CHAPTER 5 CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

Based on the results of spatial analysis of coastal line changes between 2013 and 2025 and tsunami hazard zonations mapping in Padang City, several important findings were obtained that describe shoreline dynamics and their implications for disaster risk.

1. The Padang City coastline experienced significant dynamics during the observation period, with abrasion trends in several areas, such as Koto Tangah and South Padang Districts, and accretion in North Padang, West Padang, Lubuk Begalung, and Bungus Teluk Kabung. The highest abrasion rate was recorded in Koto Tangah District at -1.754 meters per year, with an average shoreline retreat of -20.742 meters. Meanwhile, the highest accretion rate occurred in Bungus Teluk Kabung District, at +1.470 meters per year, with land accretion reaching +10.715 meters.
2. These shoreline changes are directly correlated with the level of hazard to tsunamis. Areas experiencing significant abrasion tend to experience a reduction in natural protective capacity, such as the loss of coastal vegetation and the narrowing of green belts, which spatially increases hazard to tsunami waves. Conversely, areas experiencing accretion actually form new low lying land zonations, expanding the potential inundation area if a tsunami occurs, particularly in the 0–500 meter zonation from the coastline, which will cover approximately 30.55 km² (4.40%) by 2025.
3. The overlay of four key spatial parameters slope gradient, elevation, distance from the river, and distance from the coastline results in a tsunami hazard classification divided into five classes: very low, low, medium, high, and very high. The 2025 zoning map shows that the western coastal area of Padang City, particularly the West Padang, South Padang, Teluk Bayur, and Bungus areas, is dominated by high to very high hazard zonations, as development pressure increases in the lowlands adjacent to the coastline.

4. It was found that 69.62% of Padang City lies at an elevation of <10 meters above sea level, making it highly vulnerable to tsunami inundation. Meanwhile, in terms of distance to rivers, approximately 7.57% of the city lies within a radius of <200 meters from rivers, which serve as potential routes for tsunami propagation inland.

5.2 Recommendations

This study has demonstrated the effective use of remote sensing and GIS in analyzing shoreline change and tsunami hazard zonations in Padang City. To enhance and expand upon these findings, several recommendations are proposed for future research and policy implementation:

1. This study utilized imagery from 2013 and 2025, incorporating high-resolution, multi-temporal satellite data at annual or shorter intervals could reveal more detailed coastal dynamics, including seasonal and short-term variations.
2. Future studies may benefit from the inclusion of marine bathymetry, earthquake source data, and socio-economic indicators such as population density and land use. This would support more comprehensive tsunami risk mapping both physically and socially.
3. Complementing the static spatial approach with dynamic numerical models (e.g., COMCOT, TUNAMI-N2, or Delft3D) can simulate inundation scenarios, estimate wave arrival times, and refine hazard assessments.
4. Subdistricts such as Koto Tangah, Padang Selatan, and Bungus Teluk Kabung identified as high to very high hazard zonations should be prioritized for enhanced mitigation infrastructure, including vertical shelters, evacuation routes, and community based early warning systems.
5. Spatial planning regulations should enforce development controls within 0–500 meters of the coastline (approx. 30.5 km² or 4.4% of city area). These zonations require careful zoning to prevent hazard of critical infrastructure and housing to tsunami hazards.