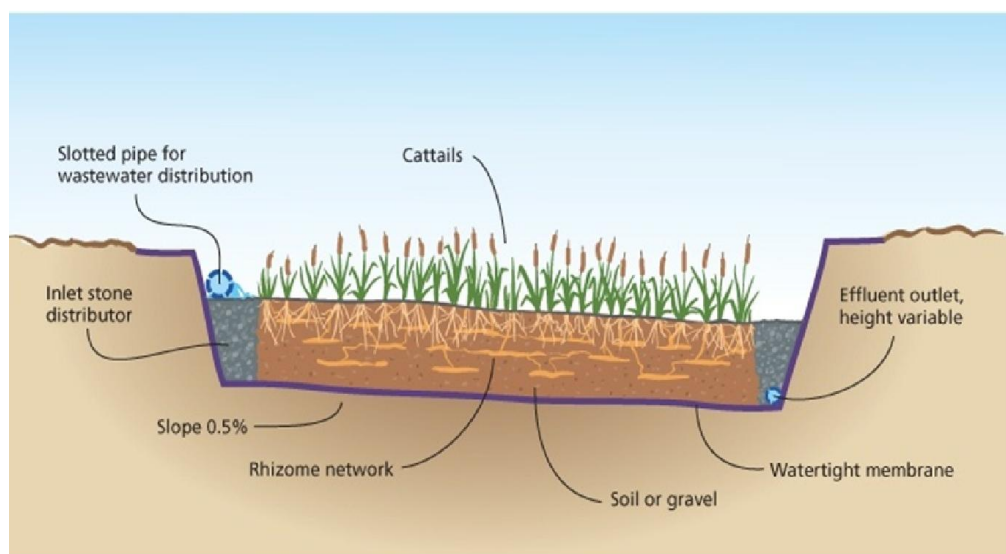


Figure 3. Cross section of constructed wetland

S.No.	Constituents	Range
1.	pH	7.20-9.30
2.	EC(micro mohos/cm)	217-1470
3.	Ca ⁺⁺ (mg/l)	26.00-144.00
4.	Mg ⁺⁺ (mg/l)	9.70-43.00
5.	CO ₃ ⁻⁻ (mg/l)	-
6.	HCO ₃ ⁻⁻ (mg/l)	92.00-525.00
7.	Cl (mg/l)	3.50-184.00
8.	NO ₃ (mg/l)	0.72-60
9.	F(mg/l)	0.11-2.45
10.	Na ⁺ (mg/l)	0.5-225.00
11.	K ⁺ (mg/l)	0.50-8.5
12.	Iron (mg/l)	0.26-7.7

Wastewater treatment at Rajouri

In Rajouri collection and treatment of household wastewater is done by privately-owned individual or community septic tanks. The best disposal of wastewater and most appropriate form treatment in this area is septic tank. The contribution from sewage discharge to total pollutant loading is nearly equal to 10%. The major disadvantage of the septic tank is that it produce adverse impact on the ground water quality.

Proposed wastewater treatment

Since most the sewage is collect through open drain in the Rajouri town and cost of land is very low so we can propose constructed wetland for the treatment of waste water in the particular city. It will help in recharge of ground water and treatment up to desires standard. Constructed wetlands treatment systems are engineered systems that have been designed and constructed to utilize the natural processes involving wetland vegetation, soils, and their associated microbial assemblages to assist in treating wastewater. They are designed to take advantage of many of the same processes that occur in natural wetlands, but do so within a more controlled environment. Some of these systems have been designed and operated with the sole purpose of treating wastewater, while others have been implemented with multiple-use objectives in mind, such as using treated wastewater effluent as a water source for the creation and restoration of wetland habitat for wildlife use and environmental enhancement.

Waste water reuse

Opportunities to reuse wastewater and regulation of its treatment vary according to where you live. Urban households

typically have a connection to a centralized, or reticulated, sewage system, whereas rural households manage their wastewater on site. Each wastewater type must be treated differently and can be used in various ways. Greywater coming from kitchen and other areas ideal for garden watering, with the appropriate precautions, such as using low or no sodium and phosphorus products and applying the water below the surface. Well treated grey water can also be reused indoors for toilet flushing and clothes washing. Resue of water have many advantages such as reduce in water bill, less depended on singe resource, reduction in pollution due to waste water, reduces load on STP.

Conclusion

This paper highlights a number of recent problems related with the wastewater discharges in rural areas, and also gives us an idea towards our first step in the development of wastewater treatment in these area. This paper also provides information about the present and future population scenario and water supply demand of the study area. We also proposed the waste water treatment process i.e. wetland. This proposal is intended to reduce pollutant loading rates and generally improve the condition of our rural environment through the delivery of cost-effective wastewater solutions.

REFERENCES

Bowman, J.J., Lough Ree: 1996. An investigation of eutrophication and its causes, *Environmental Protection Agency*.

Cooper, P., Day, M., Thomas, V., 1994. Process options for phosphorus and nitrogen removal from waste water, *J.IWEM*, 8, 1, 84-92.

Foot, R.J., Robinson, M.S., Forster, C.F. 1993. Operational aspects of three 'selectors' in relation to aeration tank ecology and stable foam formation. *J.IWEM*, 7, 304-309.

Ground water information booklet Rajauri district, jammu and kashmir, north western Himalayan region Jammu, November 2009.

Muthukumaran N. and Dr. N.K. Ambujam- Tiruchirappalli City Water Planning – A Case study –Proceedings of the International symposium on Challenges of water resources management in the developing countries in the 21 century at Andhra University, Visakapatnam, 2001.

National Onsite Wastewater Recycling Association. Model Code Framework for the Decentralized Wastewater Infrastructure. <http://www.modelcode.org/publications.html>. 2007.
