

Tsunami Hazard Assessment for Coastal Areas of Thailand: Developing a Comprehensive Tsunami Hazard Map

Panon Latcharote^{1*}, Wilawan Robroo², Nattapon Trumikaborworn³, Natt Leelawat^{4,5,6}
 Pennung Warnitchai⁷

¹ Department of Civil and Environmental Engineering, Faculty of Engineering, Mahidol University, Nakorn Pathom, Thailand

² Independence Researcher, Bangkok, Thailand

³ Disaster Preparedness, Mitigation and Management, School of Engineering, Asian Institute of Technology, Pathum Thani, Thailand

⁴ Risk and Disaster Management Program, Graduate School, Chulalongkorn University, Bangkok, Thailand

⁵ Department of Industrial Engineering, Faculty of Engineering, Chulalongkorn University, Bangkok, Thailand

⁶ Disaster and Risk Management Information Systems Research Unit, Chulalongkorn University, Bangkok, Thailand

⁷ Department of Civil and Infrastructure Engineering, School of Engineering, Asian Institute of Technology, Pathum Thani, Thailand

*Corresponding author: panon.lat@mahidol.ac.th

1. INTRODUCTION

The 2004 tsunami on the Andaman coast underscored the critical importance of preparedness for such disasters, particularly in Phuket and Phang Nga. It emphasized the pressing need for improved tsunami hazard maps, essential for identifying risk-prone areas and establishing safe evacuation zones, thus mitigating damage in tourist-heavy areas in Thailand. This study seeks to create detailed maps to assist places in Thailand, including Phuket and Phang Nga, in tsunami preparedness.

2. METHODOLOGY

Tools like satellite imagery and Google Street View, coupled with walking surveys, were employed to accumulate extensive information about the areas and their structures. This information is fundamental in assessing which areas are vulnerable and in determining suitable enhancements to strengthen their safety. This evaluation utilizes international guidelines (ATC-64, FEMA-P646) and Thai guidelines to study structural safety.



Figure 1. View from Google Street View

3. RESULTS

The study identified structures that were not originally designed for tsunami evacuation sites but have inherent

characteristics for effective protection. In Patong Beach and Khao Lak, 88 and 24 potential evacuation buildings were identified, respectively, which were primarily hotels or resorts. The tsunami hazard maps for Patong Beach and Khao Lak include important components such as outlined tsunami inundation areas, designated evacuation sites, route information, warning towers, elevation data, and identification of potential future shelter buildings. Buildings are grouped by location to provide a comprehensive and user-friendly picture of these locations.

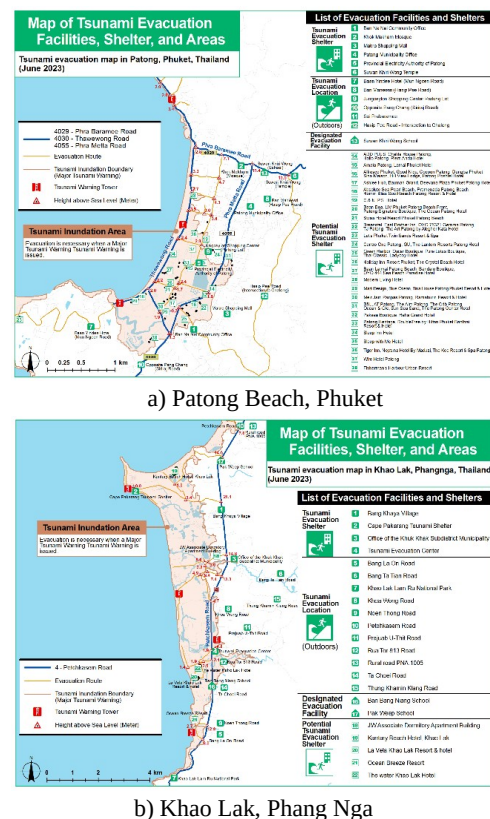


Figure 2. The comprehensive tsunami hazard map

4. CONCLUSIONS

Preliminary results indicate numerous buildings in high-risk zones are sufficiently elevated to serve as safe shelters during a tsunami. However, comprehensive evaluations are imperative to ascertain the structural integrity and safety of these buildings in such scenarios. These findings are helpful for improving tsunami safety in Thailand and have implications for strengthening safety in other areas. The insights and methodologies from this research can facilitate tsunami planning locally, serving as a valuable resource for mitigating the impact of future tsunamis. Moreover, beyond simply creating hazard maps, this study acts as a foundational work for a variety of related research fields and practical applications. It has facilitated the development of maps that are an essential part of tsunami evacuation drills, improving the realism and effectiveness of such preparedness exercises. Additionally, it has made significant contributions to the environmental modeling of agent-based tsunami evacuation simulations, allowing for a comprehensive understanding of diverse evacuation scenarios.

5. REFERENCE

- [1] K. Meechang, N. Leelawat, J. Tang, A. Kodaka, & C. Chintanapakdee, "The acceptance of using information technology for disaster risk management: A systematic review." *Engineering Journal*, 24 (4), 111-132. doi: 10.4186/ej.2020.24.4.111
- [2] N. Trumikaborworn, P. Latcharote, A. Suppasri, P. Warnitchai, "Tsunami Evacuation Simulation using Multi-Agent Simulation: a Case Study of Khao Lak, Thailand." *Proceedings of the 17th World Conference on Earthquake Engineering*, Sendai, Japan, Sep 27 – Oct 2.

6. AUTHOR BIOGRAPHIES



Panon Latcharote obtained D.Eng. in Infrastructure Systems Engineering from Kochi University of Technology, Japan. He is currently an assistant professor at Department of Civil and Environmental Engineering, Faculty of Engineering, Mahidol University. His research

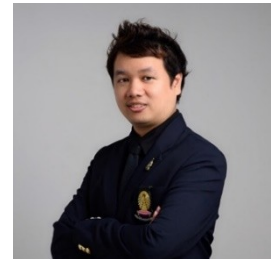
interests include physics-based computational and simulation engineering, nonlinear structural response analysis, multi-hazard risk assessment, statistical modeling and uncertainty quantification, and geographic Information System (GIS).

Wilawan Robroo graduated M.Sc. in Remote Sensing and Geographic Information Systems from AIT. Her thesis topic is greenhouse gas mapping using satellite remote sensing.



Nattapon Trumikaborworn currently works at the Disaster Preparedness, Mitigation and Management Program (DPMM), Asian Institute of Technology. Nattapon does research in An Agent-based Simulation of Tsunami Evacuation for disaster management.

Natt Leelawat is a Lecturer of the Department of Industrial Engineering, Faculty of Engineering, and the Risk and Disaster Management Program, Graduate School, Chulalongkorn University. He is a Head of Disaster and Risk Management Information Systems (DRMIS)



Research Group of Chulalongkorn University. He was an Assistant Professor at Tohoku University, Japan; Research Assistant at Tokyo Institute of Technology, Japan; and a System Analyst at the Bank of Thailand. He is an IEEE Senior.



Pennung Warnitchai has D. Eng. in Civil Engineering from University of Tokyo, Japan and is currently the Professor in Structural Engineering Field of Study, School of Engineering and Technology, Asian Institute of Technology (AIT), Thailand. Prof. Warnitchai is also actively involved with the

Disaster Preparedness, Mitigation, and Management Field of Study at AIT. Besides, Prof. Warnitchai association with AIT, he has been part of various significant elective and appointed offices both in Thailand as well as in the region. Some of Prof. Warnitchai current professional affiliations include: Scientific Board Member, The Global Earthquake Model; Member, National Earthquake Committee of Thailand; Chair, Chapter on the Effects of Earthquakes and Wind Loads, Engineering Institute of Thailand under H.M. the King's Patronage; Member, Civil Engineering Chapter, Engineering Institute of Thailand under H.M. the King's Patronage.