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USE OF QGIS FOR ROOFTOP RAIN WATER HARVESTING AT SIDHIGIRI MATH

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Abstract- Rainwater harvesting from rooftops of houses used to be an ancient practice in arid zone. It is a welcome practice in the rural areas especially where the rainfall is very scanty and the stress on groundwater has been increasing and recharges area has been decreasing continuously. Roof water harvesting was practiced, as a matter of necessity, mostly in the low rainfall areas of the country, having annual rainfall less than 500 mm per year. The rainwater that falls on the surface / rooftop is channelized to bore wells or pits or new / old abandoned well through small diameter pipes to recharge It has been observed that modern constructed houses both in rural and urban areas no provision for the collection and storage of roof water has been made.

In this paper potentiality of Rain Water Harvesting is worked out for Kaneri math ,kagal. The tool of Rain water harvesting i.e. Roof top Rainwater Harvesting in Storage Tanks is considered. The present paper uses a QGIS approach to assess total area of catchments available for rain water harvesting in Kaneri Math area of Kagal, Kolhapur district and calculate the amount of water which could be really harvested and the water is stored in tanks separately and these water is then used for the drinking purposes.

Key Words- QGIS Software, Rooftop rainwater harvesting system

I. INTRODUCTION

Rainwater harvesting from rooftops of houses used to be an ancient practice in arid zone. It is a welcome practice in the rural areas especially where the rainfall is very scanty and the stress on groundwater has been increasing and recharges area has been decreasing continuously It has been observed that modern constructed houses both in rural and urban areas no provision for the collection and storage of roof water has been made. The increase population growth and inefficient system of distribution of Municipal Corporation and Grampanchyat water supply have led to seasonal scarcity of domestic water supply in practically all the rural and urban agglomerates. Traditionally, the rainwater collected from roofs was always stored in sump. In modern days, the roof water is stored in a sump or recharged into the local aquifer. This kind of practice directly used for recharging the local aquifer has been becoming popular both in urban and rural areas.best way for mitigating the water scarcity.

The selected study area is Kaneri Math ,where rooftop rainwater harvesting is an economical.

II. STUDY REGION

The selected area fall in Kagal Taluka where Kaneri Math is developed as a tourist place and residential aashram for students and working staff.

The total area of the Math is 240 hectares (ha) out of which, about 55 ha surrounding the village.

Figure 1: Downloaded Image from Google

This area falls in the rain shadow zone of western Ghats receiving an average rainfall of 700 mm.

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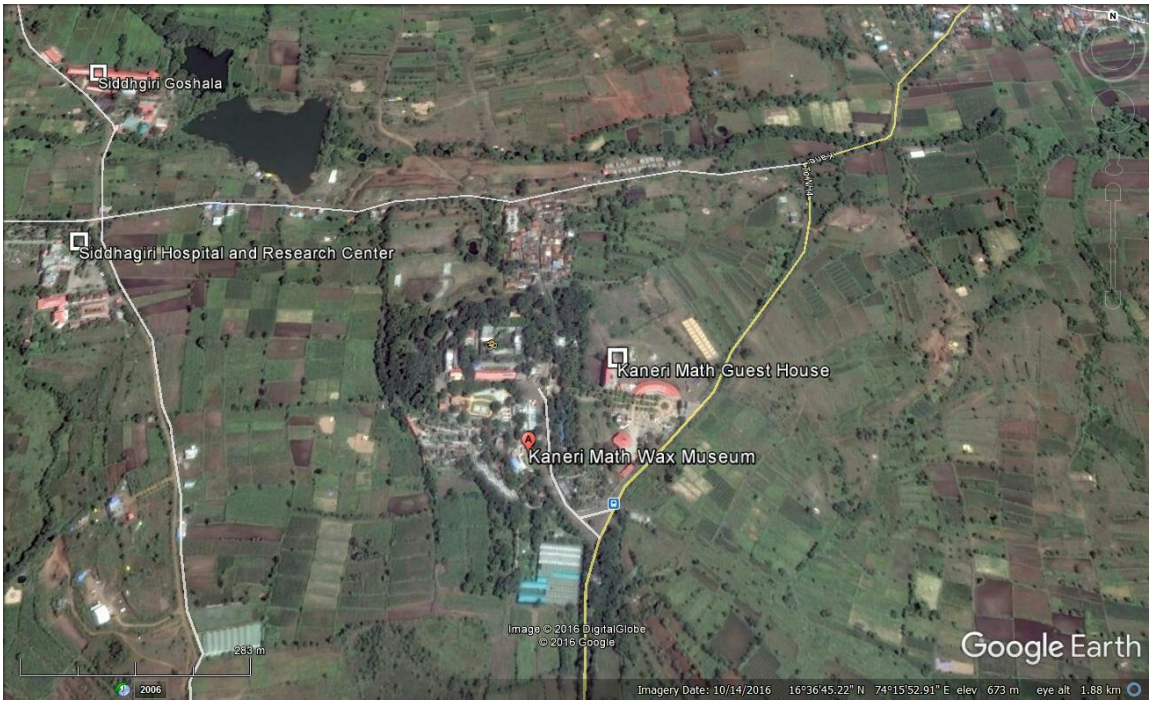

Kaneri Math Area From Google Earth

- The Kaneri math is located 4 KM South of Kolhapur which is near to western ghat area and is dominated by highlands.

- The kaneri math is oriented North-South and flanked on three sides by plateau ridges.

It is located at 17.107 latitude and 74.548 longitude and lies 4 kms towards SE of Kolhapur on Mumbai-Banglore NH4 Highway
Kaneri math is situated in the agro-climatic zone with only one rainy season which lasts from the beginning of June to the middle of the October month.

- Maximum daily rainfall is about 80mm.

- The mean annual rainfall is 799.74 mm with a low variability of 10%.

- A single intense rainfall event can cause up to 50% of the monthly soil loss.

- The daily minimum air temperature ranges from 10̊ c to 20℃.

- The daily maximum air temperature ranges from 12℃ to 40℃.

- The mean daily temperature ranges from 9 0C to 30 0C.

a). Concept of QGIS

Quantum GIS is an open source Geographic Information System that supports most geospatial vector and raster file types and database formats. Unlike many other open source GIS programs, QGIS is available for a number of operating systems, including both Windows and Mac OSX. The program offers standard GIS functionality, including a large variety of mapping features, data editing, on-the-fly projection and GRASS digitizing. Its support for plugins expands its functionality further by providing additional tools such as GPS data support, georeferencing, and additional mapping elements. It is only used to measure rooftop area.

b) Rooftop Area of Kaneri Math

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BUILDINGS	**ROOF AREA**	**ROOF TYPE**
Main Office	506 sq.m	Slopping Roof
Hall	570.76 sq.m	Slopping Roof
Parking Area	338.4 sq.m	Slopping Roof
Math	553 sq.m	Flat Roof
shopping mall	475 sq.m	Slopping Roof
Guruji's House	648 sq.m	Slopping Roof
Nivasthan	150.45 sq.m	Flat Roof
Canteen	144sq.m	Slopping Roof
Gaushala	270.54sq.m	Slopping Roof
Bazar	18.2sq.m	Slopping Roof
Gurukul Guest House	1200 sq.m	Flat roof
Hospital	2000 sq.m	Flat roof

c) Drinking Water Demand

MONTH	a)NO OF RESIDENTIAL STAFF,STUDENTS ,ADORER	DRINKING WATER DEMAND FOR a) (in lit.)	NO OF VISITORS (Per day)	DRINKING WATER DEMAND	TOTAL WATER DEMAND
JANUARY	460	69000	300	18000	87000
FEBRUARY	460	69000	300	18000	87000
MARCH	500	75000	600	36000	1,11,000
APRIL	460	69000	400	24000	93000
MAY	460	69000	400	24000	93000
JUNE	460	69000	300	18000	87000
JULY	460	69000	200	12000	81000
AUGUST	460	69000	200	12000	81000
SEPTEMBER	460	69000	300	18000	87000
OCTOMBER	460	69000	300	18000	87000
NOVEMBER	460	69000	300	18000	87000
DECEMBER	460	69000	300	18000	87000
TOTAL		8,34,000		2,34,000	10,68,000

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III. CALCULATION OF QUANTITY

AMOUNT OF WATER COLLECTED - A ×R× C

A – ROOF TOP AREA

R – ANNUAL RAINFALL IN MM

C – COEFFICIENT OF ROOF SURFACE

RAINFALL = 799.74mm

COEFFICIENT OF ROOF SURFACE

SLOPING – 0.8

FLAT ROOF = 0.85

AMOUNT OF WATER COLLECTED FROM ROOFTOP :-

BUILDINGS	**SLOPPING ROOF**
1.Main office	323.75
2.Hall	365.16
3.Parking	230.03
4.Canteen	92.13
5.Shopping mall	303.90
6.Guruji's house	414.58
7.Goushala	173.08
Total Roof top area	1902.63m^3

BUILDINGS	**FLAT ROOF**
1.Math	375.91
2.Bazar	12.37
3.Gurukul guest house	815.73
4.Nivasthan	102.27
5.Hospital	1359.55
Total	2665.83m^3

TOTAL WATER COLLECTED = 4568460 lit.

d)Rain Water Harvesting Methods Selected:

1. Planning of Use of Water from Roof Top for Drinking Purpose:

- Roof Top Water collected is planned to store in RCC storage tank at several lacations.

Water available from roof top area is 42,68,460 liters., whereas drinking water demand is 10,68,000 lit. It proves that self sufficiency can be achieved in supply of drinking water.

- Total Water Required for Drinking= 10,68,000 lit/Year
- Per Day Water Required to Drink=2966 lit.
- (460@5 lit.,300@2lit)
- Total Quantity of water available=45,68,460 lit.
- Water Sufficient for No. of Days= 45,68,460/2966lit.
- = 1540days.

IV. COSTING AND ESTIMATION

Cost Of storage tank:-(Ferro cement Tank)

I) Approximately cost o tank= 10,68,000 x 1.03=11,00,040/-

Cost of piping:-

I) length of pipe= L×Rate(300rs)

= 1247.69×300

Cost of pipe = 3,74,307 /-.

II)cost of Gutter= L×Rate
=722× 450
=3,24,900/-

III)Cost of pressure filter= 17×1,000
=17,000 /-

IV) Brick Chamber= 6×483
= 2898/-

Total cost= 18,19,145/-

V. RESULT AND CONCLUSION

From the above paper and study carried out it is clear that Rooftop Rainwater harvesting system is a compelling method in the Kaneri Math region. The total amount of rain water collected in the study area is around 45,68,460 liters/year. For the drinking demands of (*10,68,000 liters)* the water harvested is more than enough and is quiet sufficient,safe and economical if specific correction factors and losses are considered. Thus the mentioned work concludes emphasizing that, Rooftop Rainwater harvesting system is the suitable alternative available to meet the increasing water problems, in this era of development and should be promoted to the maximum possible extent.
If such scheme implanted at Kanaerimath, it will create awareness among the public regarding importance of Roof Top Rain water Harvesting.

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