Hurricane & Typhoon™

CoreLogic®

India Cyclone Model (Wind)

CoreLogic's tropical cyclone model for India is a fully probabilistic loss estimation tool that covers all 28 states and 7 union territories. It estimates damages caused by tropical cyclones and tropical depressions originating in the Bay of Bengal and the Arabian Sea.

Hazard Module

The wind hazard module calculates peak gust wind speeds for any location, using a probabilistic distribution for each event in the stochastic event set. The key components include:

- Footprint Methodology
- Event Set Generation
- Wind Field Model

Footprint Methodology

The model is based on the parametric cyclone model developed by Holland (1980), an extension of Schloemer's (1954) original formula. It calculates the pressure differential at any point within the cyclone based on its distance from the storm center, using atmospheric pressure at the system's periphery and center.

Event Set Optimization

The model's event set comprises 5,730 stochastic storms, ensuring robust and reliable results. The statistical values for individual cyclone parameters are derived from data provided by the Joint Typhoon Warning Center database, covering the period from 1945 to 2000. These events are generated using Monte Carlo sampling based on the following storm parameters:

Model Features

Footprint Methodology
- Holland Model

Stochastic Events
- 5,730

Hazard Resolution
- Grid (0.25 degrees)

Specialty Structure Types
- Auto
- Greenhouse
- Mobile Homes

Locator Accumulation Zones
- CRESTA Zone 1999 (19)
- CRESTA Zone 2007 (35)

- Storm Origin
- Central pressure
- Radius to maximum wind speeds
- Azimuth of the storm track
- Translational speed of system
- Landfill & deepening attenuations
- Number of time steps
- Number of storms

Windfield Model

Cyclone intensity is calculated by the difference between central and peripheral pressures, combined with the radius to maximum wind speeds. This is expressed through a regression function and gradient wind equations, producing wind speed characteristics at each grid point.

Maximum wind speeds are recorded at each time step and converted into 3-second gusts. These are adjusted for directional roughness specific to each hazard cell, then used with vulnerability functions to estimate potential damages.

Vulnerability Module

The vulnerability module calculates damage ratios for a given hazard intensity, which for the India Cyclone Model is peak gust wind speed.

Vulnerability functions consider:

- Structure Type
- Year Built
- Building Height
- Building Codes
- Construction Quality

Vulnerability coverages include:

- Building
- Contents
- Business Interruption (Time Element Vulnerability)

Vulnerability risk type include:

- Residential
- Commercial
- Industrial
- Municipal
- Agriculture

Damage and Loss Validation

India experiences an average of 5.4 cyclonic storms annually, with 2.5 classified as severe, according to the Indian Meteorological Department. The model focuses on assessing damage caused by severe winds from cyclones originating in the Bay of Bengal and the Arabian Sea.

The model was validated using data from sources such as the Centre for Research on the Epidemiology of Disasters (CRED), insurance carriers, and the Indian National Cyclone Risk Mitigation Project, covering events from 1916 to 2011, with most occurring after 1960. CoreLogic's market portfolio for India, which includes residential, commercial, industrial, and agricultural buildings, was also used for validation.

The loss exceedance curves align closely with historical data, particularly for return periods up to 16 years. The highest damage ratios are in states along the Bay of Bengal, such as Orissa, Andhra Pradesh, and Tamil Nadu, while western India experiences lower damage due to less frequent cyclone activity. Overall, the model offers a realistic representation of cyclone damage across India.

Why Consider CoreLogic?

The increasing frequency of catastrophic events is pushing the P&C insurance industry to reevaluate its risk management and loss adjustment strategies by enhancing its understanding of natural hazards. CoreLogic is committed to advancing this understanding and delivering critical decision-support data and solutions to the insurance industry.

Our team of Ph.D.-level scientists and engineers has developed a proprietary methodology that provides a more detailed, granular approach to risk management and reporting. CoreLogic's catastrophe risk management offers a comprehensive assessment, evaluating potential events and verifying impacts both before and after they occur.