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RESEARCH ARTICLE

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WATER SUSTAINABLE STRATEGIES FOR RAISONI CAMPUS

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ABSTRACT

Water is a basic need for the life & still it one of the most ignored natural resource. There is a lot of areas in the world which lacks water and those who got this precious gift does not pay attention for its conservation. Late, but the human race is now recognizing the importance of the water. One of the technique to conserve the water is to reuse the water again & again. The reuse of water has been practiced over 500 years in different parts of the world but still the scarcity of water specially drinking water is a bitter truth that many regions in India still lacks the drinking water due to various reasons. But the recycled water is gaining popularity in India by following strict guidelines laid by different Government & Non-Government organizations. This report deals with the feasibility of various water sustainable techniques. The study area is the RGI campus in Wagholi, Pune. These techniques in the campus may prove more cost effective & help in dealing with the water issues in the campus.

Keywords: Water Sustainable Strategies**,** Sewage Treatment Plant (STP), Rain Water Harvesting (RWH), Ground Water Recharge (GWR)

I. INTRODUCTION

Water is the basic need for life. The Earth is covered 70% with water but still many regions in the world lacks the water for drinking and use. Water and its conservation was always ignored but now the human race is recognizing its importance. There are a lots of steps have been taken for the betterment of the world considering water. Water sustainable strategies are some of those steps. These strategies include different methods to utilize and conserve water taking into account the needs of future generations. Some of the water sustainable techniques are rain water harvesting, reusing the waste water after being treated from sewage treatment plant, recharging ground water, reducing the consumption and wastage of water with the help of aerator taps, showers instead of bath etc.

OBJECTIVE

The main objective of this report is to analyze the current efforts of the RGI relative to a strategic water sustainable development. The water supply system and the water flow in the campus is observed and studied. Suggestions are presented for the STP, RWH and other water management plans. The current expenditure on the water is calculated and measures are suggested to reduce the same.

II. INVESTIGATION AND METHODOLOGY

STUDY AREA – RGI CAMPUS

The campus is spread in 7 acres of land and situated at the outskirts of Pune near the NH60 Pune – Nagar Highway in Wagholi. The campus has two engineering colleges, one MBA college, one gymkhana, girl's & boy's hostel, canteen facility. All the colleges and other buildings are well equipped to perform their jobs.

PROBLEM

The campus is dealing with various problems related to the water, right from the continuous supply of water to its management. Half of the year there is a need to purchase the water tankers though there are four bore holes available in the campus. The amount of water wasted is also quite significant. The sewage generated from the campus is not been treated & disposed off in the lawns. This leads to odour nuisance & unhealthy environment. The water management of the campus is also leads to the wastage of water. The low level of the ground water in the area is also a problem which is blocking the way of taking the maximum of the bore holes.

DATA COLLECTION

We have collected the data regarding the population of the campus, water requirement as well as the expenditure on the water tankers.

Building	Population
G.H.R.I.E.T	1800
G.H.R.C.E.M	2700
G.H.R.C.S.C	850
Girls Hostel	250
Boys Hostel	300
Workers & floating Population	300
Total	6200

Month	No.of Tanks
January	12
February	202
March	510
April	544
May	560
June	298
July	250
August	0
September	0
October	0
November	0
December	0
Total	2376

The cost of each tanker is Rs. 450/-. Hence the total cost of water tankers in a year is Rs. 10, 69, 200/-. Also there are four bore holes available in the campus but in summer, because of the low ground water table, they become useless. Also there is a large roof area available which receives a considerable amount of rainfall annually.

Building	Area (m^2)
G.H.R.I.E.T	2998
G.H.R.C.E.M (Main)	1500
G.H.R.C.E.M (Civil/Mech)	678
Workshop	900
MBA Building	932.5
Gym	321
Girls Hostel	735
Boys Hostel	735.5
Total	8800

Year/Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual
2004			0	0	15.5	181.2	87.1	316	182.7	78.5	1.3	0	801.1
2005			0.1	1.8	2.8	228.7	383.4	237.8	272.7	105.5	0	0	1233.7
2006			1.3	0	8.2	191.8	332.8	390	197.7	57.1	4.2	0	1183.1
2007			0	6	0.6	267.8	261.2	225	134.6	2.8	12.5	0	910.5
2008			13.7	0.8	0.8	148.4	99.5	216.8	259.4	60.1	4.4	6.8	810.0
2009			0.4	0	2.3	60.4	317.7	141.8	153.5	119.2	150.3	0.9	946.5
2010			16.1	0.4	4.6	210	212	172.7	157	97.5	90.9	0	961.3

The average rainfall from the above table can be taken as 978.03.

SEWAGE TREATMENT PLANT (STP)

There is a Sewage Treatment Plant in the Raisoni Campus, situated at the back side of the Girls' Hostel in the campus. It was erected in the year 2007.It is a closed type sewage treatment plant. It is compacted in size and occupies an area of 65 sq.m. Currently it is not in working condition which leads to disposal of untreated sewage and odour nuisance. We are proposing a new sewage treatment plant for the campus. According to the population, the future population is estimated to be 8000. Peak demand for water is 34480 lit per day with current population. For 8000, the demand would be 43100 lit. Hence we are proposing a STP of 45 kld capacity. The STP would be based on MBBR (Moving Bed Bio Reactor) technology. This technology is eco-friendly and here the microbes present in the sewage itself degrade the organic matter in sewage and at the end clean water for non -potable use is obtained.

Sr.No	**Equipment Details**	**Quantity**		
		Total	Duty	Stand by
01	Perforated screen in MS epoxy construction	1.0	1.0	0.0
02	Sewage transfer pumps	2.0	1.0	1.0
03	Air Blower	2.0	1.0	1.0
04	MBBR media for bioreactor	1 lot	1 lot	0.0
05	Tube media for Tube settler	1 set	1 set	0.0
06	Aeration grid	1 set	1 set	0.0
07	Sludge pump	1.0	1.0	0.0
08	Filter feed pump	2.0	1.0	1.0

09	Alum Dosing System	1.0	1.0	0.0
10	Chlorine dosing pump	1.0	1.0	0.0
11	Pressure sand filter	1.0	1.0	0.0
12	Activated carbon filter	1.0	1.0	0.0
13	Interconnecting pipeline, valves & fittings	1 lot	1 lot	0.0
14	Electrical control panel with flexible PVC cables	1 job	1 job	0.0
15	Instruments: water level switch, timer & pressure gauges as required to run the system	1 set	1 set	

The treated water can be utilized for gardening purpose. The treated water can also be used for the flushing purpose. The proposed STP does not use any hazardous chemicals for its functioning. No return sludge processing is needed. The total area of the plant is less. Due to efficient aeration system, the electrical power requirement is low. Due to user friendly equipments, the maintenance of the plant is very low. The cost of design, supply, erection of a 45 kld plant is Rs. 6, 90, 000/-

RAIN WATER HARVESTING (RWH)

As there is a considerable amount of rainfall available in the area of Pune i.e. 978.03 cm and the roof area of the campus is also good i.e. 8800 sq. m, there is a tremendous scope of the rain water harvesting. The rain water collected can be calculated as follows:

Total area of the campus = 8800 m^2
Height of the rainfall = 978.03 cm
=0.98 m

Therefore, volume of the water collected
= 8800 X 0.98
= 8624 m^2
= 86, 24, 000 lit.

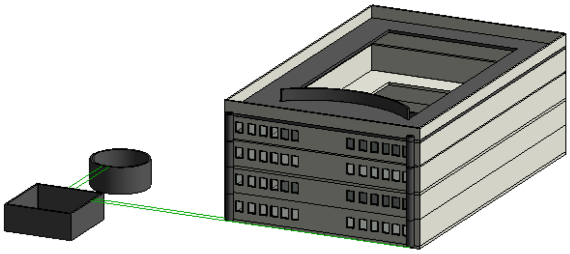
Assuming the efficiency of the RWH as 70%, then the amount of the water collected will be 60, 36,800 lit.

Annual demand of water in the campus is 1, 21, 36, 700 lit.

Hence it can be seen that if the amount of rainfall collected, then half of the water demand can be met. Hence if RWH is installed then it will be very beneficial to manage the water in the campus with low expenditure on the same.

GROUND WATER RECHARGE (GWR)

The campus has four bore holes whose depths vary from 180 feets to 350 feets. But because of the low ground water table, they become useless in the summer season. Also in winter season, only two of these bore holes work. Hence improving the ground water table can help the campus out in dealing with the demand of water in the campus. GWR can be accomplished with the help of RWH. The water collected can be used for recharging the ground water table.



The above image of the GHRIET building can be considered as a general idea of the RWH and GWR. The pipes collect the water from the roof tops and carry the same to the filter unit (rectangular). The filter units comprise of four layers namely gravel, charcoal and sand. Then the filtered water is carried to the bore well.

III. CONCLUSION

Based on the above facts we can conclude that

1. The water demand in the campus is very high and it is going to be even more in the future.
2. The expenditure on the water management system is very high.
3. The water sustainable techniques can help the campus out in dealing with the demand
4. The STP proposed can treat the sewage and the same can be used for the flushing, gardening purpose later.
5. The RWH can also provide half of the water demanded in a year.
6. The GWR can also recharge the ground water table with which the campus can rely on its four bore holes in most of the time in a year.
7. The overall cost of the water management system can be reduced.

IV. FUTURE SCOPE

1. This report contains data related to the campus's water management which could be help for the Management Authorities of the campus.
2. If there would be any plan of designing any of these techniques, this report could be very informative.

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