CHAPTER V. CONCLUSION AND RECOMMENDATION

5.1. CONCLUSION

After flood modeling simulations using HEC-RAS software, it can be concluded that the Melantai River is unable to accommodate the planned flood discharge for different return periods, namely 25-year, 50-year and 100-year. At some points, the Melantai River experiences runoff that exceeds the height of the river bank, indicating the potential for significant flooding in the surrounding area. The simulations showed that the larger the return period, the higher the water level elevation and peak discharge, with the maximum discharge reaching more than 98 m^3/s in the 100-year scenario. The flow hydrograph showed a rapid response to extreme rainfall, resulting in short peaks and slow declines in discharge, increasing the risk of prolonged inundation flooding.

Hydraulic simulation results using HEC-RAS software on the Melantai River with a total length of about 6,050 meters show that flood inundation only occurs in the upstream segment of the river, namely between STA 0 to STA 35 for each different return period. In the 25-year return period, the majority of floods occur with a depth of 0 to 1 meter, with a percentage of occurrence of 15, 70%. In the 50-year return period, the majority of floods occur with a depth of 1 to 2 meters, with a percentage of 10.74%. While in the 100-year return period the majority of floods occur with a depth of 2 to 3 meters, with a percentage of 25.62%.

Meanwhile, at STA 35 to the downstream segment, the simulation results showed no inundation. This indicates that the middle to lower reaches of the Melantai River have a more stable geometry, both in terms of depth and cross-sectional width, so the hydraulic capacity is sufficient to accommodate the planned flood discharge without causing runoff.

Flooding in Melantai River is caused by a combination of natural and anthropogenic factors, including high rainfall, low-lying topography, rapid land use change in the upstream area, and inadequate river drainage capacity. In addition, the narrowing of the river channel due to residential development and the accumulation of sediment and garbage in the river also worsen the flow conditions, accelerating runoff. The inundation visualization shows that low-lying areas adjacent to the riverbanks are in a high-risk zone and require priority treatment. Overall, the use of HEC-RAS in this study was able to provide a comprehensive picture of flow patterns and inundation distribution, but the level of accuracy is strongly influenced by the quality of input data, especially topographic data and estimated flood discharge.

5.2. RECOMMENDATION

This This research can be continued by improving several things as follows

- The simulation results using HEC-RAS have shown flood inundation areas along the Melantai River at various return periods (25, 50, and 100 years). However, to improve the accuracy of the model results, it is recommended to conduct field verification and validation of the inundation depth and boundaries of the affected areas to ensure that the simulation results reflect actual conditions.
- Simulation accuracy is highly dependent on river cross-section data and elevation data (DEM). It is recommended that future studies use GIS applications or high-resolution topographic data such as LiDAR and drone mapping to obtain a more accurate picture of river and land contours, so that simulation results can be more representative of actual conditions.
- In this study, limited historical river discharge data hampered the model calibration process, so the accuracy of the simulation results could not be fully tested. For future research, it is recommended that historical discharge data and river water level measurements be collected regularly as a basis for better model calibration and validation.