India FloodRisk™

India's First Countrywide Flood Risk Model

Flood is the largest contributor to NatCat losses in India, yet it is the least modeled peril. RMSI is proud to launch India FloodRisk™, a countrywide flood risk model.

RMSI's India FloodRisk™ provides comprehensive flood risk assessment for the entire country covering 19,000+ pincodes. India FloodRisk™ is a probabilistic flood risk model for 51 major urban agglomerations with significant flood risk accumulation along with modeled flood risk scores for the rest of the country with medium and low risk accumulation. The model integrates a visual map interface that makes it easy to understand and apply analysis.

MODEL COMPONENTS
HAZARD MODULE

RMSI's India FloodRisk™ :

- Provides flood hazard maps for 8 return periods ranging from 2 to 500 years for 27 major urban agglomerations having highest exposure to floods in the country. Most of these agglomerations fall in Ganga, Yamuna, Godavari, Krishna, Pennar, Cauvery, Mahanadi, Narmada, Tapi, Mahi and Sabarmati basins

- Offers pan India flood risk scores for rest of the country. These risk scores associate flood severity ranking to all the 19000+ pincodes of India and are a good source to identify areas of potential flooding with no flood history such as Uttarakhand. The flood risk scores are a function of hydrological inputs in the form of rainfall, its distribution and physical characteristics such as topography, soil, land use etc.

- Utilizes state of art hazard modeling practices and hydraulic modeling software

- Uses standard Digital Elevation Models (DEM) including SRTM (Shuttle Radar Topography Mission), Cartosat and high resolution DEM's (ranging from 10-25 meters) developed by RMSI in priority areas

- Derives stochastic events for surface water and riverine flooding based on historical rainfall data for 109 years (Source: IMD) and river discharge data for about 50 years (Source:CWC)

- Has been calibrated against multiple historical flood events – Gujarat 2006, Mumbai 2005, Andhra Pradesh 2009 and Chennai 2015. For these events, RMSI collected ground information including high water marks, location of levees, dams, major bridges, other mitigation structures and flood extent information based on event specific satellite imagery.

PAN India Flood Risk Scores

Flood Index - Risk Score
- NEGLIGIBLE/NOT MODELED
- LOW
- MEDIUM
- HIGH
- EXTREME
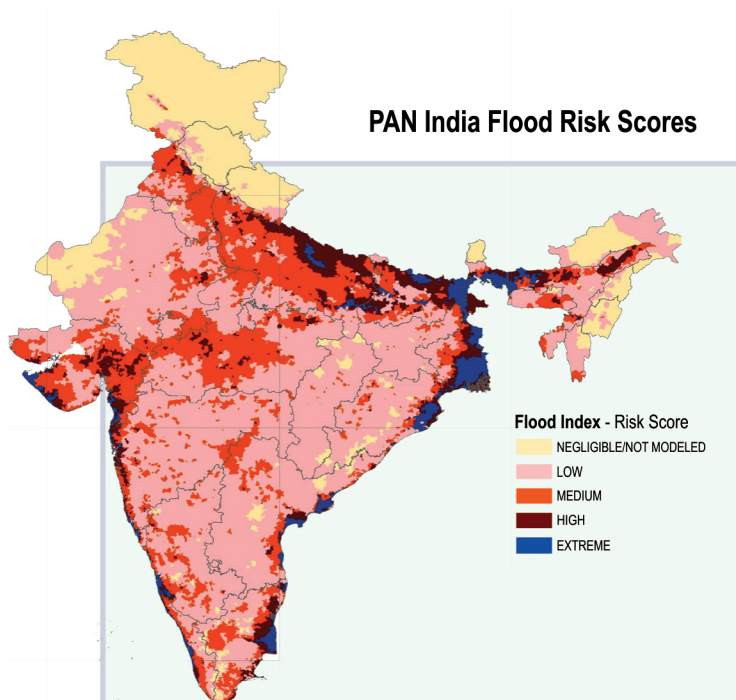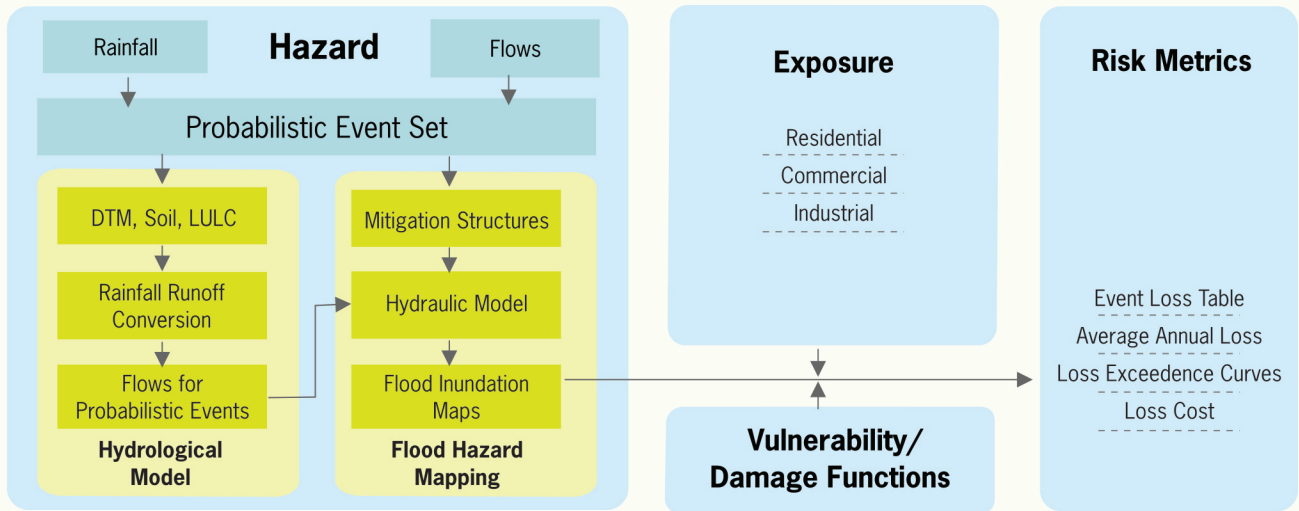
KEY FEATURES
COUNTRYWIDE COVERAGE

- Comprehensive countrywide flood risk assessment

- Pan India 19000+ pincodes covered
  - Probabilistic risk model for 51 high risk accumulation urban agglomerations of the country
  - Modeled flood risk scores for all other regions of the country

MOST ACCURATE UP-TO-DATE DATA

- Exposure data based on 2015 land use/land cover at five meter resolution
- Comprehensive river flow data spanning 50 years and historical rainfall data spanning 109 years
- High resolution Digital Elevation Models (DEM) ranging from (10 to 30m)
- Vulnerability functions / loss models developed specifically for India based on field studies for 2009 Andhra Pradesh, 2006 Surat and Vadodara, 2005 Mumbai, and 2015 Chennai flood events

India FloodRisk™ Model Framework

Hazard

Rainfall		Flows

Probabilistic Event Set

Hydrological Model
- DTM, Soil, LULC
- Rainfall Runoff Conversion
- Flows for Probabilistic Events

Flood Hazard Mapping
- Mitigation Structures
- Hydraulic Model
- Flood Inundation Maps

Exposure
- Residential
- Commercial
- Industrial

Vulnerability/ Damage Functions

Risk Metrics
- Event Loss Table
- Average Annual Loss
- Loss Exceedence Curves
- Loss Cost

EXPOSURE MODULE

RMSI used its proprietary land use land cover data (at 5m resolution) to extract building footprint information and demarcate extent of urban agglomerations. The data also includes various key industrial and commercial corridors. This information has been captured at pincode resolution for the country.

VULNERABILITY MODULE

An analytical approach complemented by engineering analyses, historical damage data and expert judgment has been applied for developing vulnerability functions. Historical damage data used includes recent flood events such as 2009 Andhra Pradesh, 2006 Surat and Vadodara, and 2005 Mumbai. The vulnerability functions have been developed for residential, commercial and industrial lines of business.

OUTPUTS

The model runs at a pincode resolution for 51 urban agglomerations, and generates the following outputs:

- Exposure distribution maps
- Flood hazard maps for key return periods
- Event loss table for 2 to 500 year return periods
- Average Annual Loss (AAL) and Loss Cost
- Loss EP curves

For rest of the country, the model provides:

- Flood risk score maps
- Exposure distribution maps
- Expected loss per year

51 major urban agglomerations covered under the probabilistic approach

Flood Index - Risk Score

- MODELED CITIES
- INDIA STATE BOUNDARY
- RIVERS
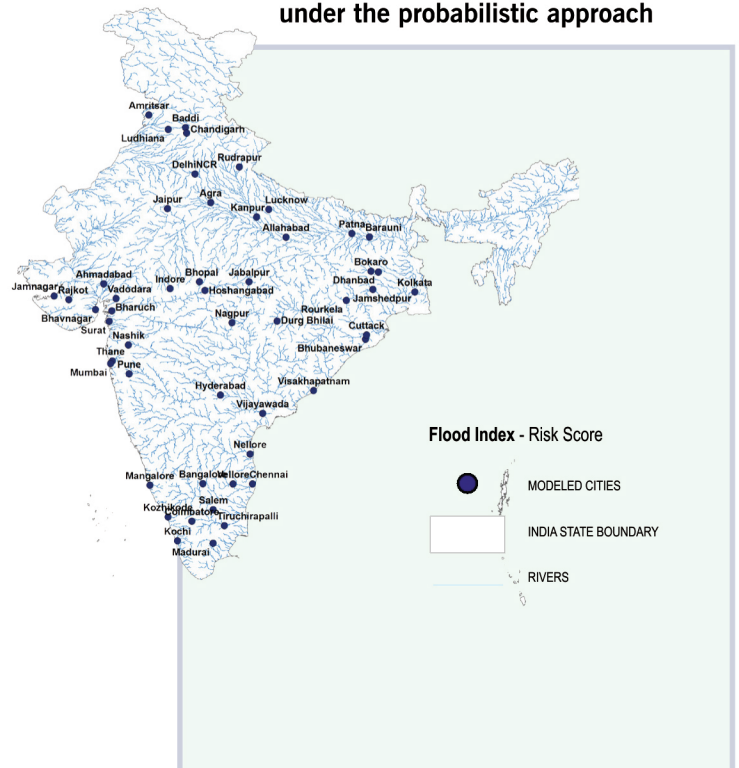
RMSI FLOOD MODELING SOLUTIONS

RMSI provides technical and consulting solutions to identify, assess and map flood risk spanning from an urban agglomeration to an entire river catchment area. At the core of RMSI's solutions, is the flood risk modeling framework that utilizes proven statistical/stochastic methods to simulate flood events, industry standard hydrological/hydraulic models to assess flood risk and geospatial enabled portal to publish the flood maps.

RMSI has developed flood models for major river basins in several countries of the world including Romania, Belgium, Morocco, Malawi, Mozambique, Yemen, Zambia, Lao PDR, Philippines and India. We have nearly two decades of extensive experience of working with multi lateral funding agencies, governments and private enterprises.

KEY PROJECTS

- Assessment of Impact of Climate Change on Urban Flood Exposure in Mumbai, India
- Flood Vulnerability Assessment for Four Major Urban Agglomerations of Gujarat State, India
- Probable Maximum Precipitation Atlas for Major River Basins, India
- Climate Risk Assessment for Select River Basins, India
- Integrated Storm Water Management System & Probabilistic Risk Assessment, Yemen
- Hydro-Meteorological Risk Assessments for Agricultural Sector, Philippines
- Natural Hazards Probabilistic Risk Analysis and National Strategy Development, Morocco
- Economic Vulnerability and Risk Assessment, Malawi and Mozambique
- Integrated Disaster Risk Management Study, Romania

ABOUT RMSI

RMSI was founded in 1992, with a mission to provide innovative technology enabled solutions that integrate business domain expertise with information, geospatial and remote sensing technologies. RMSI provides solutions for the following sectors: Risk & Insurance, Utilities, Telecom, Agriculture and Natural Resources and Land Management. RMSI is a CMMI level 5 assessed and ISO 27001 and 9001:2015 certified company.

RMSI

For further information, please contact **info@rmsi.com** or visit **www.rmsi.com**

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