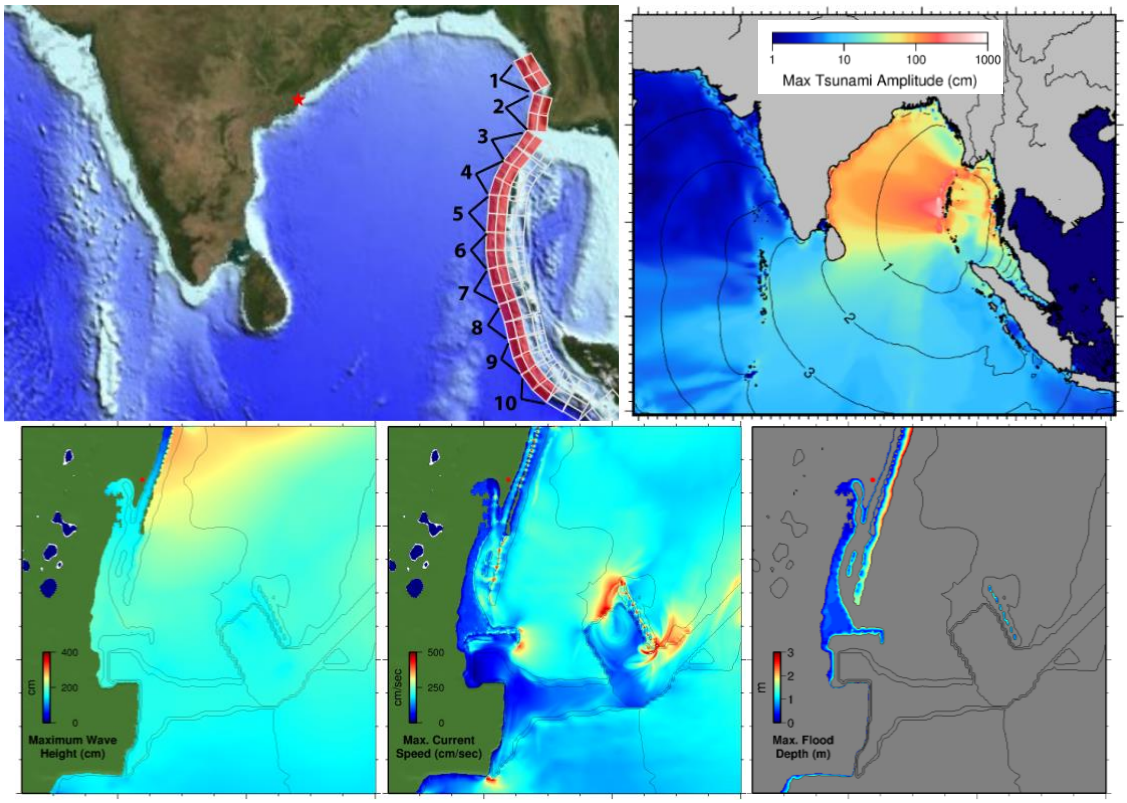
TSUNAMI HAZARD MODELLING FOR MARINE LNG FACILITIES

KAKINADA, INDIA



(top left) Fault segments along the Andaman-Sumatra Subduction Zone. **(top right)** Maximum tsunami amplitudes in the Indian Ocean from a 'worst case scenario' event. **(bottom left to right)** maximum tsunami height, current speed and overland flow depth from the worst case scenario event.

PROJECT INFORMATION:

Location: Kakinada, India

Client: Arup

Project Date: 2012

SCOPE OF WORK:

- Review of historical tsunami events
- Tsunami source characterization
- High resolution numerical modelling of tsunami inundation and currents
- Multi-scenario sensitivity testing

PROJECT DESCRIPTION:

We conducted a deterministic numerical modelling study of tsunami effects at a proposed liquefied natural gas (LNG) terminal at Kakinada, India. The study was comprised of a sensitivity analysis to analyse the response of the site to tsunami waves generated from different segments of the Sumatra-Andaman Subduction Zone and a deterministic study using five large-scale tectonic tsunami sources with magnitudes ranging from 8.9 to 9.3.

For the sensitivity study we simulated the effects of 10 tsunami sources positioned sequentially along the Sumatra-Andaman Subduction Zone. Each event was equivalent to a magnitude 8.3 earthquake with 5.6 m of slip evenly distributed over a fault area of 200 x 50 km. From this analysis we showed that sources located at approx. 12º N produced the strongest response at Kakinada. We then conducted a deterministic study using 5 tsunami source scenarios based on 'large' subduction zone thrust earthquakes. Two of the sources are based on historical events (2004 and 1833) while the other three are hypothetical scenarios of similar magnitude positioned at different locations along the subduction zone.

Using this approach, we show that peak to trough wave heights range from 2.2 to 3.2 meters in the berthing basin while tsunami induced current speeds range from 5.4 to 11.5 knots. Tsunami current speeds are heavily influenced by the port configuration with the strongest currents occurring at the edges of the dredged berthing basin, access channel and turning circle. The modelling also indicated the formation of large vortices inside the dredged basin which were shown to traverse directly across the proposed berthing locations. The modelling also suggests that the strongest currents occur at the edges of the breakwater situated at the seaward edge of the berthing basin.