



Mumbai, Leh, Uttarakhand,
J&K, Chennai: What climate
science tell us about extreme
rainfall events?

Chandra Bhushan

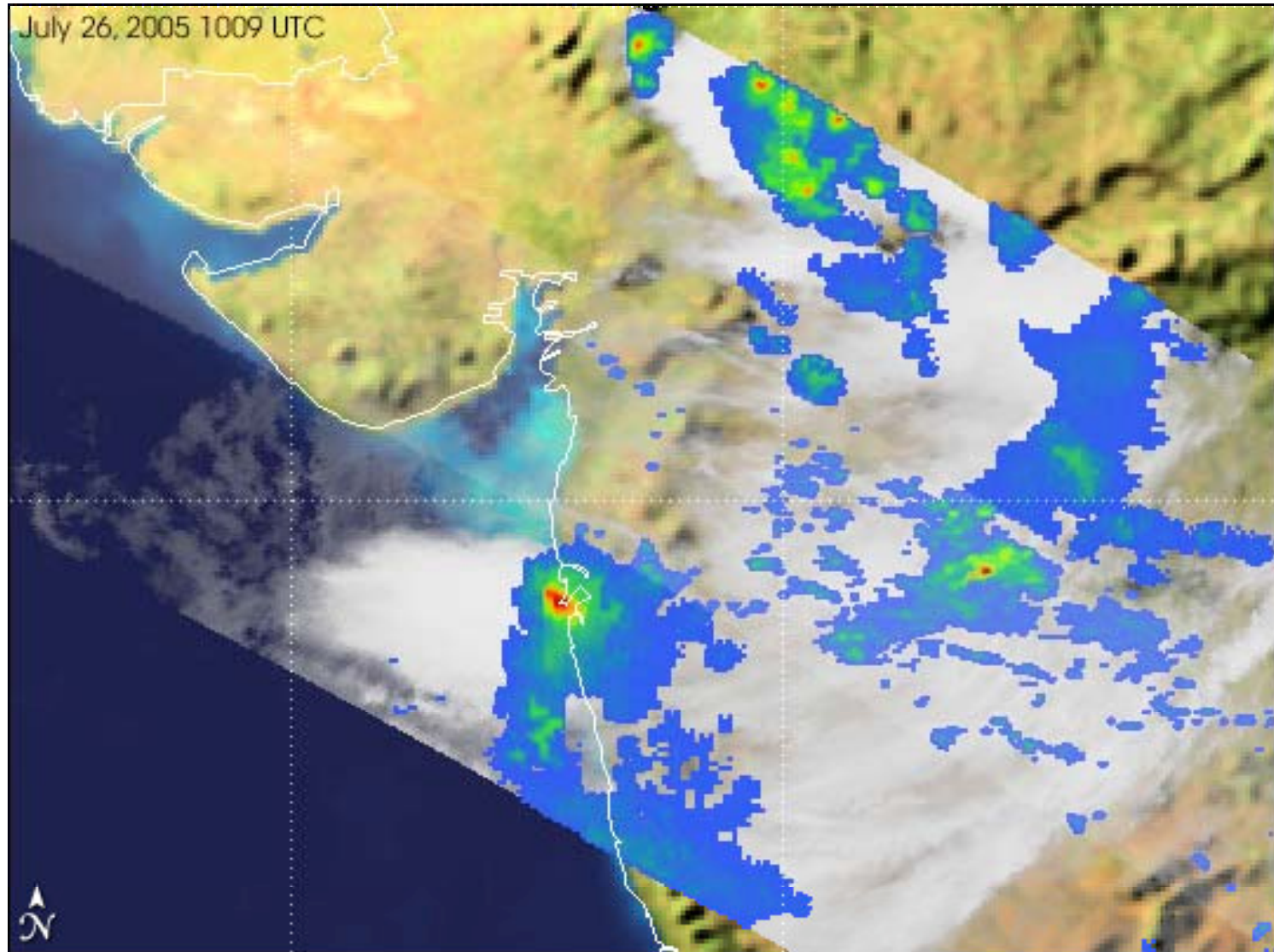


Mumbai, 2005

- On 26 July, 2005, 994 mm of rainfall in 24-hours. One of the highest ever recorded in India.
- 500 people died in Mumbai alone; the figure was 5000 including the surrounding districts.
- Economic loss was pegged at Rs. 12,000 crore
- IMD reported that it was caused due to “meso-scale convection around Mumbai”
- Didn't even utter the word climate change



Mumbai, 2005





Mumbai, 2005





Leh, 2010

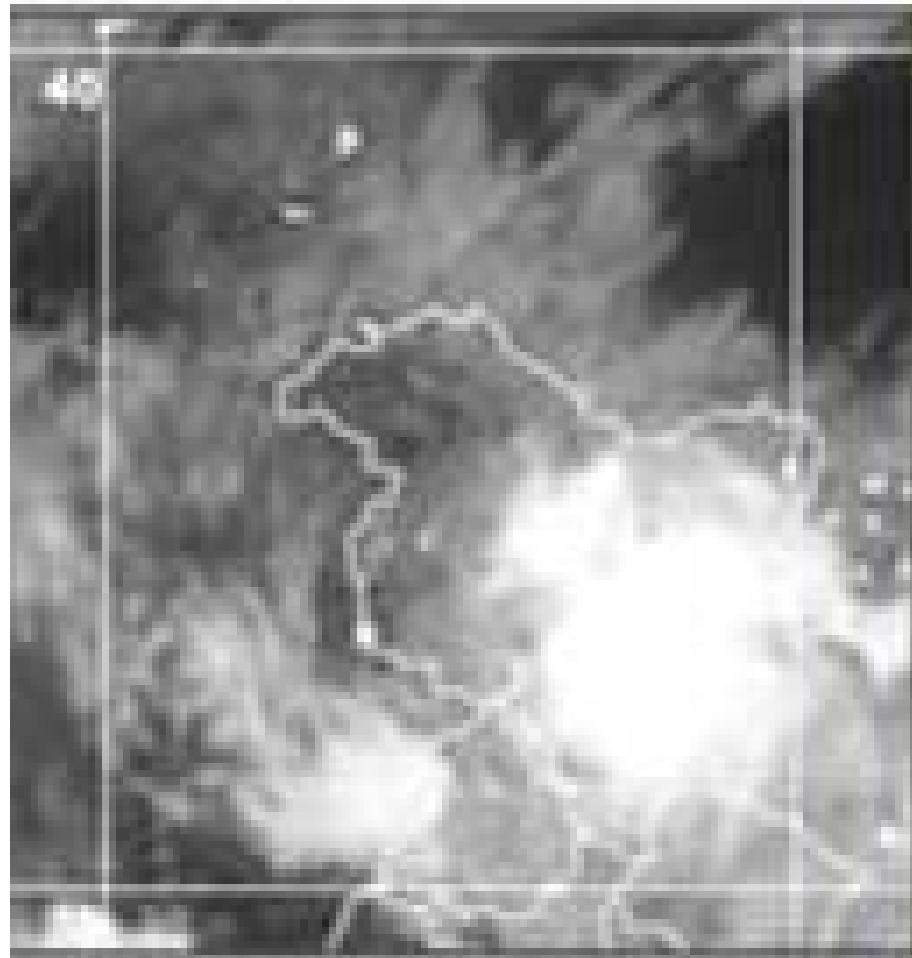
- On 6th august, 2010 Leh town and surrounding settlements devastated by “cloudburst”.
- 150-250 mm of rainfall in 30 minutes in around Leh town
- Officially 255 dead; no estimate of economic loss
- IMD report stated that “Western Himalayan region experiences cloudburst due to strong monsoon circulation or the interaction of monsoon circulation with the mid-latitude westerly system, but Ladakh region is not known to be affected by this type of phenomenon. It is a cold desert and average rainfall for the month of August is 15.4 mm only”.
- No mention of the term climate change again.

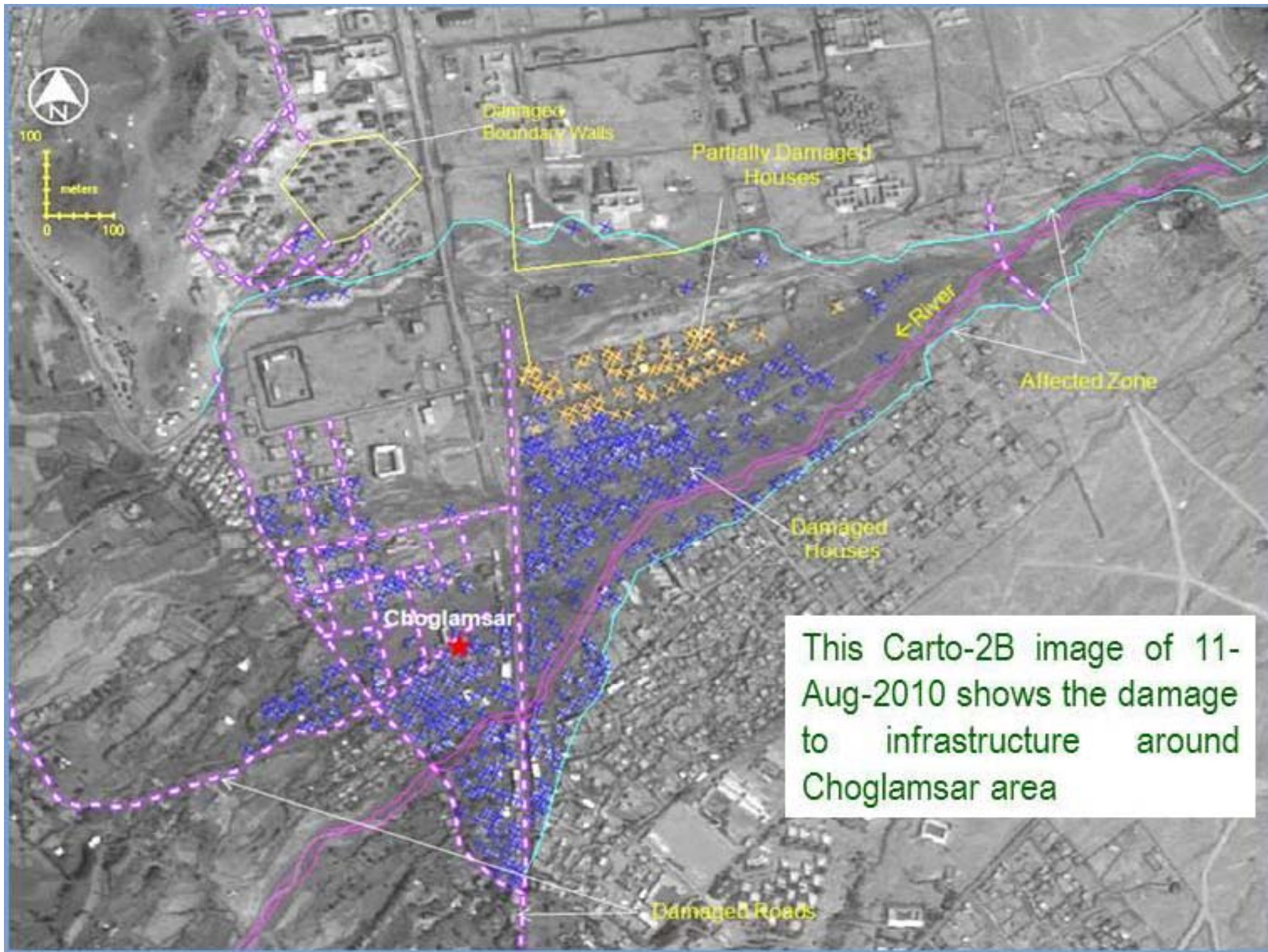


Leh, 2010

(05-Aug-2010: 18:00Z)

05-Aug-2010: 23:30 IST







Uttarakhand, 2013

- In June, 2013 Uttarakhand was devastated by extreme rainfalls.
- 5700 people died (official figures) and economic loss has been pegged at least Rs, 10,000 crores
- On 17th June alone, some parts of Uttarakhand recorded more than 340 mm of rainfall, which is 375% more than the daily normal. IMD reported a weekly departure of about 847% in the rainfall volume for the week ending on 19th June 2013.
- IMD termed it as unique but attributed it to the strong interaction between “the westerlies and the monsoon system over Uttarakhand”.
- Said such phenomenon could be due to global warming



Uttarakhand, 2013





J&K, 2014

- “Unseasonal and extreme rainfall”. Worst floods since independence.
- At many places it rained more than 200 mm in 24 hours – 400% more than the monthly average.
- IMD: “The heavy rains was due to the interaction between the monsoon current and two intense western disturbances”.







Chennai, 2015

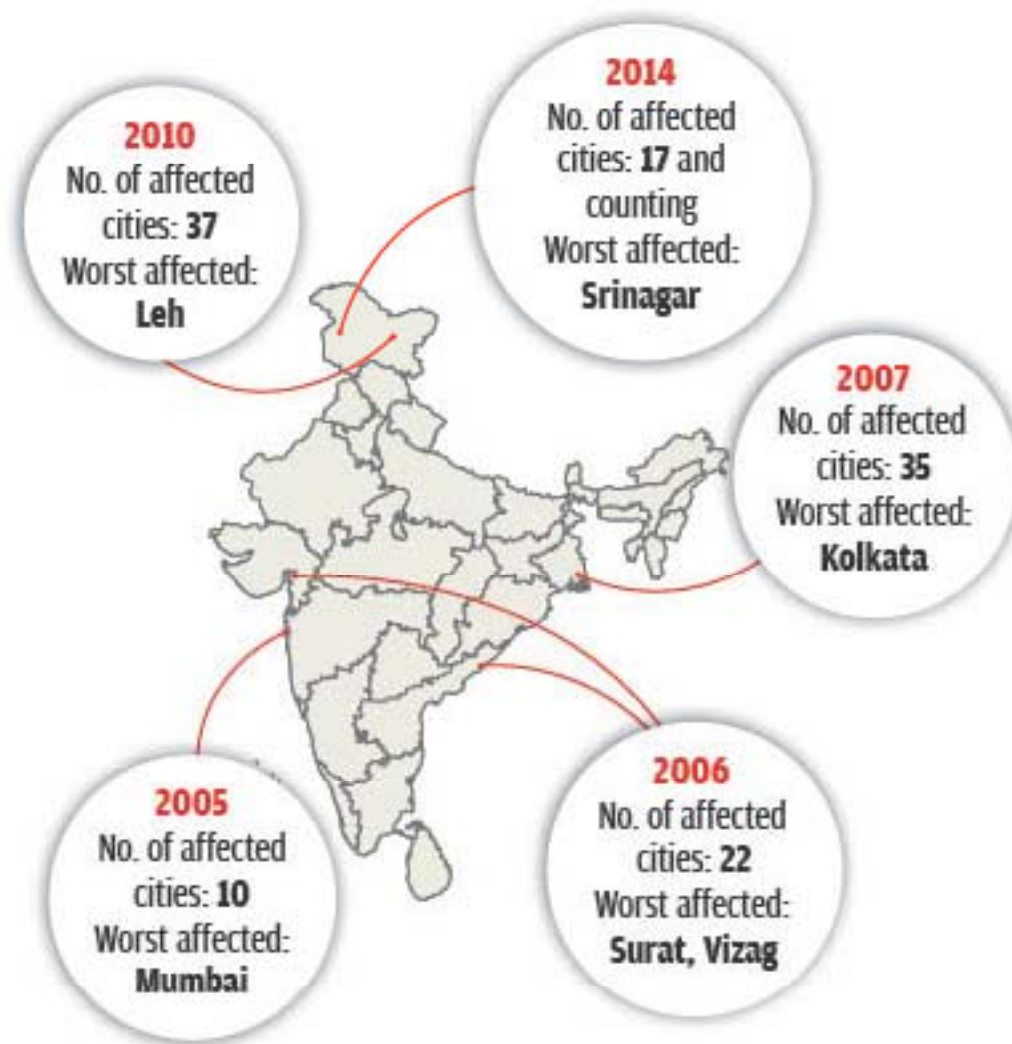
- In November, Chennai recorded a whopping 1218.6 mm of rain – three times its monthly rainfall. 290 mm of rain in 24 hrs.
- 500 dead; INR 50K-100K crore loss – worst flood in a century
- IITM: ““Studies show that with rising global temperatures, the intensity of rain spells is increasing. This has been seen both in the southwest and northeast monsoons,”. IMD concurred.



Chennai, 2015



Beyond headline





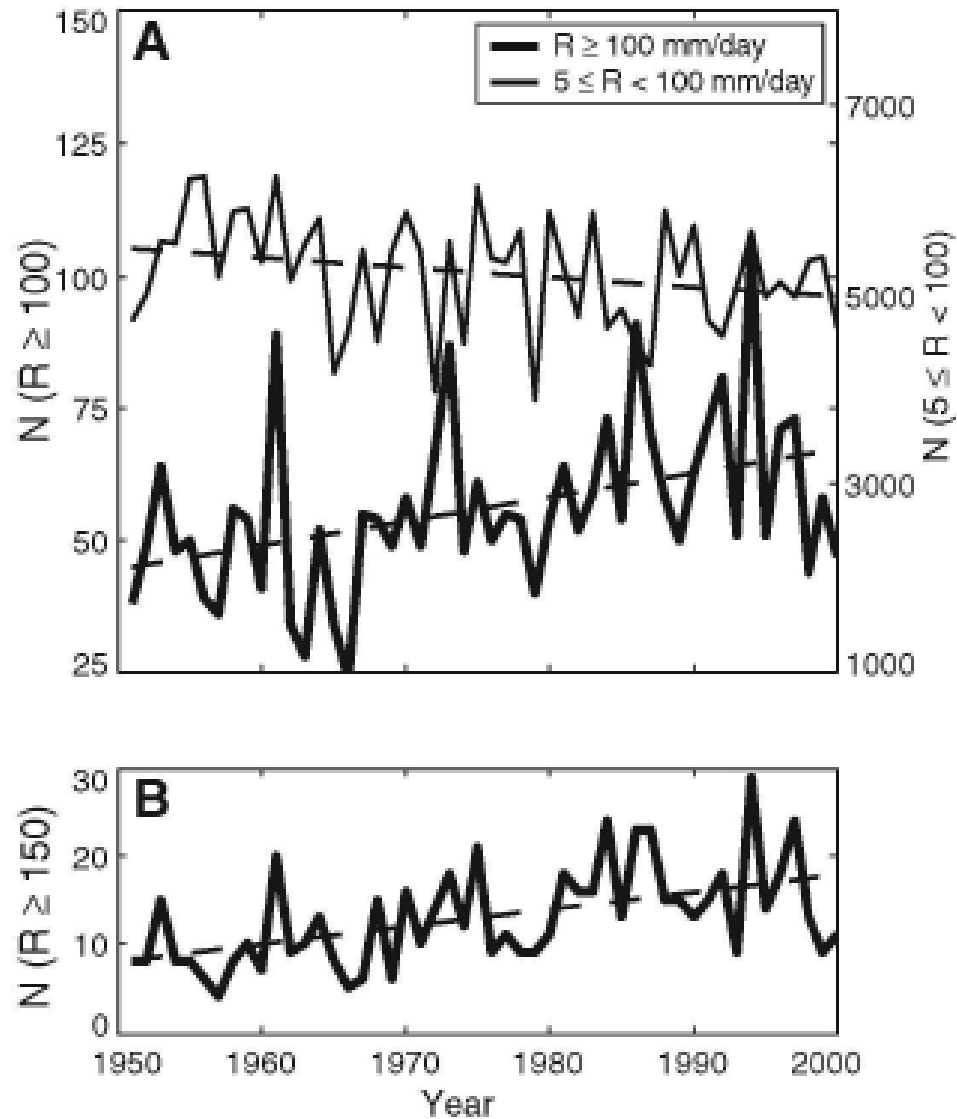
Is it climate change?

Three key reports in last 7 years:

- IPCC fourth assessment report (AR4): Extreme rainfall events are going to increase over Indian sub-continent.
- IPCC Special Report on Managing the Risks of Extreme Events and Disasters (SREX), 2011: Climate change leading to changes in the frequency, intensity, spatial extent, duration, and timing of extreme weather events. Countries like India highly vulnerable to such changes.
1-in-20 year maximum daily precipitation is likely to become a 1-in-5 by the end of the 21st century
- IPCC fifth assessment report (AR5): In general, India will get more rains, but in less rainy days – intensity of rainfall will increase



Increase in extreme rainfall events

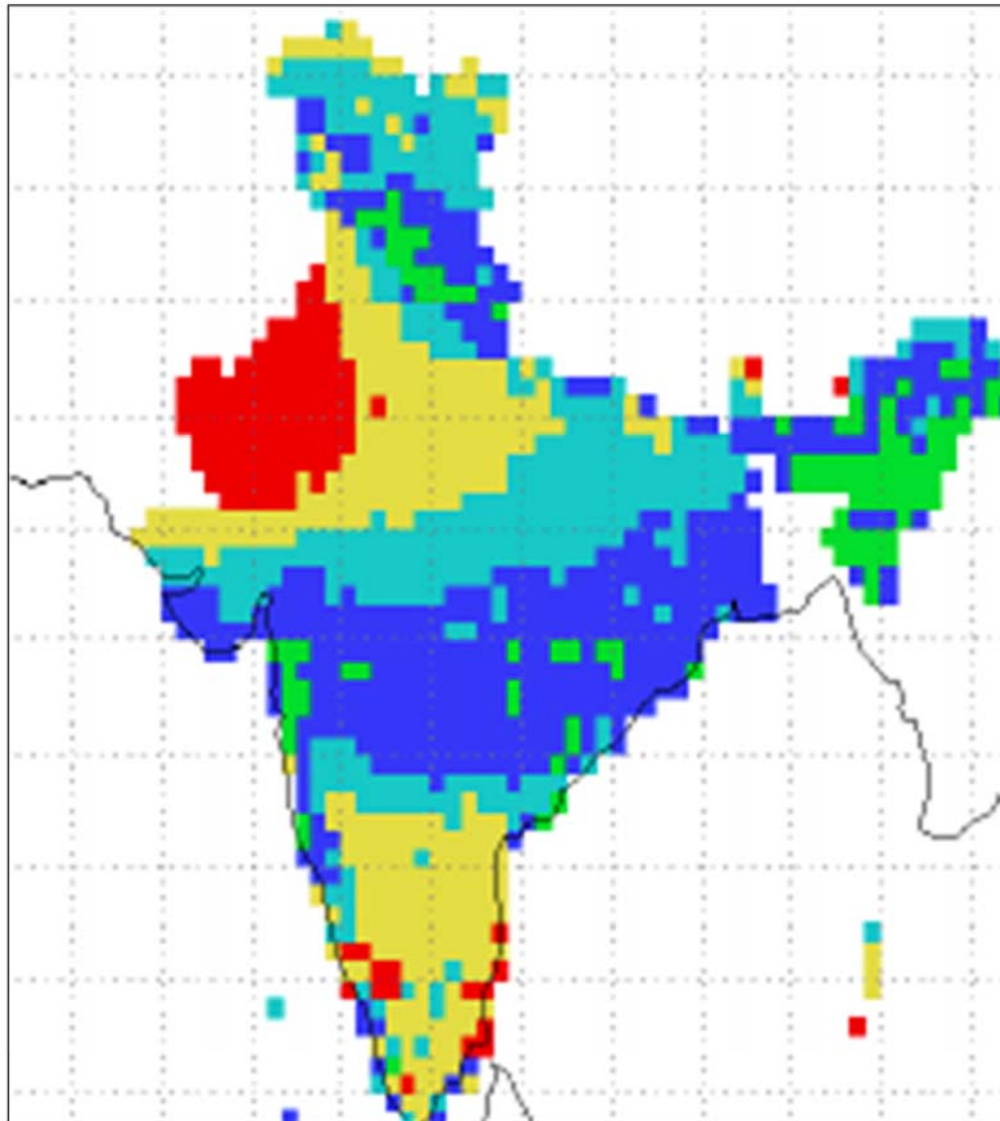


Heavy rainfall events (> 100 mm/day) and very heavy events (>150 mm/day) are increasing and moderate events (5-100 mm/day) are decreasing.

Source: Goswami B N et.al, 2006



PRECIS regional climate model



Predicted changes in
Rainfall in India

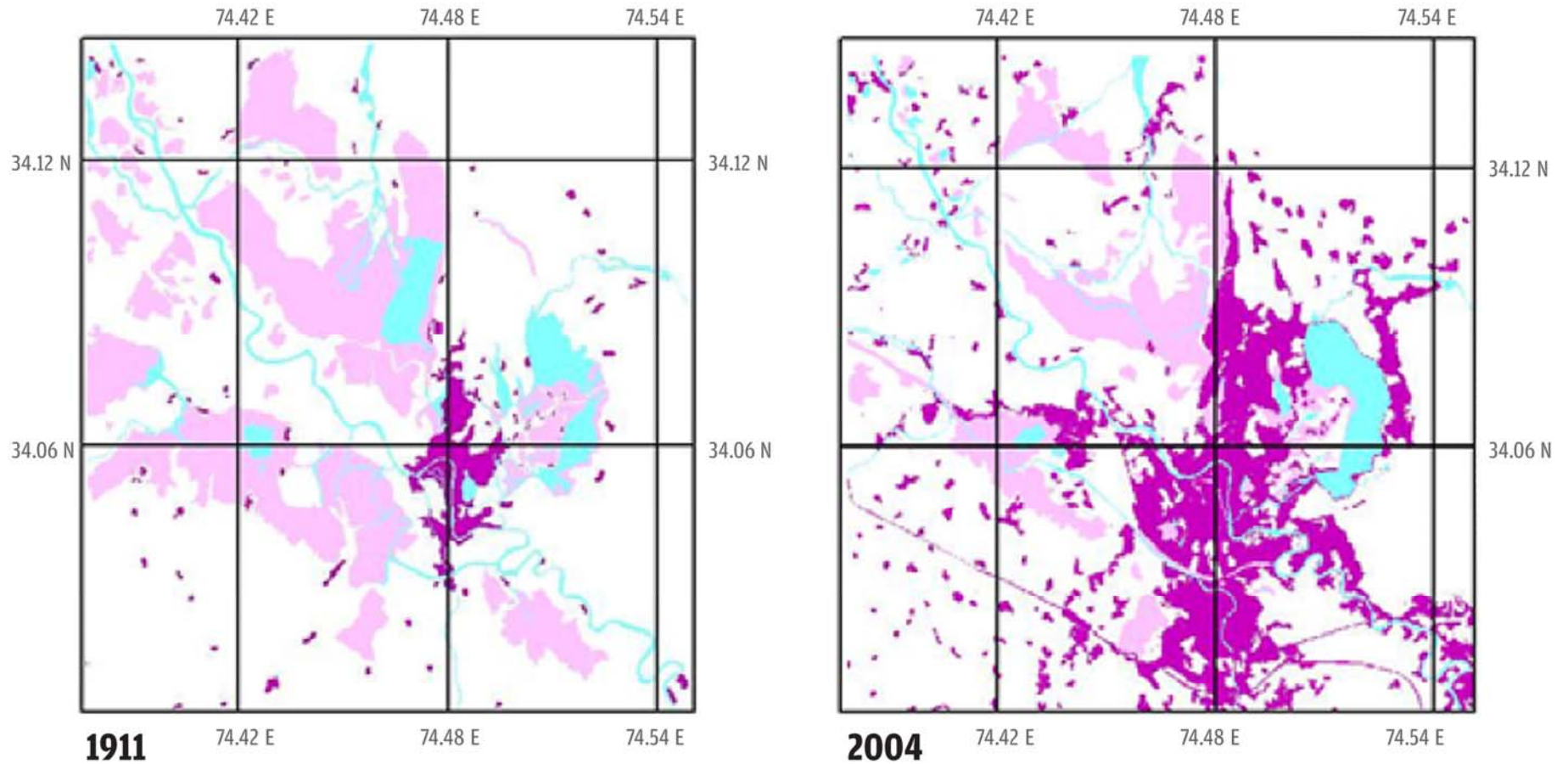
>500 **250-500** **100-250** **0-100** **<0**



India facing double whammy

- Extreme events coupled with *bad land and water management along with poor preparedness* is exacerbating the impacts.
- **J&K floods**
 - State didn't have a flood forecasting system
 - State didn't have a separate disaster management department
 - Most importantly, bad development -- encroachments coupled with destruction of lakes, ponds and wetlands – had worsened the situation.

Lakes and wetlands of Srinagar and its suburbs



Class	Area (ha)
Open water surface	4,000.50
Wetland	13,425.90
Built-up land	1,745.73
Others	50,505.90

Class	Area (ha)
Open water surface	3,065.88
Wetland	6,407.14
Built-up land	10,791.60
Others	49,426.70

Source: Humayun Rashid & Gowhar Naseem, J&K State remote sensing centre



Vanishing lakes

- Bangalore, at the beginning of the 1960s had 262 lakes, now only 10 hold water
- Ahmedabad had 137 lakes in the city but 65 had been built over
- In Delhi, 625 water bodies were identified –on court orders – but are not protected.



Don't deny climate change; start adapting

- Accept that climate change is impacting us and the impacts are likely to increase in the future. Denial is hurting us more.
- Start internalising climate change adaptation in all developmental policies and programme.
- From building of cities infrastructure to agriculture and from water supply to energy infrastructure, we will have make changes to incorporate climate change impacts.



Don't deny climate change; start adapting

- Improve forecasting and warning systems.
- Build disaster management capabilities at the local and state levels.
- Invest in research to understand more how climate change is going to affect different areas and aspects