A Comparative Study of Pollution in Sujan Ganga Canal

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Abstract: *Sujan Ganga Canal water was potable water at the state time. People used it for drinking, washing and bathing purpose at that time. People also treated as a holy water on the eve of their particular festival occasions. As the time passed gradually unlawful activities of people were increased towards Sujan Ganga Canal which led pollutions in Sujan Ganga Canal. Which is main cause of impurities because impurities are directly proportional to the pollution. This pollution is increased due to other reasons also such as encroachments on the periphery of canal, illegal emptying the municipal sewerage waste into the canal. Assessment of polluted water of Sujan canal is necessary by collecting samples from various places(Ghats) for performing various lab tests such as 5days Bio Chemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD) Dissolved Oxygen (DO).On the basis of these experiments it can be concluded that Sujan Ganga Canal is contaminated upto what extent. This experimental investigation is carried out to evaluate the ability to decrease the pollution by means recycling, reuse of material, not using as dustbin, avoiding dumping wastage into the canal.*

Keywords*: Bio Chemical Oxygen Demand, Chemical Oxygen Demand, Dissolve Demand, Sujan Ganga Canal, recycling, reuse, etc .*

1. Introduction

The Sujan Ganga Canal is existing in Bharatpur City of Rajasthan. This historically significant canal had turned into a survival war. It is now a problem for the broader population as well. Bharatpur is supposed to be part of the mystical

Braj Land. Bharatpur and its Fort were established almost 300 years ago by Maharaja

Surajamal in the year 1733. Bharatpur's basic fortification took eight years to build. Lohagarh Fort is almost rectangular ancient earthen fort with 8 bastions and a high wall surrounded by a deep tapering moat wall 18.3 metres wide. SUJAN GANGA CANAL is always filled with water.The canal is approximately 2.9 kilometres long, 200-250 mtr width and 30 feet deep, with total area of 2.4 square kilometres.

Ariel view of SUJAN GANGA CANAL

Previously, the Sujan Ganga was always full of pure/clean water from the adjacent lake Motijheel. The water was used on a regular basis for drinking, bathing, washing purposes. For the city's water supply, there were around 54 wells surrounding the Sujan Ganga canal. The Sujan Ganga Canal eventually turned into a large specific tank, causing the neighboring wells to dry up and the water to become contaminated To make Sujan Ganga Canal pollution free the water assessed so that proper preventive measures may be addopted.

1.1 Major causes of pollution

i. **Domestic Waste**:- This waste waste is generally arises due to the house hold items, food scraps and kitchen wastes.
ii. **Solid Waste:-** Solid trash encompasses a wide spectrum of junk products generated by both animals and humans. Solid cans, polythene and empty wine bottles are examples of such wastes.
iii. **Aquatic Waste:-** Water contamination is caused by water hyacinth and aquatic plants. It is a long-leaved plant that grows quickly in water bodies and absorbs all critical nutrients that marine life require.
iv. **Sediment and silting:-** Suspended silt disrupts the biological balance of a body of water by obstructing sunlight penetration which leads the pollution in Sujan Ganga Canal.
v. **Religious wastes: -** Idols, flowers, and other items are submerged in the Sujan Ganga Canal during spiritual rituals which lower down the Dissolved Oxygen (DO) level in the canal and causes pollution.
vi. **Sewage waste**:- Pathogens (disease-causing bacteria) and putrescible organic compounds are primarily found in sewage waste. All sewage from city contains pathogens because pathogens are shed in faeces.
vii. **Waste water** :- waste water included storm water, parking lots and surface runoff.

1.2 Effects of pollution

Bad smell and Fish died:- Sujan Ganga Canal water contamination has become a significant challenge. About 20 thousands fish died in the month of November 2020 as a result of severely filthy water with low Dissolved Oxygen (DO) levels, according to Department of Fisheries. Due to died fish foul smell was spread surrounding area which bothered the people living on outskirts of Sujan Ganga Canal
Fish Died in Nov. 2020

Used as a Dustbin:- In previous time people respect the Sujan Ganga Canal as a holy Canal but now a days people dump their waste & house outlet drains out in Sujan Ganga Canal using it as a big dustbin.

Used as dustbin

Unsafe water:- The water in the state time was extremely clean and was utilised for drinking, bathing, cooking, and other uses. But in due course of time the water in the Sujan Ganga Canal has become so contaminated that it cannot be utilized for any purpose

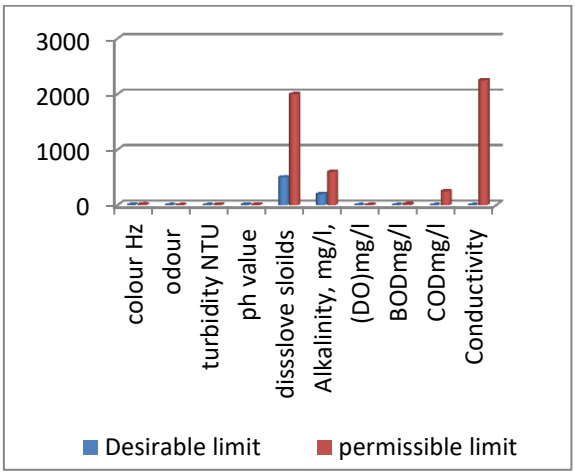
2 Testing of polluted water

To assess the pollution in Sujan Ganga Canal performed various lab experiment and also compared with the BIS & CPCB standard values of potable/Polluted water up to what extent Sujan Ganga Canal water is polluted.

Table- 2.1
CHARACTERISTICS OF WATER

Characteristics	Desirable limit	Permissible limit
Colour, Hazen Units, Max	5	15
Odour	Unobjectionable	1 Ton
Turbidity, NTU, Max	1	10
PH value	6.5 to 8.5	-
Total Dissolved solids, mg/l, Max	500	2,000
Alkalinity, mg/l, Max	200	600
Dissolved Oxygen (DO)mg/l, min	-	4 mg/l or more
Biochemical Oxygen demand (BOD)mg/l, max	-	20 mg/l or less
Chemical Oxygen Demand (COD)mg/l,max		250 mg/l
Electrical Conductivity	-	2250 micro mhos/cm (Max.)

In India, the Central Pollution Control Board (CPCB) has specified water quality requirements in terms of a few chemical properties, which are referred to as primary water quality criteria. In addition, the Bureau of Indian Standards (BIS) has established water quality requirements for several applications.



2.1 Sample Collection of Water

Water sampling for physical or chemical testing can be done in a variety of ways, depending on the level of precision required and the contaminant's properties. Many contamination incidents are time-limited, most typically in conjunction with rainstorms. As a result, "grab" samples are frequently insufficient for accurately assessing contamination levels. Auto-sampler systems, which pump increments of water at either time or discharge intervals, are frequently used by scientists collecting this type of data.

Plants and animals are collected from the surface water body during sampling for biological testing. The organisms may be recognised for biosurveys (population counts) and returned to the water body, or they may be dissected for bioassays to detect toxicity, depending on the type of evaluation.

2.2 Requirements of Water Testing

Water contamination can be studied using a variety of approaches, including physical, chemical, and biological. The majority of them entail sample collection followed by specialised analytical procedures. Temperature, for example, can be measured in real time without the need for sample. To make it easier to compare results from different testing events, government agencies and research organisations have developed standardised, approved analytical test techniques.

2.3 Performing Water Tests

Samples for conducting tests to assess Dissolved Oxygen (D.O.), Biochemical Oxygen Demand (B.O.D.), Chemical Oxygen Demand (C.O.D.) and other pollutants were collected from MANSA DEVI GHAT, KORIYA GHAT CHOBURJA and KHERNI GHAT.

TABLE- 2.2
SHOWING WATER POLLUTANTS

Location of Sources	Mansa Devi Ghat	Koriya Ghat	Khirni Ghat
Village / Habitation	Bharatpur	Bharatpur	Bharatpur
Village Code	Urban	Urban	Urban
Date Of Collection	07/11/2020	07/11/2020	07/11/2020
Lab Sample No	1	2	3

All Results Except pH are in Mg/L

pH	7.6	7.7	7.6
TURBIDITY	9 NTU	8 NTU	9 NTU
COLOUR	26 HZ	25 HZ	26HZ
ODOUR	Bad Smell	Bad Smell	Bad Smell
TOTAL ALKALINITY	393	400	390
TDS	3566	3454	3545
CONDUCTIVITY	6655	6555	6423
DO 1 ST DAY	0	0	0

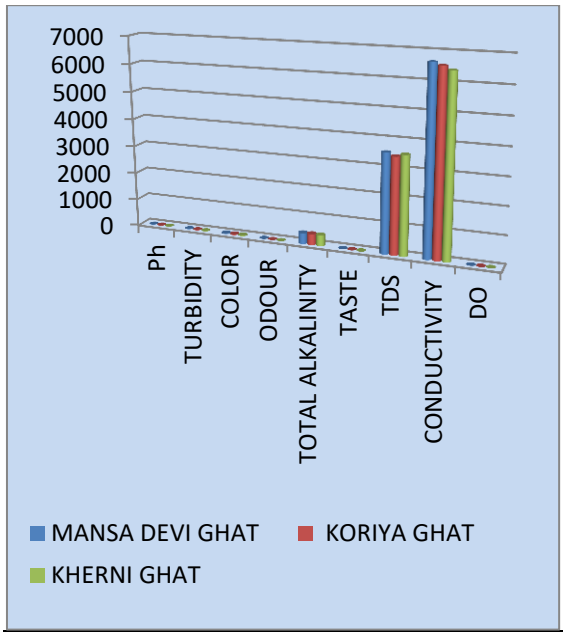


TABLE – 2.3

TABULAR PRESENTATION OF DO, BOD & COD (7.11.2020)

BOD TEST FOR 3 DAY AT 27°C

Location of Sources	**Mansa Devi Ghat**	**Koriya Ghat**	**Khirni Ghat**
Village / Habitation	Bharatpur	Bharatpur	Bharatpur
Village Code	Urban	Urban	Urban
Date of Collection	7/11/2020	7/11/2020	7/11/2020
Lab Sample No	S-1	S-2	S-3

All Results Except pH are in Mg/L

Sample Test	Mansa Devi Ghat	Koriya Ghat	Kherni Ghat
BOD @ 27° C for 3 days	120	110	100
COD	420	400	400
DO	0.0	0.0	0.0

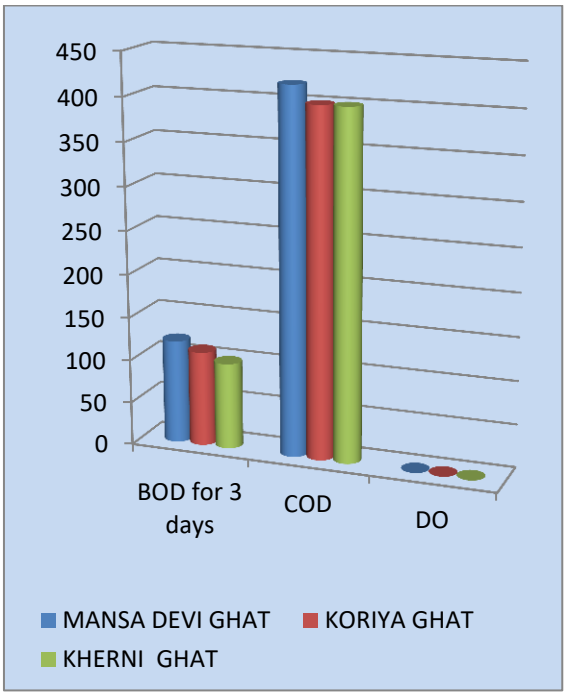


TABLE - 2.4

TABULAR PRESENTATION OF DO, BOD & COD (8.12.2020)

Location of Sources	**Mansa Devi Ghat**	**Koriya Ghat**	**Khirni Ghat**
Village / Habitation	Bharatpur	Bharatpur	Bharatpur
Village Code	Urban	Urban	Urban
Date of Collection	8/12/2020	8/12/2020	8/12/2020
Lab Sample No	1	2	3

All Results in Mg/L

Sample Test	**Mansa Devi Ghat**	**Koriya Ghat**	**Khirni Ghat**
BOD AT 5 DAYS @ 20° C	6	3.2	5.5
COD	40	50	55.4
DO	3.1	2.3	3.3

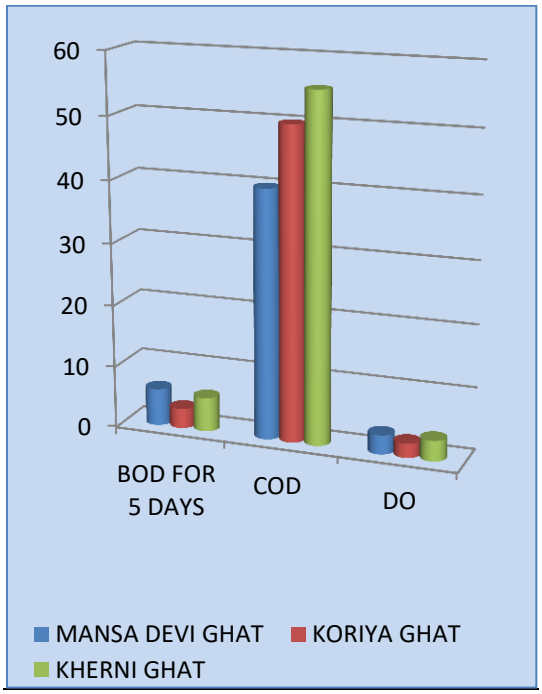


TABLE - 2.5

TABULAR PRESENTATION OF POLLUTANTS (23.12.2020)

Location of Sources	**Mansa Devi Ghat**	**Koriya Ghat**	**Khirni Ghat**
Village / Habitation	Bharatpur	Bharatpur	Bharatpur
Village Code	Urban	Urban	Urban
Date of Collection	23.12.2020	23.12.2020	23.12.2020
Lab Sample No	S 1	S 2	S 3

All result except Ph are in mg/L

pH	8.7	8.7	8.6
TURBIDITY	13NTU	18 NTU	15NTU
COLOR	134.6	135.8	140
ODOUR	Bad Smell	Bad Smell	Bad Smell
TOTAL ALKALINITY	200	230.8	287
TDS	3486	3754	3565
CONDUCTIVITY	6855	6765	6663
DO	3.6	4.1	5.4
BOD for 5 day	3	1	3.3
COD	124	112	120

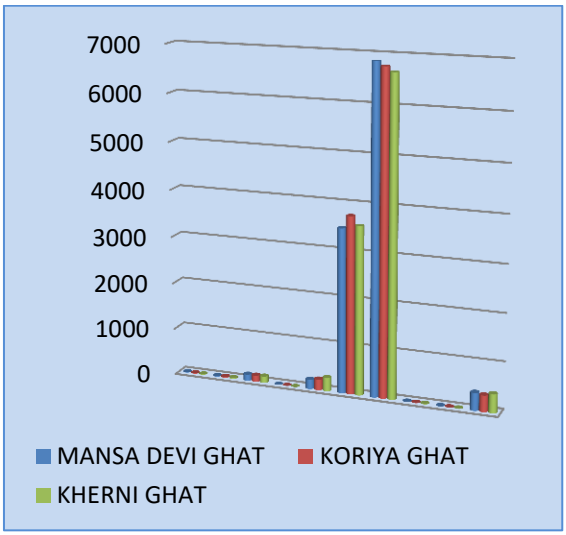


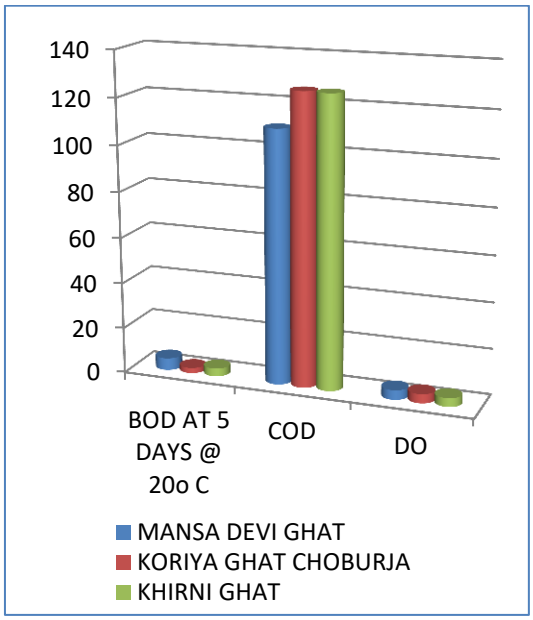
TABLE -2.6

TABULAR PRESENTATION OF BOD ,COD ,DO POLLUTANTS (3.7.2021)

Location of Sources	**Mansa Devi Ghat**	**Koriya Ghat**	**Khirni Ghat**
Village / Habitation	Bharatpur	Bharatpur	Bharatpur
Village Code	Urban	Urban	Urban
Date of Sample Collection	3/7/2021	3/7/2021	3/7/2021
Lab Sample No	X	Y	Z

All Result In Mg/L

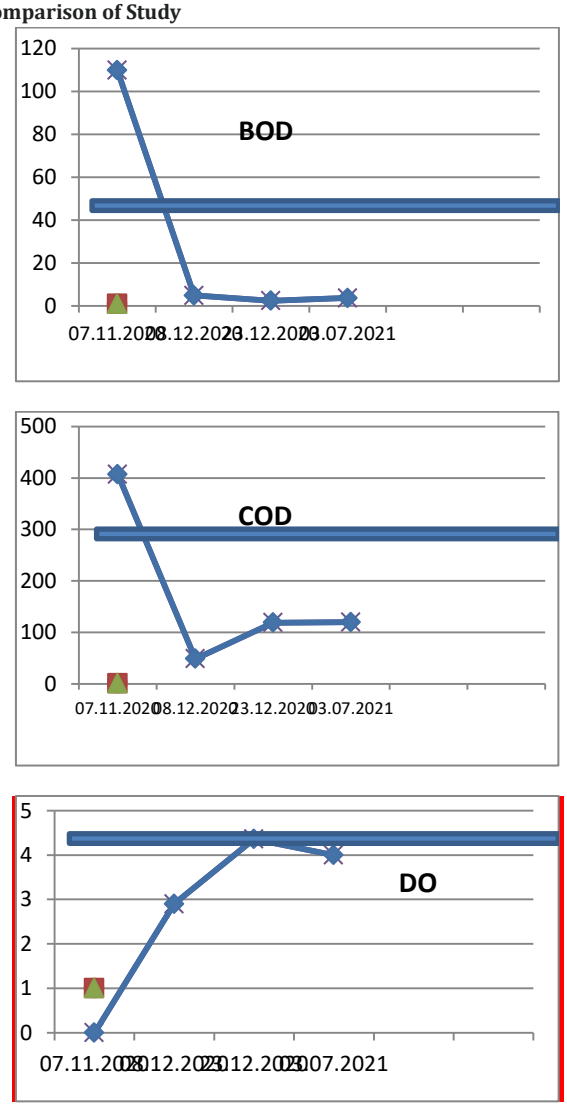
Sample Test	***Mansa Devi Ghat***	***Koriya Ghat***	***Khirni Ghat***
Bod At 5 Days @ 20° C	*5.3*	*2.3*	*3.5*
Cod	*110*	*126*	*125.8*
Do	*4.2*	*4.0*	*3.8*



3. Results and Findings

Water samples were collected from three locations (Ghats) of the Sujan Ganga Canal from the month November 2020 to July 2021 and tested for physical qualities, chemical contents. The prime water quality parameters, such as Conductance, DO, BOD, COD, pH, TDS, Turbidity, Color, Odour and Total alkalinity were analyzed. In the case of dissolve oxygen, standard for sustaining aquatic life is 4 mg/L, whereas for drinking purposes it is 6 mg/L. DO value for Sujan Ganga Canal along our particular reach lies in between 0 to 5.4 mg/L as shown in Table 2.2 to Table 2.6. While in the case of Biochemical Oxygen Demand (BOD), is 20 mg/l against which it is found 120 mg/L. Chemical Oxygen Demand (COD) is other important parameter of water quality assessment. A standard for drinking purposes is 4 mg/L, & 250 mg/l for polluted water which is not acceptable in-terms of our analyzed value as it comes out more than 420 mg/L. pH is the indicator of acidic or alkaline condition of water status. The standard for any purpose in-terms of pH is 6.5-8.5, in that respect; the pH value found 7.6 to 8.7 Total Dissolved Solids(TDS) concentrations are 3454 to 3754 mg/L against 500-2000 mg/l. This is due to the fact that waste assimilation capacity increased in Sujan Ganga Canal. Higher values of total solids are mainly due to the presence of silt and clay particles in the Canal. The value of conductance of Sujan Ganga Canal is 6423 to 6855µs against 2250 µs. Conductance depends on the number of ions present in water Turbidity is the indicator of clarity condition of water status. The standard value lies between 5 to 10 NTU but in Sujan Ganga Canal it was found 8 to 18 NTU. Color is the indicator of purity of water status. The standard value lies between 5 to 25 Hz but in Sujan Ganga Canal it was found 25 to 140 Hz which is greenish in color and highly polluted. Odour indicates the level of pollution of water. The odour of water should be unobjectionable as per standards but in Sujan Ganga Canal it was found of very bad smell. From the above results of water samples collected from various locations/Ghats of Sujan Ganga Canal, it can be concluded that water of Sujan Ganga Canal is highly polluted & not useable for any purpose.

Comparison of Study



4. Water pollution Preventive Measures

Almost 20% of the world's population does not have appropriate access to safe drinking water, while another 40% is subjected to poor sanitary conditions. Increased surface and groundwater pollution will have a significant impact on both human and aquatic life systems. While certain pollutants, such as heavy metals, do not degrade at all, others degrade extremely slowly and can be transferred hundreds of kilometers from their source. However, the consequences of their watery pollution range from contamination of drinking water, resulting in drinking water quality issues, to greenhouse gas emissions, leading in climate change challenges. However, some climate change mitigation strategies for water pollution can be implemented.

1. Carbon capture and storage, the planting of bio-energy crops, effective solid waste disposal, afforestation or reforestation, farmland management – both for water and reduced tillage, and other strategies are among them
2. Rather of using the standard empirical comparison technique, scientific study on water contamination should focus on determining the physical underlying molecular mechanisms and causes. Understanding the mechanics involved will go a long way toward appropriately situating approaches to fight the water

pollution concerns. It can be accomplished by creating a system that considers both the problem (causes and consequences)

3. A long-term working policy on water pollution should not only be devised and legislated, but also strictly enforced, particularly in emerging and poor countries where the threat of water pollution has not been adequately addressed.
4. There are three tools for handling water pollution properly namely (i) Regulations (i.e., substance ban and authorization restriction) (ii) economic tools (e.g., a product or substance fee imposed on substances containing hazardous constituents with the goal of decreasing their usage), and (iii) information (e.g., disposal requirements and information campaign).
5. Furthermore, methods for usage and disposal should be in place with the goal of reducing the amount of essential pollutants introduced into the aquatic environment, which will result in a significant framework for reliable chemical compound coverage and evaluation in complicated macroscopic ecosystems.
6. Ozonation and Advanced Oxidation Processes (AOPs), coagulation-flocculation, membrane bioreactors, Polyaluminium Chlorides (PACs) and associated growth treatment procedures are some of the other alternate ways for eliminating contaminants from water.

As a result, whatever steps are made to reduce surface and groundwater pollution will not only benefit our aquatic ecology, but will also assist man avoid further jeopardising his environment from the threat of climate change.

5. Suggestion

Since the water of Sujan Ganga Canal is highly polluted due to various causes as mentioned in this paper. The water can not be used for drinking, bathing, washing, purposes as was used in the State time. Due to highly pollution in Sujan Ganga Canal, it would be better to use the water for irrigating various gardens such as Phulwari, and Gandhi Park located near by Sujan Ganga Canal.

6. Conclusion

Since water forms a core of the existence of human and other living things, its preservation and sustainable availability cannot be overemphasized.

The availability of clean water is greatly threatened by various human activities and of interest is pollution which in turn affects the ecosystem and causes various climatic changes. While various wastewater treatment methods are being explored by industries and various treatment plants, untreated wastewater is still being discharged into the water bodies by some people.

Thus, effective environmental protection policies compliance drive will be of immense benefit to the environment and by extension to human. This will serve as a step forward in the direction of ameliorating water pollution.

REFRENCES

1. *Water Pollution by WWF*
2. *Problems of Water Pollution by NCBI*
3. *Water Pollution Facts by UNESCO*

BIOGRAPHIES

Abhinav Kumar Indora is a Research Scholar of M. Tech, Department of Civil Engineering Jagannath University Jaipur.

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Anoop Singh is working as an Assistant Professor in Department of Civil Engineering, Jagannath University Jaipur. Graduated from Rajasthan Technical University, Kota in 2016. He is M.Tech in environment engineering in 2018 and has published 1 papers in International and National Journals & 1 in National Conference He has more than 3 years of teaching experience and 1 year site experience in **TATA STEEL** .His area of interest is Environment engineering and Concrete .