

# CHAPTER 1

## INTRODUCTION

### 1.1 Background

Rain is important for nature, because rain act as water supply for living things as animal or plant as long as the amount of the rainfall is sufficient, no more no less. But, when heavy rain falls the water flows to lower area that can cause flood. Flood is harmful for residents in the vicinity that can cost a lot of money. There are several flood because of rain one of them is flash flood[1].

Flash floods are caused by heavy rains in other places in a short time that can occur elsewhere, usually flash floods occur in only one or two hours[1]. Flash floods are dangerous natural disasters that occur when water flows quickly and in a short time cause risks to humans and property caused by heavy rains and occur in mountainous areas other natural causes that are usually caused by glacier lake explosions. While other causes that are not caused by nature are dam damage and failure of the embankment[2]. Flash floods can erase everything in their path even though the area does not rain at all, this is why flash floods can be dangerous for places affected by flash floods Baleendah for an example.

Baleendah often experiences flash floods. This incident makes the residents around Baleendah always suffer from the loss of wealth when floods come and also threaten their lives but resident that live or that have an activity miles away from Baleendah had a negative impact that can cause a long traffic jam because the road is obstructed[3]. Flash floods in Baleendah occur because there are three places that cause this event to always occur, although there is no rain in Baleendah, but if there is heavy rain in the three areas flash floods can occur in Baleendah in a short time, these three places are the Bandung City, Majalaya, and Pangalengan. This event occurred because the rivers of the three regions have rivers as drainage systems that flow directly into Baleendah and create flash floods if there is heavy rain falling in those three places. This event is considered detrimental to residents near or in Baleendah itself which is material or immaterial and also often causes long traffic jams that can last for hours. This incident has happened a long time ago and there is still no action from the local government[3].

Since the 1990s, increasing the effectiveness of the early warning system has become a fundamental problem that has become the goal of reducing the loss of life,

property damage, and social and economic disruption caused by natural disasters. Early warning needs to bring scientific and technical capabilities to estimate the dangers of natural disasters using effective communication, public policy commitments, and the understanding and participation of local communities. In June-July 1997 there was an issue related to the risk of natural dams in Nepal, holding Tsho Rolpa glaciers that can be destroyed at any time which caused a sudden, very destructive flood, and hit 4,000 people in the vicinity. This is uncertain news because it was only an issue led by the media and the absence of an Early Warning System on the Tsho Rolpa glacier which caused public panic. In the end there was no flood at all[4].

In Jakarta there is already a flood early warning system available for the Ciliwung watershed and rivers that cross Jakarta. The system managed by BBWS Ciliwung-Cisadane and the DKI Jakarta Public Works Department has an Early Warning System concept that relies on Katulampa water levels and some water levels found downstream. With monitoring of the water level at the downstream, it takes a long time to inform the condition of the water level at several checkpoints before reaching Jakarta. With the flood early warning system that uses the water level in Katulampa as a basis to give warning to the community. This system can find out how long the water from upstream before reach Jakarta[5].

The purpose of this undergraduate thesis is to solved problem when surrounding residents always experience losses when flash flooding occurs in Baleendah and make the residents near or on Baleendah can save their material or immaterial. Because there are many resident which was harmed because this event like life or wealth. The importance of using our early warning system is residents near Baleendah can save their material and immaterial from flash flooding by informing the resident in Baleendah 30 minutes before the flash flooding is coming. Because flash floods is more dangerous than general flood because flash floods can be happened in a second without any warning compared to general flood that happen because the water level is increasing periodically so the resident can save their life and wealth. To have a good early warning system, data communication is needed as important part to sending data from sensor to the cloud then to the warning system so the resident know if there is flash flood coming.

## **1.2 Formulation of Problems**

The distance between the upstream and Baleendah is quite far, therefore a communication modules that can transmit information from upstream to Baleendah are

needed to warn the residents, so they have time to prepare prior to the flash flood at least 15 minutes before the flash flood come. Therefore this undergraduate thesis compares three communication modules to find the maximum range of each communication modules by using a long range and cheap communication modules.

### **1.3 Purpose of The Research**

Based on the background, there are the purpose of this undergraduate thesis:

1. As a data communication, to transmit the data from the sensor that placed on upstream to Baleendah.
2. Comparing three devices, to find the farthest distance in transmitting the data.

### **1.4 Scope of Problems**

This undergraduate thesis studies according in problem formulation which already mentioned. Problem scope is needed for limitation of the study, so the topic in this undergraduate thesis not deviate, this undergraduate thesis have problem scope among others:

1. This undergraduate thesis only compare three communication modules namely LoRa SX-1278, NRF24L01, and RF 433Mhz.
2. The three devices is only for transmitting the data from the headwaters
3. This undergraduate thesis use two parameters, price and distance.
4. All data communication devices are only using Arduino Uno as MCU.
5. This undergraduate thesis using two data communication as transmitter and receiver to simulate the data transmission.
6. The simulation is tested at straight line with and without obstacle.

### **1.5 Research Methodology**

To obtain information or data that are needed in compiling this undergraduate thesis, there are two method that used in this undergraduate thesis, among other: design and analysis

1. System Planning

First step is to define system planning for find the solution to solve the problem.

2. Data Retrieval

Second step is data retrieval to get primary data for analyze the data for each module

3. Analysis.

Last step is analyzing each module and make the conclusion.

## **1.6 Structure of Thesis**

The rest of thesis is organized as follows:

- Chapter 2 BASIC CONCEPT  
This chapter contains; Explanation of theory ,concept, tools, and equipment used.
- Chapter 3 WORK SYSTEM  
This chapter contains; the workflow and system design.
- Chapter 4 RESULTS AND ANALYSIS  
This chapter contains; the result of this thesis.
- Chapter 5 CONCLUSION AND SUGGESTION  
This chapter contains; the conclusion of the analysis and a suggestion for the next project.