



Mumbai, Leh, Uttarakhand &  
now J&K: Is climate change  
causing these extreme rainfall  
events?

Chandra Bhushan

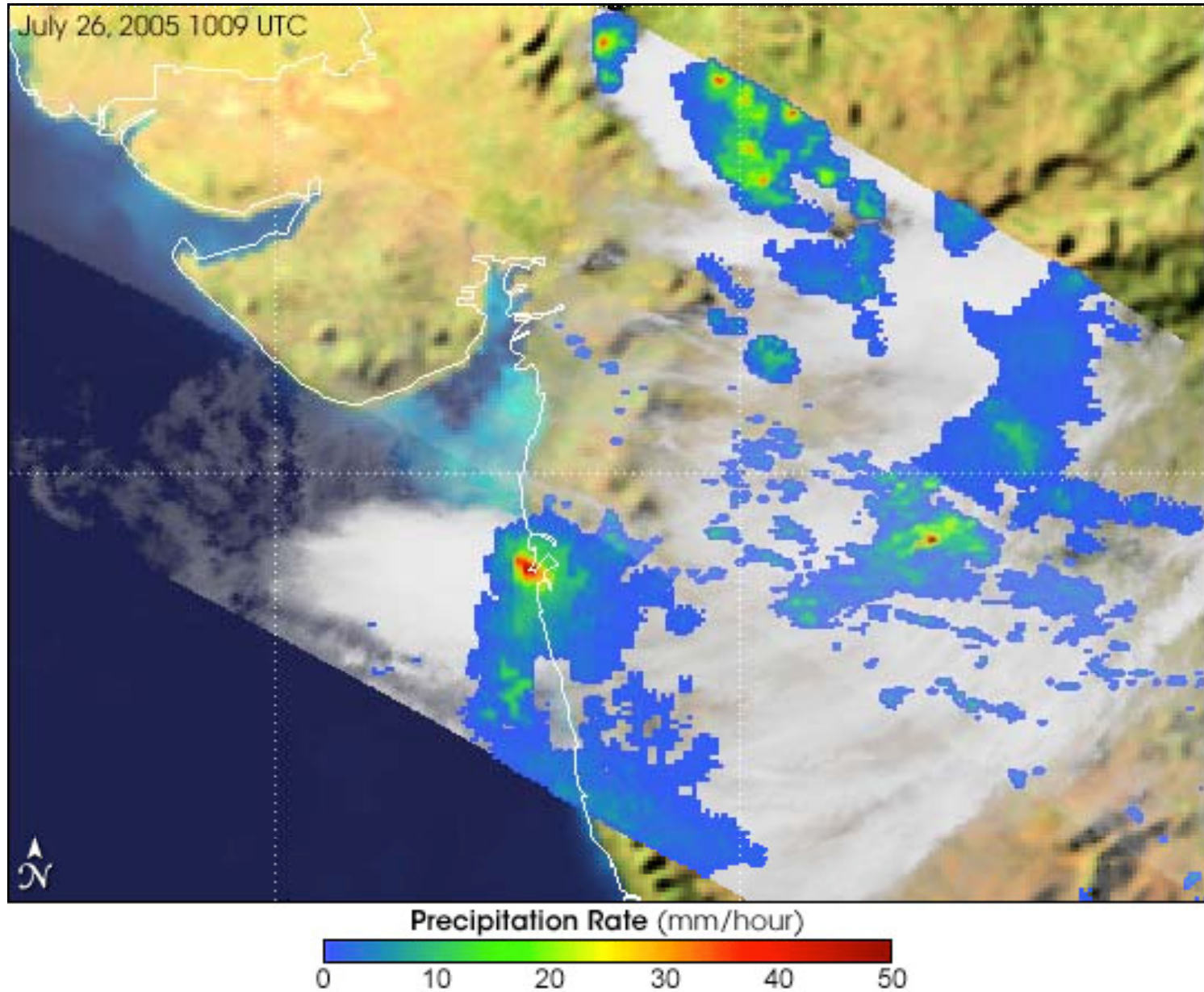


# Mumbai, 2005

- 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





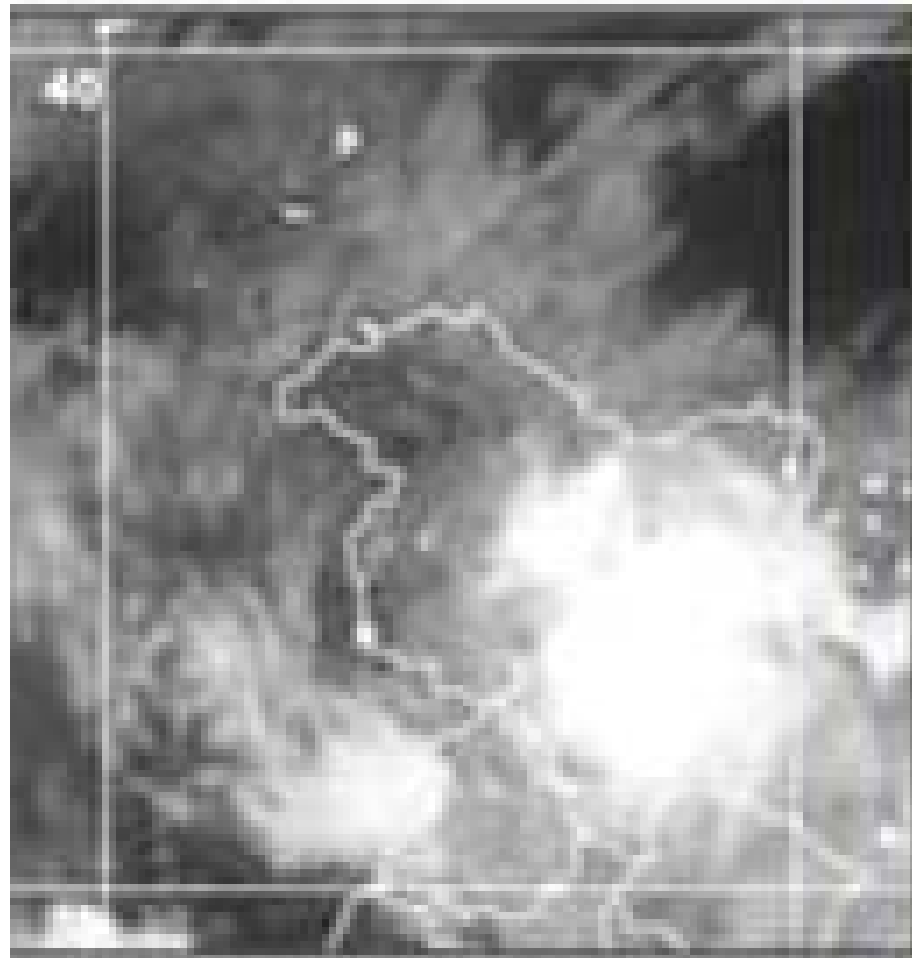
# Leh, 2010

- On 6<sup>th</sup> 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.

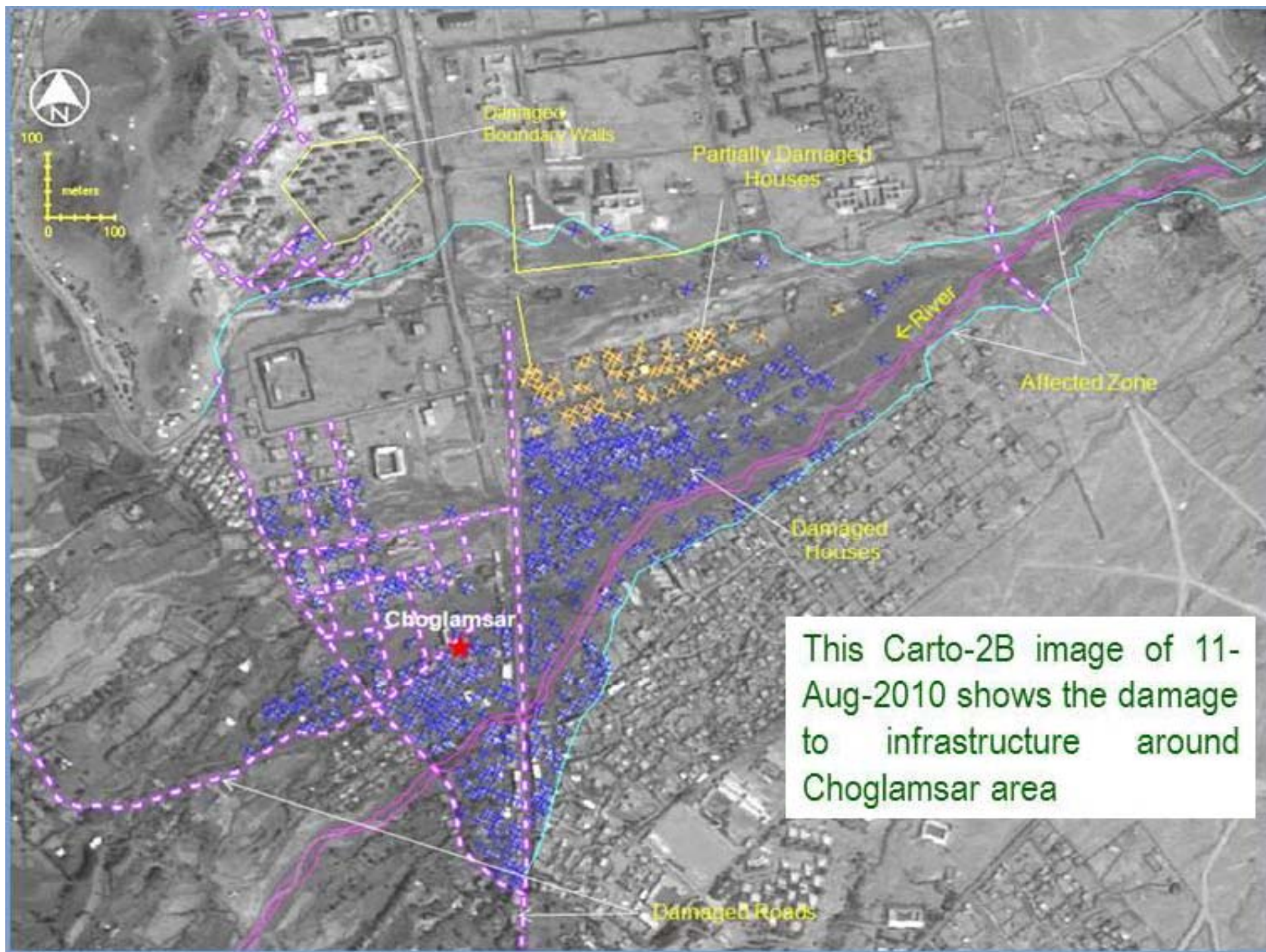


# Leh, 2010

(05-Aug-2010: 18:00Z)  
05-Aug-2010: 23:30 IST







This Carto-2B image of 11-Aug-2010 shows the damage to infrastructure around Choglamsar area



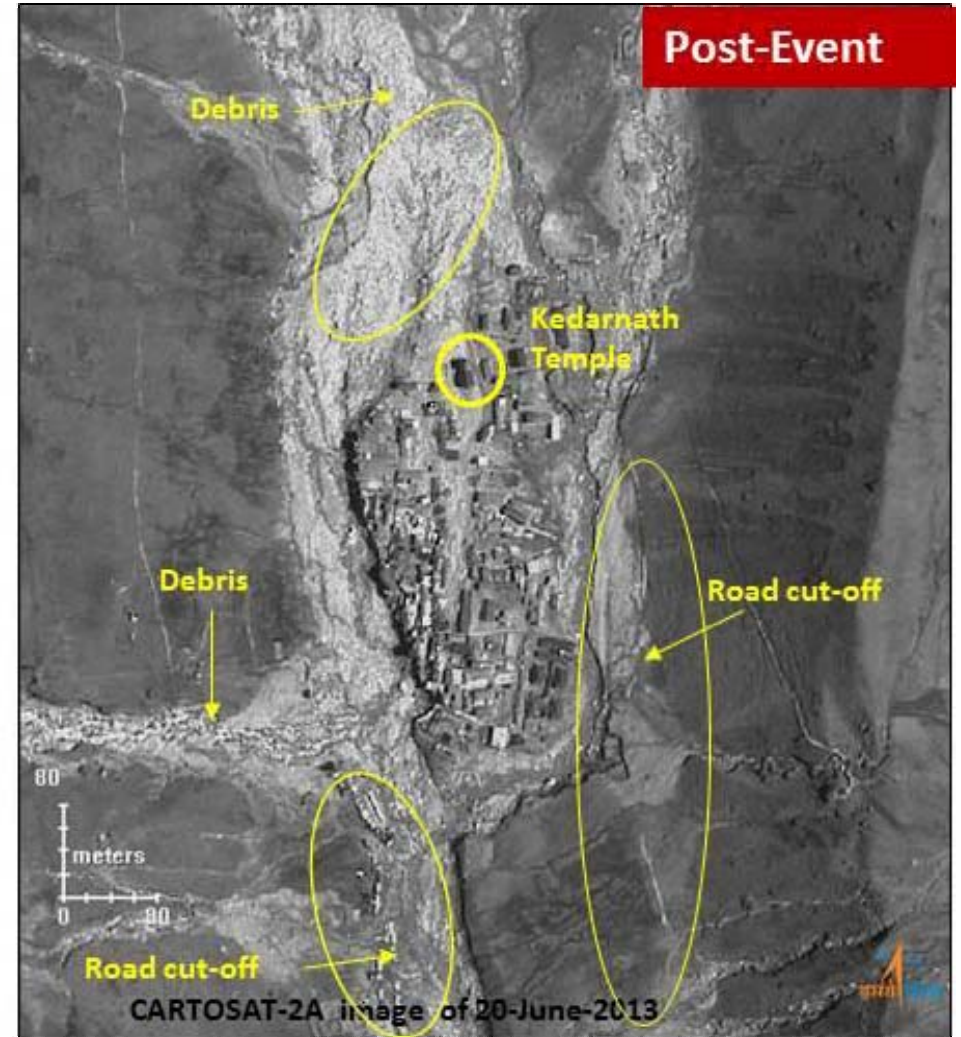
# Uttarakhand, 2013

- 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”.
- Rejected any linkage with climate change





# Uttarakhand, 2013





# Uttarakhand, 2013

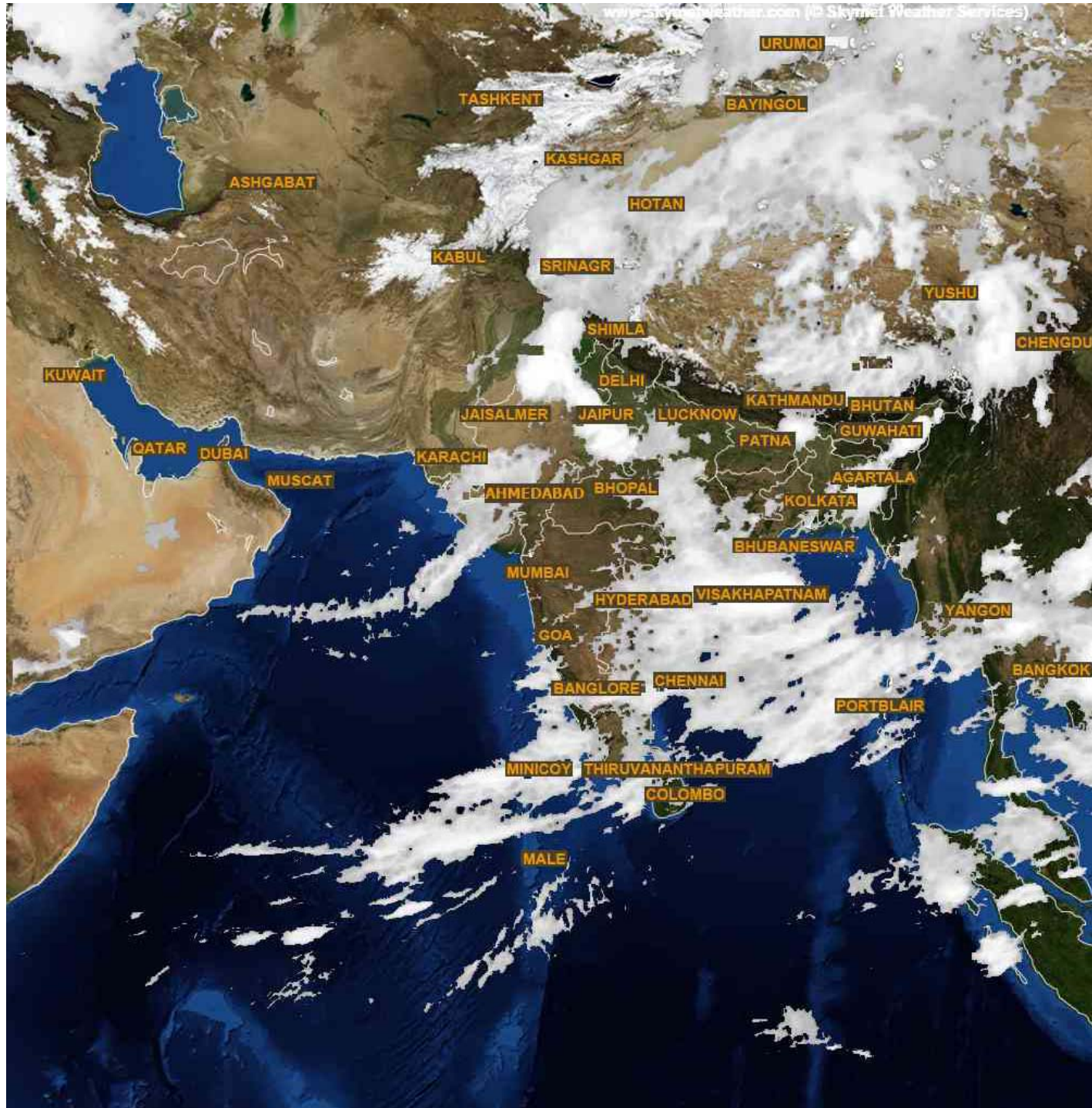




# J&K, 2014

- “Unseasonal and extreme rainfall”. Worst floods since independence.
- We will know the extent of devastation only in coming weeks; but huge.
- 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”.













# Is it climate change?

- Terms used by IMD: “Unique”, “Unprecedented”, “Unusual”; by no explanation why these events are happening so frequently.
- Ministry of Environment and Forests & Climate Change has no opinion on these extreme rainfall events



# Is it climate change?

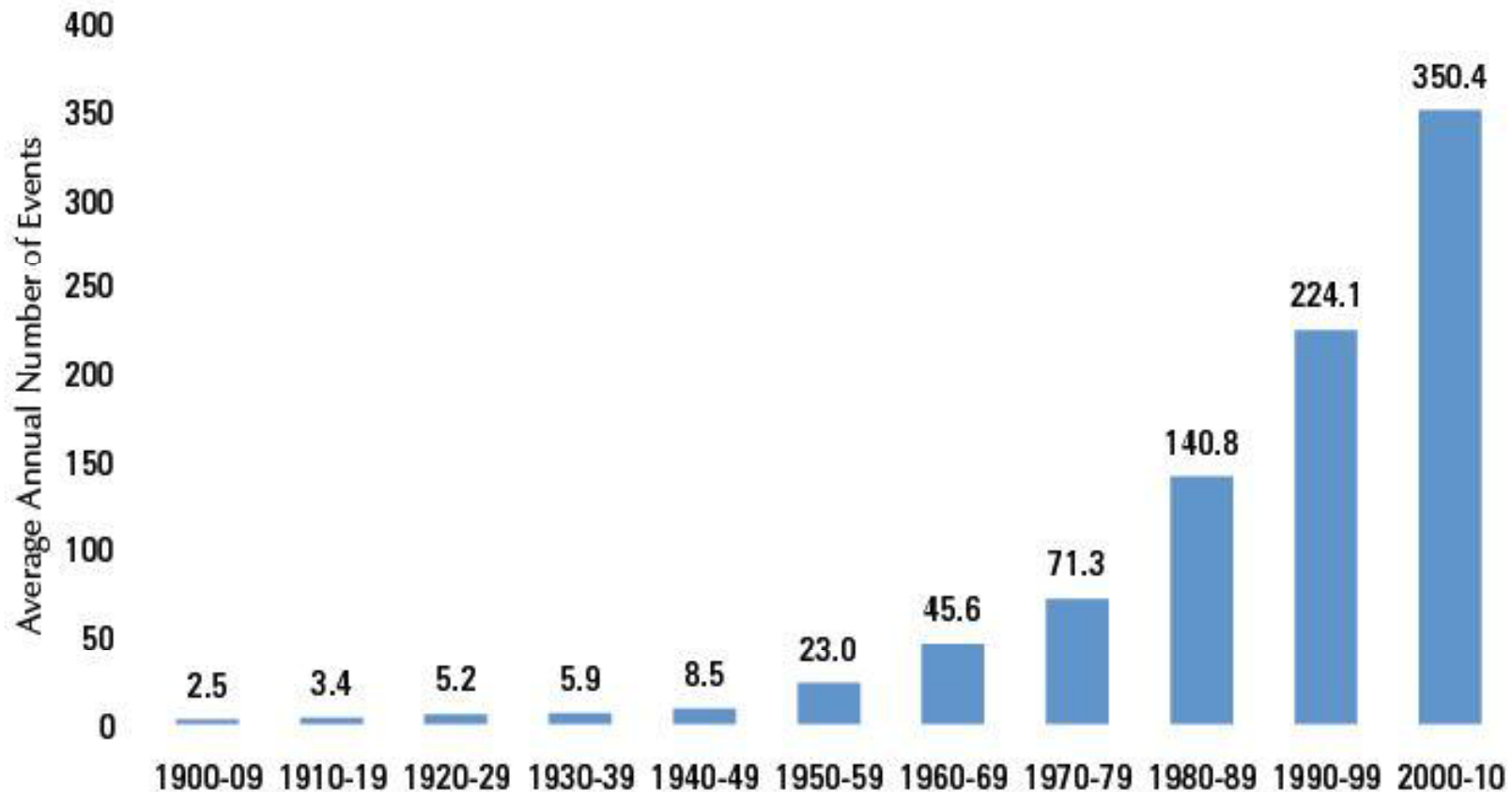
Three key reports in last 7 years:

- 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.
- IPCC fifth assessment report (AR5): In general, India will get more rains, but in less rainy days – intensity of rainfall will increase



# Climate change increasing the probability of extreme events

Figure 1: Average Number of Extreme Weather Events per Year by Decade, 1900–2010

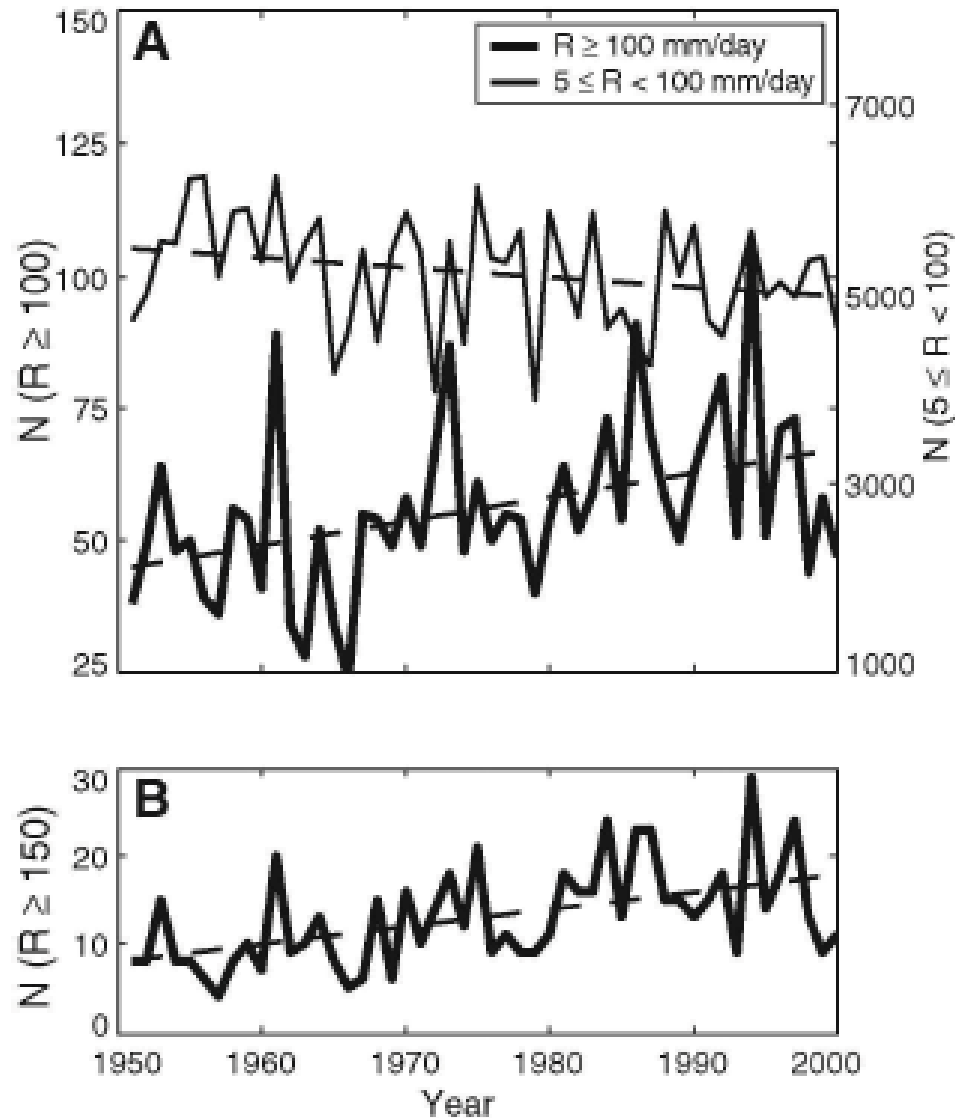


Note: For the last period, 2000–2010, the annual number of events is based on an 11-year average. Statistics from the last “decade”—2000–2010—and the data for 2010 and perhaps even 2009 must necessarily be considered preliminary at this writing (March 2011).

Source: EM-DAT (2011).



# Increase in extreme rainfall events

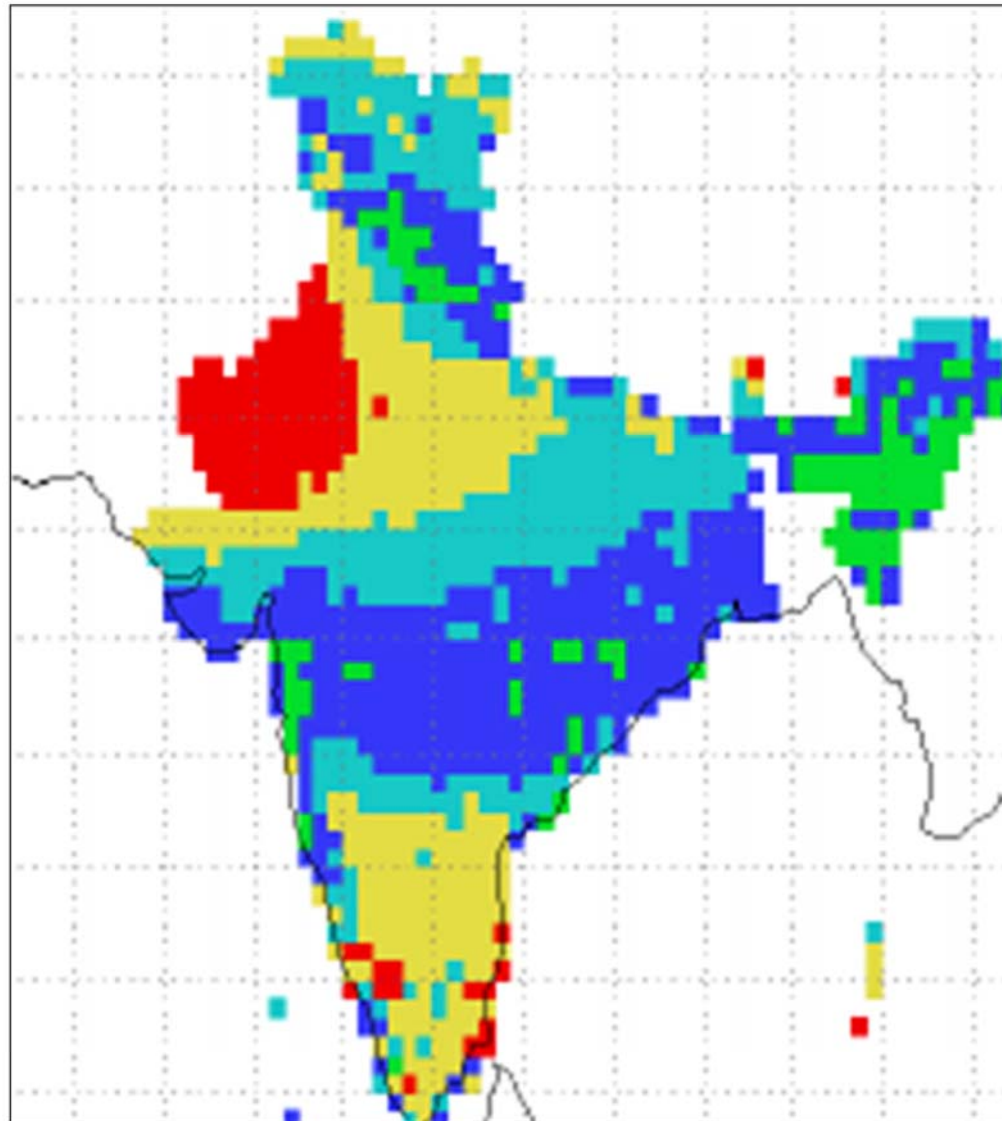


Heavy rainfall events ( $> 100$  mm/day) and very heavy events ( $> 150$  mm/day) are increasing and moderate events ( $5$ - $100$  mm/day) are decreasing.

Source: Goswami B N et.al, 2006



# PRECIS regional climate model



Predicted changes in  
Rainfall in India

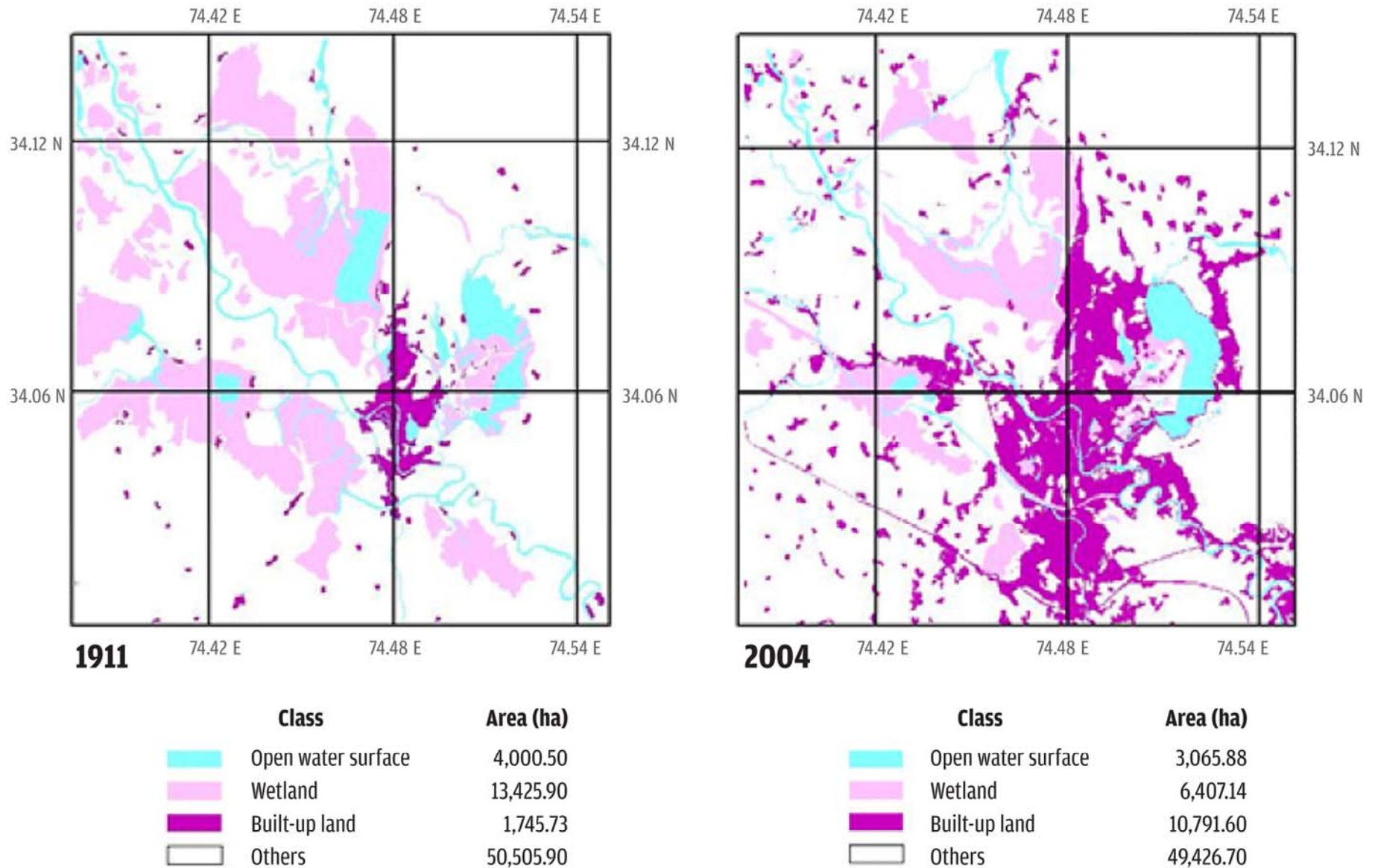




# India facing double whammy

- Extreme events coupled with *bad development and poor preparedness* is exacerbating the impacts.
- **J&K floods**
  - State doesn't have a flood forecasting system
  - State doesn't have a separate disaster management department
  - IMD claims that it had issued warnings; but how specific and actionable was the warning (area, intensity etc.) is not clear.
  - Most importantly, bad development -- encroachments coupled with destruction of lakes, ponds and wetlands – has worsened the situation.

# Lakes and wetlands of Srinagar and its suburbs



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



## **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