CHAPTER 5. CONCLUSION AND RECOMMENDATION

5.1. CONCLUSION

There are several key conclusions that can be drawn from the sediment transport simulation conducted using HEC-RAS in the Simpang Kiri River. The study demonstrated the effectiveness of HEC-RAS in modeling sediment transport, providing insights into erosion and deposition patterns, flow behavior, and sediment concentration distribution. The integration of topographic data, hydraulic parameters, and sediment characteristics enabled a realistic simulation of riverbed changes over time.

This study applied the HEC-RAS model to simulate sediment transport in the Simpang Kiri River, utilizing DEM data from USGS to define river geometry. The model successfully identified areas of erosion and deposition, offering insights into the river's sediment dynamics. Using publicly available DEM data proved efficient for initial model development, though the resolution did affect the accuracy of certain cross-sectional details. Despite this, the simulation demonstrated that HEC-RAS is a valuable tool for sediment transport analysis and can support future planning and management of river systems.

The major conclusions of this study are:

1. The flow velocity along the Simpang Kiri River is generally normal, with peak velocities observed at certain downstream sections, indicating localized zones of potential sediment transport activity. Shear stress is dentified as the key factor influencing sediment transport in the Simpang Kiri River, with high shear stress in the downstream area causing significant erosion, while lower values in the upstream area promoted sediment deposition.
2. Significant erosion occurred at several downstream cross sections from cross section 2 to cross section 23, but the highest erosion is at cross section 67 on 30 August 2010, where the bed was eroded to the bottom of the sediment control volume. While upstream areas showed more deposition, suggesting a natural sediment redistribution pattern. The highest deposition is observed around cross section 55.
3. The incoming sediment volume was 1,757 m^3/month, while the outgoing volume was 16,979 m^3/month, confirming a net erosion trend along the river reach. Sediment concentrations in Sg Simpang Kiri increase downstream due to local

inputs from erosion and runoff, with stable upper reaches and more active sediment transport in the lower river sections, emphasizing the need for targeted sediment management downstream.

Overall, the simulation confirms that sediment movement is influenced by both flow conditions and channel geometry, with the model reflecting these interactions effectively. However, the model also indicates areas where calibration and more precise data may be needed for improved accuracy in future studies.

5.2. RECOMMENDATION

The application of HEC-RAS in this study has proven to be an effective tool for simulating sediment transport processes in river systems. Its ability to integrate detailed hydraulic and sediment transport modeling with visual outputs enhances the understanding of morphological changes within the river channel. It is recommended that future research explore the use of higher-resolution terrain and sediment input data to improve the accuracy of simulation results. Additionally, incorporating more complex boundary conditions and validating with observed field data will further strengthen model reliability.

Beyond morphological assessment, HEC-RAS may also be used to evaluate the impacts of various river management strategies such as dredging, restoration, or channel modification. Long-term simulations could provide better insights into sediment accumulation trends and river evolution. Furthermore, expanding the application of this model to other rivers with similar hydrological characteristics could enhance its applicability across diverse environments.

It is also recommended to prioritize mitigation strategies in identified critical zones such as cross section 67, where persistent erosion and high hydraulic stress were observed. Protective measures like bed armoring, flow velocity regulation, or sediment trapping structures may help prevent further degradation in these areas. Finally, it is suggested that users maintain close attention to cross-sectional geometry and data quality, as these elements significantly influence model performance and output accurancy.