



The role of natural signs of tsunamis in Tsunami Early Warning systems: lessons from Thailand and the literature

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People's knowledge of, and ability to recognize and respond to, natural warnings of tsunamis is important for three main reasons. First, the signs may provide the first alert near the source of tsunamis because a) a tsunami early warning system may not be activated in time, or b) communication links that relay the scientist-official or official-public alert may be interrupted by earthquake damage, leaving natural signs as the only alert. Second, natural signs may provide a mechanism for people to *personalize* and *confirm* official warning messages, significant factors in response to aftershock warnings. Prior to December 26, 2004, no systematic study had examined these issues. The Indian Ocean events offered an unprecedented opportunity to do so.

We collected over 6,000 pages of social data on Thai adult's experiences with the earthquake and tsunami events of December 2004 and March 2005, throughout all affected provinces. This study quantifies the conspicuousness of the natural signs and explores the normative, attitudinal, and cognitive influences on decision-making processes that affected interpretation of and behavioral response to them and other official and unofficial warnings.

Clear findings emerged from 663 interviews. The conspicuousness of the natural signs was variable. Some 24% of the sample population felt ground-shaking from the 2004 earthquake, yet all but 6% ignored it or linked it to anthropogenic causes. Over two-thirds (69%) reported they saw something unusual about the ocean, such as a tsunami

trough or unusual wave form and a majority (55%) heard something unusual, such as that when tsunami crests arrived onshore. However, the link to danger came too late. Most people saw tens to hundreds of people in and/or moving towards the danger zone when the first wave struck!

We conclude that natural warning signs were widely detected as something unusual, but, not surprisingly, not linked to tsunamis. The low levels of awareness of the tsunami hazard, danger, and understanding of appropriate response suggest that even had official warning and evacuation messages been issued, they would have been ineffective in motivating the desired response. Notwithstanding, the salience of natural signs means they can, in the future, be interpreted accurately and acted on by the public with proper education. They may also serve as a means to *personalize* and *confirm* messages from Tsunami Early Warning systems, making the latter more effective. Natural signs and mechanical systems both have limitations, but collectively they make a robust system.