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"USE OF COCONUT SHELL AS CAPPING FOR SAND IN RAPID SAND FILTERS FOR LOW-COST WATER PURIFICATION"

Gautam Thakre [1], Khushi Rahangdale [2], Dr. Manish Dubey [3], Akhilesh Sharma [4]
[1-2] U. G. Scholar, Department of Civil Engineering, SISTecR, Bhopal, Madhya Pradesh, India
[3-4]Assistant Professor, Department of Civil Engineering, SISTecR, Bhopal, Madhya Pradesh, India

ABSTRACT

Climate change, driven primarily by greenhouse gas emissions, is significantly altering global hydrological systems. Rising temperatures, changing precipitation patterns, and increased frequency of extreme weather events are impacting both the quantity and quality of water resources. This study evaluates the impact of climate change on water resources using temperature and rainfall data, along with water level observations from a case study of Upper Lake (Bhopal). The findings indicate that climate variability directly influences water availability, leading to increased risks of water scarcity and hydrological extremes such as floods and droughts. The study highlights the urgent need for sustainable water management strategies to mitigate climate-related risks.

Key Words: *Climate Change, Water Resources, Hydrological Cycle, Rainfall Variability, Temperature Rise, Water Scarcity.*

I. INTRODUCTION

Climate change refers to long-term alterations in temperature, precipitation, and other atmospheric conditions that persist over decades or longer. According to the Intergovernmental Panel on Climate Change, climate change is defined as a statistically significant variation in the state of the climate system due to natural processes, external forcings, or human activities. Similarly, the United Nations Framework Convention on Climate Change emphasizes that climate change is largely attributed to anthropogenic activities that alter the composition of the global atmosphere beyond natural variability.

The water resources and the hydrologic cycle are very important links to climate change. The effect of climate change on water resources is because of the water and water quality changes that are caused by climate factors (mainly including rainfall and temperature changes).and it is achieved by the changes of the various water cycle links. Climate change will change the world of the present situation of the hydrologic cycle and cause the redistribution of water resources in time and space. It also will have a direct effect on the evaporation, runoff, the soil humidity and so on. The redistribution and changes of water resources in space will cause human society and ecology to have changed a lot. At the same time, the water resources system changes will affect the local climate and will exacerbate climate change to a certain extent.

II. LITERATURE REVIEW

Climate change has emerged as a critical factor influencing global and regional water resources. Several studies have examined its impact on hydrology, groundwater systems, and river basins across different parts of the world.

- Early work by Thomas Mack and co-authors (2009) developed a conceptual model of water resources in the Kabul

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Basin, Afghanistan, highlighting the interaction between surface water and groundwater systems. Their study emphasized the importance of hydrogeological frameworks in understanding basin-scale water availability. The report further elaborates spatial variability and recharge mechanisms affecting water sustainability.

- The Intergovernmental Panel on Climate Change (2013) in its Fifth Assessment Report provides a comprehensive scientific basis for climate change, particularly in Chapter 7, which discusses the global water cycle. It identifies significant changes in precipitation patterns, evapotranspiration, and extreme hydrological events due to rising global temperatures.The World Bank (2012) report on the Kabul River Basin emphasizes the need for integrated water resource management (IWRM) and infrastructure investments to address increasing water demand and climate variability.
- Research by Torge Tannometer and Georg Houben focuses on groundwater protection strategies to prevent drought impacts. Their findings stress sustainable groundwater extraction and aquifer recharge as key adaptation measures.
- Studies conducted by A. W. Worglul (2014) compare satellite-based rainfall estimation models (TRMM, MPEG, CFSR) with observed data, demonstrating the importance of accurate precipitation data for hydrological modeling and climate studies.
- Climate change is one area of research that has been steadily increasing in discussions over the last decades. With temperatures increasing around the globe and natural disasters happening in higher frequency, businesses are starting to pay more attention to it since it will impact the future of the whole global population, especially in littoral areas and places prone to natural disasters. Since 2010, the overall number of articles published about this topic has increased as it is important to understand and have literature about this phenomenon to act against, to prevent, and prepare for what is coming soon.

Anthropogenic greenhouse gas emission is altering the global hydrological cycle due to change in rainfall pattern and rising temperature which is responsible for alteration in the physical characteristics of the river basin, melting of ice, drought, flood, extreme weather events and alteration in groundwater recharge. This study reviewed that about 40% of Arctic sea ice has melted just within 40-50 years and global mean sea level has risen up to~0.09 to 0.88 meters as a result of global climate change. Additionally, various mega-deltas of world particularly Ganges-Brahmaputra-Meghna in Bangladesh, the Mekong in Vietnam and the Nile in Egypt are most vulnerable deltas in context of global climate change..

III. METHODOLOGY

We took the following methodology–

1. First of all, we collected annual L.S.L. (Lowest Supply Level) and F.T.L. (Full Tank Level) data of 11 years of Bada Talab (Upper Lake) situated in Bhopal district of Madhya Pradesh.
2. After this we collected the annual Rainfall data of the district which.
3. Collected 11 years annual maximum temperature data of Bhopal district from Times of India (TOI) source.
4. We arranged all the received data with the help of MS Excel software and tried to know the relationship between them.

IV. RESULT ANALYSIS & DISCUSSION

As we are seeing, due to climate change the temperature is increasing and global warming is increasing rapidly. Due to increase in temperature, water from our water sources is evaporating rapidly, which will affect the water supply in the coming days.

We want to tell you through our project how temperature affects our water resources. To know this, we have taken the data of 11 years of Bade Talab (Upper Lake) situated in Bhopal district of Madhya Pradesh state and also collected the data of annual rainfall and temperature of the district and through graphs we found out that the temperature is what is the effect on the water level of that pond.

About Bada Talab (Upper Lake) - Bhopal, the capital city of Madhya Pradesh is a city of Lakes. There are a lot of beautiful lakes in the city and the best among them are the Bada Talab or the Upper Lake which serves as a major

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source of water producing 40% to the residents of the city. Bada Talab is one of the largest manmade lakes and is dedicated to the king Pamara Raja Bhoj.

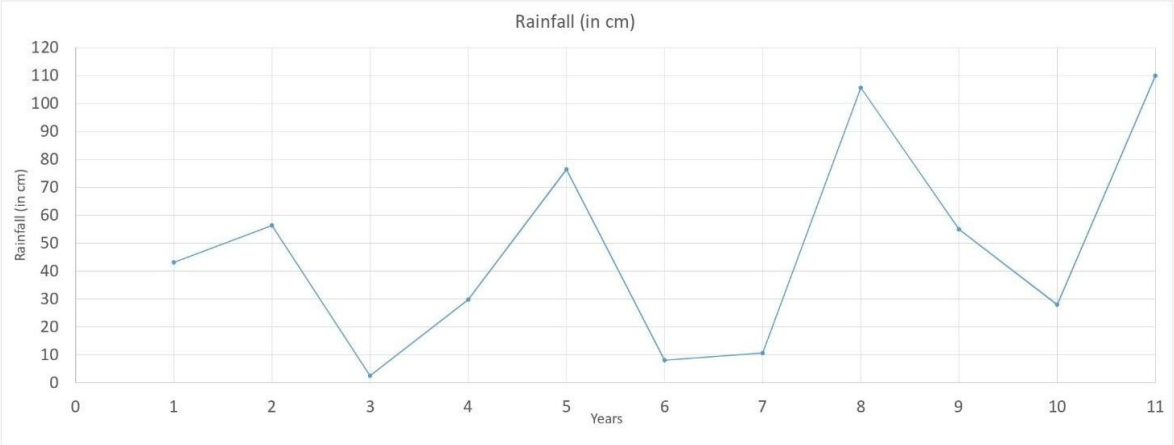
. Picture: Bada Talab (Upper Lake)

History says that the Bada Talab was built when the king suffered from severe skin disorders and when no doctors could cure him, a saint suggested to the king that he builds a huge tank to combine the 365 tributaries and take a holy dip in it to get himself relieved from the skin disease he suffered.

Data of Bada Talab (Upper Lake), Bhopal (M.P.)

Sl. NO.	YEAR	ANNUAL TEMP.(MAX.)	ANNUAL RAINFALL(in cm)	LSL (in million cubic feet)	FTL (in million cubic feet)	LSL-1640	FTL-1640	RAINFALL-70
1	2012	43.9	113.11	1656.3	1666.85	16.3	26.85	43.11
2	2013	44.8	126.35	1659.6	1666.85	19.6	26.85	56.35
3	2014	44.5	72.5	1659.2	1663.7	19.2	23.7	2.5
4	2015	45	99.8	1655	1664.8	15	24.8	29.8
5	2016	46.7	146.41	1654.9	1666.8	14.9	26.8	76.41
6	2017	45.1	78.1	1658.5	1661.5	18.5	21.5	8.1
7	2018	45.3	80.65	1650.65	1660.95	10.65	20.95	10.65
8	2019	44.2	175.65	1649.7	1666.85	9.7	26.85	105.65
9	2020	44.5	124.96	1661.7	1666.8	21.7	26.8	54.96
10	2021	42	97.98	1659.75	1666.85	19.75	26.85	27.98
11	2022	43.9	180	1659.15	1666.8	19.15	26.8	110

Here,
F.T.L. - Full Tank Level (in million cubic feet)
L.S.L. - Lowest Supply Level (in million cubic feet)



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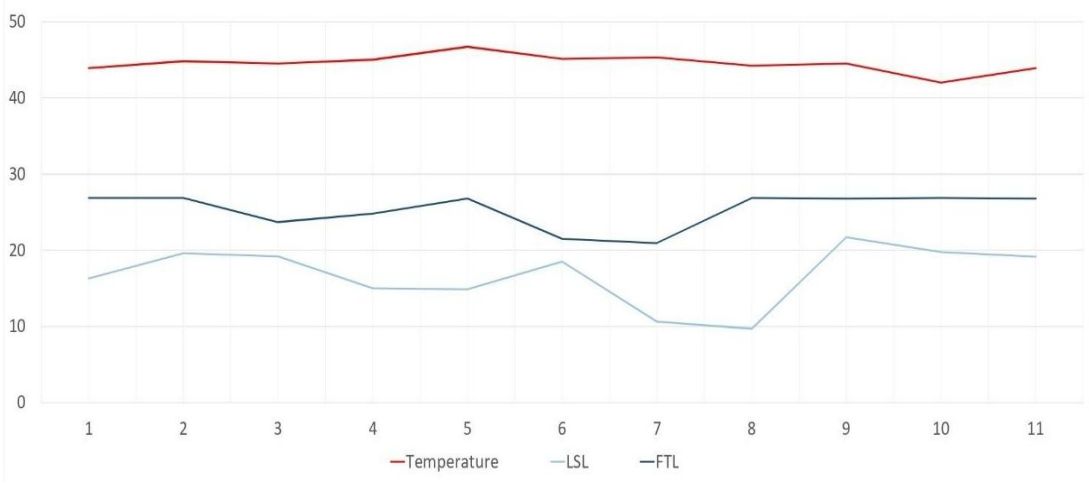

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V. CONCLUSIONS

Through the graph between Temperature, Rainfall and water level of the pond, we have got the following results :

i. From the graph we came to know that in the year when there is more rainfall, the full tank level of the reservoir also increases, but due to maximum temperature the water level of that pond falls rapidly.
ii. But on the other hand, in the years when there is less rainfall, the full tank level of the lake or pond is also less filled and the water level falls less as in 2003, 2006, 2007 which are shown in the graph.
iii. We know that climate conditions are different every year, so it is possible that we will get different results. So, we concluded that the effect of temperature depends on the water level of the pond and the rainfall that year.

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