Executive Summary

Climate change has significantly increased disasters related to disease, heat, and water management, exacerbating the risk of complex disasters where these interact. Traditional studies focused on single disasters are insufficient to effectively address these multifaceted threats. Therefore, a more integrated, triangulated approach is needed. This study systematically examines community-level response strategies to complex disasters in Indonesian coastal cities that are directly affected by, and highly vulnerable to, climate change.

This study applied an integrated research methodology combining AI-based empirical research and participatory observational studies in local communities along the Jakarta-Semarang coastal belt. First, AI techniques were used to analyze disaster-related impact factors and identify hotspot areas prone to complex disasters. Then, to validate the AI-based findings while identifying specific complex disaster issues, Living Labs were conducted in collaboration with local experts, government agencies, and community stakeholders in Indonesia. The Living Lab process explored disaster response strategies, developed practical solutions, and tested them in real-world scenarios with the participation of local residents, government agencies, private companies, NGOs, and research organizations.

Based on the empirical research results and insights from the living labs, a disaster risk index was developed using AI techniques to predict the likelihood of disaster occurrence in coastal areas and support the prioritization of policy interventions. In addition, AI-driven simulations were conducted to assess the feasibility of policy applications, and a customized mitigation plan guideline was developed to reduce the impact of complex disasters. This approach enhances the effectiveness of complex disaster response strategies and proposes a sustainable coastal city model for climate change adaptation.

This study confirms that complex disasters are the result of interactions between different disaster factors, and that single-disaster solutions are insufficient for an effective response. To address this challenge, a scientific AI-based approach was used to identify high-risk disaster areas. A living lab framework based on local partnerships was used to diagnose specific problems and develop targeted solutions. By integrating AI-driven analysis and Living Lab methodologies, this study provides a comprehensive approach to analyzing structural vulnerabilities in coastal cities and the interrelationships of complex disaster-prone areas, providing both academic and practical contributions. In addition, by proposing a guideline for international development cooperation, this study contributes to strengthening the resilience of coastal urban communities in the face of climate change, while introducing a new paradigm for complex disaster response strategies.