CHAPTER I. INTRODUCTION

1.1. BACKGROUND OF STUDY

In recent years, natural disasters have become a central issue that has attracted significant attention from both the government and the private sector. Natural disasters can occur at any time without being predicted. In Malaysia, one of the major natural disasters is flooding, especially during the rainy season at the end of the year.

In a general sense, a flood is defined as a natural phenomenon where there is excess water that is not accommodated by a drainage network in an area that can cause harmful inundation. The impacts caused by flooding are often uncontrollable, especially in areas that are unable to cope with its impact (Balahanti, Mononimbar, & Gosal, 2023). Meanwhile, flood, based on the definition Multilingual Technical Dictionary on Irrigation and Drainage issued by the International Commission on Irrigation and Drainage, can be defined as the rate of river flow that is relatively higher than normal; inundation that occurs in low-lying areas, increased, addition, and overflow of water that does not normally occurs inland.

In Malaysia, frequent flood disasters are classified into flash floods and monsoon floods. This study will focus on monsoon flood disasters. Monsoon floods occur during certain seasons due to seasonal changes in wind direction that carry large amounts of water vapor and cause heavy rains (Aziz, 2015).

One of the districts in Malaysia that frequently experiences flooding is Kluang, Johor. The issue of frequent flooding in Kluang is very significant to study. Stated that floods in urban areas are often caused by a combination of factors, namely poor channel systems and land use changes that do not consider environmental aspects (Hashim, Muhamad, Aiyub, & Yahya, 2011). The location of rapid development, especially in urban areas, causes a lack of attention to the surrounding environment and forests, which contribute to flooding (Samsuri, Bakar, & Unjah, 2018). In addition, poorly managed drainage systems and outdated infrastructure designs that require maintenance are also contributing factors to flooding. Moreover, flooding can also be caused by human factors such as the bad habits of irresponsible residents who throw household garbage and industrial waste into the channel is also a major trigger for flooding.

In early 2024, Johor experienced severe flooding with significant impacts in several areas, one of which was the Kluang District. Flooding in Kluang District was caused by the

overflowing of the Melantai River due to a collapsed river cliff, so that the Melantai River was unable to hold the river's water discharge. The floods displaced thousands of residents and damaged much of the infrastructure. The rivers in Kluang, cannot accommodate high-intensity rainwater, resulting in overflowing water and inundating the surrounding areas. In addition, the geographical conditions, which are mostly lowlands, also exacerbated the situation. Based on reports from residents, Zailan Kadir as the head of Bentong Village said that the flood level can reach a height of 1 meter or even more after heavy rain for more than 40 minutes.

Reviewed from bernama.com, Mohamad Fazli as an expert of the invitation council of Negeri Bukit Pasir said that Melantai River and Mengkibol River are the peak of flooding in the Kluang area which affects 2000 residents every year.

Flooding in the Melantai River is caused by the large number of housing estates upstream that drain their water into the Melantai River, resulting in the river overflowing quickly. In addition, the flood conditions were exacerbated by the fact that the rivers downstream of the Melantai River, namely the Beladong River and Mengkibol River were also full, so that the flow of water from the Melantai River was obstructed.

Figure 1.1 *Flood Event in Kluang District, 2024*

When a flood disaster occurs, the government immediately acts quickly and effectively in dealing with flood disasters, even with such efforts, the risk of flooding in Johor remains. Natural factors such as climate change, extreme rainfall, and geographical conditions remain the biggest challenges. In addition, rapid population growth and urbanization will increase the surface area that cannot absorb rainwater, exacerbating the flooding problem. Therefore, through this research, flood modelling is carried out so that an effective ways can be obtained so that flooding can be minimized. Flood modelling is very important in accessing flood hazards because it can show the magnitude of specific exceedance probabilities and can identify key drainage system problems where flooding can occur based on simulation results (Razi, et al., 2023).

1.2. OBJECTIVES AND BENEFITS

1.2.1. Objectives of Study

The primary objectives of this research are:

- Analyze the hydrological behavior in the study area.
- Simulate the potential flood scenarios across different return periods.

1.2.2. Benefits of Study

Flooding is one of the ongoing challenges that can occur at any time, especially in areas vulnerable to climate change. Therefore, flood management efforts are crucial. Floods cannot be avoided, but the negative impacts can be minimized by carrying out good flood management.

The benefits of this research are as follows:

- This research can increase the author's understanding of long-term flood management strategies, which can be applied in future disaster planning and management.
- The results of this research are expected to be a reference or reference in formulating policies and actions for handling floods in the Kluang District area, Johor and also floods in the Padang area, West Sumatra.
- Provide a strategic contribution to the local government in the formulation of disaster mitigation policies in flood-prone areas, especially in the Kluang District area and also Padang, West Sumatra.

1.3. SCOPE OF STUDY

This research focused on developing a quantitative flood model by understanding the flow characteristics in the Melantai River, which is located in Kluang District, Johor with a river length of 6050 meters. The starting point of the river stretch is located at 2˚02'38.01“ N and 103˚17'57.76” E with an elevation of 30 meters above sea level. While the end point of the river is located at 2˚04'10.97“ N and 103˚18'17.80” E with an elevation of 24 meters above sea level with a total cross section of 121 cross sections. The rainfall data used was from the Telemetric Station at Bandar Kluang, Johor obtained from the Department of Irrigation and Drainage (DID). Through flood simulation by using HEC-RAS software, this research will predict the potentially flooded areas based on various return periods including 25-year, 50-year and 100-year, so that effective and sustainable solutions can be obtained to solve the flood

problem in the Johor area in the future, especially in Kluang District. In addition, flood discharge analysis is carried out with the HSS Snyder method

1.4. WRITING SYSTEMATIC

The systematics of writing in research generally includes:

CHAPTER I. INTRODUCTION

This chapter presents the background of the research, the objectives and benefits of the research, and the problem limitations of the research conducted.

CHAPTER II. LITERATURE REVIEW

This chapter presents the theoretical and empirical that underlie this research. The literature review includes studies of the flood phenomenon, specifically in Malaysia, such as flood theories, factors that trigger flooding, flood impacts, and previous research. In addition, this chapter also explains the contribution of this research to science in the field of hydrology with the use of HEC-RAS software in flood modelling and disaster management.

CHAPTER III. RESEARCH METHODOLOGY

This chapter will discuss the methods and software used in this research. It will also discuss what data is needed for HEC-RAS and the steps in flood simulation modelling.

CHAPTER IV. RESULTS AND DISCUSSION

This chapter presents the results and discussions, which includes identifying factors that cause flooding, setting up the Melantai River model and hydraulics simulation.

CHAPTER V. CONCLUSION AND RECOMMENDATION

In general, this chapter summarizes the results of this research. Where the conclusion is made based on the results of the analysis of the data of the previous chapter.