International Journal of Scientific Research and Engineering Development-– Volume 5 Issue 6, Nov- Dec 2022

Available at www.ijsred.com

RESEARCH ARTICLE OPEN ACCESS

Analysis of Deccan Trap Area with Special Reference to Hydro-Landscape

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Abstract:

Basalt rock is very fine-grained, almost glassy, and impervious in the Deccan trap area. It covers Maharashtra and parts of Madhya Pradesh. Since it is an impervious geological zone, rainwater harvesting and hydro landscape planning will be the best way to develop a water body. Chandrapur is one of Maharashtra's eleven Vidarbha districts. It borders Andhra Pradesh on the south, Garhchiroli on the east, Gondia, Bhandara, Nagpur, and Wardha on the north, and Yavatmal on the west. Wardha and Wainganga rivers border the district. 19°30'–20°45' north latitudes and 78°46'–80°00' east longitudes define the district. Since annual rainfall averages 1227.0 mm, humidity ranges from 17%-89%, and temperatures range from 4deg C to 44deg C. A lake will improve the hydro landscape and accommodate flooded water since the region receives 5.0 lakh to 6.0 lakh cubic meters of water annually. The impervious Deccan trap causes flooding and water logging in local depressions due to its good runoff. The study area is in Deccan Trap, where low rainfall infiltration and high runoff cause waterlogging, flooding, and ugly hydro landscapes. The lake is suggested to improve the hydro landscape and accommodate flooding and waterlogging.

Keywords: hydrolandscape, rainwater harvesting, sustainable lake design

INTRODUCTION

The deccan trap area has got complex geological condition and consists of basalt rock which is very fine grained and almost glassy structure and impervious in nature .it covers Maharashtra and parts of Madhya Pradesh.

Since it is an impervious geological zone therefore development of water body using rain water harvesting by planning and design of hydro landscape will be the correct assessment of the area. The area falls in the Chandrapur region and is one of the eleven districts of Vidarbha region of Maharashtra. It is bounded on south by Andhra Pradesh State, east by Garhchiroli district, on north by Gondia, Bhandara, Nagpur and Wardha districts on west by Yavatmal district. Wardha River forms the western boundary, whereas Wainganga River forms the eastern boundary of the district. The district lies between 19°30’ and 20°45’ north latitudes and 78°46’ and 80°00’ east longitudes.

Since the average rainfall is about 1227.0 mm per year with the humidity varying from 17%-89% and temperature variation from 4 C to 44 C. Every year with average rainfall in the region is about 5.0 lakh to

6.0 lakh cubic meters of water which is creating flooding and water logging condition therefore planning of a lake will not only improve the hydro landscape but also accommodate flooded water.
It is therefore the feasibility and proper planning to create appropriate hydro landscape in this rea has been suggested.

SCOPE OF WORK
The deccan trap is an impervious rock which has got good runoff condition which creates flooding in the area and water logging in the local depressions which is not considered a good landscape.

3.OBJECTIVES

The planning of a lake using rain water harvesting system will be a good option is order to improve the hydro landscape of the area

A. To delineate the total catchment area.
B. To access the total rainwater potential of the catchment
C. To access the total amount of rainwater received by depression zones.
D. To plan and design of the lake which is the appropriate hydro landscape.

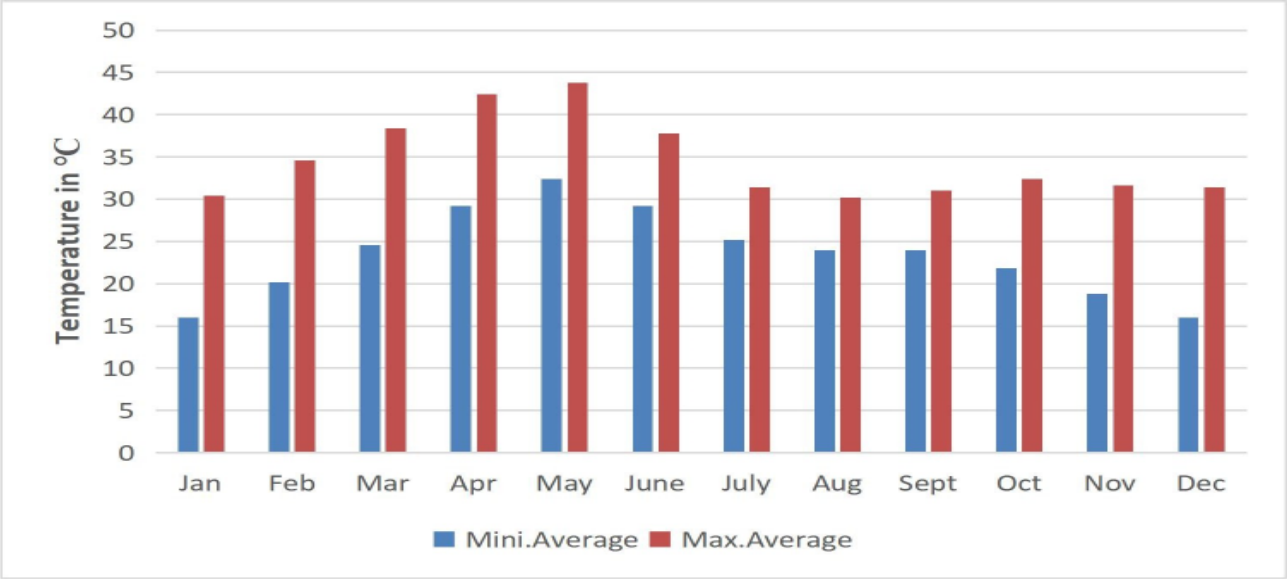
4.METHODOLOGY:

To achieve the main objectives of the study the following methodology will be adopted:
A. The study area will be divided into different zones as macro and micro level grid pattern according to the physiographic condition.
B. The meteorological department's rainfall data will be used for the rainfall intensity and pattern calculations in and around the study area.
C. The average rainfall of the study area will be integrated as the rooftop area and open space areas of different zones in monsoon months for rainfall restoration.
D. The water will be analysed and properties i.e., rainfall-runoff condition, turbidity condition and sediment load analysis will be done accordingly the silting pattern will be adopted along with filtration system.
E. The planning and design of the lake will be done which is the appropriate hydro landscape.

5.ANALYSIS AND DISCUSSIONS

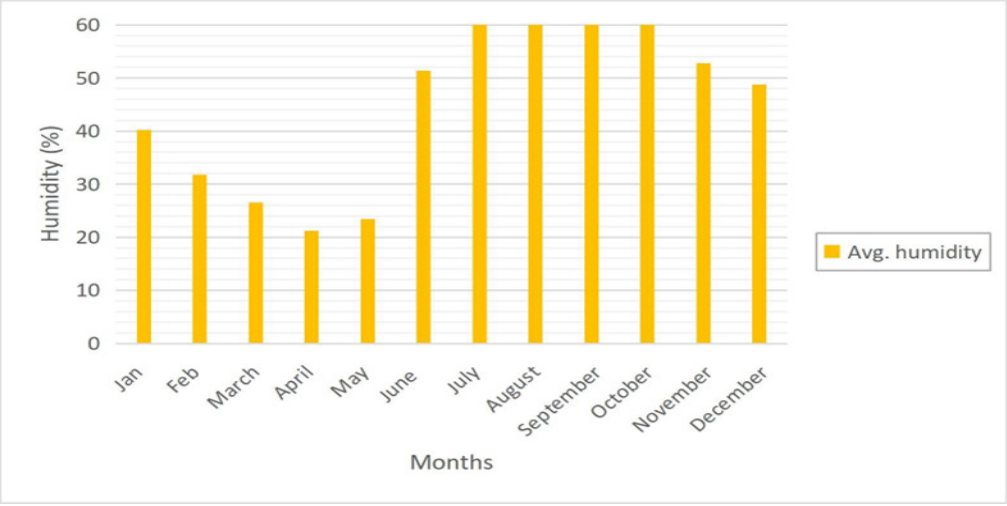
5.1 Geology of the area
Geomorphologically, Chandrapur district can be divided into two physiographic regions i.e., plane region in valleys of Wardha, Penganga and Wainganga Rivers and Upland Hilly Region.
(A)The Plane Region:
The plane region is made up of widely spread and flat terrain occurring mostly along Wardha River. In Wainganga valley flat terrain exhibits rolling topography with residual hills in the southern part, while in the northern part (Brahmapuri taluka) wide alluvial flood plains are observed.
(B)Upland Hilly Region:
The upland hilly region lies between Wardha and Wainganga rivers comprising parts of Warora, Chandrapur, Mul and Brahmapuri talukas. The south western part of the district in Penganga basin and covering parts of Rajura and Chandur talukas exhibit hilly topography.
(C)Temperature

Temperature data for last five years from 2015 to 2019 was collected from Indian meteorological department and an average rainfall of these five years was considered for calculation of water losses due to high temperature, which depicted that Pre-monsoon months are the hottest months recorded with a maximum temperature of 42□ C - 45□ C.



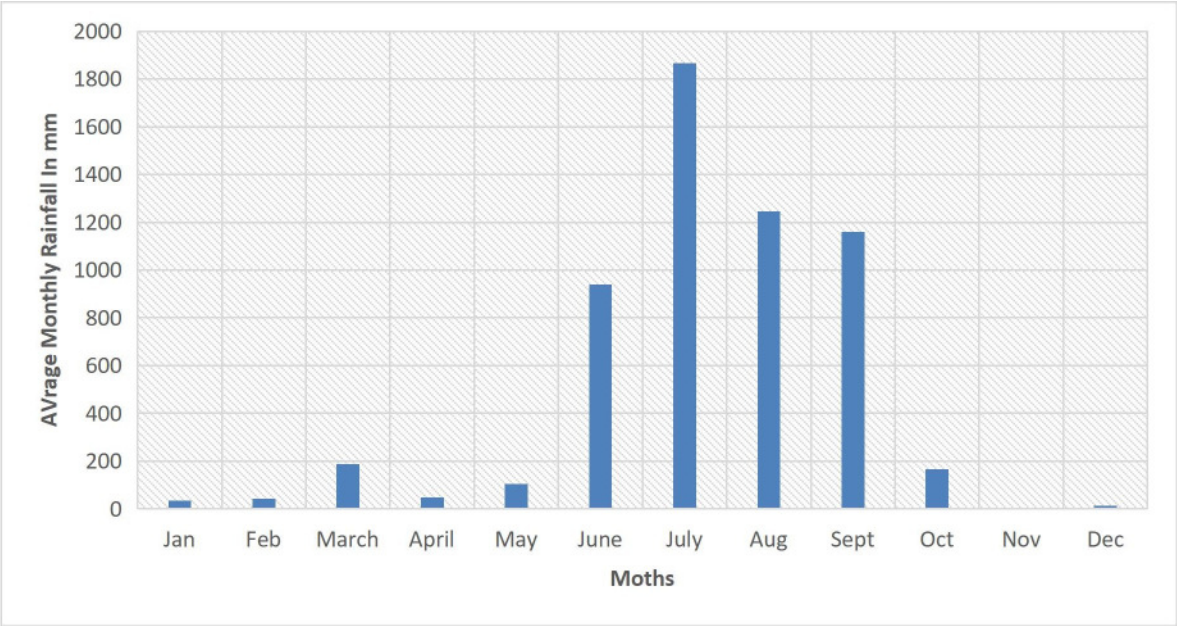
(D)Humidity

Humidity data for last five years from 2015 to 2019 was collected from Indian Meteorological Department. Average humidity is highest during the rainy months. The air is very humid during south-west monsoon season and the rest of the period the humidity is comparatively less. Highest humidity of 80% has been recorded in the month of August and a minimum of 21.2% in the month of May has been recorded.



(E)Rainfall

The southwest monsoon causes heavy rain to fall in the region in rainy months starting from Last week of June to End of September. Frequency of rain is highest in the months of July and August, reaching up to 475.8 mm in the month of July in 2016.The average annual rainfall is 940.9 mm.



Average monthly rainfall from 2014-2018 of Chandrapur, Maharashtra (2014-2018) [SOURCE: IMD]

(F)ASSESSMENT OF WATER AVAILABILITY:

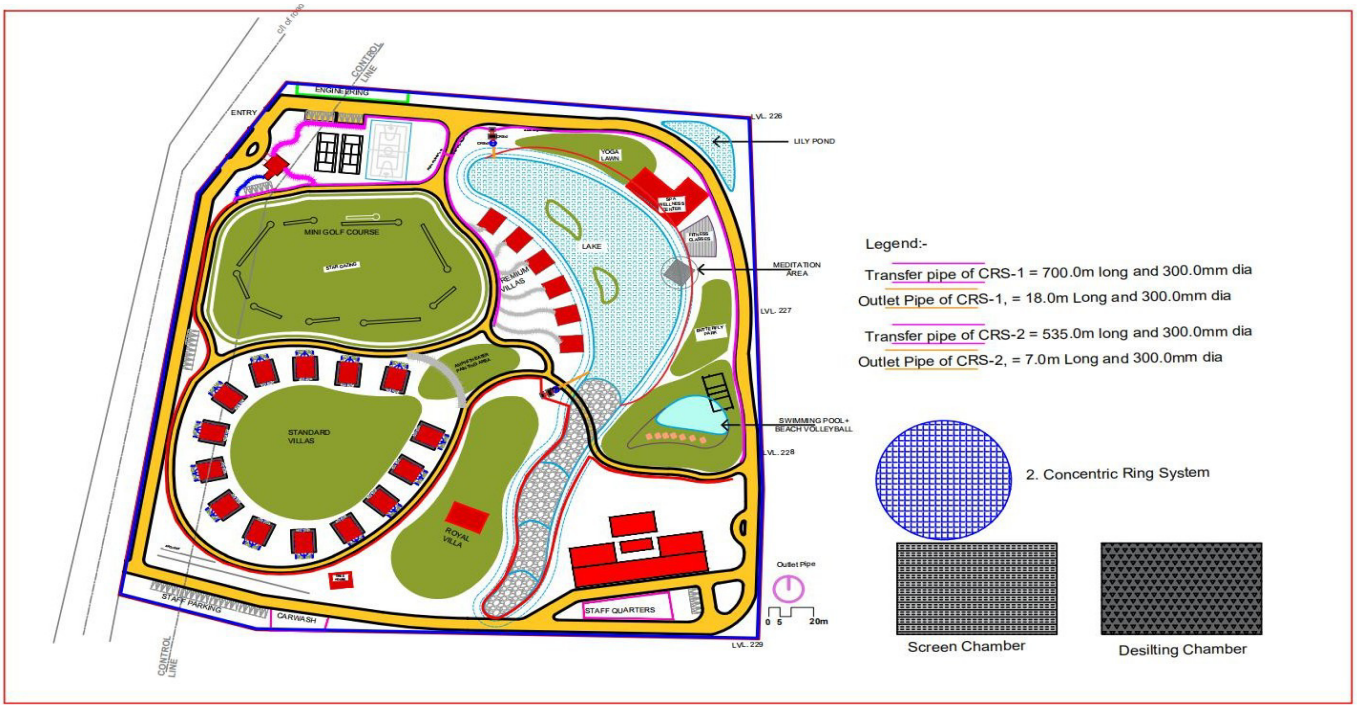
Estimating the availability of rainwater availability from rainwater harvesting

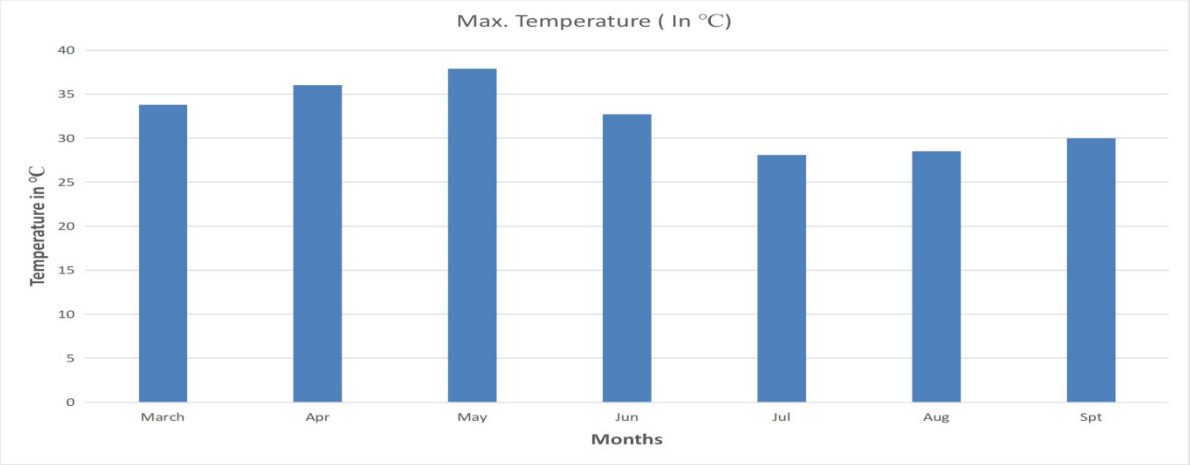
S.NO	NAMEOFAREA	RUNOFFCOEFFICIENT	INTENSITYOF RAINFALL (YEARLY INM)	AREA(M^2)	DISCHARGEQTOTAL ^{3}/m year	DISCHARGEQTOTAL ^{3}/m day
1.	ROOFTOPAREA	0.85	1.280	6543.93	7119.80	203.42
2.	GREENAREA	0.3	1.280	18020.37	6919.82	197.71
3.	OPENLANDAREA	0.3	1.280	25073.56	9628.24	275.09
4.	PAVED AREA	0.65	1.280	2293.852	1908.48	54.52
5.	ROAD AREA	0.65	1.280	9621.724	8005.27	228.72
					33581.62	959.47

(G)EVAPORATION LOSSES

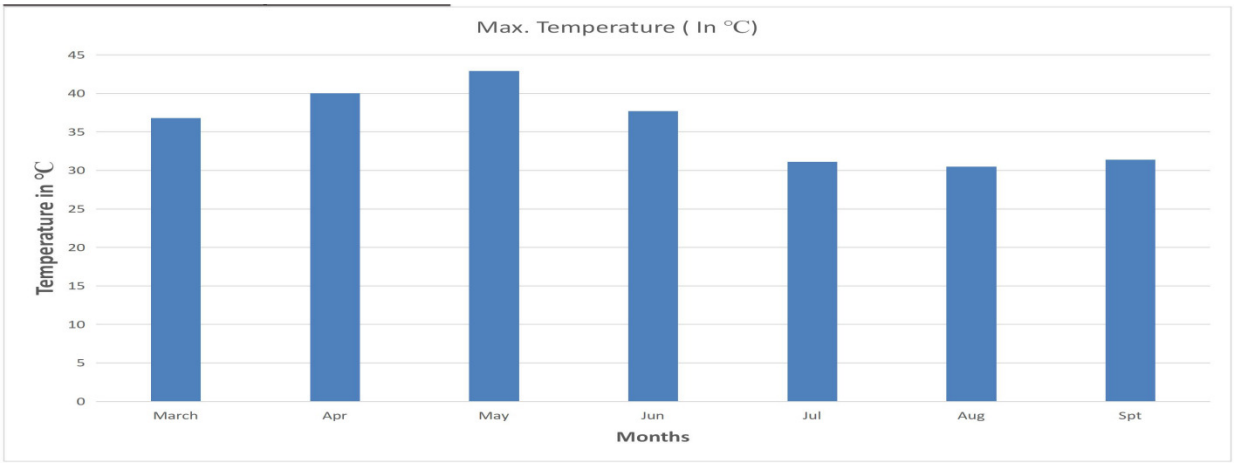
Month	Evaporation Rate(Inmm)	Area of Lake(Sq.m)	Evaporation Loss(cu.m)	Make up water (Incu.m)	Losse swate r
Jan	35	6000	210	157.413	52.587
Feb	42	6000	252	341.063	
Mar	78	6000	468	524.712	
Apr	126	6000	756	367.299	388.701
May	231	6000	1386	288.592	
Jun	256	6000	1536	4565.002	
Jul	112	6000	672	9995.780	

(H)PLANNING AND DESIGN OF LAKE





Thermal Comfort Graph without Lake



Thermal Comfort Graph with Lake

6. CONCLUSION AND RECOMMENDATION:

The study area is located in Deccan Trap region where the rainfall infiltration is very low and runoff is very high which creates waterlogging and flooding and creates ugly looking hydro landscapes. In order to accommodate flooding and waterlogging and create the appropriate hydro landscape the lake has been suggested to improve the hydro landscape of the area.

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