

## **PROJECT TITLE : FLOOD MONITORING AND EARLY WARNING**

### **PHASE 1 : PROBLEM DEFINITION AND DESIGN THINKING**

#### **Problem Definition in Flood Monitoring and Early Warning:**

##### **Problem Statement:**

The problem in flood monitoring and early warning systems can be defined as follows:

Natural calamities happens everywhere in the world, and which affects the human life and economy of the country. Economy and growth of any country depends upon the agriculture, hence the proper alert makes the farmers vigilant to protect the crop from flooding.

In flood-prone regions, there is a critical need for a comprehensive and efficient flood monitoring and early warning system due to the recurring nature of floods, inadequate infrastructure, and limited accessibility to real-time data. Existing systems may suffer from inaccuracies, inefficiencies, and insufficient public awareness and preparedness, leading to increased vulnerability to flood-related disasters.

Floods are among the most destructive natural disasters, wreaking havoc on communities, infrastructure, and ecosystems. Effective flood monitoring and early warning systems are essential to mitigate the devastating impacts of these events.

In essence, the problem lies in the inadequacy of existing systems, resulting in inefficient flood response, increased risks, and compromised safety. To be more specific:

- **Inadequate Infrastructure:** Many regions susceptible to floods lack the necessary monitoring infrastructure, including river gauges, sensors, and weather stations. This deficiency significantly

impairs the ability to collect real-time data crucial for timely alerts and responses.

- **Data Integration Challenges:** Flood monitoring involves the integration of data from various sources, such as weather forecasts, river gauges, remote sensing, and historical data. The problem often arises when these data streams are not effectively synchronized, leading to inaccurate predictions and inadequate early warnings.
- **Limited Accessibility:** Information about flood conditions, warnings, and evacuation plans may not be readily accessible to both government authorities and the public. This limitation can delay critical decision-making and actions during flood events, exacerbating the consequences.
- **Insufficient Early Warning:** Existing early warning systems may lack the robustness needed to provide timely alerts to affected communities. The problem extends to the reliability of communication channels, including the timeliness of SMS alerts, mobile apps, and sirens.
- **Public Awareness and Preparedness:** A significant problem is the insufficient level of public awareness and preparedness concerning flood risks and the appropriate actions to take when floods occur. This knowledge gap can lead to a lack of vigilance and potentially life-threatening situations.

### **Design Thinking Approach for Flood Monitoring and Early Warning:**

In order to detect and avoid flood like disastrous calamities in a timely manner, current world technology plays a vital role. We can

prevent natural disaster caused by flood, with the aid of an IOT based early flood related parameter monitoring and detection system and its avoidance using the Arduino project, is proposed as a solution to the mentioned problem.

The proposed model is very much utilized for monitoring of the water level, flow variations, humidity and temperature variation in the river and the same can be used at dam or reservoirs. The measured values are regularly updated on the web server which is very much useful to send flood alerts to authority and people for faster action.

The entire system consist of five different Arduino compactible sensors which are temperature, humidity, water level, flow and ultrasonic sensors. Also it consist of an Arduino controller, a Wi-Fi module, an LCD display an alarm and an IOT remote server based platform.

In this advanced system the initial stage indicates the level of water and the other parameters like flow rate temperature and humidity. Then these information is passed to the web server or the IOT via a Wi-Fi module, here the ESP8266 is used as Wi-Fi module. DHT11 is the temperature and humidity sensor, it is a basic low cost digital temperature and humidity sensor. And HC-SR04 ultrasonic sensor used as the water level sensor, which works on the SONAR principle.

The main objective is to implement a system which covers both the IOT based system and the sensor network interfaced with both ESP8266 and the Arduino Uno R3 board for detecting floods and for sending alert to organizations and the society.

The LED and buzzer act as alerting system when there is rise in the water level and the associating parameters.