CHAPTER 1

INTRODUCTION

1.0 BACKGROUND OF STUDY

Rainfall occurrence is a natural process defined as the amount of precipitation of water form in the specific area and time interval which expressed in units of millimeters or inches. The precipitated water is measured using rain gauge that is set in the specific area that functions as rain collector. In some regions, the rainfall not always fall in the liquid form but also including solid precipitation such as snow, hail. This may occur due to surrounding condition of the region and the common condition is due to the weather.

When rain falls onto the earth, the water flows from the highest peak to the lower places with some of the precipitation portion will infiltrating into the ground and replenish the groundwater and most of the precipitation will flows as a runoff. The common factors affecting the precipitation are the intensity and the duration of the rainfall or the storm. Higher rain intensity caused the soil to be saturated and rate of infiltration will decreased causing the excess water to fall as the runoff. The type of soil also affecting the runoff as the non-porous soil has lower rate of infiltration compare to porous soil. The rate of runoff also affects by other factors such as the present of plant and the local topography of the area.

Rainfall runoff may cause the occurrence of flooding as if the runoff from the storm is higher, it may exceeding the capacity of the stream capacity which will causing flooding. Runoff also contributes on the reduction of ground water recharge. Most of the drinkable water is extract from the groundwater sources. Overuse of the groundwater without natural replenishing or slower rate of replenishing due to runoff
will cause the land to collapse which known as the subsidence process. The groundwater fills the spaces in the soil gives an internal strength to the ground. When the water is removed, it will leave an opening spaces filled with air. The absence of the internal strength will cause the soil structure to collapse and filled the spaces, thus destroying the groundwater aquifer. There also will be a decreased in the stream base flow due to the runoff. Base flow is the water that continuously flows even on the dry periods. This flow is vital for the survival of the aquatic life in the stream. Other than that, runoff also increased the soil erosion and reduction of natural filtration of the water.

Hydrological modeling is important for watershed management as hydrology is the driving force behind many processes occurring on the watershed (Albek et al., 2004). The modeling is used for the purpose of forecasting and predicting flood peaks and runoff volumes due to heavy rain. The modeling of the model can be conduct and it can be used as a virtual model associated to the real condition which can be used to investigate the changes to the depth of the rainfall and the rate of runoff in the study area. For this modelling, simulating process is carried out using the HEC-HMS method with the modified SCS-Curve Number as the loss model, Lag method as the flood routing approaches and Constant Monthly as the base flow method. The parameter of the study area is delineated using the Geographic Information Systems (GIS) which is important as an input for the simulation process. The Soil Conservation Service curve number method, SCS-CN is essentially an empirical, one-parameter CN event rainfall-runoff model. It is a dimensionless curve number which takes into account the effects of land use/cover, soil types, and hydrologic soil groups on surface runoff, and basically will relates the direct surface runoff to rainfall in the watershed. The SCS-CN method has been widely used for estimating rainfall-generated surface runoff in watershed hydrologic modeling (Chu and Steinman, 2009). An importance aspect of watershed modelling processes is the ability to determine and obtain various parameter inputs for the watershed. Information on precipitation, soil properties, and land use/cover is of critical importance to watershed modelers and managers (Daniel et al., 2010).

For this research, a rainfall event data that occurred in Kuantan was selected to be used in the simulation. The selected rainfall event was used to setup the hydrologic model for the Kuantan watershed. The accuracy of the result can be analysis by
comparing the simulated discharge to the actual discharge data from the stream flow station. Through this, I will be able to develop the rainfall-runoff relationship in Kuantan watershed. The relationship between rainfall and runoff is essential in a catchment for hydrologic analysis and design (Chang, 2009). The rainfall will change runoff in term of surface-runoff, interflow and base-flow after it subjected to losses due to evaporation, transpiration, interception and infiltration. The rainfall-runoff usually influenced by factors such terrain condition, geology condition, soil type, area, slope, and plant-types in the watershed.

Based on the developed model, the performance of the HEC-HMS model in the runoff prediction can also be assess by comparing the simulation data with the observe data. The model will performed well if the simulated result is almost fit to the observed data. Apart from that, Kuantan river basin is located in a tropical region which consists of wet and dry season throughout the year-round. Therefore, by using the develop model, the accuracy of the modified SCS-CN as the loss model on the runoff prediction on the tropical region can be evaluate based on the result obtained from the simulation.

1.1 PROBLEM STATEMENT

![Flood prone area](image)

**Figure 1.0:** Flood prone area in Peninsular Malaysia (DID, Malaysia)