

Need for a Closer Look

- Natural Catastrophes in India

Anup Jindal emphasizes that if a realistic assessment of the catastrophe risks is to be made, one should also take into account the future projections; and not merely the past losses.

The industry needs to analyse the development patterns and adaptation measures especially those related to urbanization in order to better understand the vulnerability of future exposure to natural catastrophes.

India is facing a unique paradox. The unprecedented economic growth leading to rise in prosperity is also increasing the vulnerability to natural catastrophes. The recent earthquake and tsunami events in Japan have brutally reminded us of the devastating aftermath of natural catastrophes and the need for effective disaster risk reduction.

The insurance industry in India is expected to play an increasingly important role in disaster risk financing and reduction. It is therefore vital for the industry to better understand the historical trend and future projections related to natural catastrophes along with changes in exposure distribution and vulnerability in the future. The industry can also leverage its expert understanding of these issues to increase awareness and contribute towards development of effective adaptation measures.

It is important to understand both the historical trends and future projections related to the occurrence, severity and distribution of natural catastrophes in India. There has been a marked increase in occurrence of natural catastrophes since 1990 around the world including India.

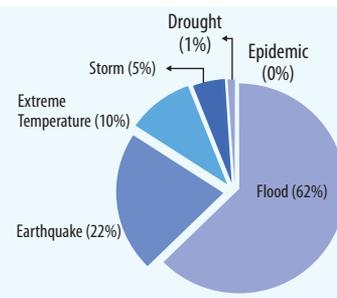
Scientists are already attributing increased risk of natural catastrophes to climate change.

The economic growth along with demographic and socio-economic changes will have a significant impact on the exposure in the future. However, just understanding exposure distribution is not good enough. The industry needs to analyse the development patterns and adaptation measures especially those related to urbanization in order to better understand the vulnerability of future exposure to natural catastrophes.

India is one of the most natural catastrophe prone countries in the world. In 2009, India was ranked at fourth place both for the number of natural catastrophes that afflicted the country and the quantum of economic losses suffered¹. India is exposed to a variety of natural catastrophes that afflict a large area of the country. Since 1900, the natural catastrophe afflicting India most frequently has been floods followed by storms, epidemics, extreme temperature, earthquake and drought. While drought, epidemics and windstorms have resulted in the most fatalities due to scale and

ECONOMIC DAMAGE FROM NATCAT EVENTS IN INDIA FROM 1900 - 2010

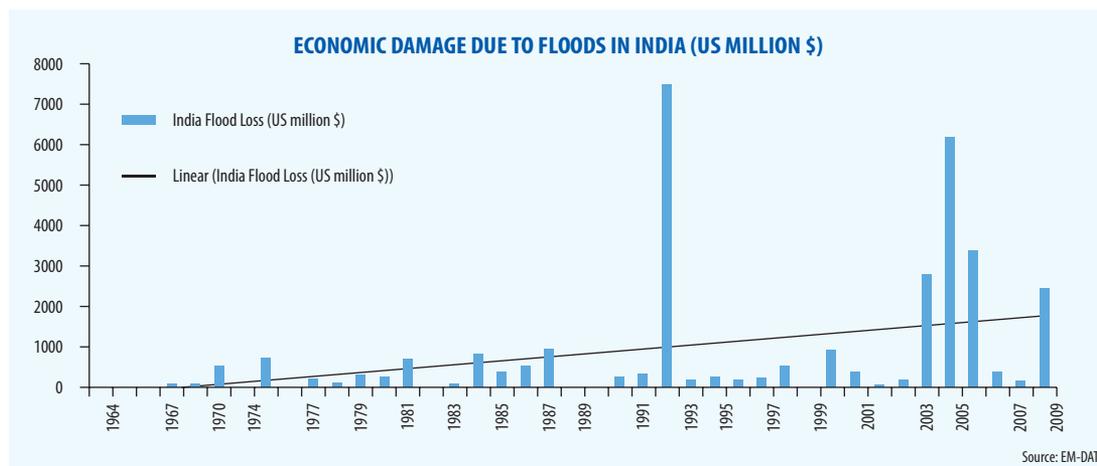
	No. of Events	Fatalities	Economic Damage (\$ B)
Flood	232	60,218	31.9
Storm	151	1,64,11	11.1
Earthquake	32	2378,3	5.1
Drought	14	87	2.4
Extreme Temperature	47	42,50,3	0.5
Epidemic	68	20	A.A.



ECONOMIC DAMAGE Source: EM-DAT

duration of such catastrophes, it is floods followed by storms and earthquake that have led to the most economic and insured losses. (Refer: Table 1 depicting economic damages from NatCat events in India from 1900-2010). Alarming, there has been a growing global trend in the frequency of natural catastrophes over the last decade and India has been no different. In fact some of the worst NatCat

events that include tsunami, Gujarat earthquake, urban floods in Mumbai, Gujarat and Kashmir earthquakes have occurred in the last decade. There is a growing trend in the economic losses suffered due to floods in India (Refer: Table 2) since 1900. More worrying has been an increase in the frequency of flood events that have severely affected urban areas in the last decade.

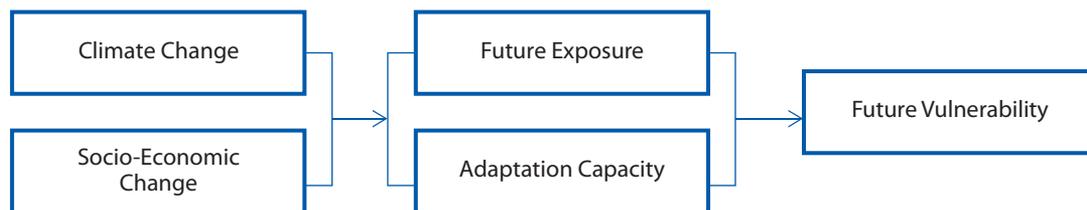


This historical trend in the occurrence of natural catastrophes becomes even more worrisome considering the impact of both weather variability and climate change. The variability of weather from year to year has a major impact both on the frequency and severity of hydrological and meteorological catastrophes in India. According to a study², India was ranked at 11th place amongst 62 countries studied for weather variability. In the same study the sensitivity of the Indian economy to weather variability was estimated to be about 31% of the GDP. Climate change is likely to increase weather variability in the future.

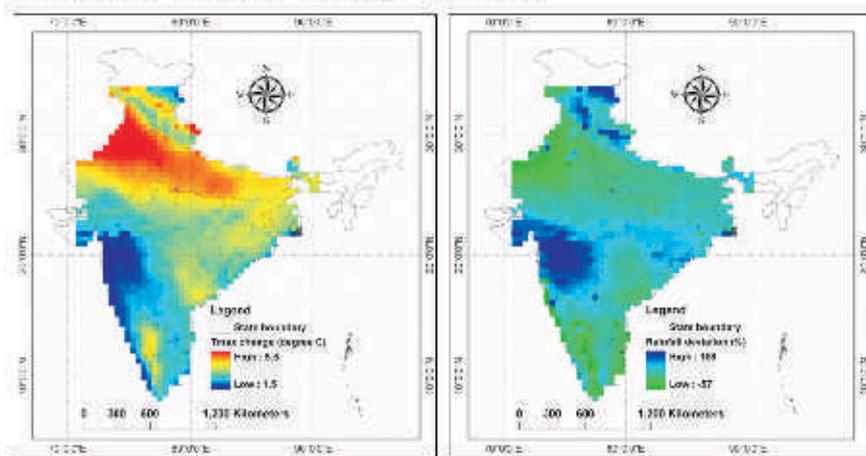
The impact of climate change is studied by combining the outputs of various climate models with various impact models in the area of hydrology, agriculture and so forth. The climate models predict that most of India would be hotter by 2° to 5° C by 2080. The rainfall distribution pattern is expected to change considerably with quite a few regions receiving less rainfall and other regions receiving increased rainfall in the form of high intensity short duration events. (Refer: Table 3)

depicting impact of climate change on temperature and rainfall in India). A study conducted by OECD to assess the risk of flooding in coastal cities due to climate change ranked Kolkata and Mumbai as the top two most vulnerable urban agglomerations in the world. It was estimated that the return period (or probability) of rainfall that resulted in Mumbai 2005 floods will increase from 1 in 200 years to 1 in 100 years by 2080 due to climate change³. Recently published studies⁴ in a leading scientific journal conclude that global warming is already causing extreme weather events that affect the lives of millions. The research directly links rising greenhouse-gas levels with the growing intensity of rain and snow in the northern hemisphere, and the increased risk of flooding. This is bad news for India as floods already cause the most economic losses in India. Climate change is likely to have a negative impact on the agriculture output and has important implications for agriculture insurance providers.

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Impact of Climate Change on India



Modeled change in max. temperature and rainfall in 2071-2100 compared to 1964-1990 time period

Source: UMSEI, 2008

It is important to note that India's large urban agglomerations and more developed states are already quite vulnerable to natural disasters and in the absence of adequate adaptation measures, the situation is likely to worsen.

While there are still uncertainties on the likely impact of climate change and it will take more research to conclusively establish a linkage between occurrence of extreme events and climate change, the socio-economic changes that India is undergoing and is expected to undergo are more certain. These changes are leading to increase in exposure at risk as well as increasing vulnerability.

India is set to become the most populous country in the world with more and more people living in urban areas. According to a study⁵, India's five large and highly developed states (Tamilnadu, Punjab, Gujarat, Maharashtra and Karnataka) will have more people living in urban areas than villages by 2030. The number of cities with population exceeding 1 million will increase to 68 from 42 today. The urban India will drive economic growth with 69% of the GDP forecasted to come from cities by 2030. The growing population coupled with the increase in per

capita income will significantly increase exposure to natural catastrophes. It is important to note that India's large urban agglomerations and more developed states are already quite vulnerable to natural disasters and in the absence of adequate adaptation measures, the situation is likely to worsen.

The demand for new residential and commercial space has led to large scale property development in almost all urban areas. However, the urban infrastructure that includes sewer and storm water network, storm surge protection and emergency response has not kept pace. This has led to increased vulnerability to natural catastrophes. It has been estimated that the economic loss from the 2005 Mumbai flood could have been drastically reduced if the government had revamped the storm water and sewer system in order to increase its capacity and efficacy. India's urban development marked by poor planning and inadequate enforcement has led

to uncontrolled development in highly vulnerable areas such as river beds, coastal zones and obstruction to urban drainage and evacuation routes.

Insurance companies will have to deal with a situation where a growing client base will be located in highly vulnerable areas that are at an increased risk to natural catastrophes due to climate change.

The industry will need to better understand the natural catastrophes affecting India and their impact by performing a scientific hazard

vulnerability risk assessment study. It is imperative to develop India specific climate models in order to better assess the impact of climate change and be able to do so at a high resolution required for urban areas. Development of such climate models is very complex and requires both financial support as well as access to wealth of data available with the insurance industry.

The industry should implement robust risk management practices that are based on scientific framework and enabling technologies. This will help in better exposure

Delhi – Case Study

Perils

In the past both floods and earthquakes have occurred in Delhi and its close surroundings.

Five earthquakes of magnitude 5.5 to 6.7 on Richter scale are known to have occurred in the UT of Delhi and nearby areas since 1720 AD. While a rigorous seismic hazard assessment for Delhi region is yet to be undertaken, various experts have indicated a very high probability of occurrence of a magnitude 6 event in the next few decades.

Delhi has experienced six major floods in the years 1924, 1947, 1976, 1978, 1988 and 1995. The most severe was the flood event in September 1978 when the river level was 2.66 m above the danger level. This led to large parts of northeast, east and northwest Delhi being completely submerged. In 2010, few weeks before the Commonwealth games, there was a flood scare with river Yamuna flowing 2 m above the danger level.

Urban Development Pattern

Delhi urban area has witnessed explosive growth over the years with its population expected to be around 22.5 Million by 2035. The eastern and north eastern parts of Delhi have grown the fastest and also have the highest population density. The entire city comprises of either high density high rise developments, high density unplanned settlements comprising of low rise planned settlements. Most of the structures do not comply with the latest earthquake resistant building guidelines.

Increasing Vulnerability

The entire city has pockets of high rise buildings and dense unplanned settlements with sub standard structures that in would be extremely vulnerable to damage by a moderate earthquake. All of the new developments in east Delhi and other parts along the Yamuna river bed section with up to 200m deep alluvial soil are even more vulnerable as they face the risk of soil liquefaction during an earthquake. The damage caused by a moderate earthquake could be devastating as was the case in Latur where a 6.4 magnitude earthquake led to more than 10,000 fatalities.

Delhi primary defence against floods are the embankments built along the river side. Large parts of East and North East Delhi, Noida have developments that are well below the danger mark level and at times 3 to 4 m below the highest flood level. The effect of failure of such embankments, as has been observed in the form of breaches during past floods, is devastating because the pressure of the entire embanked stretch is released at one point, and it takes the people by surprise.

“ Indian insurance industry must develop innovative solutions that leverage India's knowledge capital and use them to establish presence in similar emerging markets. ”

management, enforcement of guidelines, implementation of risk based pricing and modelling of losses.

Industry needs to engage with the government to develop innovative disaster risk financing mechanisms in order to provide protection to people who are most vulnerable to natural catastrophes.

It is important to develop an industry think tank that brings together experts from various domains to play an effective role in formulation and development of India's disaster risk reduction strategy. Proactive engagement with local governments is necessary to make them aware of risks and the important role of adaptation measures in reducing economic losses.

While natural catastrophes present a multi-dimension challenge, they also offer a unique opportunity. Indian insurance industry must develop innovative solutions that leverage India's knowledge capital and use them to establish presence in similar emerging markets.

¹EMDAT Database, www.emdat.be

²Weatherbill Inc. (2008), “Global weather sensitivity, a comparative study”

³Hallegatte, S et.al. (2010), “Flood Risks; climate change impacts and adaptation benefits in Mumbai.”, OECD Working Paper no. 27, OECD Publishing

⁴Pardeep Pall et.al. (2011), “Anthropogenic greenhouse gas contribution to flood risk in England and Wales in autumn 2000”, Nature 470, 382-385 (17 February 2011)

⁵McKinsey Global Institute (2010), “India's urban awakening – building inclusive cities, sustaining economic growth”

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