IoT BASED SUSTAINABLE GROUNDWATER SUPPLY SYSTEM FOR GREEN INDIA

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Abstract: Based on the surveys conducted water management has become very difficult and the issues are arising frequently because of insufficient supply of water resources and degradation in water quality. So we have to effectively utilize our water resources efficiently by real time monitoring of water quality parameter to differentiate the quality of the water. Some areas in a city will have stable supply of water resources while compared to other cities based on the supply channel. This is due to some problems in the distribution line such as defects or cracks in pipeline caused by over pressure or low water pressure where in water cannot reach consumers located on a high-ground areas or far away from the pumping stations or water tank. All of these issues concerning water distribution arise because on lack of real time monitoring of these water resource and also because of complex manual testing procedures and time taken by it. Today, cities are now transforming rapidly and people rather concern themselves about their comfort regarding the issue. As they participate for economic advancement and our standing regarding their contribution in saving these natural resources, water has become a priority in their checklists. Creating water sustainability requires a multidisciplinary approach. It also requires awareness and state of the art facilities to be given by the national authorities which can give a significant boost to these movements regarding water management.

Keywords: IoT, Water quality, monitoring, pH, detection.

I.   INTRODUCTION

Groundwater is one of the most important source of fresh drinkable water which can satisfy the needs of the humankind This document is a model and instructions on nonstop and real time monitoring of water resource in IOT platform. Water resource with nonstop monitoring makes a proper distribution so that, we can have a record of available quantum of water in tanks, inflow rate, abnormality in distribution line.

Internet of things is nothing but the network of physical objects bedded with electronics, detectors, software, and network connectivity. Monitoring can be done from anywhere by accessing the servers where the data is stored. Using blynk app as a medium to monitor the water quality parameters. These parameters can be accessed using different detectors with microcontroller and Arduino as Minicomputer can cover data and also control operation through wireless network efficiently.

Ground water depletion is mainly caused due to sustained groundwater pumping. Some of the issues caused by this are: Lowering of the Water Table, Increased Costs, Reduced Surface Water Supplies, Land Subsidence and Water Quality Concerns. Thus, in this proposal using IoT based smart technology to overcome the   issue of water supply system would control and monitoring of water supply in smarter IoT technology.

II.   SCOPE OF THE PROJECT

The need of this project is that groundwater is the largest source of drinkable and fresh water in the world. In different part of the world specially where availability water is very less, so ground water acts as a primary source for domestic, agricultural and industrial needs can only met by using water beneath the ground. Groundwater depletion is because of poor management of available resources.

The negative effects caused by groundwater depletion are: scarcity of water, increased cost, land subsidence and water quality concerns. Hence in this proposal using IoT based smart technology to overcome the issue of water supply system

to control and monitor water supply in very smarter and efficient way.

A. Problem Statement

In the era of technological advancement there are lots of inventions which contributed to human needs but at the same time there were pollutions, global warming which cause harm to all the available natural resources, where water is one of such important resource because of this the availability of safe drinking water has become one of the major issues to the world's population. In the present day, situation monitoring and detecting the water quality parameters is full of challenges which led to improper management and degradation in water quality. The water quality parameters such as pH, turbidity, Total dissolved solids and temperature are one of the few parameters to check water quality. Pure water should have a pH around 6.5-8.5 pH, turbidity around 1-10 mg/L, TDS around 0-300 ppm. To check this parameter there are few manual testing methods which is time consuming and not very convenient.

III. RELATED WORK

[1] J G Natividad and T D Palaoag (2019): The focus of this paper is on the use of IoT technology for developing a self-sustained and intelligent water quality management system from one part to different part of the areas. This system is used to monitor status of the tanks such as whether the tank is full or it is empty based on the water pressure, flow rate and also to check leakages in the pipes. A prototype was developed for this task where Arduino microcontroller and other IoT sensors where used for this task, and the outcome was sent to a server which could be accessed by the user.

[2] Pranita Vijaykumar Kulkarni and M. S. Joshi: Internet of Things (IoT) technology has made a great contribution in todays era. IoT is the network of objects where devices such as electronic sensors are embedded together and connectivity has made it easier for this device to talk to each other. This work focuses on water quality and management in urban and rural areas by regulating the water resources and detecting its quality for drinking purpose. This project addresses environmental features like affordability, durability, prevention against leakages and other maintenance issues which leads to avoidance of excess use of water and promises efficient water management system.

[3] E.V.de Souza, M.A Costa Da Silva (2021): The focus of this paper is to implement and develop effective water loss strategies, the current paper aims at the presentation of different methods for improving water management and supplying it efficiently.

[4] Kusuma S S, Anil G N: This paper addresses the issue of overflow of the water from tanks and effective ways to overcome this overhead in the tanks. This overhead in the water tanks is mainly caused because of poor monitoring and management of water resources and also due to external reason such pipeline damage etc. To overcome all this we use IoT based technology to address all these issues and effectively overcome.

[5] G M Tamilselvan, V Ashishkumar, S Jothi Prasath, S Mohammed Yusuf: Various protocols are used for safe transmission of various parameter without any tampering of data by any malicious user. It is typically based on safe and secure transmission and easily accessible to end user.

[6] Hassaan Th. H. Thabet : Has considered framework which can manage water resources based on the data available and continuously acquiring the data for future use.

[7] Grunwald, A.; Schaarschmidt, 2019: Due to absence of mobile substructure in the village and rural areas use of lot of the technologies are not used efficiently, so because of this they have developed a prototype using the common and easily available technologies. Here the parameters of the water are directly monitored by a lcd screen present in the prototype itself which helps in real time monitoring and management.

IV. SYSTEM DESIGN

The IoT based smart water quality system of household for sustainable ground water management uses tank to store water before the water supply.

There is a Nitrate/Sulphate/Fluoride sensor and pH sensor that is attached after the water flow sensor which checks the Nitrate/Sulphate/Fluoride value and decides if the water is potable (suitable for drinking). If the water is not potable, the sensor doesn't release the water further. The same would be attempting for other quality of water standards.

Collecting all the required data to process continuously and push data through a Wireless signal to a device.

Flow rate measured in Litres/sec/min/hour. By counting the pulses from the output of the sensor, could easily track fluid movement.

The IoT based model consists of node MCU for transmitting data over an app which can be accessed by the authorized end user. The final data is compared with manual tested data for further verification.
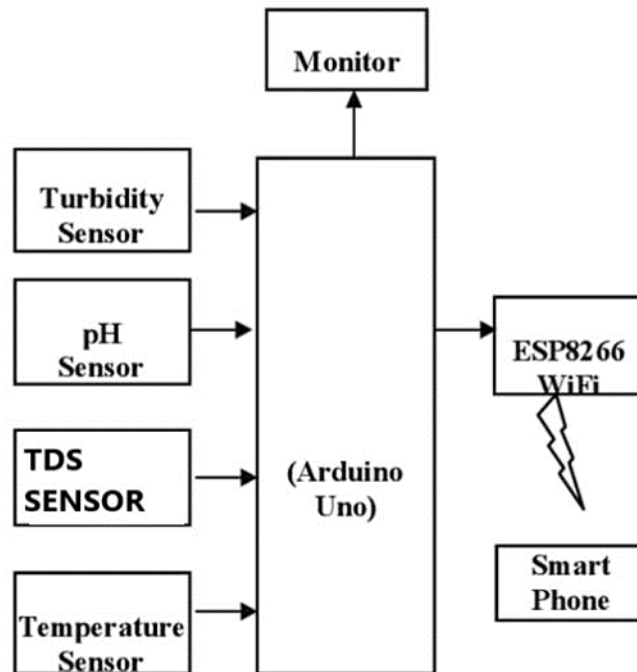
Fig. 1. General block diagram

V. RESULTS

The circuit was designed according to the block diagram Fig.1, Various sensors such as pH, temperature, turbidity and TDS are interfaced to Arduino for water quality system and further processing. Final output signal from Arduino is relayed through ESP8266 node MCU to the designated application for real time monitoring water quality to the users.

pH	TURBIDITY (NTU)	TEMPERATURE (C°)	TDS (PPM)	STATUS
7.5	1.619	27.8	230	VERY GOOD
9.2	332.2264	29.4	550.2	BAD

VI. CONCLUSION

Monitoring and detecting of water quality parameter such as pH, turbidity, TDS, temperature are done by various sensors which are embedded in the prototype is done and can be accessed via node MCU through an app (blynk IoT) and the acquired data is compared with the data acquired from manual testing.

The main focus of the project ease of monitoring and detecting for the end user to differentiate the water quality. The prototype developed is working according to the desired certificate and purpose and passed all the set of tests conducted.

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