## INTRODUCTION

India constitutes 16 percent of the world's population, but the country has only four percent of the world's freshwater resources. With the changing weather patterns and recurring droughts,India is water stressed. As groundwater resources come under increasing pressure due to over-reliance and unsustainable consumption, wells, ponds and tanks dry up. This has escalated the water crisis and placed an even greater burden of accessing clean water.

### 1.1 Overview:

A brief description about our project.
This project is carried out by a team of four members on the topic clean water and sanitization. In this project IBM Watson Assistant was used to build up a chatbot CHATESA and also an interactive dashboard was made. In the dashboard the water clarity for the past years 2017,2018,2019 are displayed for all the Indian states. Further the dashboard is embedded in the chatbot and the user can access it.

### 1.2 Purpose:

The use of this project.
What can be achieved using this?
This project helps the citizens and also the water department to check on the cleanliness of groundwater in particular state, and they can also visualise whether the water quality is improving or deteriorating in the region, can take the possible steps to improve the water quality if it's deteriorating.After having a view of the visualisation, the concerned department can find the root cause of the decreasing water quality and can work accordingly.

## LITERATURE SURVEY

### 2.1 Existing problem

A WaterAid report in 2016 ranked India among the worst countries in the world for the number of people without safe water. More than 50% of the population had=s no access to safe drinking water and about 200,000 people die every year for lack of access to safe water.Official figures show that each day, approximately 500 million litres of wastewater from industrial sources is dumped into he Ganga. The Yamuna, similarly receives 850 million gallons of sewage every day from Delhi alone. For those who are dependent on groundwater sources, the presence of arsenic in the eastern belt in the Ganga-Brahmaputra region poses equally dangerous threats. The 2018 Composite Water Management Index (CWMI) noted that 6% of economic GDP will be lost by 2050, while water demand will exceed the available supply by 2030. Over 75% of households do not have clean drinking water, while 40% of the population will have no access to drinking water by 2030. Out of the 20 million bubble top water bottles sold in Bangalore each month, 17 million are unsafe for drinking.

## 2.2 Existing Approaches

Over the past years, the government has worked on groundwater recharging projects, micro-irrigation, and legislative changes to promote better water management. Prime Minister Narendra Modi has also announced a plan to provide piped potable water to every rural household by 2024. In the past year, the Jal Jeevan Mission has served 20 million families with clean water.The private sector is also pitching in to put a lasting solution to this crisis. New water purification technologies like smart water purifiers and auto-maintenance systems are paving the way to a better future. The introduction of IoT technology, sensors, and data-driven approach in water purification by Indian startups are showing the ray of hope to solve this problem. With IoT technology real-time tracking of input water quality, water consumption, and filter use is being tracked which assures safe drinking water. Rainwater storage and harvesting is still not a regular practice in India. In 2001, the Tamil Nadu government made it compulsory for each household to have rainwater harvesting infrastructure and the results reflected in the improvement of overall water quality within 5 years.

**Source 1:-**
(https://www.financialexpress.com/lifestyle/science/indias-water-crisis-is-there-a-solution/2089860/

**Source 2:-**
(https://swachhindia.ndtv.com/76-million-dont-have-safe-drinking-water-indias-looming-water-crisis-5606/ )

## 2.2 Proposed Solution

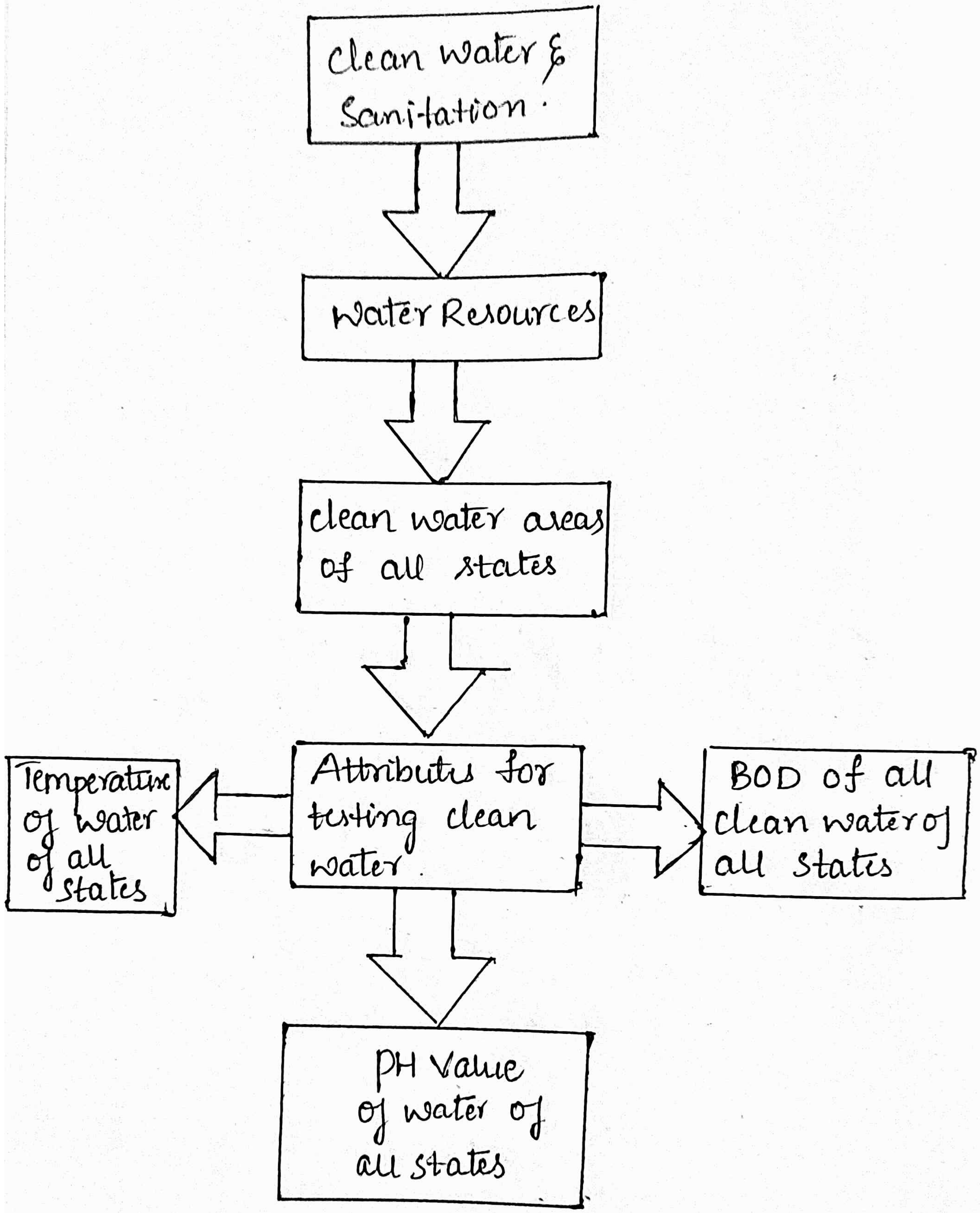
Unfortunately, millions of Indians across the country are not equipped with such facilities to test whether the water consumed and used by them is safe enough or not. The dual problems of not having access to water, or having access to unsafe water have resulted in safe and hygienic water, a basic amenity becoming a luxury. Access to safe drinking water has been a grave problem for India, especially in rural areas where lack of usable water has resulted in decades old sanitation and health problems. The biggest reason for accessing poor quality water is the lack of knowledge. This project helps people in gaining the knowledge about the quality of ground water in their state. As ground water is the only water source which is available in most parts of the country unlike rainfalls, rivers and ponds. After selecting ground water, different parameters like pH, Temperature and BOD were considered, and different charts show relations of this parameters with each other and also with the states.

What is the method or solution suggested by you?

## THEORITICAL ANALYSIS

## 3.1 Block diagram

Diagrammatic overview of the project


Clean water &
Sanitation.
Water Resources
clean water areas
of all states
Attributes for
testing clean
water.
Temperature
of water
of all
states
BOD of all
clean water of
all states
PH Value
of water of
all states

## 4.EXPERIMENTAL INVESTIGATIONS

The global population of the world is expected to exceed 9.8 billion by 2050 (World Population Prospects, 2017). The rapid population growth is expected to have associated impacts such as increased demand for food, water and other basic needs. This, in turn, will put more pressure on the agricultural sector for increased production of food creating added stress on resources such as water and fuels *etc.* (Bierkens and Wada, 2019). About 70 % of the world's accessible freshwater is used for agriculture (Anon, 2016). However, the decreasing availability of drinking water makes it a valuable asset which should be used sensibly. Water pollution pressures brought about by activities such as industrial discharge, agricultural run offs, mining, and sewage disposal, have resulted in the contamination of both surface and underground water resources. Conventionally, groundwater was assumed to be the most unspoiled, cleaner and pristine source of water compared to surface water supply. However, in the past decades, the problems of ground water contamination and pollution are widespread globally (The United Nations World Water Development Report 2017) and developing countries are most affected in particular (Kumar et al., 2014). To overcome this global issue, promising development on waste-water remediation techniques based on different mechanisms such as organic ligand-based metal ion chelation (Vashisht et al., 2020), molecular organic frameworks (MOFs) (Dias and Petit, 2015), nanomaterials (Vashisht et al., 2020), transformation of waste to useful materials (Liew et al., 2019, Yek et al., 2019) etc. have been reported.

India is one of the affected developing countries with 17% of the world's population and 4% of the world's freshwater resources ranking it among the top ten water-rich countries (Yadav et al., 2015, Bhadbhade et al., 2002). However, India is the third most polluted nation in the world and is currently designated as water-stressed by the intergovernmental panel on climate change (IPCC) with current utilizable freshwater much lower than international standards. Heavy dependence on groundwater, years of limited rains and disproportionate demand for water due to rapid population increase, urbanization and industrialization have put considerable stress on water management (Jain et al., 2004, Sabater et al., 2018). Eighty percent of India's drinking water comes from groundwater, a resource that is depleting and continuously being compromised by large scale discharge of industrial and agricultural effluents, primarily emerging contaminants and toxic metals (Water Aid Assessment, 2017) (Nayak, 2009). Emerging contaminants are naturally occurring or synthetic chemicals which needs to be monitored and regulated in the environment. These contaminants include pharmaceuticals, pesticides, metals, surfactants, industrial effluents, and solvents (Rosenfeld and Feng, 2011). Three EU-listed priority '***emerging contaminants***' (Dichlorodiphenyltrichloroethane (DDT), Endosulphan (ES) and hexachlorocyclohexane (HCH)), represent more than 67% of the total pesticide used in India and their presence in water is causing the spread of antibiotic ingredients, enabling bacteria to develop immunity to antibiotics, and creating superbugs (Gani and Kazmi, 2017).

Pesticides are the chemicals used directly or as mixtures in some solvents to prevent, fight and kill weeds, pests, fungi, and rodents (Giliomee, 2009). The transfer of these harmful chemicals from the site of the application by runoff leads to bioaccumulation in living beings. About 3% of the total consumption of pesticides in the world is in the India. The contamination of surface and groundwater due to excessive use of pesticides is a serious threat to the environment and living beings (Bhadbhade et al., 2002).

The use of pesticides is highest in the Indian states of Maharashtra, Uttar

Pradesh followed by Haryana and Punjab. In 2016-17, a significantly increased consumption was recorded in Maharashtra and Uttar Pradesh, while it declined in Punjab and Haryana (Yadav et al., 2015). In a report by Centre for Science and Environment, the packaged bottles of water samples of about 17 different brands in the Delhi region were analysed for 12 organochlorines and 8 organophosphorus pesticides. Among the organochlorines, 94% of all the samples were detected with γ-isomer of HCH (Lindane). 70.6 % of the samples were found to contain DDT. The reason was found to be the water supply to Delhi which is majorly from the river Yamuna, one amongst the most polluted rivers in India. Industrial and domestic waste from the city gets deposited along the bank which was the major contributor to pollution (Mathur et al., 2003).

According to a report by Mittal *et al.* (Mittal et al., 2014), the advent of the Green Revolution in 1965 witnessed a tremendous increase in agricultural productivity. This Green Revolution filled the bread bags with increased production of food and crops such as pulses, wheat, sugarcane, cotton, *etc.* The revolution was based on the introduction of new and chemical fertilizers, pesticides and high yielding seed varieties. Punjab was the hub of this revolution as it made the farmers of Punjab self-sufficient and removed their dependency over other states. However, due to excessive usage of pesticides, the Malwa region in the state of Punjab has recorded in recent times a large number of cancer and reproductive disorder cases. The environmental, occupational and social factors were found to be responsible for such a high pesticide consumption.

The capital city of Punjab and Haryana is Chandigarh which is known for its well-managed, planned infrastructure and architecture in addition to its cleanliness, water supply, electricity, transport, and sanitation facilities. When the ‘City Beautiful’ Chandigarh was planned, the availability of e subsoil water was adequate to meet the city's requirements. As the population of the city increased, the tube wells dried up and surface water from Bhakra dam main line was deployed to meet the city's water supply requirements. The supply of water to the city of Chandigarh comes from two sources: (i) Surface water from Bhakra Main Canal tapped at Kajauli (27 km from Chandigarh) (ii) Underground water pumped through deep bore tube wells (Municipal Corporation Chandigarh 2017)). Despite the progressive developments, there are villages and rural areas surrounding Chandigarh which lie close to the municipal domestic waste dumping ground and industrial site whose activities usually lead to contamination of the water supply. In addition, the nearby areas lying within 14-20 km of Chandigarh are fields where cultivation of various crops is practiced by farmers. According to Mahajan (2017) and Puri et al. (2014)*, many* cases of gastroenteritis were reported because of the contaminated water supply in January 2017. It was identified in the study that mixing of the drinking water with sewage leakage from pipes was the chief reason for the contamination and disease outbreak. The quality of groundwater in the Chandigarh which is the major source of freshwater is susceptible to deterioration due to primitive dumping practices, agricultural activities and rapid industrialization. The nearby states of Chandigarh, i.e. Haryana, Punjab and Delhi have also reported poor quality of groundwater. A comprehensive analysis of the Chandigarh's underground and drinking water has been performed. The main objectives of the investigation were to assess the quality of water and monitor the levels of ES & HCH in the drinking and underground water samples of Chandigarh and nearby region. To our knowledge, no study on the physio-chemical analysis and monitoring of emerging contaminants, ES and HCH in the drinking and groundwater of the Chandigarh is available, however, the reports on examination of physiochemical parameters of the drinking water in the neighbouring cities of Chandigarh are available in literature (Kaushik et al., 2010, Rout and Sharma, 2011, Singh et al., 2010, Gupta and Sunita, 2009, Hundal et al., 2009, Sharma, 2015). In the present work, an investigation of the levels of emerging contaminants and physiochemical parameters has been carried out and interpreted as pollutant pressures.

**5.FLOWCHART**

Chandigarh is located at the foot of the Himalayan range. The city beautiful, Chandigarh is fast emerging as one of the most advanced cities in India. It is spread over 114 sq. km, located at Shivalik Foot Hills, surrounded by Patiala ki Rao on the northwest and Sukhna Choe on Northeast. The layout plan of the Chandigarh is as shown in Fig. 1.

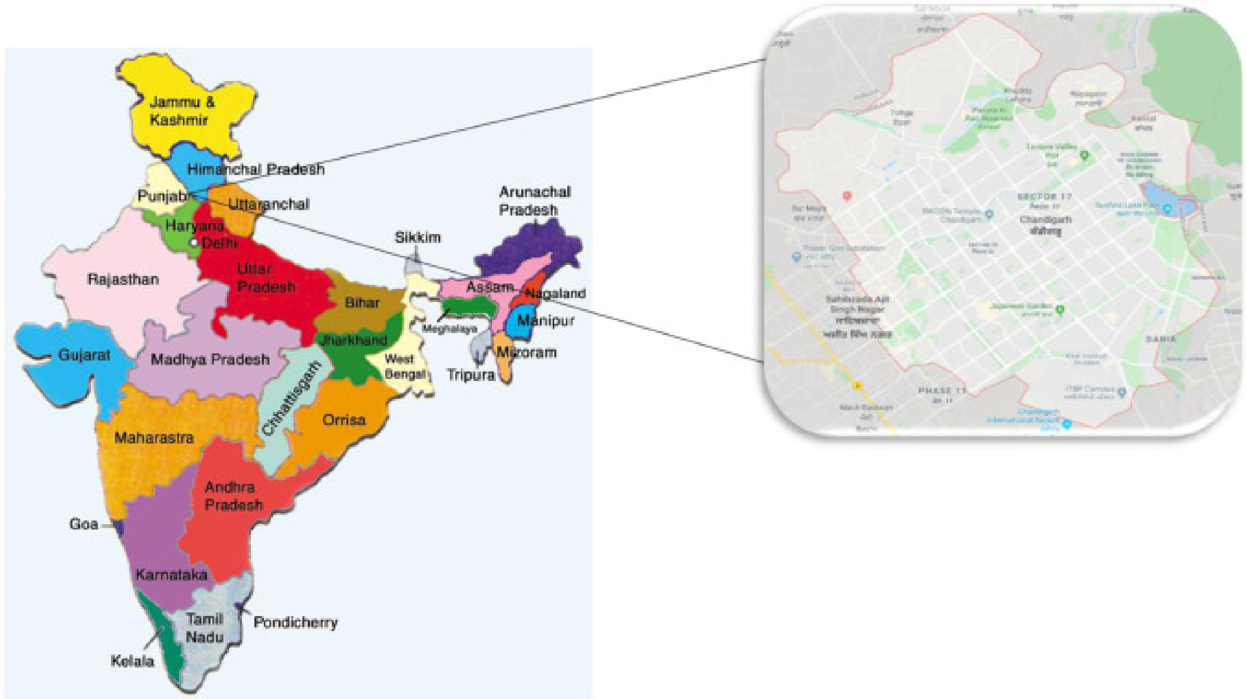



Fig. 1. Location of the Chandigarh in map of the India.

The climate of the Chandigarh is sub-tropical with hot summer and cold winter except during the monsoon when the moist air of oceanic origin reaches the areas. The annual rainfall of the Chandigarh is 1061 mm, which is unevenly distributed over the area in 49 days. The southwest monsoon from the last week of June and withdraws at the end of September and contributes 80% of the annual rainfall.

The city has been divided into 6 zones for water supply. Each of these zones is supplied water through independent water works. The Mother water works is Water Works, Sector 39, Chandigarh which receives water from Kajauli and various tube wells. At the water works-39, the canal water received is treated at the water treatment plan. The raw water from Kajauli, Punjab is transmitted through the main transmission to the water treatment plant in Sector-39. The water is then treated, disinfected and stored which is further pumped to five different waterworks. These waterworks further pump the water to the Chandigarh's water distribution system (Tiwari and Bhatia, 2013).

Sample collection

The sample collection was done during the months of February to June 2019. 1L amber-coloured glass bottles with polytetrafluoroethylene lined screw caps were used for sampling. The sample bottles were rinsed with deionized water and sterilized in hot air oven at 170°C for 1h. Once sterilized, the bottles were allowed to be cooled. A total of 54 samples were collected (Fig. 2). The specific sample point for tap and underground water is shown in figure S1. Tables S1 and S2 represent the location of the sample in terms of Longitude and Latitude and allotted sample IDs for tap and groundwater samples, respectively.

Colour and odour

The colour of the water sample was noted down by direct observation without any filtration or centrifugation. Only simple visual comparison method was used for colour measurements. It is known that most of the organic and inorganic substances exhibit a characteristic odour. So, all the samples were directly observed for the odour.

Temperature

The behavioural characteristics of the aquatic organisms, solubility of salts, etc. are dependent on the temperature. The temperature was noted down with the help of a digital thermometer by immersing it in the water body and allowing sufficient time to get a constant reading.

pH

The pH of water is an index to signify the basicity/acidity of the water sample. The value of any sample may vary in the laboratory and it may not be the same as on the sample site because of the loss or absorption of any gases, sediments, etc. So, the pH value was taken at the time of sample collection. A 100 mL of sample was taken in a beaker and the pH was noted. Before making another measurement, the electrode was rinsed twice. This procedure was repeated thrice to get reliable value.

Total Dissolved Salts (TDS)

The presence of carbonates, hydrogen carbonates, chlorides, nitrates, sulphates of calcium, magnesium, sodium, potassium and organic material contributes to TDS. The higher value of TDS is indicative of the non-potability of the water for drinking purposes.

Electrical Conductivity (EC)

The electrical conductivity of the water is representative of the amount of salts present in it. The high value of the electrical conductivity indicates the presence of the high amount of the dissolved salts in the water sample. It is the measure of the ability of an aqueous solution to conduct electricity. A 100 mL of the water sample was analysed by immersing the cell into the sample. The cell was washed thoroughly with distilled before and after the measurement.

Biological Oxygen Demand (BOD)

The BOD determines the amount of dissolved oxygen required for the organic break down of the organic material by the aerobic organisms. The water sample to be analysed were made sure to be free from chlorine, pH to be in the range of 6.5-7.5 and to have adequate amount of microbiological population.

Specialized barcoded, sequentially numbered, borosilicate glass and chemical resistant 300 mL BOD bottles with no air space were used. One bottle with dilution water as blank was also analysed. The DO was evaluated by using Winkler's procedure (titration method). Each bottle was then kept in dark incubator for 5 days at 20°C. After 5 days the DO reading was again noted. To measure the BOD value of the water sample collected, the constant temperature was maintained (20 ± 1°C) in the chamber. The dilution water was aerated followed by the addition of potassium phosphate, magnesium sulphate, calcium chloride and ferric chloride per 1 L of dilution water to saturate the water with oxygen. The dilution water was placed in a constant temperature chamber to maintain the temperature of 20°C until the analysis and sample dilution begun. A similar procedure was followed for the environmental sample. The sample container was then placed in the temperature chamber and aerated for about 15 minutes. Different dilutions of the sample were prepared and analysed. The sealed BOD bottles containing samples were kept in the incubator for about 5 days at 20 ± 1°C for 5 days. 3 BOD bottles per sample were used.

Total Hardness (EDTA Method)

Ca (II) and Mg (II) ions in the water samples sequester upon the addition of disodium ethylene diamine tetraacetate (Na2EDTA). Eriochrome Black T was used as an indicator to detect the endpoint which showed red colour in the presence of Ca (II) and Mg (II) ions and blue colour when the ions were sequestered.

**6.RESULT:**

Through this project everyone are able to analyse the data to get clean water and sanitisation information areas in India. Our main aim is to provide the easiest way of analysing the data related to years 2017,2018 and 2019 water quality in India. A person can able to select a state and get the particular information like water PH value, BOD and temperature for that particular state.Not only through visualization graph but also they can solve their own queries through CHATESA bot which will help them when they are in need.

**7.ADVANTAGES AND DISADVANTAGES:**

By referring our solution regarding clean water and sanitation , every person or people can access the data about water resources in the year mentioned in solution.The Ph value,BOD and many things related to water information can be accessed through our solution.

## 8.APPLICATIONS:

Entire Indian states data related to clean water and sanitation is gathered in CSV files. Not only single state, every state information is available. Every one can access the data about clean water and sanitation by referring our solution. U can search every state data in solution. Suppose you want to know about clean water areas ,by giving your queries our chat bot will take the queries and give you the related information.

## 9.CONCLUSION:

Our project is to provide a meaningfull data so that not only the individuals but also the organizations can make use of it and can able to provide funds to the areas in need of clean water and sanitization. Visualization through dashboard is useful for analysing the particular data and also the Chatbot is very affective in solving the queries of many people who are in need.

## 10.FUTURE SCOPE:

For the first time,we have done the project about our present world issue i.e clean water and sanitation. Many people are facing this problem for the past few years. Any person or any government should take a forward step and should discuss about the problem. So, our solution will help them to get the data about clean water areas, automatically they can analyse the unclean water areas in India. Entire States info is available. In the future we want to develop more about the project and will develop the quality, quantity of information.