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Integrated Environmental Management of Suitable Resource for Cost Optimization of V-iMEET Campus.

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***Abstract*—** Watershed management & rainwater harvesting plays a vital role in reducing soil erosion & water conservation. Several districts in coastal Maharashtra face the perennial problem of water storage despite of getting heavy rains during the monsoons lack of water is particularly acute problem during the months after the monsoon seasons. This study aims to cater the water scarcity by implementing watershed management & rainwater harvesting systems, to model & analyze watershed & Rainwater harvesting project in our college area to fulfill water requirement.

Keywords- *Watershed management ; rainwater harvesting*

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I. INTRODUCTION

Watershed management is a concept which recognizes the judicious management of three basic resources of soil water and vegetation, on watershed basis, for achieving particular objective for the well being of the people". It includes treatment of land most suitable biological as well as engineering measures. Watershed management is also a term used to describe the process of implementing land use practices and water management practices to protect and improve the quality of the water and other natural resources within a watershed by managing the use of those land and water resources in a comprehensive manner.

Watershed management involves determination of alternative land treatment measures for, which information about problems of land, soil, water and vegetation in the watershed is essential. In order to have a practical solution to above problem it is necessary to go through four phases for a full scale watershed management.

- Recognition phase.
- Restoration phase.
- Protection phase.
- Improvement phase.

The Integrated Watershed Management Programme (IWMP) one of the Flagship programme of Ministry of Rural Development is under implementation by the Department of Land Resources since 2009-10 after integrating three area development programmes namely:

- Desert Development Programme (DDP)
- Drought Prone Areas Programme (DPAP)
- Integrated Wastelands Development Programme (IWDP)

The concept of rainwater harvesting involves 'tapping the rainwater where it falls'. A major portion of rainwater that falls on the earth's surface runs off into streams and rivers and finally into the sea. An average of 8-12 percent of the total rainfall recharge only is considered to recharge the aquifers. The technique of rainwater harvesting involves collecting the rain from localized catchment surfaces such as roofs, plain / sloping surfaces etc., either for direct use or to augment the ground water resources depending on local conditions. Construction of small barriers across small streams to check and store the running water also can be considered as water harvesting. In Urban areas, the roof top rainwater can be conserved and used for recharge of ground water. This approach requires connecting the outlet pipe from rooftop to divert the water to either existing wells/ tube wells/bore well or specially designed tank. The urban housing complexes or institutional buildings have large roof area and can be utilizing for harvesting roof top rainwater to recharge aquifer in urban areas. The runoff from the terrace of the college building is channelized into three recharge wells located at three different locations, each measuring 1m x 1m x 2m. All the rooftop rainwater outlets, except that from the Tutorial Block, discharge into storm water drains and then to the recharge structures. In the Tutorial Block, a network of pipes linked through chambers take the rainwater to the recharge wells. To facilitate groundwater recharge, all structures are provided with 15m deep bore wells of 150mm diameter. Layer of bricks filled inside the recharge well ensures proper filtration of harvested water.

The filtration is a technique used for two main purposes. The first is to remove solid impurities from a liquid .the

second is to collect desired solid from solution from which it was precipitated or crystallized.

The use of sand and gravel as filter media for water supplies can be split into three basic filter types: slow sand filters, rapid filters and roughing filters. Apart from desalination and reverse osmosis, slow sand filters are perhaps the most effective single treatment for purifying drinking water supplies. They are use on a large scale as part of the water supply for large cities, as part of systems for small villages and on a much smaller scale they can be adapted for use in individual households. Rapid sand filters are normally require a subsequent chlorination process and are thus of less use for small village supplies unless the raw (untreated) water supply is of a reliably high quality.

II. OBJECTIVES

Watershed management is renowned technique for conservation of water. But due to expenditure behind it, it is not yet accepted by the society. The purpose of this project is to find out the suitability in terms of cost for the ViMEET campus. This assessment includes the investigation of current literature, conduction of surveys required for the watershed management. This also includes the designing of the same watershed management system in the same campus and cost analysis of the system. In order to achieve this aim following objectives had to be met:

a. To carry out extensive Literature survey.

b. Collection of the data of site selected as ViMEET campus.

c. Designing of watershed management system for ViMEET campus.

d. Cost analysis of the system.

III. METHODOLOGY

Research Methodology includes description in detail about study of the ViMEET campus and designing the suitable watershed management system for the campus which includes the following points.

1. Collection of data of site conditions and surroundings.
2. Preparation of contour map of selected site.
3. Profile levelling is used to select the water outlets.
4. Constructing the suitable structures on water outlet points.
5. Preparation of the estimates of structures proposed.

IV. DATA REQURMENT

A. Basic Requirement Of Water For The Month September 2016

1) Total No. of student in ViMEET (Including Staff)
= 1592

2) No. of student staying in Hostel
= 205

3) No. of remaining student (Non-staying)
= 1592-205

B. Basic Requirement of water (As per IS 1172-1993 in lpcd)

1) Student staying in Hostel
= 205x135 = 27675

2) Student Non-staying in Hostel
= 1387x30 = 41610

3) Total (1 + 2) = 69285 ……. (1)

C. Actual Supply of water (Per month)

1) For Drinking Purpose = 1724*20
= 34480
2) For Domestic Purpose = 73*15000
= 1095000
3) Total (a + b) = 1129480

(A) Actual Supply of water (Per day)
= 1129480/ 30
= 37650

(B) Water supply for canteen (Per day)
= 1387*20
= 27740

Total (A + B) (Per day)
= 65390 ……(2)

D. Rainfall Data

Rainfall was high with **average rainfall of 3336.36 mm** for past 10 years. The highest rainfall in last 10 years was 3921.4mm in 2009 and lowest rainfall was 2289.4mm in 2015.

- 2007- 3293.5 mm
- 2008- 3489.9 mm
- 2009- 3921.4 mm
- 2010- 3148.6 mm
- 2011- 3234.2 mm
- 2012- 3375.3 mm
- 2013- 3913.5 mm
- 2014- 3031.8 mm
- 2015- 2289.4 mm
- 2016- 3670.30 mm

E. Data Collection For Rainwater Harvesting

- Area of catchment 2220 Sq.m
- Average annual rainfall 3336.79 mm
- Runoff coefficient 0.25
- Rainfall that can be harvested from the rooftop

- Annual water harvesting potential =2220*3.33*0.25

  =1848150 lit.

- Approximate requirement of water/day: 30000 lit

V. DISCUSSION

- Location of tank from contour sheet.

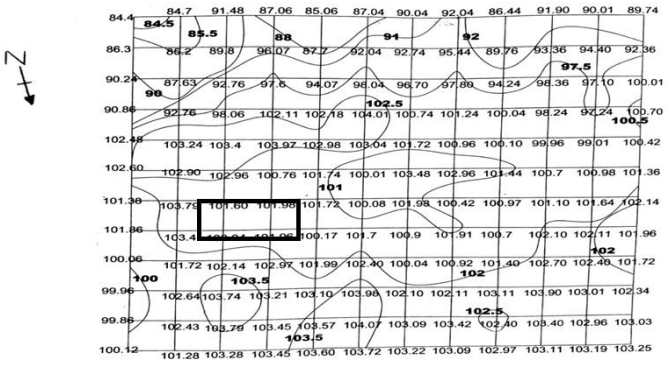

Fig. Contour Plan of the college area which comes under watershed

VI. CONCLUSION

Plenty of water is available in rainy season, particularly in Konkan region where more than 3000 mm rainfall is available. After the rainy season around the month of December water scarcity starts & water demand increases. As large amount of ground water is drown out from underground, reduction of ground water table occurs which interns reduces water level in well.

To cater this problem of water storage in rural areas, the technique of watershed management is best suited. By this method ground water table increases thus providing sufficient water during summer season & reducing the call of tankers on which a lot of money is spent.

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