Nat Cat Modelling

Images of destruction caused by the Uttarakhand Floods, Cyclone Hudhud or the Bhuj Earthquake are still livid in the minds of most of us. While loss of lives and property are always painful, the scale of destruction during a natural disaster hits us with a sense of despair at the helplessness of human beings. Advances in technology and development in economy could not prevent the Tsunami or the Katrina.

India is prone to natural disasters due to its climate and topography. As per the research done by Mishra (2014) during the past 100 years (1913-2013), 51.4 percent of the natural disasters in India were due to floods, 32.7 percent from storms, 7.4 percent from landslides, 5.6 percent from earthquakes and 2.9 percent from droughts.

The economic losses to the nation are huge; to give a perspective, in a report in 2003, World Bank estimated that the Economic losses to India due to natural disasters were around 2 percent of the Gross Domestic Product (GDP), per annum.

"Reported direct losses on public and private economic infrastructure in India have amounted to approximately $30 billion over the past 35 years [up to 2001] (nominal values at then applying exchange rates). Since less than 25% of the registered loss events actually provide any loss estimates, the official numbers substantially understate the true economic impact of direct losses. A crude grossing up for reporting frequency indicates that direct natural disasters losses equate to up to 2% of India's GDP and up to 12% of federal government revenues"...Pg 8, The World Bank Report (2003)

The stakes could be as high as 4.4% and 6.5% of the States GDP in states like Gujarat and Orissa. The report also noted that the official figures are generally lower than the actual losses and it also observed a rising trend in the losses over the years. It must also be noted that these figures do not include the cost of rehabilitation and restoration.

According to a report on "Natural Hazards, UnNatural Disasters" by the World Bank and the United Nations, the impact of natural disasters on the GDP is 20 times higher in developing countries than in industrialized nations.

The years 2013 and 2014 have seen catastrophes like the Uttarakhand Floods and the Cyclone Hudhud, which have resulted in large losses, both of lives and property (Table 1).

Event	No. Killed	No. Total Affected	~Economic Losses (in Rs crores)	~Insured Losses (in Rs crores)
Uttarakhand Floods	6054	504473	6600	3000*
Cyclone Phailin	47	13230000	3800	600*
Cyclone Hudhud	109	10000000*	65000*	4000*

Source: EM-DAT: The OFDA/CRED International Disaster Database
**Estimate based on news reports*

The irony is that the General Insurance penetration in India is very low, especially for personal property. The gap between people who need Insurance most and the penetration of Insurance amongst them is huge. The pace at which the economy of India is growing is indicative of a huge potential for increasing the insurance penetration.

The government of India is desirous to make Insurance as the primary mechanism for disaster risk financing in India (Ref. Disaster Relief and Risk Transfer through Insurance, IRDA-NDMA July 2013). A panel including NDMA, IRDA and general insurers in India is considering several options including:

- Setting up a pool for states, NDRF, etc.
- Parametric insurance solutions for NDRF
- Optional simple Indian Natural Catastrophe Insurance Policy
- Mandatory property insurance in highly disaster prone urban areas

However, there are several questions that need to be answered before such schemes could be launched. Some of these questions are:

- How much fund is needed for the pool
- Who would fund the pool
- Categories of population to be covered under the Indian Natural Catastrophe Insurance policy
- How to price the coverage of such policies
- What should be the triggers and how much payment should be associated to specific triggers for parametric insurance solutions, etc.

Natural Catastrophe modelling is the science that can help in finding the answers to several of these questions.

Probabilistic NatCat modelling can be used to arrive at the possible economic loss scenarios associated to various return periods, the impact of specific historical or latest hazard events, as well as the average annual direct economic loss by state or any other resolution at which the pool needs to be setup. Figure 1 shows the impact of cyclone Hudhud based on RMSI CycloneRIsk Model.

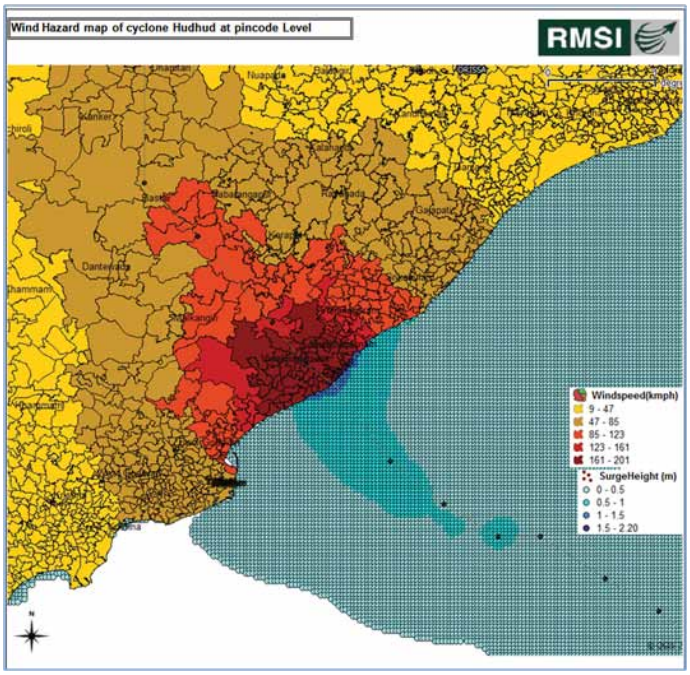

Figure 1: Cyclone Hudhud wind and surge estimates using RMSI's CycloneRIsk model.

Based on return period scenarios various categories of population that are under high risk zones could be estimated. Return period losses and average annual loss could be estimated for all these population categories thereby giving insights into the coverage pricing for various population categories. Based on the income levels and sample surveys eliciting willingness to pay for various population categories, an estimate of insurance affordability could be arrived at. This information could be combined with the NatCat modelled loss estimates to decide if the entire burden of the insurance could be passed to any specific population category or not.

Using probabilistic NatCat modelling, homogeneous risk zones could also be created , that associate hazard intensities to average losses within every homogeneous zone and provides a hazard risk score. Specific rates could be developed by risk zone for taking into account the NatCat risk in pricing of policies. Figure 2 shows the flood hazard risk score zones. This could serve as a basis for the definition of the triggers for specific areas along with payouts associated to the trigger. For every such homogeneous zone, an authentic source that provides the hazard intensity values at the time of the event will have to be setup to ensure success of parametric insurance. So, NatCat modelling not only helps to setup the triggers and associated payouts but also the number of trigger monitoring stations and areas where these should be setup.

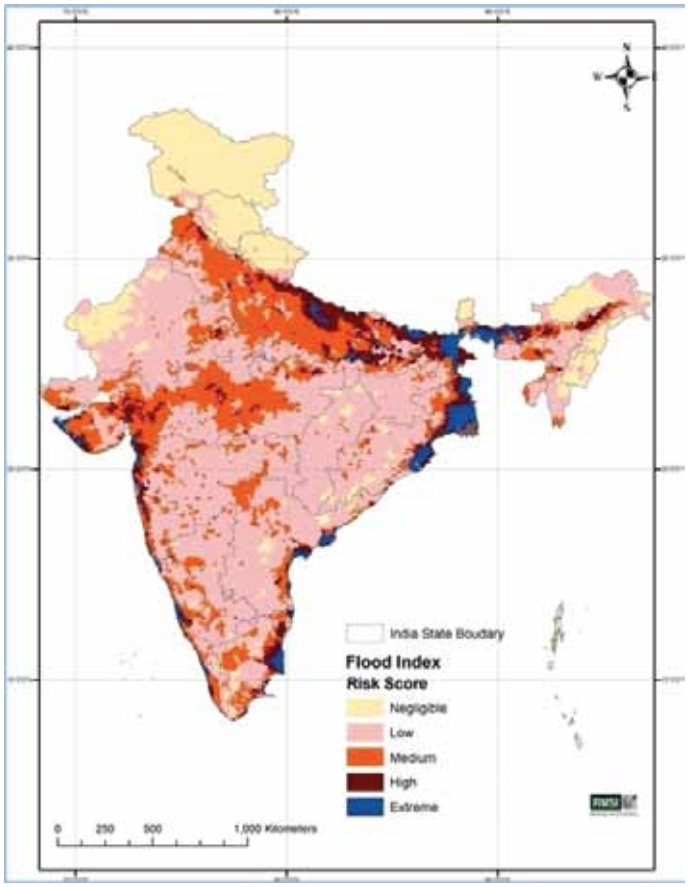

Figure 2: Flood Risk Score Map categorizing every pincode in India flood risk categories

The models could also be used to test out various insurance penetration scenarios and how various levels of penetration could impact the risk as well as pricing of the coverage.

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About IIB

Insurance Information Bureau (IIB) was established by the Insurance Regulatory & Development Authority of India (IRDA) as a single platform to meet the data needs of the Insurance industry, in 2009.

IIB fills the need for a sector–level data repository and analytics which would empower stakeholders through provision of accurate, timely, reliable insurance data and analysis. The Bureau is also mandated with the responsibility of throwing insights on issues of strategic importance by generating reports through deployment of advanced analytics.

IIB will provide information support on a complete, consistent, and concise manner, to all stakeholders associated either directly or indirectly with the Insurance sector, including insurers, regulator and government agencies.

The Bureau was formally registered as a Society with Registrar of Societies, Government of Andhra Pradesh, in November 2012. The society is governed by a Governing Council with 20 members consisting of experts from the insurance sector, technology and management experts and eminent academicians. The council also consists of ex-officio members from the Life and General Insurance Councils, and members of the Board of IRDA.