CHAPTER 5. CONCLUSION AND RECOMMENDATION

5.1 CONCLUSION

This study aimed to assess the rainfall-runoff characteristic at Melantai River catchment using SWAT+. The major findings are summarized based on the objective. The three main objectives were established: (i) to characterize the land use and soil types of the watershed, (ii) to estimate the rainfall-runoff using SWAT+, and (iii) to analyze the impact of climate change on rainfall-runoff.

The analysis revealed that the characteristics of land use in the Melantai river basin are dominated by agriculture (53.90%), and the rest is filled by several types of urban. soil type in Melantai River is divided into two, namely Ferric Acrisols (clay) and Orthic Acrisols (Clay Loam). Ferric acrisols soil is the dominating soil type in the catchment area with a percentage of 75.92%. These factors result in reduced infiltration and become the reason for increased surface runoff.

In estimating the rainfall-runoff relationship using the QSWAT+ application, it is generally observed that the relationship between rainfall and runoff is linear. However, there are several occurrences that are theoretically less appropriate, where high rainfall is not always followed by high runoff. This mismatch commonly occurs in rainfall-runoff modeling using software, especially when validation data in the form of actual flow measurements taken directly in the field (e.g., river flow) is not available. Such validation data are crucial to align simulation results with real hydrological conditions. Nevertheless, the maximum discharge values obtained from modeling using SWAT+ show results that are relatively close to those obtained through manual processing using the SCS-CN method and Snyder method, which are 58,06 m^3/s, 57,09 m^3/s, and 52,50 m^3/s respectively.

The impact of climate change shows a significant decrease and increase in seasonal rainfall, however the output from SWAT+ indicates that peak runoff in the 2040-2060 period is smaller compared to the 2010-2021 period. However, the more frequent occurrence of rain in the future results in a higher value of runoff compared to the runoff values obtained from the observational data simulations. The increase in rainfall-runoff is clearly seen in the seasonal pattern, which rises in October, November, and December. The rainfall-runoff relationship in a seasonal pattern is more pronounced in the 2040-2060 period compared to the current period of 2021.

5.2 RECOMMENDATION

Based on the results of the analysis from the assessment of rainfall runoff using SWAT+, the following recommendations are provided for evaluation and future mitigation steps.

- Application of SWAT+.

  The application of SWAT+ is very complex and has high sensitivity, thus requiring accurate data in conducting research using the SWAT+ application. Calibration data in the form of observational discharge data is needed to validate the output results from SWAT+.

- Mitigation measure.

  The rivers in Kampung Bentong, Kluang often experience flooding. This can occur because this area has soil types and land use that result in a quick response to runoff. Therefore, the government can implement mitigation measures by creating detention ponds, applying and promoting rainwater harvesting systems, and better regulating land use in the future.