DEVELOPMENT OF WATER CONSERVATION PLAN AT MANIPAL, UDUPI DISTRICT

HG UMESHCHANDRA[**], GURU PRASAD[*], KARIGOWDA[*], KARTHIK N S[*], LEISHEMBA SOIBAM[*]

** ASSOCIATE PROFESSOR, DEPARTMENT OF CIVIL ENGINEERING, ALVA'S INSTITUTE OF ENGINEERING AND TECHNOLOGY

* UG SCHOLAR, DEPARTMENT OF CIVIL ENGINEERING, ALVA'S INSTITUTE OF ENGINEERING AND TECHNOLOGY

Abstract

Water has become oil of 21st century due to increase in demand in proportion to the rapidly increasing population. Now it is high time we must conserve this natural resource. For conservation of water resources, we can adopt number of conservation plans like Rain water harvesting, artificial ground water recharge from roof top catchments to improve the ground water level and fulfill the daily requirements. This should be made mandatory in urban areas to satisfy their demands. Although, the study area Manipal receives annual rainfall of 500 – 560 cm faces water scarcity in dry season due to variation in the population and lack of conservation plans. Since the area consists of multiple large infrastructures, adoption of water conservation plans will be effective. In this project we have discussed regarding structural components and advantages of water conservation plans. These recommendations of water conservation plan have also been made for future benefits of the society.

Keywords:- Water Conservation, Conservation plans : Rain Water Harvesting, artificial ground water recharge, Urbanization

I. INTRODUCTION

Water is an essential and basic human need for urban, industrial and agricultural use. While an abundance of fresh water resources is available, its uneven distribution around the globe creates challenges for sustainable use of this resource. Water conservation refers to the careful use and preservation of water supply. It includes both the quantity and quality of water utilized. Water is an essential asset for the nourishment of all life. The fundamental demand for all activities appropriate from local use to agricultural industry. With the regular expanding weight of the human population, there has been a serious tension on water resources. Negligence of customary water bodies like tanks and lakes, unpredictable and abuse of groundwater, and incorrect preservation of surface water systems has bothered the issue. Still further and is no doubt going to grow in the years to come. There are various approaches to make your water to last nowadays. One simple yet often disregarded strategy to cut your water bill is to use your water twice. Unlike electricity, water can be reused over again and again. That's the idea of water conservation. an efficient and optimal use as well as protection of valuable water resources.

II.STUDY AREA

Manipal is locality of Udupi city, located 8 kilometers from center of Udupi City in Karnataka, India and is administrated by the Udupi City Municipality. It lies at latitude of 13.36050N and 74.78640E and is located in the part of Coastal Karnataka, 62.8km north of Mangalore and 8km east of the Arabian Sea. The total area of Manipal is $26km^2$.

The reason for selecting Manipal particularly for the study is even though the area receives maximum rainfall of 500cm to 560cm annually it faces water scarcity critically due to lack of water conservation plan.

Since the area includes good infrastructures, development of suitable water conservation plan for the region may help in overcoming this problem.

III.OBJECTIVES

To develop water conservation plan

To develop and present implementation strategy.

To identify and select potential water conservation measure.

IV.METHODOLOGY

1.Methodology adopted for Developing Water Conservation Plan

Study area is identified and data has been collected on infrastructure and existing population.

Collected the annual rainfall data for previous 13 years from the Municipal Office, Manipal.

Door to door survey has been conducted to identify the water consumption.

The potential rain water quantity to be harvested is estimated.

Measurement of roof top catchment area is done using Google My maps.

The basic elements of roof top rain water harvesting system are designed

Other water conservation methods are suggested.

2. Population Forecasting

Design of water supply and sanitation scheme is based on the projected population of a particular city, estimated for the design period. Any underestimated value will make system inadequate for the purpose intended; similarly overestimated value will make it costly. Changes in the population of the city over the years occur, and the system should be designed taking into account of the population at the end of the design period.

3. Rain Water Harvesting

Rainwater harvesting can be done at individual household level and at community level in both urban as well as rural areas. At household level, harvesting can be done through roof catchments, and at community level through ground catchments. Depending on the quantity, location and the intended use, harvested rainwater, it can be utilized immediately or after storage. Other than as a water supply, RWH can be practiced with the objectives of flood control and soil erosion control.

4. Artificial Recharge of Ground Water

In order to increase the natural supply of ground water, people artificially recharge ground water basins. Artificial recharge may be defined as augmenting the natural movement of surface water into underground formation by some method of construction, by spreading of water, or by artificially changing natural conditions. A variety of methods have been developed, including water spreading, recharging through pits and wells and pumping to induced recharge from the surface water bodies. The choice of a particular method is governed by local topography, geologic and soil conditions, the quantity of water to be recharge, and the ultimate water used.

V. RESULTS AND DISCUSSION

1.Population forecasting

The population has been projected for two decades as the reference how the water consumption scenario will change and to distinguish whether the conservations plan can be feasible till the design period.

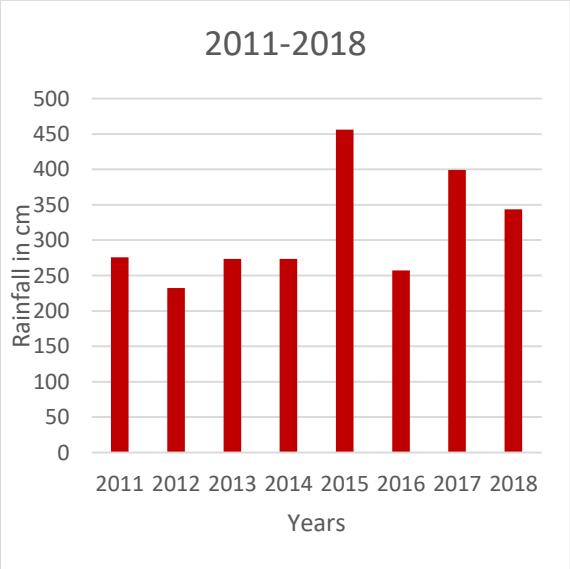
Place	**2001**	**2011**	**2021**	**2031**
Saralebettu	3728	4473	5367	6440
Parkala	591	709	850	1020
Eshwaranagara	7007	8408	10089	12106

As In 2021, combining all the population the water requirement per day is 2.2MLD and in case of 2031 the water requirement per day is 2.64MLD. Therefore, the rooftop area of about 1000m^2can harvested around 1.2 million liters annually in the selected region, i.e., about 54% of water can be harvested by an area of about 1000m^2. Therefore, in an overall view if water conservation plans were adopted then it can meet the requirements.

2.Collection of Rainfall Data and Analysis

Hydrometeorology is a branch of meteorology and hydrology that studies the transfer of water and energy between the land surface and the lower atmosphere. Hydrologists often utilize meteorologists and products produced by meteorologists as an example, a meteorologist would forecast 2-3 inches of rain is a specific area, and a hydrologist would then forecast what the specific impact of that rain would be on the terrain.

The average amount of the rainfall over a specific area may be determined by the arithmetic average of the rainfall recorded by individual rain gauge stations located in that area.



The figure representing annual rainfall data shows that the selected region receives abundant amount of rainfall and it can be supportive for the implementation of water conservation plans in the area.

3. Data collection

Place	Number of houses	Number of people	Quantity of water consumed (litres)	Conservation plans	Any scarcity of Water
Saralabettu	44	526	1,76,080	No	Yes
Eshwaranagara	46	571	1,26,350	No	Yes
Parkala	50	522	1,40,220	No	No

To develop a water conservation plan it is essential to know about the water demand of an area, in our project the selected areas are Parkala, Eshwaranagara, Saralabettu. Door to door survey for nearly 150 houses has been conducted to collect the details of water consumption.

From the collected data we came to know that, 2 places among 3 face water scarcity and implementation of a water conservation system is necessary.

4. Roof area calculation

Rain water harvesting traditionally comprises the collection of precipitation falling on the roof or terrace of a building and storing it in a water proof sump at ground level for use in period of scarcity of supply from other sources such as pond and well.

Sl.no	**Building**	**Roof area (m^2)**	**Quantity of water harvesting (m^3)**
1	Ideal Residency	1860	2250
2	Loyal Residency	640	1000
3	Vaishnavi Residency	990	1200
4	Regal hills	770	1000

5. Artificial recharge of ground water

In order to increase the natural supply of ground water, people artificially recharge ground water basins. Artificial recharge may be defined as augmenting the natural movement of surface water into underground formation by some method of construction, by spreading of water, or by artificially changing natural conditions.

A variety of methods have been developed to recharged ground water artificially.

Recharge methods may be classified such as,

- Recharge pit method
- Recharge point method
- Recharge well method
- Recharge trenches
- Ditch and furrow method
- Channel method
- Water spreading method

VI. CONCLUSION

Considering the unknown future consequences climate change and increased population growth may have on freshwater supplies, we must begin to adopt water conservation measures at all levels of use.

We explored different conservation plans that are suitable and can be implemented easily in the study area. We focused mainly on the conservation of rain water in order to reduce the water demand and improve the ground water table.

In the present study the potential of roof top harvesting has been estimated. Residential buildings with more water consumption rate were selected in the study area and relative rain water harvesting can reduce the dependency on Municipal water supply system.

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REFERENCES

[1]. Peter H Gleik (2008) "*A look at 21st century water resource development."*

[2]. Mansi Master[1], Khushbu Gandhi[2] (2017), "Water audit and inevitability of water meter."

[3]. Daniel P Loucks[1], Jery R Stendinger[2], Douglas A Haith[3] (1981), "Water resource system planning and analysis".

[4]. Santhosh Kumar Garg., water supply engineering, Vol-1, Khanna Publishers, New Delhi, pp. 338-365.

[5]. Shivakumar. A R, Principal Investigator, Amruthavarshini – A guide for rain water harvesting, Bangalore, 2008.

[6]. Dr. Kalia S N., " Roof top harvesting" – A case study, National seminar on Rain water Harvesting and Water management, Nagpur, 2006, pp. 267-274.

[7]. Nagaraj Rao P S., " Groundwater Resources in Puttur taluk, South Karnataka District, Groundwater studies, Vol. no. 91, Bangalore, 1973,pp 1-27.

[8]. Rosa Aisa, Gemma Larramona (2012), "Household water saving: Evidence from Spain".

[9]. Sitaram Shetty B., "Rainwater Harvesting in Coastal Districts of Karnataka State, India", National Seminar on Rainwater Harvesting and Water Management, Nagpur, 2006, pp.171-172.

[10]. James L. Wescoat Jr.,et al, "Urban and Rural Water Conservation Research in India."