**Phase 1: Problem Definition and Design Thinking**

* **Problem Definition**

The problem is the absence of an effective flood monitoring and early warning system in flood-prone areas, resulting in delayed warnings, limited public awareness, and coordination challenges during flood emergencies. This project aims to deploy IoT sensors, develop a warning platform, and integrate them using Python to address these issues and enhance flood preparedness and response.s

* **Design Thinking**

**1.Project Objectives**

* Real-time Flood Monitoring
* To continuously monitor water levels near water bodies and flood-prone areas in real-time.
* This objective aims to provide accurate and up-to-date information on water levels, enabling proactive flood monitoring to identify potential flood events as they occur or develop.
* Early Warning Issuance
* To issue early flood warnings based on predefined criteria and thresholds.
* This objective seeks to provide timely alerts to both the public and relevant authorities about impending flood risks, allowing them to take precautionary measures and mitigate potential damage.
* Public Safety
* To prioritize the safety of the general public through effective communication and awareness.
* This objective aims to ensure that the public is well-informed about flood risks, knows how to access flood warnings, and understands how to respond safely in the event of a flood.
* Emergency Response Coordination
* To facilitate coordination and communication among emergency response teams and relevant authorities.
* This objective is essential for enabling swift and coordinated responses to flood emergencies, ensuring that resources are allocated efficiently and response efforts are well-organized.

**2..IoT Sensor Network Design**

* The appropriate types of sensors for monitoring water levels. Common sensor types include ultrasonic sensors, pressure sensors, radar sensors, or even cameras for visual monitoring.
* Identify the likely pathways of floodwater within the area. Place sensors along these pathways to detect and monitor the movement of water.
* Position sensors as close as possible to rivers, streams, lakes, or other water bodies that pose flood risks. Placing sensors directly in or near the water is often necessary to monitor rising water levels accurately.
* Determine the optimal spacing between sensors. This spacing depends on factors such as the rate of change in water levels, the desired level of accuracy, and the sensor's range.
* Implement sensor redundancy by placing multiple sensors in critical areas. Redundancy helps validate data accuracy and provides backup in case of sensor failure.

**3.Early Warning Platform**

* Create an intuitive and user-friendly web interface that allows users to easily access and understand the displayed data.
* Implement an alert system that can issue warnings based on predefined criteria
  + Set threshold levels for water levels that trigger warnings.
  + Differentiate between warning levels (e.g., flood advisory, flood watch, flood warning) based on the severity of the situation
  + Include visual and audible alerts to catch users' attention.

**4.Integration Approach**

* Select a communication protocol that facilitates data transmission from the IoT sensors to the early warning platform. Common protocols for IoT data transmission include MQTT, HTTP/HTTPS, CoAP, and LoRaWAN.