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Ground Water Recharging by Semi-filtered Sewage and Runoff

Jameer Shaikh[1], Rahul Sonawane[2], Geeta Thakare[3], Devesh Tulsani[4], Supriya Patil[5]
[1,2,3,4 5] *Department of Civil Engineering, D. Y. Patil college of Engineering Akurdi, Maharashtra, India.*

Abstract- ***This report contains the use of daily sewage from a small town without being wasted which later meets the river. This also consist of preserving runoff from monsoon to summer using ground water recharging the sewage and runoff from town gets wasted by meeting sewer and flowing forward. We can use both of this for ground water recharging which keeps water for dry seasons. The daily sewage is treated by screening first then by small sedimentation pond in which large particles gets settled and after that it will be treated by root zone cleaning system by passing sewage through beds of soil containing small plants in vertical direction. The purpose is just to eliminate the waste of sewage and runoff.***
KeyWords: Semi-filtration, Sewage, Runoff, Screening, Sedimentation, root zone cleaning system.

I. INTRODUCTION

A. Introduction of the Project Work

Ground water is an important source of water supply in India because of its capacity to buffer short term climatic variability and climatic variability is a big problem in India. One area in India can have very low temperature in winter and high rainfall in monsoon and the same area can have very high temperature in summer and gets affected by drought too. So groundwater plays vital role for the water supply in such areas. Runoff from farm area and residential area of that village goes to river and from river this water flows forwa rd and gets wasted and this village gets affected by drought. So not giving this water to river and diverting it to ground is the best way for preserving water for drought time. The daily sewage also flows from this residential area in downward direction to meet the river. This sewage water from a small town doesn't have any toxic materials in it. So the daily sewage is treated by screening first then small sedimentation pond in where large particles gets settled and after that it will be treated for root zone cleaning system by passing sewage water through various beds of soil containing various small size plants in vertical direction. This semi-purified sewage water can be used for plants or if not needed then diverted to ground for increasing water table. Using this water in drought condition is a best way for facing the drought. The runoff from the farm area in monsoon season can be screened and directly used for infiltration in ground and preserving for future use.

B. Problem Statement

Climate variation is a big problem in India. One small town in India gets high rainfall in monsoon but in summer same area gets lack of water and gets affected by drought. The rainfall collected from the area flows to the downward side to meet river and flows forward with river. Some part of water from river gets evaporated and some part flows and leaves that village without ground infiltration. The sewage from the same area flows to the river and flows with the river. So this is the total wastage of runoff and the sewage. Using our method we can eliminate this wastage of sewer water and the runoff and keep it for future use by ground water recharging.

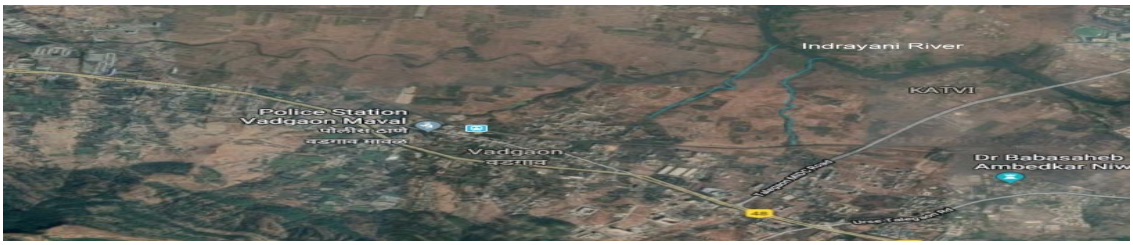


Fig 1.1- Map of Vadgaon Maval

C. Objective

Main purpose of this method is to eliminate the wastage of daily sewage of the residential area of village and the runoff from the farm. The objective is to eliminate the waste and to avoid the drought condition of the same area. Drought condition can only be

eliminated by preserving the water from monsoon season and daily sewage water which is Semi purified. The sewage water is Semi purified by using some economical methods like screening, sedimentation and root zone cleaning system. The sewage water is Semi purified because it doesn't have any toxic materials so now this water can be used for ground recharging.

D. Scope of the Project Work

Today many of villages in India are affected by drought these are the same areas with are having higher or medium rainfall but due to the wastage of runoff the water cannot be preserved for future use. If this water is used for ground water recharging, the water can be preserved to use when required. This water can be used in drought conditions. Drought condition of many villages can be eliminated using this method.

II. LITERATURE REVIEW

A. General

Detailed review papers are required for the technical terms in this project. The technical terms like root zone cleaning system, phytoremediation, filtration, sedimentation, ground water recharging are listed below some of them are national and some of them are international. These literature surveys gave the detailed knowledge about the all the technical terms.

B. Literature Surveys

1) Root Zone technology: Reviewing its past and present, A. A. Raval and P. B. Desai

Due to increase in population, human activities and urbanization is an effect on quality and quantity of water resources, this result in the pollution of water bodies due to increased generation of various types of sewage. This paper reviews root zone cleaning system (RZCS) which are planted filter beds consisting soil. This is effective way of treating domestic waste and it is a natural technology. It is used in temperature climates. It is easy to operate, easy installation, low maintenance. It is a well-known technology in Europe and America. There is a need to popularize this technology in India for benefits and sustainable development.

2) Sewage/wastewater Treatment Technologies: A Review, Niraj S. Topare, S. J. Attar, Mosleh M. Manfe

Users must concentrate their Sewage/Wastewater treatment process to ensure that it complies with regulatory guidelines. The main purpose of Sewage treatment process is to remove the various constituents of the polluting load: solids, organic carbon, nutrients, inorganic salts, metals, pathogens etc. Effective wastewater collection and treatment are of great importance from the standpoint of both; environmental and public health. Sewage/Wastewater treatment operations are done by various methods in order to reduce its water and organic content, and the ultimate goal of wastewater management is the protection of the environment in a manner commensurate with public health and socio-economic concerns. In this article, Sewage/Wastewater treatment techniques, factors affecting selection and design Sewage/Wastewater systems are discussed briefly.

3) Efficiency of Root zone Technology for Treatment of Domestic Wastewater: Field Scale Study of a Pilot Project in Bhopal. (MP), India, Vinita Vipat, U R Singh and S K Billore

In this paper author want to say that urban water bodies in tropical developing countries are the worst victim of domestic wastewater / sewage, basically because of the widening gap between the increasing waste water generation and unavailability of commiserating economical resources to address the issue through conventional technologies. Hence, biological machines may prove to be a novel tool for sustainable management of water bodies. Root zone technology being natural biological systems operating solely on solar energy is low cost and almost negligible operation and maintenance. The paper under reference therefore is an attempt to evaluate the performance efficiency of a field scale *Horizontal Subsurface Flow constructed Wetland/Root zone* demonstration unit was constructed by Environmental Planning & Coordination Organization (EPCO) at Ekant Park, Bhopal as an economically and ecologically viable pilot project. The unit is designed to treat 70,000 liters/day of wastewater of nalla passing through the park.

4) Root Zone technology for campus waste water treatment, G. Baskar, V.T. Deeptha and A. Abdul Rahaman*

Author says that the pollutants are removed by various physical, chemical and biogeochemical processes like sedimentation, absorption, and nitrification as well as through uptake by wetland plants. Root zone systems are reported to be most suitable for schools, hospitals, hotels and for smaller communities. The aim of this research was to study the effectiveness of the wetland plant Phragmites australis in the treatment of waste water generated in the SRM University premises. A pilot wetland unit of size 1.5X0.6X0.3m was constructed in the campus grounds. Phragmites australis species were grown in the field with fresh water. 3X3 rows of plants were transplanted into the pilot unit and subjected to waste water from the hostels and other campus buildings. The raw waste water and treated waste water were collected periodically and tested for quality. It is seen that this pilot unit is reducing

the concentrations of TSS, TDS, TN, TP, BOD, COD by 90%, 77%, 85%, 95%, 95%, 69%, respectively on an average. Root zone system achieves standards for tertiary treatment with no operating costs, low maintenance costs, enhances the landscape, provides a natural habitat for birds, and does not have any odour problem.

5) *A literature review of recharge estimation and groundwater resource assessment in Africa, Lei Wang, Brighid Ó Dochartaigh, David Macdonald*

This report reviews the available literature on groundwater recharge and groundwater resource assessment in Africa. The purpose of this review is to identify estimates of groundwater recharge that have been undertaken either in Africa, or outside Africa but in similar environments and climates to those found in Africa. The first part of the report highlights the importance of groundwater recharge modeling to the study of climate change impacts on groundwater resources in Africa. Section 2 discusses groundwater recharge mechanisms, and challenges in recharge estimation, particularly in arid and semi-arid regions. Sections 3, 4, 5, and 6 largely describe groundwater recharge studies in arid and semi-arid areas, especially in Africa, which used different methods at different scales. In the final part of the report we emphasize our main conclusion that there is a gap in information on the scale and temporal and spatial distribution of groundwater recharge across much of Africa. Most existing recharge estimates have been done on an *ad hoc* basis using very different methods and data, so that there is no consistency between estimates in different regions. The distribution of these estimates across Africa is also patchy and unequal.

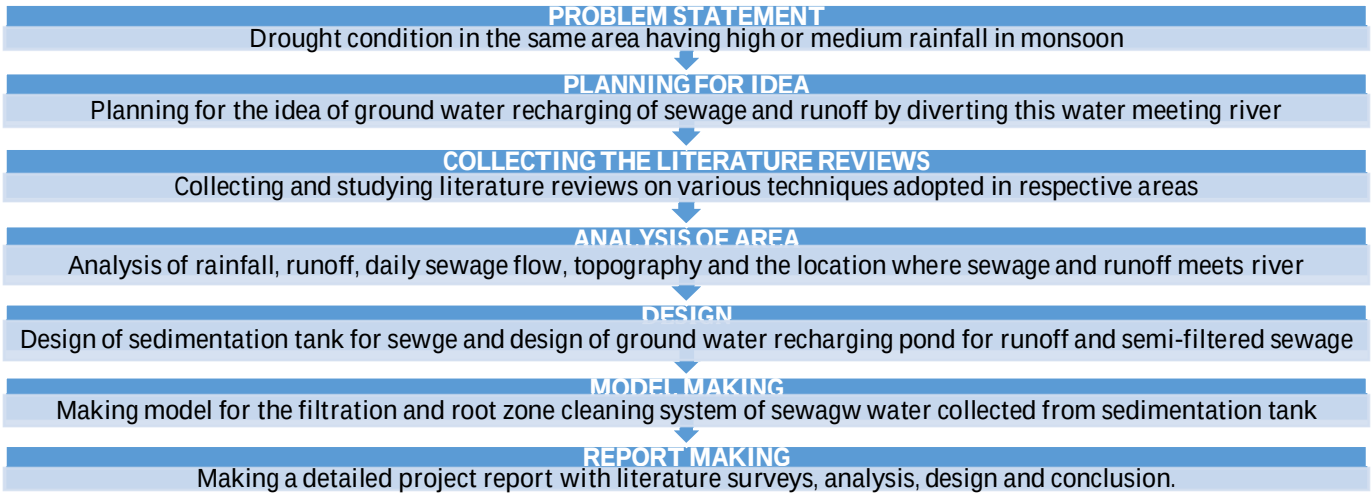
6) *Operational performance of sedimentation basins, Mathew d. bleything*

A literature review was conducted to get a basis for designing removal of the type of material that would be treated at the sediment basins and how it is formed at the power plant. The science of how the sediment will be removed from the waste stream was studied. A review of other technologies that would be available for TSS removal was also conducted.

7) *Artificial ground water recharge review of the current knowledge of the technique, Antonio Jódar-Abellán, José Antonio Albaladejo-García and Daniel Prats-Rico*

Nowadays, intensive exploitation of aquifers is seen as one of the main environmental issues worldwide together with other phenomena such as climate change, changes in land use, the disappearance of species, and so on. To that respect, the artificial groundwater recharge almost stands as the only solution in order to reduce directly the effects of aquifer exploitation. To be exact, the recharge of This study deals with the hydraulics and hydrogeological aspects related to the technique by performing an exhaustive analysis of the existing literature published in the last decades about the definition of the technique itself, the available water sources to develop it, the long list of objectives that this technique shows, the phases of the hydrodynamic mechanism, the different technology developed recently in order to introduce it. This way, this study aims to improve the knowledge acquired on artificial groundwater recharge in order for this technique to be taken into consideration as a valid option when reducing intensive exploitation of aquifers, especially in arid and semi-arid areas.

III. METHODOLOGY



A. Methodology to be Adapted

First we are going to visit a small town Vadgaon maval which doesn't have industrial area and having medium rainfall. Then we are going to collect the data about the rainfall and use of water per capita by which we can calculate the daily average sewage flow and runoff discharge and by analyzing the area we can get to know that in which direction water is flowing and at which location it is connecting to the river. By using the analysis we are going to design sedimentation tanks for daily sewage flow and ground water recharging pond for the runoff. We are going to make a model of filtration and root zone cleaning system (RZCS). This semi-filtered sewage water will also go to ground water recharging pond along with the runoff water.

IV. ANALYSIS AND RESULT

Average Annual Rainfall - 741 mm

Maximum Annual Rainfall - 1111.5 mm

Area- 4.81 km^2

Methods of Analysis- Standard Table Method

Emperical Formula Method

For discharge of 5535 m^3

Design of ground water recharging pond

Dimensions of pond= 24x15x8 m (no. of ponds -2)

For population – 17346

Daily supply by municipality – 135 lpcd

For discharge of 390.208 m^3

Dimensions of sedimentation pond= 10x8x5 m

V. CONCLUSION

This project is giving us clear indication about the problem statement. The area having high or medium rainfall should not face drought but due to wastage off runoff and daily sewage drought occurs in that area. From this project we can conclude that runoff and daily sewage should not be wasted by meeting it to the river. We can use it for the purpose of ground water recharge and eliminate drought condition. With this methodology we can effectively work on the problems occurring due to climatic variation.

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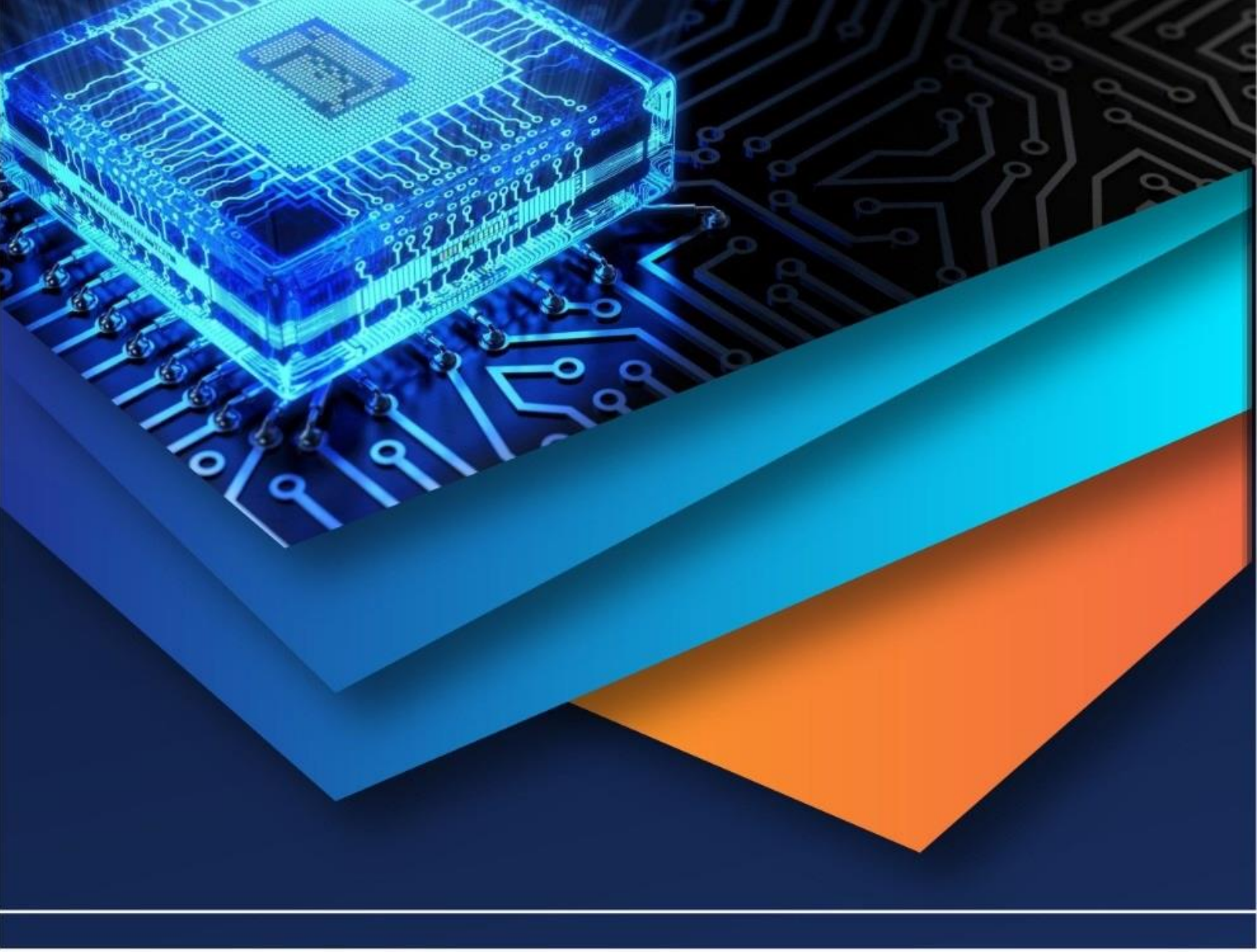

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