

## **CHAPTER V**

### **CONCLUSION**

This chapter presents the conclusions drawn from the test results and analysis conducted in this study. In addition, recommendations for further development are provided, which are intended to serve as a guide for future research aimed at improving the performance of the method and refining the system that has been developed.

#### **5.1 . Conclusion**

Based on the results of the research and analysis conducted, the following conclusions can be drawn:

1. The BDCN-UNet model combined with OBIA demonstrates excellent performance in coastline extraction, yielding more stable and accurate results across various types of remote sensing data. The application of OBIA results in an average improvement of approximately 0.3–0.5% in the F1-score and IoU, as well as a reduction in RMSE of approximately 0.2–0.6 m. Although this improvement is relatively small numerically, it has a significant impact on the quality of segmentation results, particularly in improving previously disjointed coastlines to make them more continuous and smooth.
2. There are performance differences between SAR, optical, and multisensor data. The results show that multisensor (fusion) data delivers the best performance with an F1-score of 93.48%, an IoU of 96.35%, and an RMSE of 5.15 m. Meanwhile, Sentinel-1 (SAR) data produced high performance with an F1-score of 93.11%, an IoU of 88.12%, and an RMSE of 10.03 m, while Sentinel-2 (optical) data showed the lowest results with an F1-score of 86.41%, an IoU of 80.24%, and an RMSE of 12.53 m. The performance improvement in the multisensor data is quite significant, particularly in the IoU values and the reduction in RMSE, indicating that the integration of SAR and optical information can produce a more comprehensive, detailed, and accurate representation of coastal features compared to using a single type of data alone.

3. The results of the coastline extraction modeling were implemented into a web-based system using the Flask framework. This system is capable of automatically processing images, presenting visualizations of the extraction results, and providing download features in PNG and GeoJSON formats to support further analysis.

## **5.2 . Recommendations for Improvement**

Based on the results of this study, there are several recommendations for future development that can be considered to improve model performance and the quality of coastline extraction results, both in terms of data and the development of supporting features. The following are development recommendations from this study:

1. A wider variety of remote sensing data, such as high-resolution multispectral, hyperspectral, LiDAR, thermal infrared imagery, and UAV (drone) data, can be utilized to improve the completeness of information and the accuracy of extraction results.
2. The use of more advanced post-processing methods, such as CRF, morphological operations, or edge refinement, can be applied to smooth the boundaries of segmentation results and improve the consistency of coastline delineation.