M.KUMARASAMY
COLLEGE OF ENGINEERING
NAAC Accredited Autonomous Institution
Approved by AICTE & Affiliated to Anna University
ISO 9001:2015 Certified Institution
Thalavapalayam, Karur – 639 113.

A Minor Project Report

on

REAL TIME RIVER WATER MONITORING SYSTEM

Submitted by

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

M. KUMARASAMY COLLEGE OF ENGINEERING

(An Autonomous Institution Affiliated to Anna University, Chennai)

THALAVAPALAYAM, KARUR - 639113.

MAY 2024

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(Autonomous Institution, Affiliated to Anna University, Chennai)

BONAFIDE CERTIFICATE

Certified that this Report titled **"REAL TIME RIVER WATER MONITORING SYSTEM",**is the bonafied work of **N PALANIAPPAN(927622BEE080),T PRAVEENA (927622BEE084), M SANJANAA SHRI(9276BEE096)** who carried out the work during the academic year (2023-2024) under my supervision. Certified further that to the best of my knowledge the work reported here in does not form part of any other project report.

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Submitted for minor project II (18EEP202L) viva voce Examination held at M.Kumarasamy college of Enginneering,Karur – 639113 on ……

DECLARATION

We affirm that the Minor Project report titled "**REAL TIME RIVER WATER MONITORING SYSTEM"** being submitted in partial fulfillment for the award of **Bachelor of Engineering in Electrical and Electronics Engineering** is the original work carried out by us.

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VISION AND MISSION OF THE INSTITUTION

VISION

- ✓ To emerge as a leader among the top institutions in the field of technical education

MISSION

- ✓ Produces mart technocrats with empirical knowledge who can surmount the global Challenges.
- ✓ Create a diverse, fully engaged, learner-centric campus environment to provide Quality education to the students.
- ✓ Maintain mutually beneficial partnerships with our alumni, industry and Professional associations.

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

VISION

To produce smart and dynamic professionals with profound theoretical and practical knowledge comparable with the best in the field.

MISSION

- ✓ Produce hi-tech professionals in the field of Electrical and Electronics Engineering by inculcating core knowledge.
- ✓ Produce highly competent professionals with thrust on research.
- ✓ Provide personalized training to the students for enriching their skills.

PROGRAMME EDUCATIONAL OBJECTIVES(PEOs)

- ✓ **PEO1:** Graduates will have flourishing career in the core areas of Electrical Engineering and allied disciplines.
- ✓ **PEO2:** Graduates will pursue higher studies and succeed in academic/research careers.
- ✓ **PEO3:** Graduates will be a successful entrepreneur in creating jobs related to Electrical and Electronics Engineering /allied disciplines.
- ✓ **PEO4:** Graduates will practice ethics and have habit of continuous learning for their success in the chosen career.

PROGRAMME OUTCOMES (POs)

After the successful completion of the B.E. Electrical and Electronics Engineering degree program, the students will be able to:

PO1: Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/Development of solutions: Design solutions for Complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct Investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: The Engineer and Society: Apply reasoning in formed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and Teamwork: Function effectively as an individual, and as a member or leader in diverse teams, and in multi-disciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multi-disciplinary environments.

PO12: Life-long learning: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES(PSOs)

The following are the Program Specific Outcomes of Engineering Students:

- **PSO1:** Apply the basic concepts of mathematics and science to analyses and design circuits, controls, Electrical machines and drives to solve complex problems.
- **PSO2:** Apply relevant models, resources and emerging tools and techniques to provide solutions to power and energy related issues & challenges.
- **PSO3:** Design, Develop and implement methods and concepts to facilitate solutions for electrical and electronics engineering related real-world problems.

Abstract (Key Words)	**Mapping of POs and PSOs**
PH Sensor IoT based system Turbidity sensor Wireless sensor network	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO11, PSO1, PSO2, PSO3.

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TABLE OF CONTENTS

ABSTRACT

Rivers, as vital components of our ecosystems, are susceptible to environmental stressors that can compromise water quality. One critical parameter influencing the health of river eco systems is pH. Fluctuations in pH levels can indicate pollution or other environmental disturbances, necessitating timely intervention for effective conservation. This project addresses this concern by proposing a River Monitoring System utilizing IoT, pH sensors, and GSM technology. The primary objective of this project is to establish an intelligent and real- time monitoring system for river water quality, with a particular emphasis on pH levels. The Internet of Things (IoT) acts as the central controller, orchestrating seamless communication and collaboration between a pH sensor and a GSM module. The system continuously collects pH data from the sensor, utilizing the IoT controller to analyze and compare the readings against predefined thresholds. Detection of abnormal pH values triggers an immediate response, as the IoT controller signals the GSM module to transmit alerts. These alerts, containing pertinent information such as the timestamp and location of the anomaly, are communicated swiftly through SMS data connection. This initiative is crucial for environmental conservation, offering as capable and adaptable approach to safe guarding water quality. The project not only addresses the imminent need for real-time river monitoring but also contributes to the broader mission of preserving and sustaining our invaluable natural resources.

SAMPLE PICTURES OF SURVEY

CHAPTER 1
SURVEY FORM ANALYSIS

This chapter says about the survey which had been taken from the following localities and it also specifies about the problem they had faced.

NAME AND ADDRESS OF THE COMMUNITY:

NAME : Thangamani

ADDRESS: Solasiramani, Namakkal,637203.

NAME : Thangavel

ADDRESS : Karattupalayam, Solasiramani, Namakkal.

NAME : Rajalakshmi

ADDRESS : 22, RSNagar, Dindigul.

NAME : Sowmiya

ADDRESS : Naga lNagar,Karur.

PROBLEM IDENTIFICATION

- Due to the fast growing urbanization supply of safe drinking water is a challenge for the every city authority.
- Water can be polluted anytime.
- So the water we reserved in the water tank at our roof top or basement in our society or apartment may not be safe.
- Sometimes the water has dangerous particles or chemical mixed and general purpose water purifier cannot purify that.

CHAPTER 2

LITERATURE REVIEW

This chapter says about the projects and their inferences which are related to the "REAL TIME RIVER WATER MONITORING AND CONTROLLING SYSTEM".

Paper1: Smart River monitoring using wireless sensor (SEP2020)

Inference:

Water quality monitoring(WQM)system seek to ensure high data precision, data accuracy, timely reporting, easy accessibility of data, and completeness. The conventional monitoring systems are inadequate when used to detect contaminants/pollutants in real time and cannot meet the stringent requirements of high precision for WQM systems. In this work, we employed the different types of wireless sensor nodes to monitor the water quality in real time. Our approach used an energy-efficient data transmission schedule and harvested energy using solar panels to prolong the node lifetime.

Paper 2: CPCB's real time quality monitoring (MAR 21)

Inference:

In order to eliminate problems associated with manual water quality monitoring, Central Pollution Control Board (CPCB) has planned to go for hi- tech solution. CPCB is planning to install 'Real Time Water Quality Monitoring Network' across Ganga Basin for testing ten parameters. The Ganga is the largest and the most important river of India, with its watershed covering 10 Indian states, namely Uttaranchal, Uttar Pradesh, Bihar, Jharkhand, West Bengal, Himachal Pradesh, Rajasthan, Haryana, Madhya Pradesh and Delhi. Discharge of untreated sewage from urban centres is a major cause of water quality degradation in the river.

Paper 3: Intel collaborative research for real time river water and air monitoring system. (JANUARY 2020)

Inference:

The aim of this initiative is to develop key technologies for sensing, communication and analysis of large-scale data collected from autonomous networks of perpetual/long-lived sensor nodes, followed by integration and deployment for water and air quality monitoring in real-time. The program will be administered by the binational Indo-U.S. Science and Technology Forum (IUSSTF). River systems have been the birthplace of civilizations all over the world.They are woven into the social and economic fabric of society and penetrate deep into the psyche of the people living around them. Nowhere is this more evident than in India where the Ganga, Indus, Narmada and other rivers possess the cultural identity transmitted down the ages through literature, the Puranas and the Vedas,as well as through popular myths and legends.

Paper 4: Smart water quality monitoring with IOT (MAR2021)

Inference:

Pollution of water is one of the main threats in recent times as drinking water is getting contaminated and polluted. The polluted water can cause various diseases to humans and animals, which in turn affects the life cycle of the ecosystem. If water pollution is detected in an early stage, suitable measures can be taken and critical situations can be avoided. To make certain the supply of pure water, the quality of the water should be examined in real- time. Smart solutions for monitoring of water pollution are getting more and more significant these days with innovation in sensors, communication, and Internet of things (IoT) technology. In this paper, a detailed review of the latest works that were implemented in the arena of smart water pollution monitoring systems is presented. The paper proposes a cost effective and efficient IoT based smart water quality monitoring system which monitors the quality parameters uninterruptedly.

Paper5: Multi sensor system for monitoring of river water pollution.

(AUG 2016)

Inference:

In this research objective to design and develop a new system with multiple sensors system to monitor river water pollution because most of the people use it. Wireless Sensor Networks (WSNs)used in this design and development because of advantages WSNs system, multiple sensor nodes installed for detection of water pollution such as water temperature, pH, electrical conductivity (EC)and dissolved oxygen(DO). The system designed to be able to monitor river water pollution parameters and send the information to the data center (backend system). Arduino microcontroller used to process and filtering the data before sending to the back end system, only valid and valuable information to collect and keep in the database. Results show system be able to detect polluted water with indicating parameters and shows in a graph. Based on analysis can be concluded that polluted water indicator mostly from residence waste and industry. Further more, WSNs sensors will deploy in some area then compare the results each other.

CHAPTER 3

PROPOSED METHODOLOGY

This chapter brings about the proposed methodology of the “REAL TIME RIVER WATER MONITORING AND CONTROLLING SYSTEM” project.

BLOCK DIAGRAM

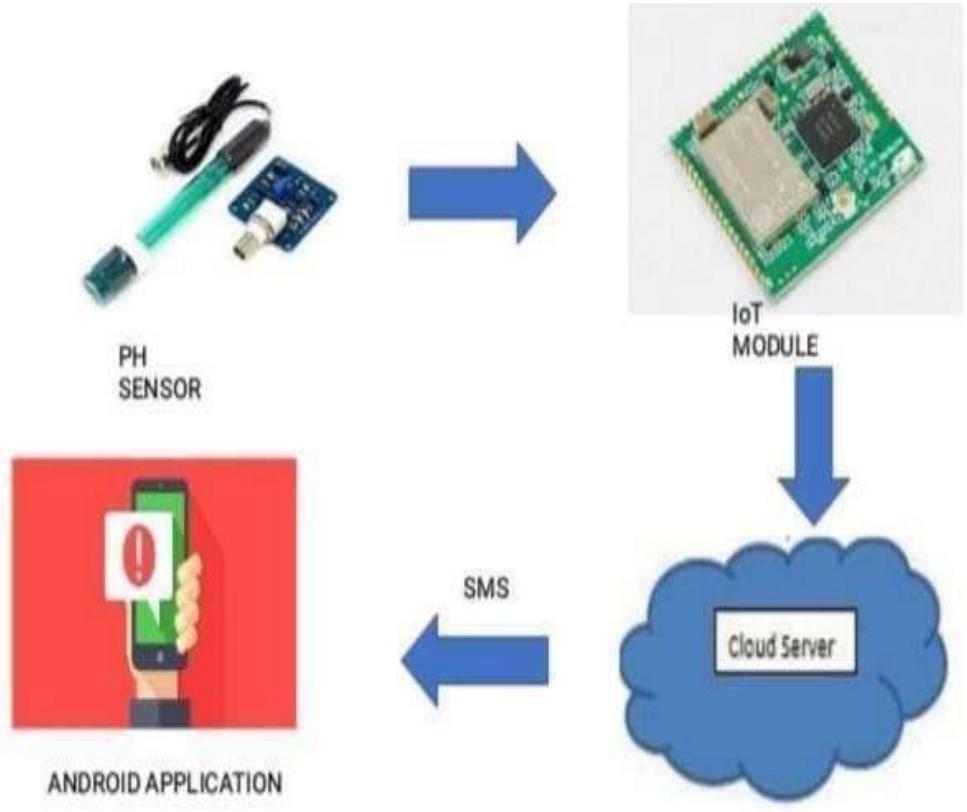

Fig 3 .1 BLOCK DIAGRAM

DESCRIPTION

- The real-time river water monitoring system is a comprehensive solution designed to address the critical need for continuous assessment and management of water quality in river ecosystems.
- The system aims to provide an accurate and real-time depiction of key water quality parameters. These parameters include traditional metrics such as pH, dissolved oxygen, turbidity, and temperature, as well as an extended range of sensors for detecting pollutants, heavy metals, and microbial contaminants
- The system continuously collects pH data from the sensor, utilizing the IoT controller to analyze and compare the readings against predefined thresholds.
- Detection of abnormal pH values triggers an immediate response, as the IoT controller signals the GSM module to transmit alerts. These alerts, containing pertinent information such as the timestamp and location of the anomaly, are communicated swiftly through SMS or data connection.
- This initiative is crucial for environmental conservation, offering a scalable and adaptable approach to safeguarding water quality.
- The project not only addresses the imminent need for real-time river monitoring but also contributes to the broader mission of preserving and sustaining our invaluable natural resources.

PH SENSOR:

Fig 3.2 PH SENSOR

pH sensor is one of the most important tools for measuring pH and is commonly used in water quality monitoring. This type of sensor is capable of measuring alkalinity and acidity in water and other solutions. When used properly, pH sensors can ensure the safety and quality ofproducts and processes that occur in wastewater or manufacturing plants.

MICROCONTROLLER:

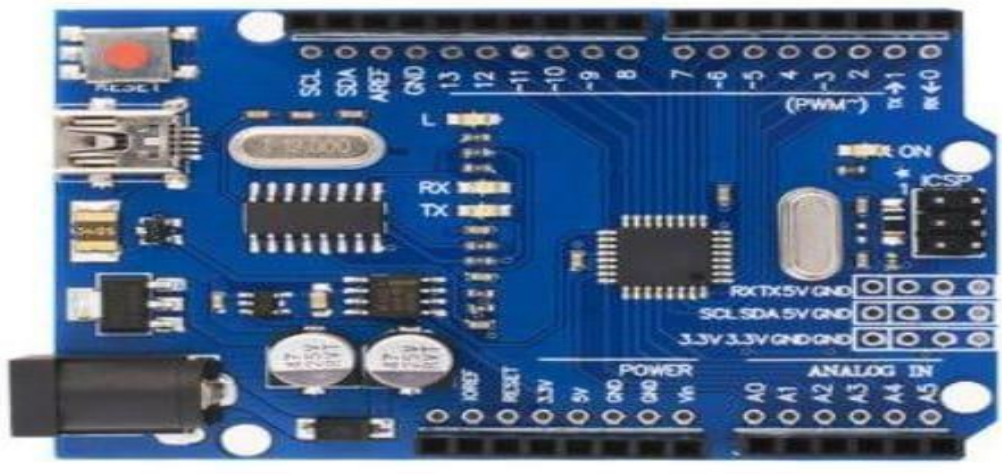

Fig 3.3 MICROCONTROLLER

A microcontroller is a compact integrated circuit designed to govern a specific operation in an embedded system. A typical microcontroller includes a processor, memory and input/output peripherels on a chip.

GSM MODULE:

Fig 3.4 GSM MODULE

A GSM (Global system for mobile communication) module refers to a specialized hardware device that uses GSM technology to enable communication capabilities through cellular networks. **A GSM** module works by connecting to a GSM network through a SIM card. The SIM provides the module with unique identification number, which is used to identify the device on the network. The GSM module then communicates with the network using a set of protocols, which allows it to send or receive data.

TRANSFORMER:

Fig 3.5 TRANSFORMER

A **transformer** is a passive component that transfers electrical energy from one electrical circuit to another circuit, or multiple circuits. A varying current in any coil of the transformer produces a varying magnetic flux in the transformer's core, which induces a varying electromotive force across any other coils wound around the same core.

CHAPTER 4

HARDWARE IMPLEMENTATION

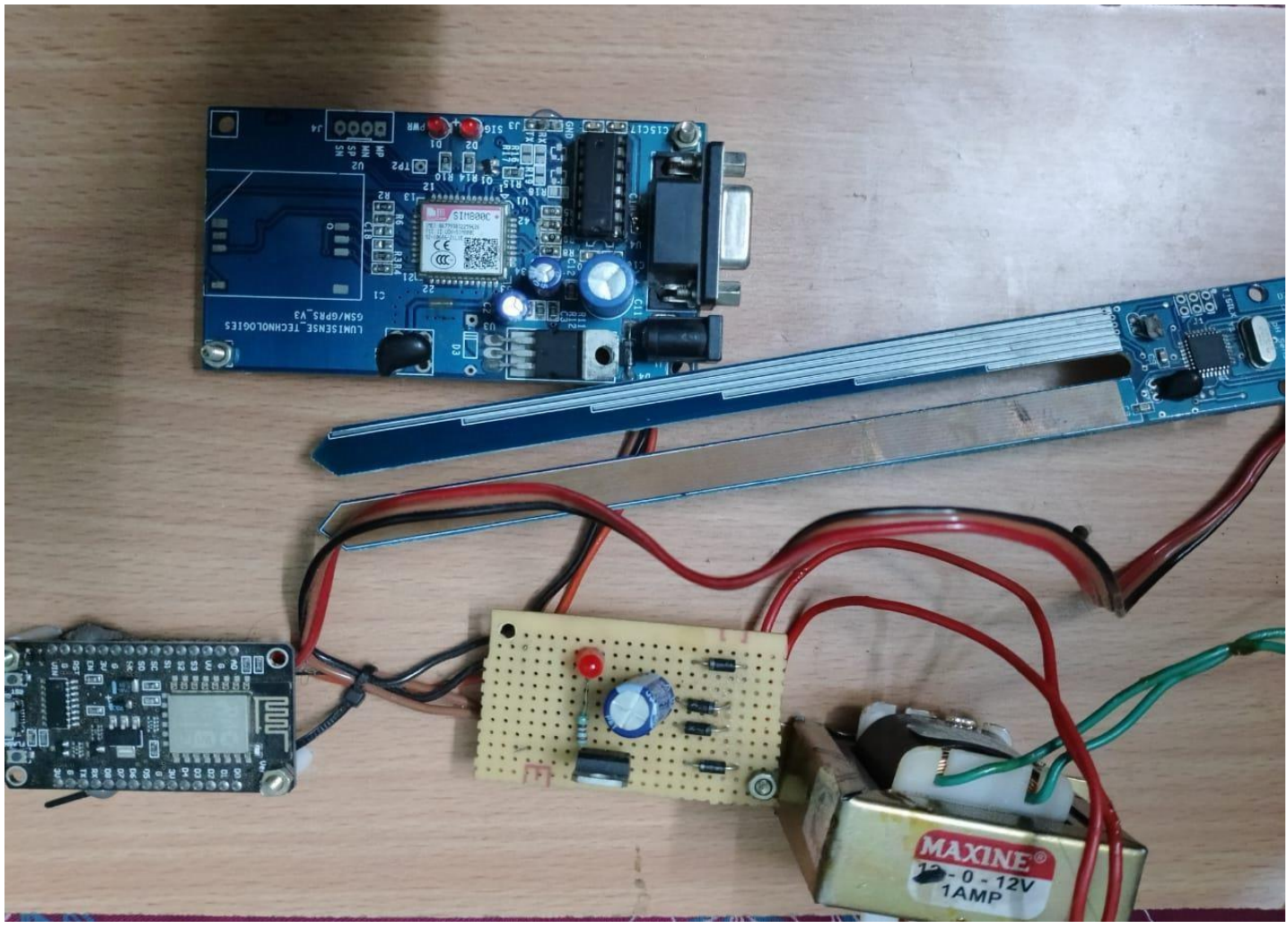

Fig 4.1 HARDWARE IMPLEMENTATION

HARDWARE USED:

- pH sensor
- Microcontroller (IoT controller),
- GSM module
- Power supply
- Transformer
- Optional sensors

COST ESTIMATION

TABLE 1: Cost Estimation

S.NO	COMPONENT DESCRIPTION	QUANTITY	COST(INRUPEES)
1	ARDUINO BOARD	1	800
2	PH SENSOR	1	70
3	TEMPERATURE SENSOR	1	10
4	9V BATTERY	1	30
5	WIRES	As per required	20
		TOTAL -	930

DRINKING WATER PH MEASUREMENT

Fig 4.1(a) Drinking water pH measurement

The pH level of water can vary depending on its source and any materials or substance it may contain. Ph level of normal water is 7.

RIVER WATER PH MEASUREMENT

Fig 4.2(b) River water pH measurement.

Generally, river water tends to have a PH ranging from around 6.5 to 8.5, which is considered slightly acidic to slightly alkaline.

POLLUTED RIVER WATER pH MEASUREMENT

Fig 4.2(c) Polluted water pH measurement

The PH level of an impurity can vary significantly depending on the nature of the impurity itself. For example, if the impurity is a strong acid or base, its PH level could be very acidic(PH < 7) or highly alkaline . However, it's a weak acid or base, its PH might be closer to neutral.

GEO TAG PHOTO OF IMPLEMENTATION

CHAPTER 5

RESULT AND DISCUSSION

Rivers are our essential to our ecosystems and can be negatively impacted by environmental stresses that lower the quality of their water. pH is one important factor affecting the condition of river ecosystems. Variations in pH levels may be a sign of pollution or other environmental disturbances, which calls for prompt action to effectively conserve the ecosystem. In order to sole this issue, this project suggests a river monitoring system that makes use of GSM, pH sensors, and the Internet of Things. Establishing an intelligent, real-time river water quality monitoring system with a focus on pH levels is the main goal of this project. A pH sensor and a GSM module work together seamlessly thanks to the coordination and control provided by the Internet of Things (IoT). The sensor provides pH data to the system continually, and the IoT readings are detected, the IoT controller immediately sends a signal to the GSM module to send out alarms. These warnings are sent quickly by SMS or data connection and feature important information like the timestamp and location of the anomaly.

This project is essential for environmental preservation since it provides a flexible and scalable method of preserving water quality. In addition to meeting the urgent need for real-time river monitoring, the initiative advances the larger goal of protecting and maintaining priceless natural resources. In order to provide thorough water quality monitoring, the hardware implementation of the system entails combining components such as a pH sensor, microprocessor(IoT controller), GSM module, power supply, enclosure, antenna, and optional sensors. Once put together, the device helps with environmental conservation efforts by continuously monitoring river pH levels and notifying users in real time.

TABLE-2 RIVER WATER POLLUTION MEASUREMENT

S.NO	TYPE OF WATER	PH LEVEL
1	DRINKING WATER	7
2	RIVER WATER	7.4
3	POLLUTED WATER	9

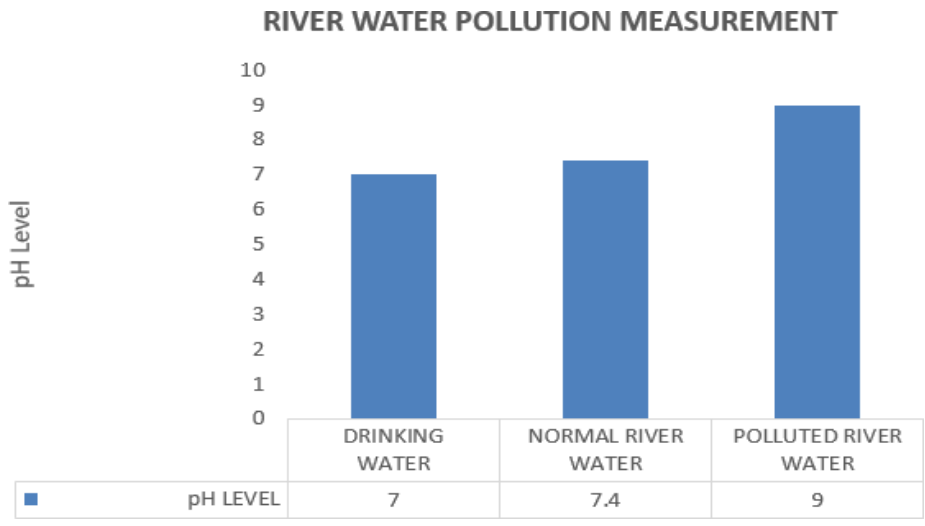

Fig:5 River water pollution measurement

CHAPTER 6

FUTURE SCOPE

Water quality monitoring is a complex and multi faced arena. Like any area, there is always room for improvement and as technology continues to advance and develop, scientists are looking at new ways to gather data, share information and use results to make better decisions.

One of the biggest changes set to shape the future of water quality monitoring is a focus on long- term, comprehensive strategies. Across the globe governments and environmental organisations are starting to roll out new policies that require local authorities to have these For example,in the USA, independent states and the EPA are currently reviewing Sections 305(b) and 303(d) of the Clean Water Act in order to stream line and improve water quality monitoring techniques.

While there is plenty of data available on oceans, rivers and lakes, wetlands are one water body that remains largely un-researched. Over the next few years there will be an increasing focus on water monitoring in wetlands and what challenges they face.

Another major change will be the introduction of advanced new technologies, particularly electric reporting equipment. This will make it much easier for members of the public, as well as government officials to review and make decisions based on results.

From large scale changes such as a national review of the Clean Water Act to smaller projects like independent studies on local wetland areas, the water quality monitoring strategies of the future will have are sounding impact on the health of our global water bodies

CONCLUSION

The River Monitoring System is an intelligent solution designed for real-time assessment and preservation of river water quality, specifically focusing on pH levels. Utilizing IoT technology, pH sensors, and GSM modules, the system ensures efficient responses to environmental stressors. The pH sensor continually measures water acidity or alkalinity, providing real-time data for ecosystem health evaluation. The IoT controller processes pH data, comparing it against predefined thresholds, and the GSM module transmits alerts in real-time through SMS or data connection upon detecting abnormal fluctuations. These alerts, with timestamp and location information, enable prompt intervention by relevant authorities to address potential pollution sources. The system's real-time nature facilitates swift detection of abnormal pH levels, allowing for timely conservation actions. Its scalability and adaptability permit the integration of additional sensors for diverse water quality parameters across various river ecosystems. In conclusion, the River Monitoring System is a compact and versatile solution, providing proactive monitoring for sustainable environmental management and protection of natural water resources.

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