Project Design Phase-I

**Solution Architecture**

| | |
|---|---|
| Date | 23 October 2022 |
| Team ID | PNT2022TMID51308 |
| Project Name | Natural Disasters Intensity Analysis and Classification using Artificial Intelligence |
| Maximum Marks | 4 Marks |

# Solution Architecture:

The architecture of an early warning system for the dissemination of timely alerts during pluvial flash floods. EWS is understood as a set of procedures, steps or key elements related and interconnected with each other . The United Nations has defined early warning systems as “An integrated system of hazard monitoring, forecasting and prediction, disaster risk assessment, communication and preparedness activities systems and processes that enable individuals, communities, governments, businesses and others to take timely action to reduce disaster risks in advance of hazardous events”. According to the World Meteorological Organization (WMO) and International Strategy for Disaster Reduction (ISDR) the architecture of an effective EWS is divided into the following key elements or structures: Disaster risk knowledge, Forecasting, Dissemination–Communication and Preparedness–Response.

## 1. Disaster Risk Knowledge

An event becomes a disaster when it abruptly affects a community’s daily activities and involves human and material losses and has economic or environmental impacts . It would also be considered as a disaster when damage exceeds the community’s ability to respond with their own resources . When there is a greater knowledge of the risk to which a population is exposed, this leads to the improvement of the processes of risk management, reduction and adaptation . The knowledge contains information that can be used to make decisions an actions that allow the community to improve their capacity to react to disaster risk in a timely manner .

To reduce the risk of flooding in urban areas, the data collected should be relevant and concise, qualitative or quantitative, and should

be obtained through official sources. The following areas should be covered:

- Historical background
- Geographical aspects
- Environmental and physical aspects
- Socio-cultural aspects
- Economic aspects.

## 2. Forecasting

For urban flash floods, the main goal of this key element is forecasting and establishing alert levels in real time. This process is divided into two sections: Monitoring and Information Processing. The Monitoring section monitors and transmits information on meteorological and hydraulic variables related to urban flash floods

The forecasting process requires the use of a number of technologies and areas of expertise for the analysis of large volumes of data and predictions based on simulations. These technologies include sensors to measure meteorological and hydraulic variables and computational models and simulation software to process the information. It is necessary to provide an advanced visualization technology to interact with people at risk and a decision support system with remote access to assist public authorities and citizens in timely decision making

## Example - Solution Architecture Diagram:

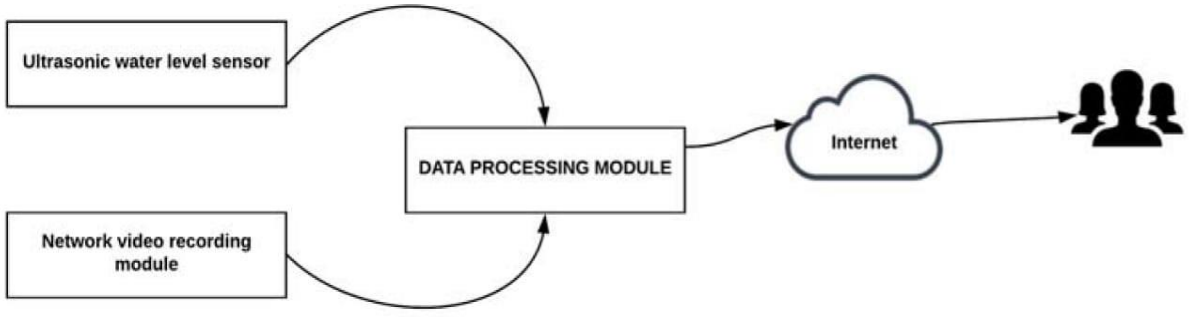


*Figure 1:General structure for motes-based sensor network.*

## 3. Dissemination-Communication

Sending and communicating warnings is the determining step between forecast and action . Dissemination refers to sending the warning, while communication is achieved only when the information is received and understood . Sending the alerts to people at risk during high-intensity precipitations is an extremely important phase in which the message should be simple and useful. This allows for adequate responses that help safeguard lives and livelihoods . Dissemination and communication systems for alerts should be able to answer the following questions:

- Do warnings reach all those at risk?
- Are the risk and warnings understood?
- Is the warning information clear and usable?

To achieve positive answers to these questions, alerts must be available in different formats, such as text, graphics, colour coding, audio, etc. This facilitates the reception and action on warnings. According to the WMO [16], for alerts to be effective, their content should be brief, concise, understandable, and answer questions such as “What?”, “Where?”, “When?“, “Why?” and “How to respond?”. Also, detailed threat information using localized geographic references should be included. Dissemination of alerts must be done through multiple channels in order to reduce delays in delivery to end-users, as well as ensure it reaches as many people as possible.

## 4. Preparedness-Response.

Disaster preparedness includes all the activities necessary for a community to react to such an event. It is necessary for the community to receive and correctly interpret issued alerts, so they may draw the necessary conclusions for actions to be taken, such as alerting local police or firefighters. Many deaths have been recorded during flash floods worldwide, as people try to drive or walk across the streams of water unknowingly or poorly assessing the risk . Therefore, it is necessary not only to issue flood warnings

in a timely manner but also to identify the community's perception of flash floods and the factors that influence their responses when receiving the warning. The survey structure was divided into three main sections:

- Perceptions and understandings of flash flood risks.
- Perceptions and interpretations of flash flood forecasts, warnings, and other alerts
- Protective decision making in response to flash flood warnings.

## Example - Solution Architecture Diagram:

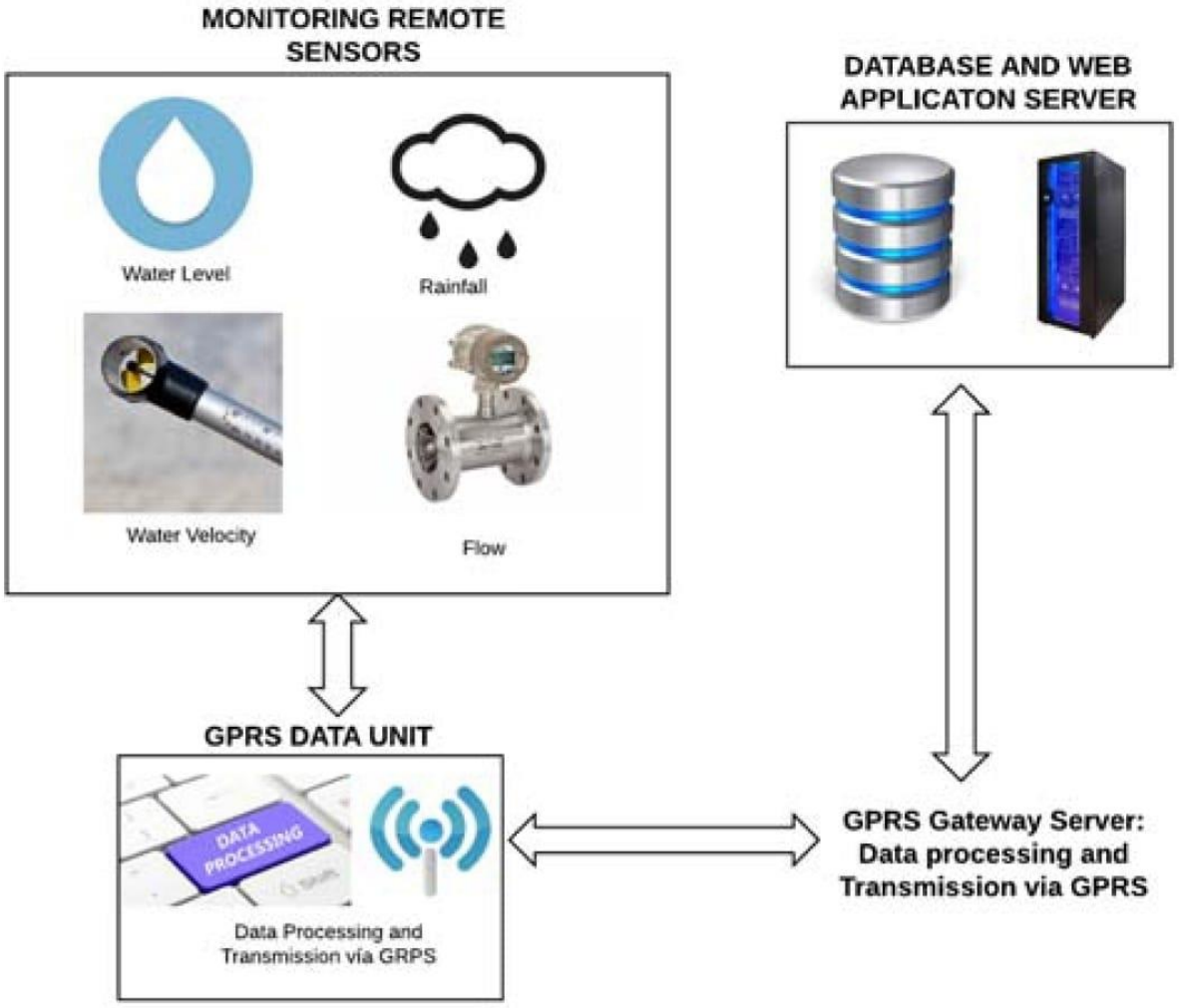


*Figure 2:Wireless flood monitoring system.*