Experimental Study of Storm Water at DYPIEMR Campus

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Abstract— Actual stormwater management involves the carrying of water from the catchment area to the storage reservoir through a series of pipes to the nearest watercourse to prevent local flooding. In recent year, due to climate change so that rainfall variation is uneven. Also due to the tremendous increase in population, industrialization, urbanization so there is a vigorous increase in demand for water. This factor leads to the cause of water pollution and makes an adverse effect on reservoirs. The problem also leads to the flooding or drought condition, so there should be development and maintenances of reservoirs with minimizing use. The stormwater management is the technique to reduce surface runoff and store it for future use and groundwater recharge. It also prevents flooding condition up to certain limits. It should preserve the hydrological cycle and fit within the capacity of the existing infrastructure.

Key words: Catchment Area, Storm Water, Pollution, Reservoir, Surface Runoff, Hydrological Cycle

I. INTRODUCTION

Nowadays, the stormwater management system is in the action of scrutiny and revision. The stormwater is found in various forms such as rainwater, melted snow form and other site condition. When stormwater infiltrated in the ground so there is ultimately increased in groundwater and also increase in the discharge of river. Basically, this technology is used for collecting and restoring stormwater from the ground surface and rocky area. Stormwater can be treated and reused. Due to climatic change urbanization are converging to challenge city drainage system due to adverse impact such as clogging in the drainage system. The drainage system has the growing public interest in research on positive water quality and quantity issues and additional amenities received in the urban landscape.

A. Problem Statement

Water clogging in the campus area of DYPIEMR by providing proper drainage and storage.

B. Objectives

This research paper aims to identify and improvising the quality of stormwater and its effective use. This paper serves the general idea about how stormwater management system works and contribute to the hydrological cycle.

- To avoid water clogging in DYPIEMR campus area by providing effective stormwater management analysis.
- To use surface runoff for various purposes like gardening, laboratory requirement, fountain, and groundwater recharge.
- To provide proper treatment of stormwater and providing underground storage, for future use.

II. LITERATURE REVIEW

Sr. No.	Author	Paper	Year	Conclusion
01	Shuhan Zhang, Yongkun Li, Meihong Ma, Ting Song and Ruining Song	Stormwater management and flood control in sponge city construction of Beijing	2018	Water logging control, stormwater utilization, low impact on water resource development.
02	Liana Prudencio, Sarah E Null	Stormwater management and ecosystem services: a review	2018	Minimise and desirable stormwater impact and maximize green stormwater infrastructure benefits.
03	Vinay Ashok Rangari, Ajey Kumar Patel, N.V.Umamahesh	Review on urban stormwater models.	2015	Reduction trend of Urban flooding by selecting a proper drainage system.
04	Qianqian Zhou	A review of sustainable urban drainage system considering the climate change and urbanization impact.	2014	Techniques of SUDES and various model approaches and decision aid tools for simulating and accessing sustainable alternative for drainage design.

Table 1: Literature Review

III. METHODOLOGY

There are four types of stormwater system briefly described as Storage vaults, Gravel beds, Perforated Pipes, storm chambers etc. The methodology introduced contains the first step which includes "defining the runoff area of campus" which measures the total area under the shed. For determination of stormwater available per year the quantity of stormwater needs to be calculated for which "collecting and measuring of the rainfall data throughout the season is necessary". To find out the volume of tank needed to be constructed it is necessary to measure the discharge over a year that comes under the most important step. To determine the design capacity of filter it needs to specify the quality of water which is to be filtered hence, perform the quality analysis on the stormwater sample collected.

A. Key Plan

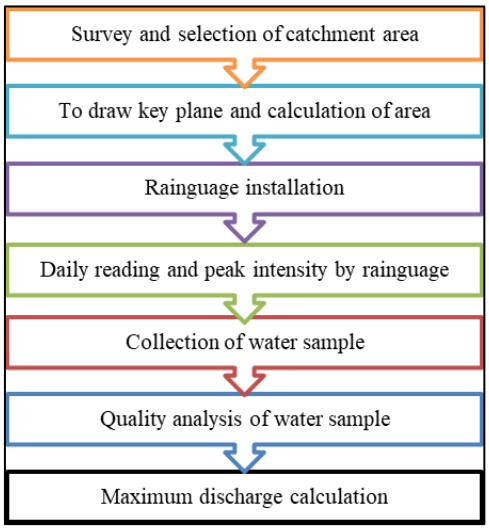

Fig. 1:

1) Survey and selection of catchment area:
By observing ground profile catchment area is selected at the time of rainfall. The catchment is selected by observing the flow of rainwater on the ground.

2) To draw key plane and calculation of area:
By using Google maps catchment area is calculated .for various ground surface, runoff coefficient are found out.

3) Rainguage installation: (fig. 1)
Standard calibrated rainguage installed at a specific point in the catchment area.

4) Daily readings and peak intensity by rainguage:
Readings were observed and note down after rainfall and its intensity is measured.

5) Collection of water sample:
Water sample is collected in different region

6) Quality analysis of water sample:
Various tests were performed such as BOD, TDS, PH, Turbidity, Alkalinity, Hardness, Conductivity etc.

7) Maximum discharge calculation:
Maximum discharge is calculated for maximum intensity of rainfall.

B. Study Area:

1) Area Calculation (by satellite map)
Total area= 93067.84 sq.m
a) Catchment Area
Total area =15170.35 sq.m
b) Excluded area
1) Area = 590.51 sq.m
2) Area = 502.01 sq.m
3) Area = 742.2 sq.m
4) Building area :
Area = 533.82 sq.m
Total catchment area =Total selected area – (1+2+3)
= 15170.35-(590.51+502.01+742.24 =13335.59 sq.m

2) Calculation for Intensity
I=1020/(T+10)
=1020/(30+10)
= 25.5mm/hr
I=Intensity
T=Duration
Catchment area=13335.59 sq.m
=1.34 ha
A Coefficient of runoff (c) =0.85(for paved surface)
A Quantity of stormwater (Q)
Q = CIA/360
=(0.85x25.5x1.34)/360
=0.08 cu.m/s

C. Quality Analysis

1) Test for BOD (Fig 2)
Initial DO=8.5
Final DO = 6.4
BOD = (Initial DO-Final DO) DF
=21 mg/l

2) Determination of total solids (Fig 3)
W1 =65.16g
W2 =65.96g
Weight of solids = W2 – W1
=0.80g
Volume of sample = 50ml

3) Determination of Solids
Volume of sample =50 ml
W1 = weight of filter paper = 0.942
W2 = 0.972
W= weight of non-soluble solids = W2 – W1
=0.029g

4) Determination of Dissolved Solids
W1 = 65.92g
W2 = 66.90g
W= W2-W1=0.98g

5) Conductivity (Fig 4)
Standardization by KCl =1.41 mS
Distilled water conductivity = 0.05ms
Sample water conductivity = 0.23mS
TDS by conductivity meter = 0.12g

6) pH of sample(Fig 5) = 6.53
pH of rainwater = 5.56

7) Turbidity
1) For distilled water = 0 NTU
2) For Rainwater = 0.8 NTU
3) For Sample collected =10.2 NTU

IV. THEORETICAL FRAMEWORK

For analysis purpose, the catchment area is selected. By using rainfall data quantity of discharge is calculated for this paper. By collecting the sample of raw water its quality analysis is done. According to the result obtained from analysis filtration techniques and treatment, a flowchart is done.

V. FUTURE SCOPE

The actual provision of stormwater management in DYPIEMR campus.

Applying this type of system in the various institutional building, commercial building, public building, can decrease the average annual demand for water.

In the drought-prone zone, stormwater management can be effectively used to solve the problem of water scarcity.

VI. CONCLUSION

As a conclusion, area clear stormwater management policy does not exist yet in the campus of DYPIEMR, which can be a tool in order to measure and value the quality and quantity of stormwater.

Fig. 1: Raingauge

Fig. 2: BOD Test

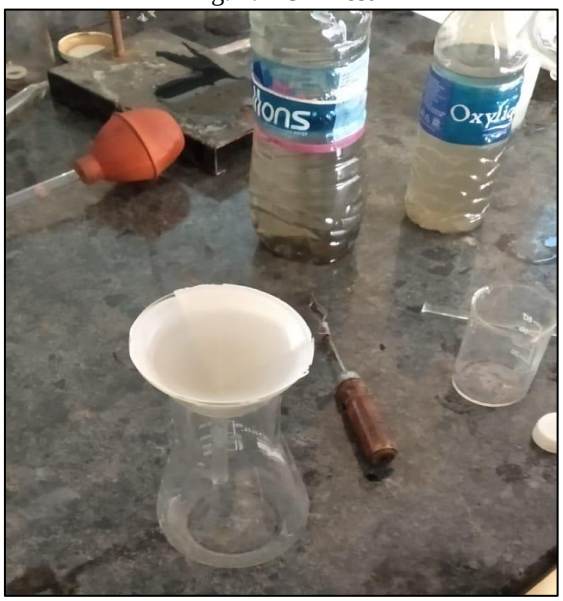

Fig. 3: Solids Determination

Fig. 4: Conductivity Test

Fig. 5: pH Test

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