# Are our cities prepared for extreme precipitation dates?

From Mumbai to Houston, cities have caught up with heavy precipitation events in much fiercer ways than ever before. Urban infrastructures have been found grossly lacking to adapt to climate induced disasters such as heavy rainfall and the consequent floods

**Ranjan K Panda**
Convenor, Combat Climate Change Network, India

Climate change, no doubt, is at the centre of this but the way we are planning our cities too is to blame largely for the devastation. Is there a solution at sight? I don't think anyone has an answer to this right at the moment.

Technological advancement is certainly making us more aware about the kind of disasters we are facing and their probable impacts. Be it depression or hurricanes, our forecasting has increased even though accuracy of the predictions is still facing lot of questions. Similarly our preparation efforts have improved. That's the reason evacuation drives have become better and deaths have reduced. But there are some disturbing results that have come to be known and yet we are not prepared to face them the way we would want to.

On Monday, September 4th, Chris Milliner of the Jet Propulsion Laboratory tweeted with a satellite image that shows in a simple map that the whole Houston area had been pushed down roughly two centimetres by the weight of the water that fell during Hurricane Harvey. The Atlantic reported it, adding, "Why this would happen is simpler than you might think. A gallon of water weighs about 8.34 pounds. And by one estimate, Harvey dropped 33 trillion gallons of water across the area it hit. So that's roughly 275 trillion pounds". That can have a lot of devastating effects for which our city planners – howsoever economically and technologically advanced they may be – would not be prepared as yet.

After Katrina, that devastated the New Orleans in 2005, Harvey - in August 2017 - was the first hurricane

of Category 3 or above. Harvey that hit Houston and nearby cities between 24th and 31st August - was more dangerous in the sense it stayed put for almost a week and lashed a lot of rain and was unlike otherhurricanes. Weather scientists opine that tropical storms normally don't dump this much rain into one area. Clare Nullis, spokeswoman for the World Meteorological Organization, in a United Nations briefing in Geneva said that Tropical Storm Harvey was probably linked to climate change associated with global warming that increases the amount of moisture in the atmosphere. "Climate change means that when we do have an event like Harvey, the rainfall amounts are likely to be higher than they would have been otherwise," Clare further said. Rainfall across Houston and nearby cities went up to 50 inches or 1.2 meters. The previous all-time record for US was set in Texas back in 1899 and was estimated at 21.39 inches said Nielsen-Gammon as reported in news sites. He is a professor of atmospheric sciences at Texas A&M University and Texas State Climatologist.

## Mumbai paralysed

India's financial capital and the most happening city of India is not new to heavy rainfall. Being a low lying and saucer area on the Arabian Sea coasts, it's almost regularly flooded. But the floods of the city got global attention in July 2005 when it received 944 cm (more than 37 inches) just in a span of 24 hours. More than 500 people died (some estimates put it at more than thousand); the city got chocked and went out of gear for almost a week. The city was supposed to have learnt a lesson from the same. However, this August, when it received only about one third of what it had received in 2005, it chocked and life got paralysed.

On 29th August, between 8:30 am and 8:30 pm, the Santacruz observatory recorded 315.8 mm of rainfall between 8:30 am and 8:30 pm. Other parts of the city received somewhere less than that but still very heavy for a city which had already received more than average rainfall since June while the country's average monsoon rainfall was little short of normal. Commuters got stranded as all public transport including metro trains got halted, power was out in most parts of the city, a building collapsed killing about 21 people, a famous doctor of the city died by getting drained into a sewer manhole, and about 7 more people were dead. That's the extent of damage one can get from collating various newspaper reports. The real figures of devastation could be much worse.

## Cities in South Asia affected

Just a week before the Mumbai deluge, Chandigarh had received 112 mm of rainfall, that's almost 23 times of what it should have received on an average monsoon day. A week before that, Bengaluru had received 37 times more than an average day's rainfall on a single day. Agartala too had received heavy rainfall consecutively for three days in August second week, bringing the city to a complete halt.

In July last week, Ahmedabad city had similar fate and faced huge floods due to 200 mm of rainfall in just 24hours. It was reported that this year monsoon-induced floods have killed more than 1200 people across India, Bangladesh and Nepal. More than 40 million people have been affected in the region.

## Monsoon shrinks, extreme-rainfall increases

Studies find that the volume of monsoon rainfall – that provides 85 per cent of total rainfall in India – has declined in recent decades. However, the incidences of sudden torrential rainfalls have increased. A study by Stanford scientists, published in the Nature Climate Change journal, reveals that the intensity of extremely wet spells and the number of extremely dry spells during the South Asian monsoon season have both been increasing in recent decades. According to the researchers, short periods of very heavy rainfall can create humanitarian disasters, such as in 2005, when massive flooding killed thousands of people in Mumbai.

When the team analysed data gathered by the Indian Meteorological Department (IMD) and other sources over a 60-year period and used rigorous statistical methods to compare peak monsoon rainfall patterns during two time periods: from 1951 to 1980, and from 1981 to 2011. They looked specifically at rainfall during the months of July and August, which is the peak of the South Asian summer monsoon focussing on Central India and discovered that although the average total rainfall during the monsoon season has declined, the variability of rainfall during the peak monsoon months has increased. The researchers observed increases in the intensity of wet spells and in the frequency of dry spells, the Stanford School of Earth Sciences reported.

## Things are going to be worse

The Fifth Assessment Report of Intergovernmental Panel on Climate Change (IPCC) published in 2014 said that half to two-thirds of Asia's cities with one million or more inhabitants are exposed to one or multiple hazards, with floods and cyclones the most important. It further warned that by the 2070s Mumbai and Kolkata would be two of the most vulnerable cities at risk due to climate change in terms of population and assets exposed to coastal flooding. Both these cities will face annual loss of $6.4 billion and Kolkata $3.4 billion respectively by 2050 due to flooding even if they put in upgraded protection systems at place, says a World Bank study.

Houston in the USA is known for unabated construction. Mumbai too has been obsessed with concretisation. We have been destroying our wetlands, rivers, forests and flood plains that would give us ample cushioning to absorb extreme rainfall events. Ironically, even the most modern and latest concept of urban development i.e. Smart City, does not incorporate ecological planning. If we continue with business as usual, our cities will soon be forcefully recrafted by climate induced disasters. ■