

## **TSUNAMI HAZARDS: ASSESSMENT OF EXPOSURE OF SRI LANKA – CASE STUDY IN POTUVIL, KALMUNAI AND NILAVELI**

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Tsunamis, caused by impulsive disturbances such as undersea earthquakes, volcanic eruptions, and landslides, pose significant risks to coastal regions worldwide. This research focuses on assessing the tsunami exposure levels of Sri Lanka, specifically from potential future events generated in the Sunda Trench, using numerical modelling techniques. The study highlights the importance of understanding the varying degrees of risk along the coastline to enhance disaster preparedness and mitigate impacts. The Indian Ocean Tsunami of December 26, 2004, demonstrated the devastating effects of such events, particularly in Sri Lanka, where extensive loss of life and property occurred. Subsequent tsunami alerts underscored the need for accurate risk assessments, as damage levels varied significantly across different coastal areas. Sri Lanka's geographical location, in proximity to earthquake-prone zones like the Sunda Trench and the Makran Fault, exposes it to far-field tsunamis, providing a crucial time window for early warnings and evacuations.

This research employs the Community Model Interface for Tsunami (ComMIT) to simulate various tsunami scenarios and analyse nearshore wave characteristics. The study focuses on Potuvil, Kalmunai, and Nilaveli, areas significantly impacted by the 2004 tsunami and characterized by high population density and growing tourism, increasing their vulnerability to coastal hazards. ComMIT, based on the Method of Splitting Tsunamis (MOST), is used for the numerical simulations, incorporating predefined earthquake sources and detailed bathymetric data. The simulations cover potential tsunami events from earthquakes of magnitudes 7.5 to 9.2 in four segments of the Sunda Trench. The results provide insights into the maximum wave amplitudes and arrival times at selected coastal locations.

The findings reveal that the coastal areas of Potuvil, Kalmunai, and Nilaveli are highly exposed to tsunamis generated in the Sunda Trench, especially from high-magnitude earthquakes. Nilaveli and Potuvil show severe exposure to events with magnitudes 9.0 and 9.2, while Kalmunai faces substantial exposure to magnitude 9.2 earthquakes. These results are critical for enhancing disaster preparedness and risk mitigation in Sri Lanka's coastal regions. By identifying areas with high exposure, authorities can prioritize the development and implementation of early warning systems, evacuation plans, and infrastructure improvements. This research contributes to the broader goal of increasing resilience to natural disasters through informed decision-making at both local and national levels.

Future research should continue to refine tsunami hazard assessments with updated data and advanced modelling techniques to ensure accurate predictions. Additionally, efforts to enhance public awareness and community preparedness are essential to foster a culture of resilience and proactive response to tsunami threats. Leveraging scientific research and collaborative efforts, Sri Lanka can effectively mitigate tsunami impacts, safeguarding lives, and livelihoods in its coastal communities.

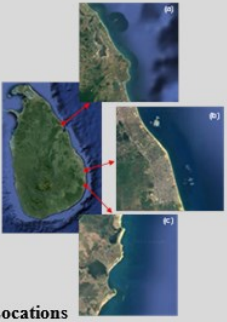
**Keywords:** ComMIT, Early warning, Numerical modelling, Tsunami height

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## TSUNAMI HAZARDS: ASSESSMENT OF EXPOSURE OF SRI LANKA – CASE STUDY IN POTUVIL, KALMUNAI AND NILAVELI

**Study Area**

Nilaveli  
Kalmunai  
Potuvil



**Details of the Locations**

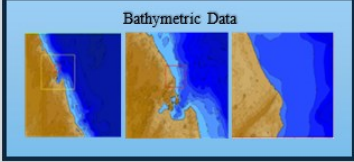
Location	Latitude	Longitude	Depth (m)
Potuvil	6.84764	81.94170	50
Kalmunai	7.41187	81.95249	50
Nilaveli	8.7112	81.24723	50

**Earthquake Magnitudes**

7.5	8.0	8.2	8.4
8.6	8.8	9.0	9.2

**Input Data for ComMIT**

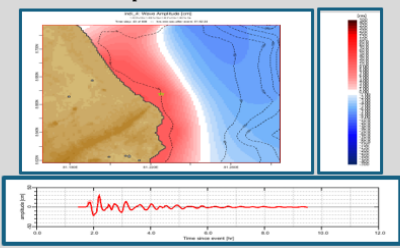
**Bathymetric Data**



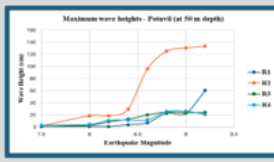
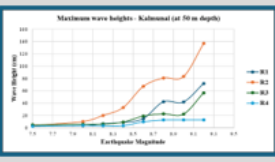
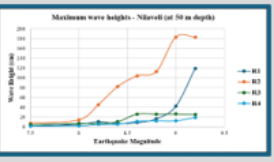
Fault parameter calculation  
Forming unit source combinations

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**Output Data from ComMIT**



**Maximum Wave Heights at 50 m Depths**

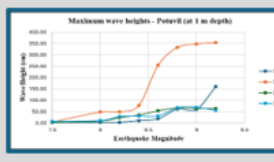

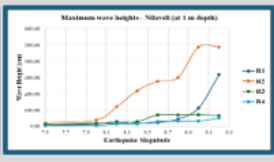




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**Wave Transformation**

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**Maximum Wave Heights at 1 m Depths**

**Exposure Assessment**

Maximum wave height at 1 m depth	Level of exposure	Potuvil				Kalmunai				Nilaveli				
		R1	R2	R3	R4	R1	R2	R3	R4	R1	R2	R3	R4	
0 – 0.5	Low(L)	7.5	L	L	L	L	L	L	L	L	L	L	L	L
		8.0	L	L	L	L	L	L	L	L	L	L	L	L
0.5 – 2	Medium(M)	8.2	L	L	L	L	M	L	L	L	M	L	L	L
		8.4	L	M	L	L	L	M	L	L	L	H	L	L
>2	High(H)	8.6	L	H	M	L	L	M	M	L	L	H	M	L
		8.8	M	H	M	M	M	H	M	L	L	H	M	L
		9.0	M	H	M	M	M	H	M	L	M	H	M	L
		9.2	M	H	M	M	M	H	M	L	H	H	M	M