Decoding the Monsoon Floods

in Bangladesh, India, Myanmar and Nepal

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Cover Image: Cyclone Ockhi approaching the west coast of India in 2017

GIS Analysis: Shubham Mishra

Images: © SEEDS/ Avani Rai, Sarika Gulati, Siddharth Behl and Sharbendu De

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Notes on data:

- The analysis and data products in this report are based on information from the following sources:
  — EM-DAT: The Emergency Events Database - Université catholique de Louvain (UCL) - CRED, D. Guha-Sapir - www.emdat.be, Brussels, Belgium.
  — Census data of India, Nepal, Myanmar and Bangladesh
  — Global Adminstraive Unit Layers for Bangladesh, Myanmar and Nepal
  — GADM database of global administrative areas for India. Maps are based on 642 districts and their spatial distribution as per Census of India 2011 data.
- The maps in this report are for analysis purposes only. They are not intended to be used for description or authoritative definition of legal boundary.
- All attempts have been made to verify the data. However, the lack of standardised primary collection methods and terminology account for variations in data on specific disasters.
- In disasters where there is a large percentage of missing people, total deaths tolls include both deaths and missing.
- Disaster data for 2017 is provisional, and is in the process of being consolidated further.

Preface

Floods are amongst the most damaging and recurrent of all disasters.

Data reveals that floods are at the top of the list of disasters that should worry us, defying our perceptions about most dangerous disasters that are often based around the more media savvy earthquakes. Additionally, floods are morphing into new and even more devastating forms in recent years.

The ongoing 'Safer Communities Innovation Lab', under which this report has been developed looks at supporting community-led innovations on disasters. The lab is based out of Bangladesh, but looks at the sub-region of India, Myanmar and Nepal. This raised the need for us to look at what forms of deeper risks plague the communities against which these innovations will be identified.

A data based analysis of the context has led to this report, identifying floods as a major area of concern and highlighting a number of nuances within this larger risk.

With almost the entire region having experienced at least one flood in the new millennium, more than half the region prone to recurrent flooding, and even known desert regions experiencing a flood event almost every year in recent years, the emerging trend underscores the urgent need to focus on community resilience to floods. This is where a significant share of our efforts will need to focus in the coming times.

The study also gives us a spin-off benefit in terms of insights on how to anticipate and prepare for the 2018 monsoon and cyclone seasons.

We hope that this data will make a small contribution towards better decisions on disaster preparedness, at the levels of both policy and community innovations.

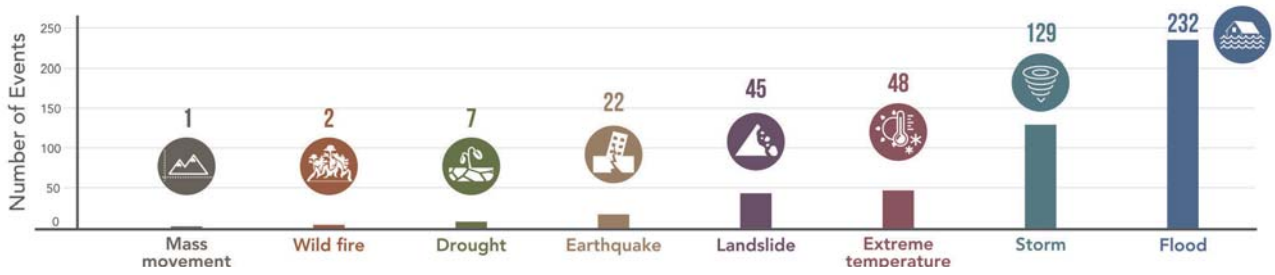
Floods make up the highest number of disaster events in 2000-2017 across Bangladesh, India, Myanmar and Nepal

"I watched the river break down the walls of my home, before it washed away my family's agricultural plot. I was left with nothing. Our children fell ill with stomach problems and loose motions and it was even tougher to control the spread of disease with the monsoon season."

– Rajeshi, Uttarkhand, India

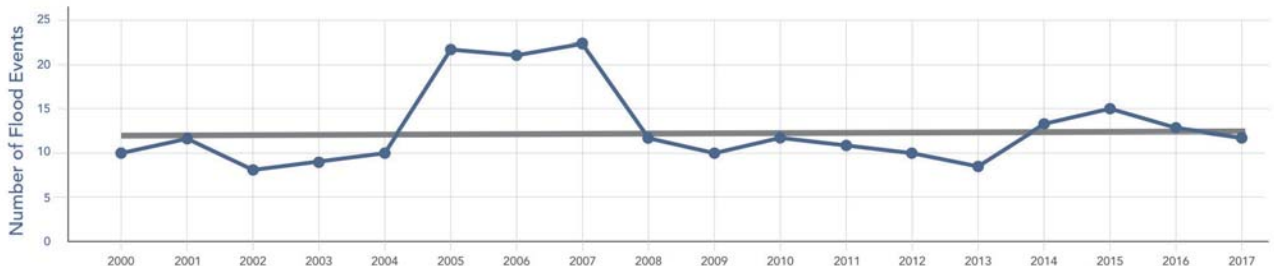
In June 2013, a cloudburst and torrential rainfall led to massive flooding in Uttarakhand, India. Rains continued unabated, leading to secondary disasters of landslides and continued flooding.

Number of events across the 4 countries: 2000-2017



The attention of the humanitarian sector is often focused on bigger shocks such as earthquakes, but floods by far constitute the maximum number of disasters that the region has faced between 2000-2017.

Number of flood events: 2000-2017



The spikes in floods events in 2005, 2006 and 2007 are partly due to events that were unprecedented at the time. In India, this includes Jammu and Kashmir, the Barmer floods in Rajasthan and urban floods in Mumbai.

Flooding is a complex event with multiple impacts

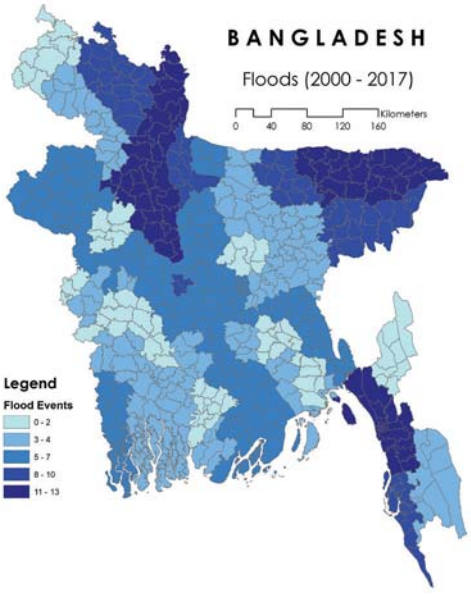
"There was a boat with two people in it. We saw it start to sink slowly. During Aila, we had nothing, we were left with nothing. Our people are very vulnerable. If another big storm comes, we will lose everything again."

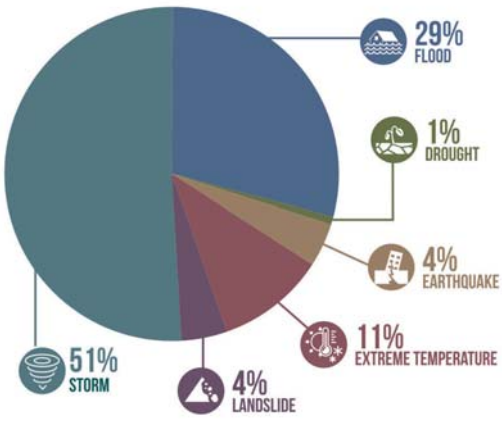
- Polo Dasi, Shyamnagar, Bangladesh

When Cyclone Aila hit on May 25, 2009, it made headlines for windspeeds. The devastating impact in Bangladesh and parts of West Bengal in India, however, came from flooding. It spurred a storm surge that destroyed most of the poorly built embankments and caused saline water intrusion in vast tracts of agricultural land. This devastated the income base of the poor and the agro-economy of the affected areas. Saline-affected lands became a salt-water desert and the local ecosystem came under severe threat.

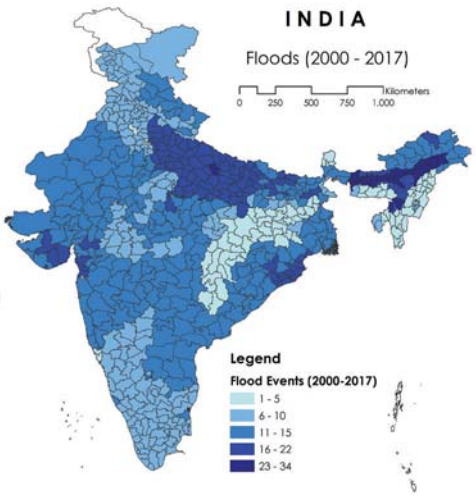
In this region, storms (cyclones) are feared more due to water than to wind. Drowning constitutes the majority of the deaths. Between 51% to 93% of all the disaster events in the four countries across 2000-2017 have been due to flooding or storms. At the same time, a large part of the landslide events in Nepal are a secondary disaster from flooding. Hazard classification may place them separately, but the commonalities need to be understood to address their impact on the ground!

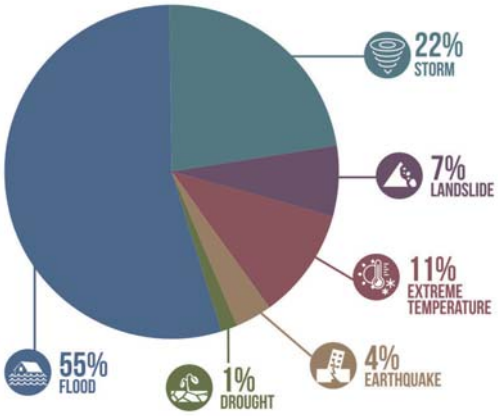
Bangladesh



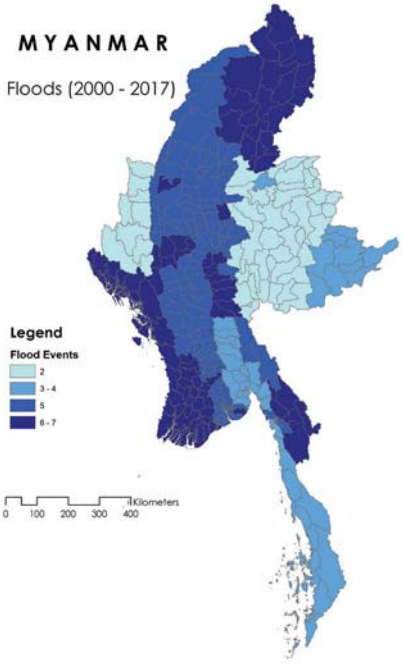


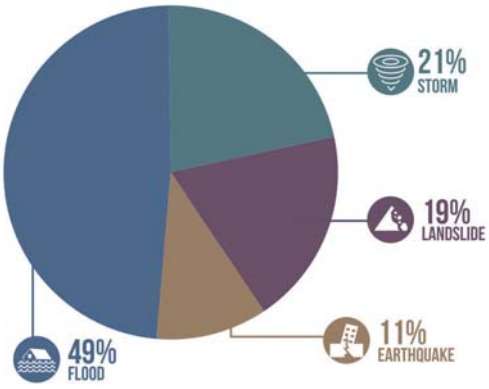
India



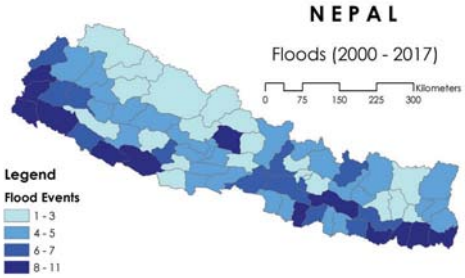


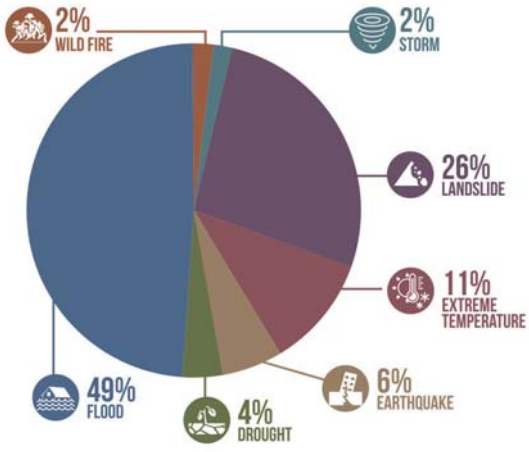
Myanmar





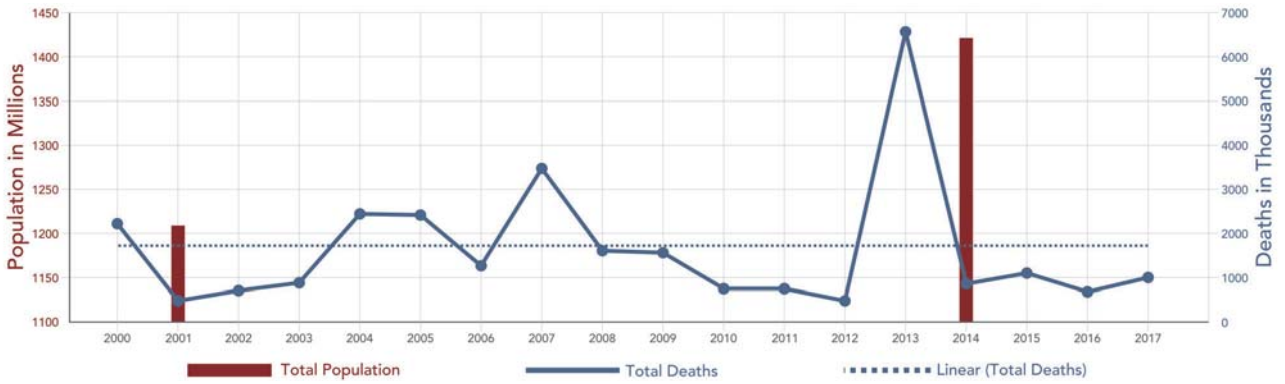
Nepal





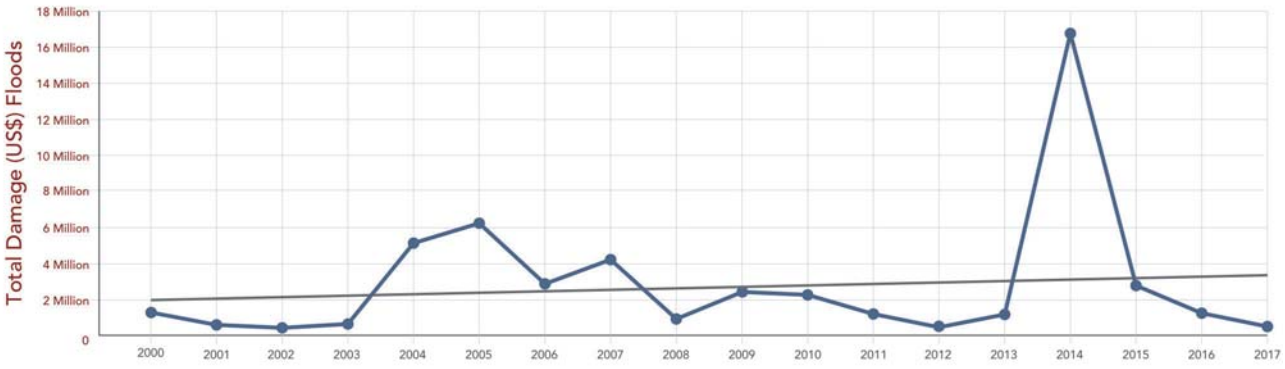
Flood deaths are decreasing but what about economic losses?

Total deaths in floods across the 4 countries: 2000-2017



Linear trends show a stable line of total deaths aggregated across the four countries. Yet, when factoring in the rising population this means that the number of deaths as a percentage of total population has actually decreased. The total deaths have decreased from 138 persons per million in 2001 to 117 persons per million in 2014.

Total damage in floods across the 4 countries: 2000-2017



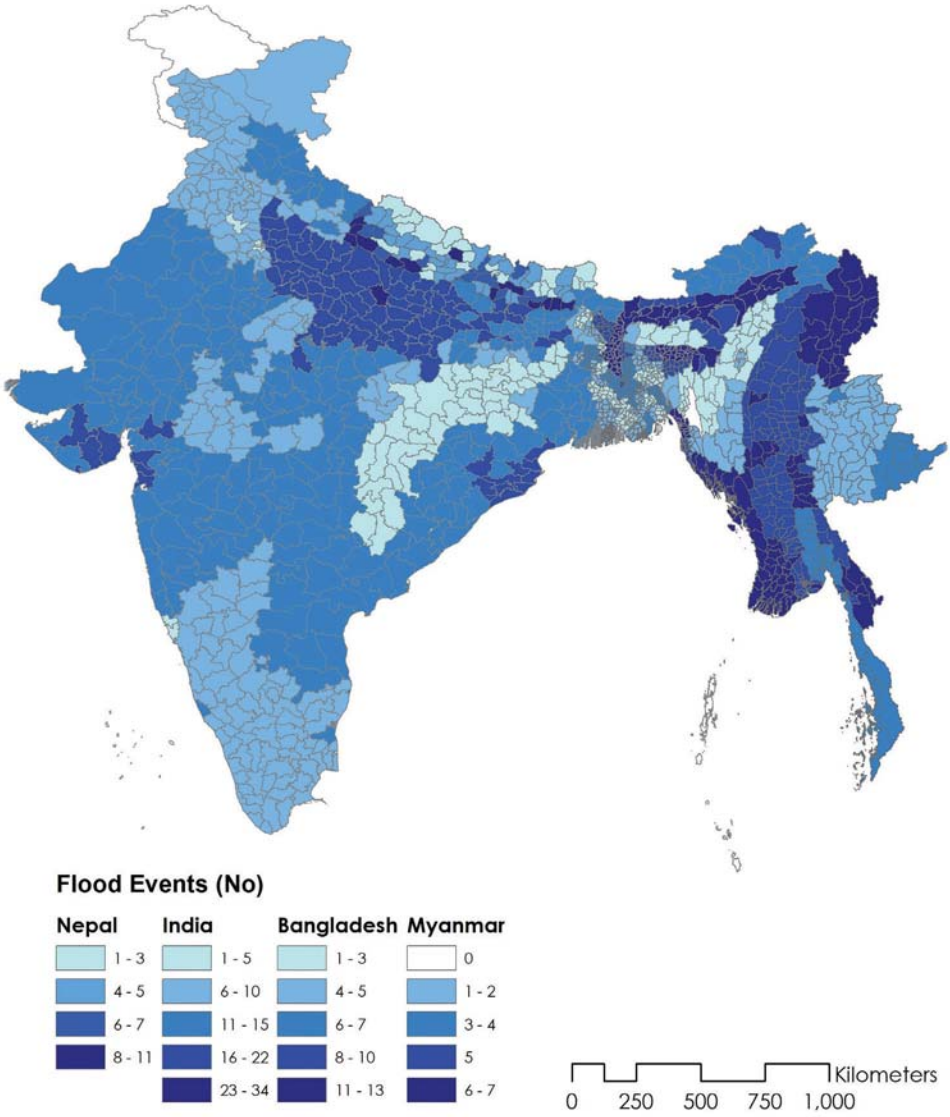
Economic losses however tell a different story. In a region where insurance penetration is still low, much of the loss remains private and informal and unreported. The 2017 floods in Bangladesh, India and Nepal between the start of June and mid-October affected millions. Total reported damages were US$ 352,000, just 0.1% of the losses estimated by Munich Re to be US$ 3.5 billion. Of this, some US$ 350 million in occured in Bangladesh, US$ 2.5 billion in India and US$ 600 million in Nepal. The insured losses however are estimated by Munich Re to be negligible.[1]

Overall global disaster economic losses in 2017

At US$ 330 billion, overall economic losses globally in 2017 were far greater even than those in the extreme years of 2005 and 2008. The Munich Re NatCatSERVICE recorded 710 relevant loss events, which is far above the average of 605 for the last ten years. Yet just 41% of these losses globally were insured.[2]

It is not just large-scale events; floods are recurring across the region

Flood events across the 4 countries: 2000-2017

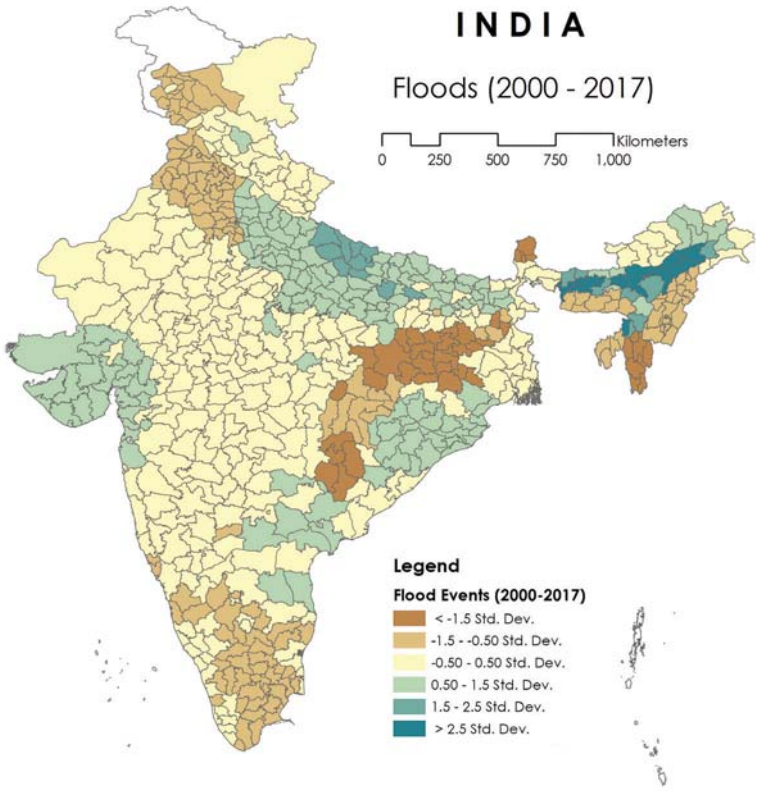


The sheer volume of flood events across the region demonstrates how a number of events pass by under the radar, invisible and with little outside assistance.

Between 2000-2017, Nepal had a mean of 5 events per district; Bangladesh has a mean of 6 events; and Myanmar had a mean of 5.

India had a mean of 11 flood events per district over the last 18 years. Ninety eight percent of its 642 districts have received at least one flood event.

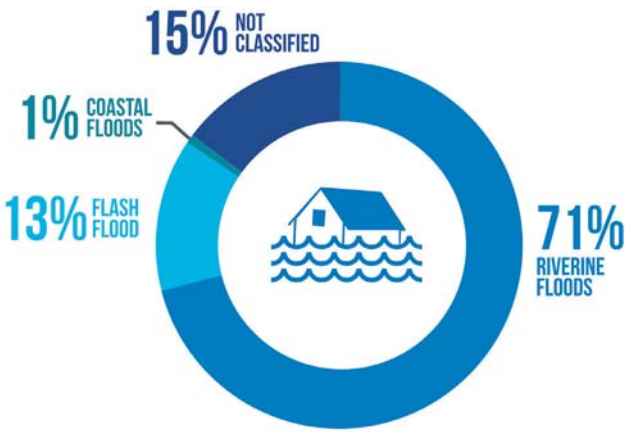
Flooding in the desert and high levels of unpredictability prevail in India



Lakhimpur in Assam was hit by 31 floods from 2000-2017, i.e. approximately two flood events every year! Leh, a cold desert, is known for its surprise massive flash floods of 2010. It has actually seen nine flood events since 2000.

Similarly, the hot deserts of Rajasthan known for drought have received more than the national average of 11 events over the last 18 years. Gujarat has a mean of 15 events, including the district of Kutch known for its salt desert.

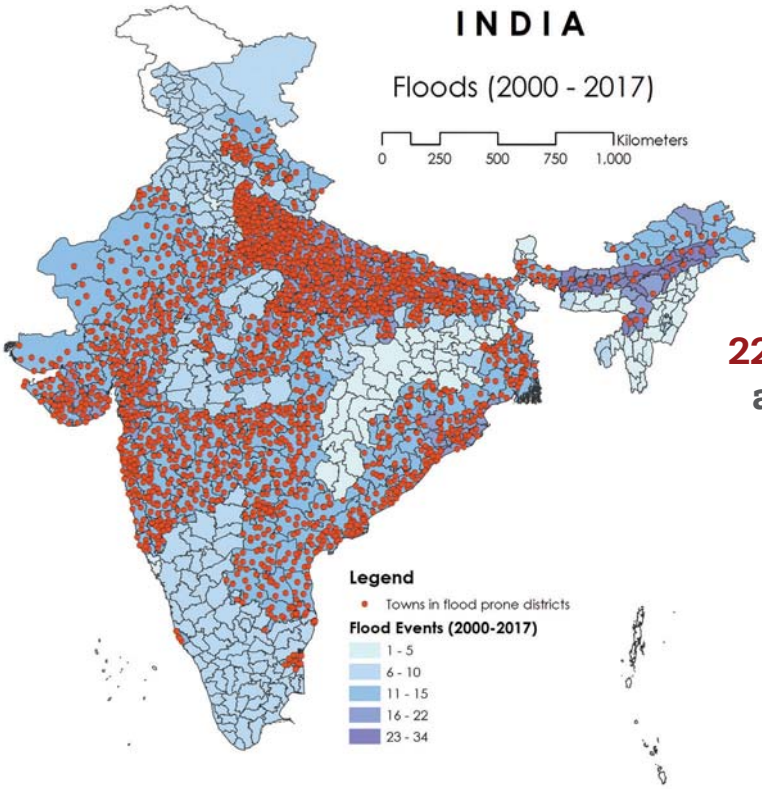
Types of Floods in India: 2000-2017



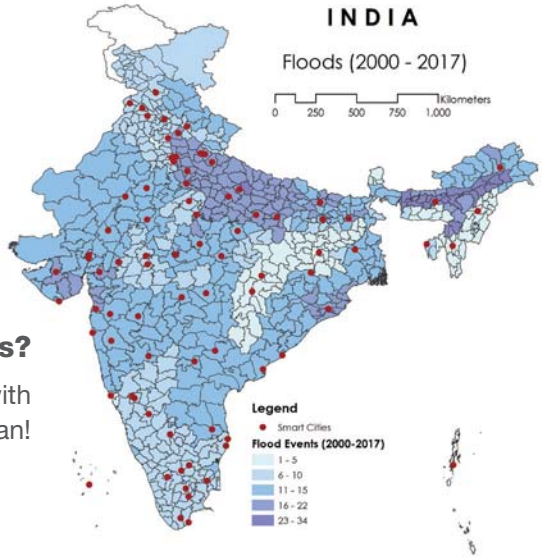
Coastal floods accounted for only 1% of the flood events, while riverine foods accounted for the maximum. River flooding in many areas actually deposits fertile sediments that aids food production. Flash floods that bring a level of unpredictability accounted for almost a sixth of the total, as did events that were unclassified. This also brings questions of water releases from dams and upstream effects.

Each of these floods is highly different. How do you prepare with flood measures that suit these varied contexts?

Urban settlements are increasingly under risk



2292 cities and towns in India are located in districts which have seen at least 11 flood events over the last 18 years.



How safe are our smart cities?

56% of our smart cities are in districts with flood events higher than the mean!

Development vs. wetlands: Chennai Flood 2015

The non-stop torrential rains in two consecutive spells in November and December 2015 brought flooding across Tamil Nadu, with rainfall exceeding the norm in 32 of its 34 districts. Chennai itself received more rainfall in a single day than it had on any day since 1901. Over 400,000 people were affected and more than 400 lost their lives in the worst flooding witnessed by the state in the last 100 years. While this flood was the one that made headlines for its enormous impact, Chennai had actually experienced five major floods between 1943 and 2005.

The massive rainfall aside, Chennai's wetlands and natural sinks which act as a sponge, have actually shrunk massively over the years due to urbanisation. Estimates put the remaining original wetlands at just 10%! Concrete encroachment on Cooum River, Adyar river and Buckingham Canal which serve as the main rainwater drains, poorly designed drainage systems and aging civil infrastructure added to the problem. With nowhere for the rainwater to go, it settled instead on the roads.[3]

The extensive flooding was also a huge blow for industrial activity. Major manufacturing units had to suspend operations with estimated economic losses at US$ 2.2 billion. In a marked departure from other events, however, the commercial angle meant insured losses were higher, with Swiss Re estimating it at US$ 755 million.[4]

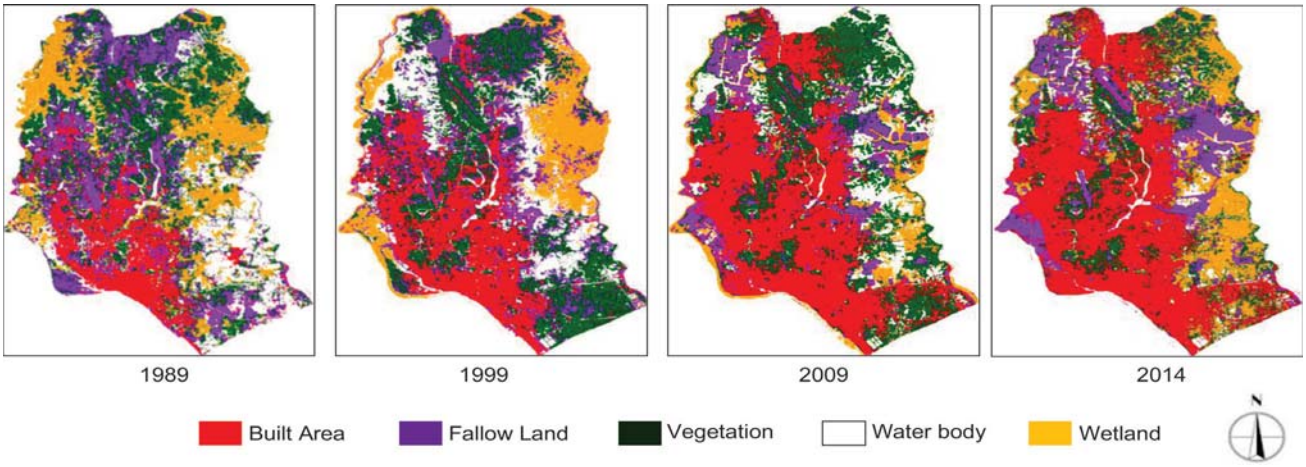
Dhaka: Floods, Heat & the Built (Up) Environment

The quality and spread of the built environment often determines the extent of a disaster's impact, with higher casualty rates being observed in communities living in sub-standard houses and settlements. Flooding is therefore emerging as a major concern for high-density and low-income urban centres.

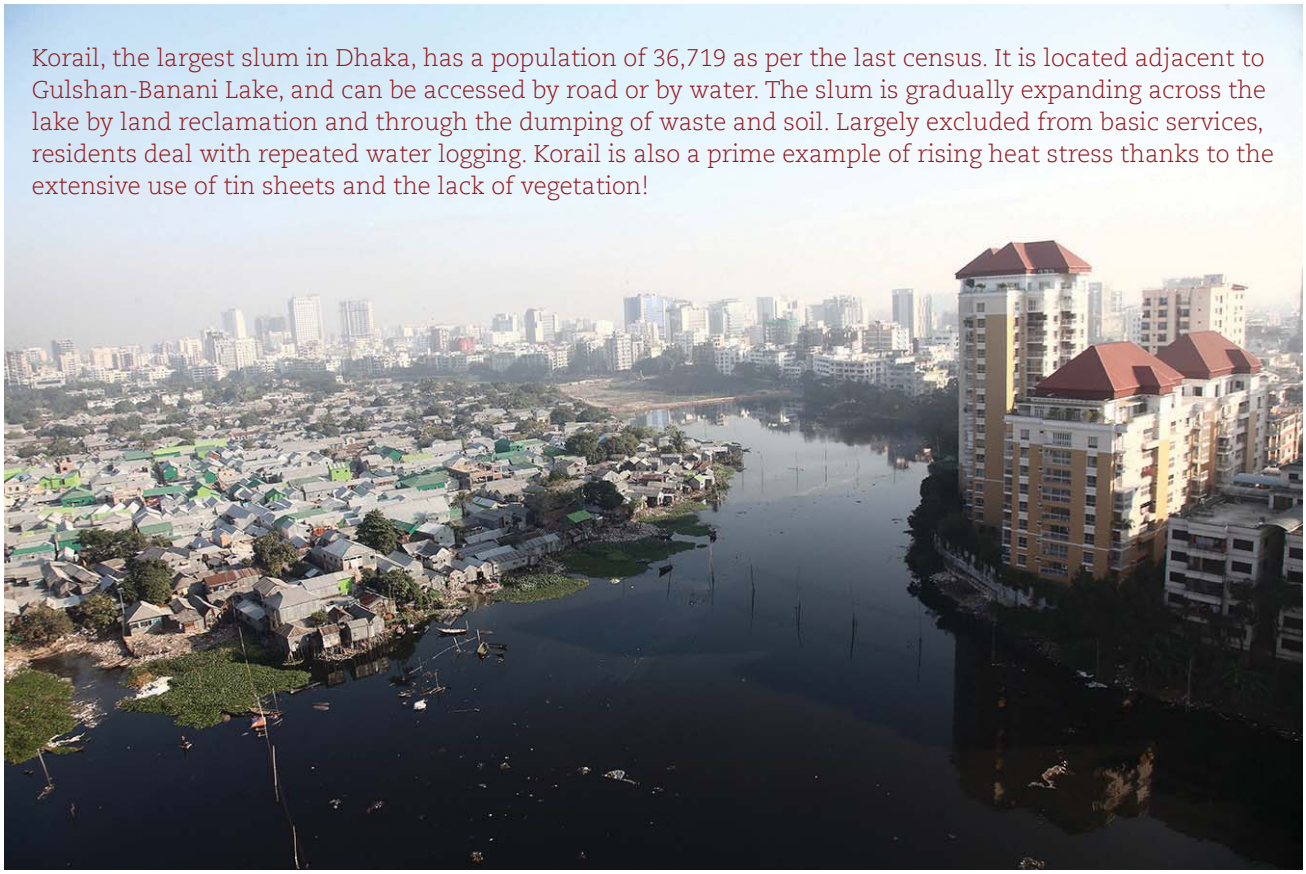
Dhaka already hosts over 18 million people and is one of the fastest growing cities in South Asia. The built area is rapidly expanding over marsh land, leaving no space for the water to go. Already extremely flood prone, researchers predict that even a slight sea level rise may engulf large parts of the city considering its low elevation (2-13 metres above mean sea level).[5]

In one of the most striking incidents in September 2016, Eid celebrations in Dhaka were marred with public horror as rain-fed floodwaters mixed with animal blood inundated large parts of the city.[6]

Built up area of Dhaka between 1989 and 2014 [7]



Korail, the largest slum in Dhaka, has a population of 36,719 as per the last census. It is located adjacent to Gulshan-Banani Lake, and can be accessed by road or by water. The slum is gradually expanding across the lake by land reclamation and through the dumping of waste and soil. Largely excluded from basic services, residents deal with repeated water logging. Korail is also a prime example of rising heat stress thanks to the extensive use of tin sheets and the lack of vegetation!

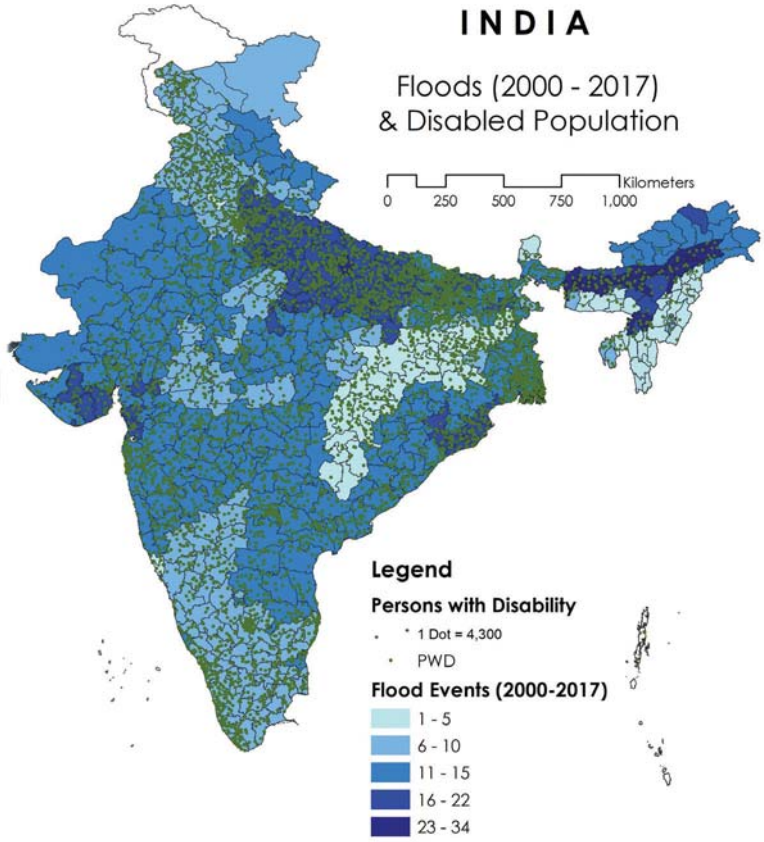


Floods have broader impacts; especially on the most vulnerable

"Due to changing climatic conditions in countries where dengue is endemic, the capacity for one of the main mosquitoes (Aedes aegypti) to transmit dengue fever has increased globally since 1950 by 9.5%."

— Lancet Countdown 2017 Report

The challenging conditions a flood creates have deeper impacts, from the destruction of livelihoods that may entirely shift a community's earning potential to growing instances of vector and water borne diseases to protracted risks for already vulnerable populations.



Of the 15.6 million people who were affected by floods in India in 2017, over 316,185 were people with disabilities!*

* Calculated based on Census 2011 percentages of People with Disabilities (PwDs) in affected states in India.

Data to help innovate for impact

This is a region where 15 million people are affected by floods in a single year. Not just by the deluge but also in invisible ways through prolonged water and vector borne diseases, loss of livelihoods and educational sessions. Clearly, this requires new solutions. For poorer families, particularly those who are hit by multiple under-the-radar shocks, the recurrent struggle keeps them in a chronic cycle of vulnerability and poverty. Investment in supporting and scaling community innovations on flood resilience can have very significant impacts and pay rich dividends.

This is a region where over 1.2 million houses are lost to disasters annually.[8] Investing in resilience of the built environment will help not just save lives and assets, but also reduce secondary impacts. This will often be on health factors such as gastro intestinal diseases and vector borne ones like dengue and chikungunya.

The Safer Communities Innovation Lab therefore focuses on the interface of health and the built environment in disaster contexts. It examines the direct, yet seldom recognised impact of built environment on emergencies as well as chronic stresses and quality of life.

When the scale is this huge, the nature of the losses informal and resources limited, promoting coping practices at the community level from isolated innovations to large scale norms will have a very beneficial effect. Well positioned innovations addressing systemic problems can indeed be disruptive in narrowing the otherwise growing gap between humanitarian needs and aid.

Communities affected by the flooding discussed in this report are meanwhile coping with amazing levels of ingenuity and wisdom. The Safer Communities Innovation Lab is uncovering a wide spectrum of such innovators and micro-innovations, ranging from rafts made out of waste material to fuel rods that can be carried during flood evacuation to higher ground, top hang shutters that also shade from sun and rain, space efficient water storage systems and child centric communication tools.

The patterns of risk prevalence are a useful input to studying innovations and their applicability, and thus arriving at a better understanding on what kind of innovations are required and in what kind of settings they can be replicated and scaled.

We hope a greater resolution of data at the local level will help give more power to the people, and their ideas to deal with flood impacts. There is no other way to address a crisis of this scale.

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Global Adminstraive Unit Layers

The Global Administrative Unit Layers (GAUL) is an initiative implemented by FAO within the Bill & Melinda Gates Foundation, Agricultural Market Information System (AMIS) and AfricaFertilizer.org projects.

The GAUL compiles and disseminates the best available information on administrative units for all the countries in the world, providing a contribution to the standardization of the spatial dataset representing administrative units. The GAUL always maintains global layers with a unified coding system at country, first (e.g. departments) and second administrative levels (e.g. districts). Where data is available, it provides layers on a country by country basis down to third, fourth and lowers levels. The overall methodology consists in a) collecting the best available data from most reliable sources, b) establishing validation periods of the geographic features (when possible), c) adding selected data to the global layer based on the last country boundaries map provided by the UN Cartographic Unit (UNCS), d) generating codes using GAUL Coding System and e) distribute data to the users (see TechnicalaspectsGAUL2015.pdf).

GADM GIS Database

GADM is a spatial database of the location of the world's administrative areas (or administrative boundaries) for use in GIS and similar software. Administrative areas in this database are countries and lower level subdivisions such as provinces, departments, bibhag, bundeslander, daerah istimewa, fivondronana, krong, landsvæðun, opština, sous-préfectures, counties, and thana. GADM describes where these administrative areas are (the "spatial features"), and for each area it provides some attributes, such as the name and variant names.

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