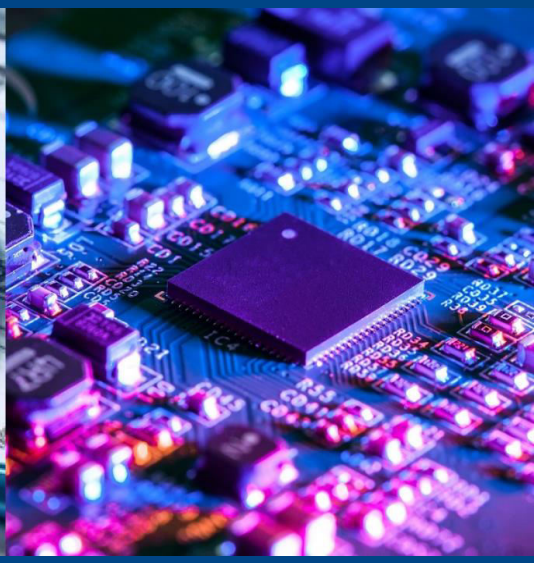
ISSN: 2582-7219





# International Journal of Multidisciplinary Research in Science, Engineering and Technology

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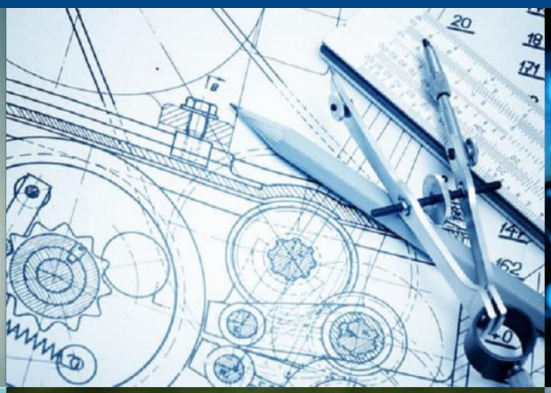

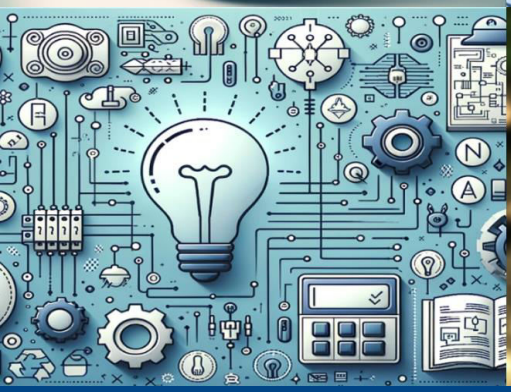

**Impact Factor: 9.864**

**Volume 9, Issue 6, June 2026**

© 2026 IJMRSET | Volume 9, Issue 6, June 2026| DOI:10.15680/IJMRSET.2026.0906014

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 9.864| ESTD Year: 2018|

International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

# Flood Detection and Monitoring System Using ESP32 and IoT

**Dr. S. A. Shaikh[1], Saurabh Bhausaheb Kothwal[2], Rupali Prakash Pawar[3], Vishal Dadasaheb Balme[4]**

Project Guide, & Associate Professor, Department of Electronics and Computer Engineering, Pravara Rural College of Engineering, Loni, Tal. Rahata, Dist. Ahmednagar, Maharashtra, India[1]

Student, Department of Electronics and Computer Engineering, Pravara Rural College of Engineering, Loni, Tal. Rahata, Dist. Ahmednagar, Maharashtra, India[2,3,4]

**ABSTRACT**: This study details the development of an Internet of Things (IoT)-based egg incubator designed to automate the control and monitoring of temperature and humidity, addressing the inefficiencies of traditional hatching methods. The primary aim was to design and build a cost-effective and user-friendly incubator prototype for small-scale poultry farming, capable of maintaining stable environmental conditions to improve hatching success rates. The methodology involved a product development approach, starting with the design of an electronic system using an ESP32 microcontroller and a DHT22 sensor, and constructing a physical prototype. The system's functionality was tested over a 21-day incubation period with 10 chicken eggs, and its usability was evaluated through a survey of 11 poultry farmers. The findings demonstrated that the system effectively maintained temperatures between 37.1°C and 37.7°C and humidity between 41% and 73%, resulting in three successful hatches. User feedback was positive, with 72.7% of farmers expressing interest in the system, though 100% indicated a need for training. In conclusion, the project successfully produced a functional IoT incubator that meets the technical requirements for egg incubation and shows strong potential for adoption by its target users. Further enhancements are recommended, such as incorporating alternative power supplies and developing advanced automation features.

## I. INTRODUCTION

Flooding is among the most frequent natural disasters in Malaysia, particularly affecting the eastern coastal states such as Kelantan, Terengganu, and Pahang. Contributing factors include heavy rainfall, river overflow, and inefficient drainage systems, all of which exacerbate flood occurrences, resulting in property damage and loss of life. Flash floods—such as the one that occurred in August 2021—highlight the critical need for a responsive and reliable early warning system. The Internet of Things (IoT) technology has shown significant potential in addressing this issue. Through the integration of smart sensors and real-time data processing, IoT-based systems can deliver early warnings to communities more effectively and inclusively (Ou et al., 2025; Raman & Iqbal, 2024).

For times, overwhelmed streets have been an issue in Metro cities and villages. It causes weighty Inflow of business. The two drivers and suburbanites are stalling out in an overwhelmed regions and becoming mixed up in risking potential courses just to go to their objections. Whenever business happed, individuals' magnate, time and inconvenience are squandered. 1.3 Challenges and Issues Heavy waterfalls, rainfalls and floods are the most deadly of cataclysmic events in India. Between 1980 and 2017, India got through 235 waterfalls, which prompted passing and affected1.93 billion individuals. His beneficial misfortunes because of waterfalls remained at a humongous$58.7 billion. Waterfalls in India are likewise the dear among fiascos, counting for around 68% of productive misfortunes brought about by all calamities (Exigency Events Database. For this issue we are trying to develop the "IOT FLOOD MONITORING & ALERTING SYSTEM" with the help of different types of sensors and power of IOT, to help the street stoner/people to stay away from this issue happed. It was developed grounded on issue looked by drivers and workers when storm passed. This downpour/monitoring and the alerting checking framework is planned and created to exhort and caution both power and the owners about what is happening near them.

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## II. LITERATURE REVIEW

The review process adopted is as follows: We have started with reading each IEEE paper multiple times for the basic understanding of them and then we saw the amount of relation it has with our project and what is the difference between the paper and our project and then we have analysed its various aspects and developed a sense of what all the paper is saying. Also we differentiated each paper with our project by the technology and components used for a better understanding. First of all our project is on "IOT Flood Monitoring & Alerting System" and during our preparation of project report in total we have read and studied ten research and review papers. Talking about the year in which these papers are published ranges from the year 2012 to the year 2021-22. Now in this chapter of literature review we will read about the research papers which we have mentioned in depth.

**[K.Vinothini and Dr.S.Jayanthy., 2019]** In this paper titled "Design and implementation of SALVUS women safety device" the author have mentioned that Flood is accounted as a name among the most star distinguishing peculiarity on the earth, influencing mortal lives what's more, framing crazy disadvantage to individuals and bundles. Avoiding waterfalls before extreme hindrance can give OK chance to occupants void in the nearby areas. The Vaticinator and cautioning framework could have verifiable issue to drop the base of storm impacts. Waterfalls are early on sad occasions that permits outrageous destruction of any country. They're by and large achieved in rush and flood of reservoir conduits, particularly during weighty blustery season. This plan expects to cover the downpour condition and shoot alert assuming that there's a situation of danger through IOT. The component of rising water position is done to descry the downpour. The author have proposed a downpour cautioning structure has been inspected and made. The design contains an early storm cautioning station which is charged by sun oriented power. The downpour exhorted station is furnished with the water position identifier. The information, which is gotten from finders are been put away and communicated to noticing centre through GPRS show. The component of rising water position is done to descry the storm. The framework utilizes three finders to descry temperature, dampness and water circumstances at each stage. The distinguished locator values are reused utilizing PIC Microcontroller and it is sent to IOT through Wi-Fi module. The framework by and by transfers and broadcast identifier values through pall. The choice tree calculation is implemented to play out the section process. The exploratory outcomes for rightly arranged Cases and that's what minimum Absolute Error demonstrates the proposed Decision Tree Algorithm gives delicacy with Minimum Mean Square Error than Hyper Pipes Calculation.

**Low Cost IoT based Flood Monitoring System Using Machine Learning and Neural Networks**

[Dola Sheeba Rani.et.al., 2020] In this paper titled "Low Cost IoT based Flood Monitoring System Using Machine Learning and Neural Networks", In the time 2019, there was a weighty ruin in the India that made significant misfortune for 13 nations, which included loss of somewhere around 200 individuals and a huge number of them were lost. The most impacted district was Karnataka and Maharashtra. Various spots comparable as littoral regions or the spots approaching the swash or heads are likewise inclined to downpour fiasco. Destruction principal landscape component to influence the likelihood of downpour, and a several of machine proficiency models were surveyed for storm ratiocination models. The primary gift of the paper presents the gift of machine education models. The work on the development of storm ratiocination models have added to limit the deficiency of mortal life, drop fiasco, and decrease annihilation of bundles furthermore, resources. This paper gives the machine proficiency design, to foresee the presence of waterfalls, by taking into account the ruin information from for starters accessible information to guess the ruin for coming month. The framework likewise computes the time taken for the storm to arrive at the asked region. Water inflow identifiers measure the water position in the water body, though downpour indicators measure the power of ruin in millimetres. The whole data can be seen from a remote position, outfitting the expected data on IoT gecko stage. The term Internet of Effects (IoT) alludes to the consistently extending complex arrangement of basic impacts that underline correspondence between computing items, predisposition and frameworks by offering availability from wherever and whenever. It's assessed that by the finish of 2020, 50 billion inclination are supposed to be associated. IoT advances have a vital impact to envelop various brilliant activities, in actuality. On the other hand, the crosscutting idea of IoT factors also, frameworks, present new security challenges. In this framework we utilize three downpour finders and three water indicators, which are kept at three unique districts; additionally a sneer pi with water locators, downpour finders. This framework predicts the downpour and caution is delivered for discrete specialists while sounding moment alert in close town lets to send correspondence about potential Cataracts utilizing IoT. IoT covers benefits for beautiful fields like farming, assiduity, medical care, motorcars and home robotization for consummating and robotizing vivid everyday moulding. Flood is for the most part caused either by change in the condition of water

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body or because of the flood of drains, heads, and so on. Because of cutting edge progress and bettered mortal life, territory issues likewise will generally increment. This paper incorporates the powerful and adaptable framework for the disclosure of storm and waking framework. The most trend setting innovations like machine proficiency (ML) give critical aid to the area of innovation are authentically significant in covering the typical and unusual conduct characters of any machine. The ideal of this work is to study on downpour issues. Brain organizations are generally famous, broadly utilized for ruin soothsaying also, perform proficiently. To forecast or read the ruin, information is held from Indian meteorological office. Two distinct datasets that comprises of normal destruction information from 1951-2000 for each month and each quarter; substitute information is of 1901-2015, which comprises normal ruin information for each state is utilized. The presentation of prepared models were assessed on mean outright blunder also, standard divagation.

## III. METHODOLOGY OF PROPOSED SURVEY

The IoT-based Flood Monitoring and Notification System utilizes a well-defined methodology, establishing an overall framework for data collection, data analysis, and notification. Several different types of sensors will form the basis of the system, including water level sensors, flow sensors, and rain gauges, that will be placed in flood-prone regions, utilized for real-time monitoring. An ESP32 microcontroller will be used to process the data collected and send it to a cloud server via Wi-Fi or LoRa connectivity. The cloud server will analyze the collected environmental data, identifying possible flooding risk using either machine learning models or predetermined thresholds.Once a possible flooding risk is identified, notifications will also be automated by the system with numerous modes of communication, including SMS, email, and mobile app notifications, ensuring timely alerts for both authorities and residents. In addition to communication, the system can provide a website-based dashboard for real-time monitoring and visualization of flood-related data that can enable emergency responders to take preventative action.Prior to deployment, the system will be tested extensively under controlled simulated flood conditions to ensure accurate and effective operation in the expected conditions. After verification, it will be installed in high-risk areas to monitor real-time flood conditions. This methodology will support an effective, low-cost, and a sustainable flood monitoring solution.

### 3.1 Block Diagram

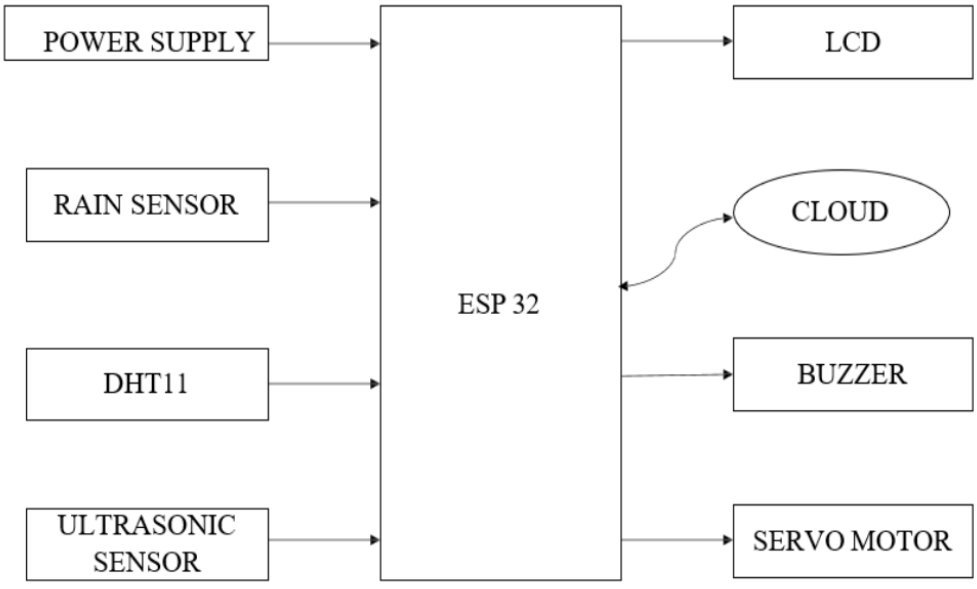


**Figure 1: Block Diagram**

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3.1 Block Diagram ESP32 Micro-Controller

**a. The ESP32** microcontroller acts as the main processing unit in a flood monitoring and alert system with IoT. It collects, analyzes, and sends input from several sensors connected to the microcontroller. The ESP32 is wired to water level and flow sensors, to monitor the water level of the river, reservoir, or drainage. The ESP32 has builtin Wi-Fi and Bluetooth capabilities that prepare the microcontroller to send real-time sensor data to a cloud web app or mobile application for ease of use. The ESP32 can also send alerts or notifications to app, SMS, email, when water levels are at dangerous levels. The ESP32 has low-power requirements, multiple GPIO pins, and is also compatible with IoT-related protocols like MQTT and HTTP, making them dependable for public, real-time flood monitoring application.

**b. Rain Sensor** A rain sensor detects rainfall and measures its intensity by detecting water droplets on its plate. It usually consists of a conductive plate or a water-sensitive board with exposed traces. When rainwater falls on the sensor, current flows between the traces and completes the circuit, causing resistance to decrease. Then, based on the amount of water, the sensor generates an analog or digital signal. This signal is sent to the corresponding microcontroller (like ESP32) for data processing and to actuate alerts or automate actions, such as closing windows or turning on drainage systems.3

**c. DHT11 Sensor** The DHT11 is a digital sensor that measures temperature and humidity.It uses a thermistor to check temperature and a humidity sensor to measure moisture in the air. After the sensor gathers data, an internal chip processes the data to transmit the output reading as a digital signal to a ESP32 microcontroller. The sensor operates on a single-wire communication protocol which makes it easy to interface with microcontrollers. DHT11 is an inexpensive, low-power consumption application with easy-to-use operation commonly used in Internet of Things such as weather monitoring, smart homes, and agriculture. d. Ultrasonic Sensor A distance is measured by an ultrasonic sensor using sound waves. This type of sensor has a transmitter which sends out high-frequency ultrasonic pulses, and a receiver which can detect the sound waves after they have bounced off an object. The distance is calculated by measuring the amount of time it takes for the echo to return and the speed of sound in air is then used to calculate the distance. The sensor will pass this information to a microcontroller - such as an ESP32 - for processing. e. Servo motor A servo motor is a special type of motor that moves to a specific position when given a command. It is employed for automated control tasks, such as opening or closing floodgates dependent on water levels. The servo motor receives a control signal (PWM - Pulse Width Modulation) to accurately adjust its position. The ESP32 microcontroller sends signals to the servo motor instructing it to turn to a specific angle. A DC motor, gear system, and feedback mechanism within the servo all work together to ensure accurate positioning.

**d. Buzzer** A buzzer is a small device that makes a sound when electricity passes through it.An alerting device in a flood monitoring and warning system is a buzzer that can be used to alert individuals of rising water levels. The buzzer is activated by the ESP32 microcontroller when sensor data indicates a flood risk. Upon activation, the buzzer outputs a loud alert sound that alarms individuals in the vicinity to be cautious. Thus, it is an important mechanism for allowing immediate audible warnings in an emergency setting.

**3.2 System Architecture & Working Principle:** The IoT flood monitoring and notification system operates by continually collecting and analyzing environmental data to identify potential flood risks. The system architecture is built upon the ESP32 microcontroller, which can connect to a variety of sensors such as an ultrasonic sensor used for measuring water levels, a rain sensor used for measuring the amount of rainfall, and a DHT11 sensor used to collect temperature and humidity. All sensors detect environmental change and send their real-time data to the ESP32 microcontroller, which processes and transmits the collected data to a cloud platform through WiFi. When the water level reaches to threshold, the system will operate an alert mechanism - this includes a buzzer that sounds to alert people in the near vicinity, and an LCD display that displays the real-time reading from the sensors. In addition, a servo motor can be activated to automatically open or close a floodgate to pace the flow of water.

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### 3.3 Hardware Implementation

Figure 3: Physical Connection of System The Flood Monitoring and Alert system uses an ESP32 micro controller to gather and process real-time data from several different sensors. It has an ultrasonic sensor that takes water level readings, it has a rain sensor that measures how much rain is falling, and it has a DHT11 sensor that monitors temperature & humidity. Once readings indicate that water level is above a safe level, an alarm is activated and a warning message is displayed on an LCD display. The data is also sent to the cloud. In addition to notifications, there is also a servo motor that can be set up to automatically open the floodgates. All data is stored online and community members can view the data to get early warnings and take precautions to stay safe.

## IV. CONCLUSION AND FUTURE WORK

In this paper, we have proposed a novel approach to This project successfully developed a cost-effective, user-friendly, and efficient smart flood warning system capable of delivering real-time information to communities. It addresses a research gap in small-scale domestic systems and contributes meaningfully to disaster risk reduction efforts. Future studies are recommended to explore the integration of artificial intelligence (AI) for flood forecasting analysis and to expand the system's implementation in high-risk rural areas.

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