

## CHAPTER 5: CONCLUSIONS

Our numerical simulations provide a robust and detailed understanding of sediment transport dynamics at the Batang Arau Floodway Mouth and offer crucial insights into its sustainable management. The study rigorously evaluated multiple jetty configurations to identify an optimal solution for maintaining navigational channel depth.

The findings unequivocally demonstrate that Scenario 5, characterized by a short straight right jetty and a long left jetty angled  $66^\circ$  rightward, offers the most effective solution for minimizing sedimentation and preserving the navigational channel. This specific layout effectively modifies the wave and current patterns at the mouth, creating conditions conducive to reduced net sediment accumulation within the critical navigation path. Quantitatively, Scenario 5 consistently showed near-zero net sedimentation or erosion within the main channel and at the floodway mouth, ensuring the maintenance of the required cross-sectional area for safe vessel passage.

Furthermore, our analysis indicates that integrating targeted dredging with this optimized jetty layout significantly enhances its effectiveness. This combined approach promises to achieve and sustain the necessary navigable depths for larger fishing vessels, even during periods of high flood discharge. This synergy between structural intervention and periodic maintenance offers a more cost-efficient and environmentally sustainable long-term solution compared to dredging alone.

The benefits of these results extend significantly to the local community and coastal management. By ensuring consistent navigability, the optimized jetty design will directly support the livelihoods of coastal fishing communities, allowing larger vessels year-round access and fostering economic stability. From a broader perspective, these findings provide valuable, transferable insights for the design and implementation of similar coastal engineering solutions in other floodway mouths and estuarine

environments facing chronic sedimentation challenges across Indonesia and globally. This study contributes to developing more effective strategies for preserving crucial waterways, enhancing maritime access, and promoting the socio-economic well-being of coastal populations.

