As flood waters rise, is urban sprawl as much to blame as climate change?

Global warming may have intensified Hurricane Harvey and storms in Asia and Africa but the real problem may be our sprawling cities

Residential neighbourhoods near Interstate 10 are flooded in the wake of Hurricane Harvey. Photograph: Marcus Yam/LA Times via Getty

John Vidal

Sunday 3 September 2017 00.04 BST

First came the dire warnings of Hurricane Harvey, then the terrible scenes as the skies opened, whole neighbourhoods drowned and motorways became rivers. Now, as the waters subside and the full extent of the damage is assessed, come the voices of distraught people who have lost everything and the rallying of Americans to help in the recovery.

Houston may have broken the US rainfall records, but lost in the dramatic worldwide coverage of Texas has been the plight of tens of millions of people across Asia and Africa who are also counting the human cost of equally intense storms in which months of rain has fallen in just a

few hours.

One of the heaviest monsoons recorded in the past 30 years has swamped large parts of India and south-east Asia, affecting millions. Nepal, Bangladesh, Cambodia and Pakistan have all been hit and major cities such as Mumbai, Bangalore, Chennai, Karachi and Dhaka have been paralysed as roads turn to rivers and waters flood villages.

The scale of the flood disasters in the US and south Asia has shocked governments worldwide and left aid agencies struggling. Around 1,200 people are known to have died so far in Asia, more than 40 million people have been affected and millions of hectares of crops have been destroyed.

Since June, 21 countries - many in west and central Africa, such as Guinea, Ghana and the Democratic Republic of the Congo - have been struggling with exceptionally heavy rains, mudslides, hurricanes and floods, say aid agencies. Twenty people died in Lagos in a repeat of last year's unprecedented flooding in Nigeria. And three months of rain in a few hours killed 40 in Niamey, the capital of neighbouring Niger. A mudslide that killed as many as 1,000 people in Freetown, Sierra Leone in July was also triggered by torrential rain.

So what is to blame for these severe weather events and some of the worst flooding ever seen?

Climate scientists agree that extreme rainfall will increase as the world warms. Other researchers argue that poor urban infrastructure and the rapid, unchecked sprawl of cities on to marshlands and other places that usually absorb excess rainwater have led to flooding.

"We know climate change is influencing the capacity of the atmosphere to hold water but it is hard to attribute this to individual [flooding] events," says Paolo Ruti, head of the global weather research division of the UN's World Meteorological Organisation (WMO) in Geneva.

WMO is waiting for more data before making links between the various flood disasters and climate change, says Ruti, "[but] we are seeing worldwide evidence of temperature extremes. Heatwaves are happening more and more, and July 2017 looks like it will have been one of the warmest months ever recorded. Climate change is increasing temperatures and therefore the potential for heavier rain." He says that warmer seas evaporate more quickly and that warmer air holds more water vapour. So, as temperatures rise around the world, the skies store more moisture and dump it more intensely. "The frequency of hurricanes and tropical storms is not changing, but we must get more and more used to these events."

Writing in the *Guardian*, Michael E Mann, professor of atmospheric science at Pennsylvania State University, says: "We cannot say climate change 'caused' Hurricane Harvey but we can say that it exacerbated several characteristics of the storm in a way that greatly increased the risk of damage and loss of life. Climate change worsened the impact of Hurricane Harvey."

But others argue that urban development is as much to blame for the floods as climate change. "Houston, Bangalore and many other cities share the same problem," says T V Ramachandra, coordinator of the energy and wetlands research group at the Indian Institute of Science. "These floods are mostly manmade. They are not natural disasters. They are very similar and largely because of concretisation."

In the rush to economic development in India, China and elsewhere, ecological sense has been

ditched in favour of explosive growth across the world, he says.

Cities have expanded into marshes, wetlands and flood-prone areas as populations have grown and people have moved from rural to urban areas in search of work. The result has been that the scale, intensity and duration of floods has increased.

Heavy rain and flooded streets bring Mumbai to a virtual standstill. Photograph: Anadolu Agency/Getty

Mumbai, which this week experienced its biggest floods since 2005 when it received 94cm (37in) of rain in 18 hours, is just the latest Indian flooding disaster. In 2015, Chennai received 34cm of rain in a single day; in 2014, Srinagar was flooded; and in 2013 it was Kolkata. "Banglalore is typical. It has tripled in size since 1995, the temperature in the city has risen by 2C to 2.5C and since 2000 it has flooded regularly. It is experiencing unprecedented, unrealistic and irresponsible urbanisation and sprawl. Most of the vegetation has been lost, 75% of the city surface is impervious to water and the 2,500 lakes which used to store water have been drained for development," says Ramachandra.

Sam Brody, a Texas A&M University marine researcher who specialises in natural hazards, believes the addition of more than 1 million people moving to flood-prone areas near Houston since 2000 has overwhelmed the city's ability to drain water.

The Texas coastal climate is changing, the sea level is rising and there are more heavy downpours, says Brody, but the key factor in the flooding is development in unsuitable areas.

"If you are going to put 4 million people in this flood-vulnerable area in a way which involves ubiquitous application of impervious surfaces, you're going to get flooding. The driving force is the built environment," he says.

According to a ProPublica/*Texas Tribune* investigation last year, Houston's flooding was predictable. "As millions have flocked to the metropolitan area in recent decades, local officials have largely snubbed stricter building regulations, allowing developers to pave over crucial acres of prairie land that once absorbed huge amounts of rainwater. That has led to an excess of floodwater during storms that chokes the city's vast bayou network, drainage systems, and two huge federally owned reservoirs, endangering many nearby homes," said the report.

Urban researchers are predicting that many of the world's largest cities can expect to be flooded as climate change and rapid urban expansion combine. "Most cities are at increasing risk from the effects of climate change, including increasing heatwaves and, for coastal cities, rising sea

levels and storm surges. In many locations, climate change is also likely to be increasing the intensity of extreme rainfall," says David Satterthwaite, a researcher at the International Institute for Environment and Development in London.

The floods will mostly affect the poor, he says: "When storms or floods hit cities, it is generally low-income groups that are hit hardest. Many informal settlements develop on land at high risk of flooding or landslides because their inhabitants cannot afford safer sites."

People rest at the George Brown Convention Centre which has been opened as a shelter in Houston, Texas, after Hurricane Harvey. Photograph: Xinhua/Barcroft Images

City governments have been unable to keep up with urbanisation, he says, and as a result there is a vast and often growing backlog in the basic infrastructure a city needs to stop extreme weather causing disasters.

"It's now estimated that about one in four residents living in cities in the global south are in informal settlements. Most are often on peripheral, vulnerable land, including flood-prone areas," says Colin McFarlane, a Durham University urban geographer who has studied flooding in Mumbai. "Given that informal settlements globally are often stigmatised and denied basic provisions, emergency responses and support are also often weak."

Flooding is already one of the world's greatest causes of illness and death. According to the Dartmouth Flood Observatory, between 1985 and 2014 floods worldwide killed more than 500,000 people, displaced over 650 million people and caused damage in excess of $800bn. Between 2003 and 2008 large-scale floods that displaced at least 100,000 people occurred in more than 1,800 cities in 40 countries.

Saleemul Huq, director of the International Centre for Climate Change and Development in Dhaka, Bangladesh, says flooding will worsen. "This is what we can see happening already, with rainfall patterns becoming more erratic and unpredictable. The scientific consensus seems to be that while the overall precipitation across the entire year is not likely to go either up or down significantly due to climate change, the pattern of rainfall will change significantly with greater precipitation in the monsoon season and less in the dry season. Paradoxically, this will probably lead to more flooding in the wet season and more droughts in the dry season, even if the overall amount of rainfall across the year does not change very much.

"The bottom line seems to be that we have already entered the Anthropocene era, in which human activities have cumulatively resulted in changing global weather patterns as well as

other global phenomenon such as forest fires and sea level rises."

Since you're here ...

... we have a small favour to ask. More people are reading the Guardian than ever but advertising revenues across the media are falling fast. And unlike many news organisations, we haven't put up a paywall - we want to keep our journalism as open as we can. So you can see why we need to ask for your help. The Guardian's independent, investigative journalism takes a lot of time, money and hard work to produce. But we do it because we believe our perspective matters - because it might well be your perspective, too.

I appreciate there not being a paywall: it is more democratic for the media to be available for all and not a commodity to be purchased by a few. I'm happy to make a contribution so others with less means still have access to information. *Thomasine F-R.*
If everyone who reads our reporting, who likes it, helps to support it, our future would be much more secure.

Become a supporter
Make a contribution
Topics

- Natural disasters and extreme weather
- The Observer
- Hurricane Harvey
- Flooding
- features