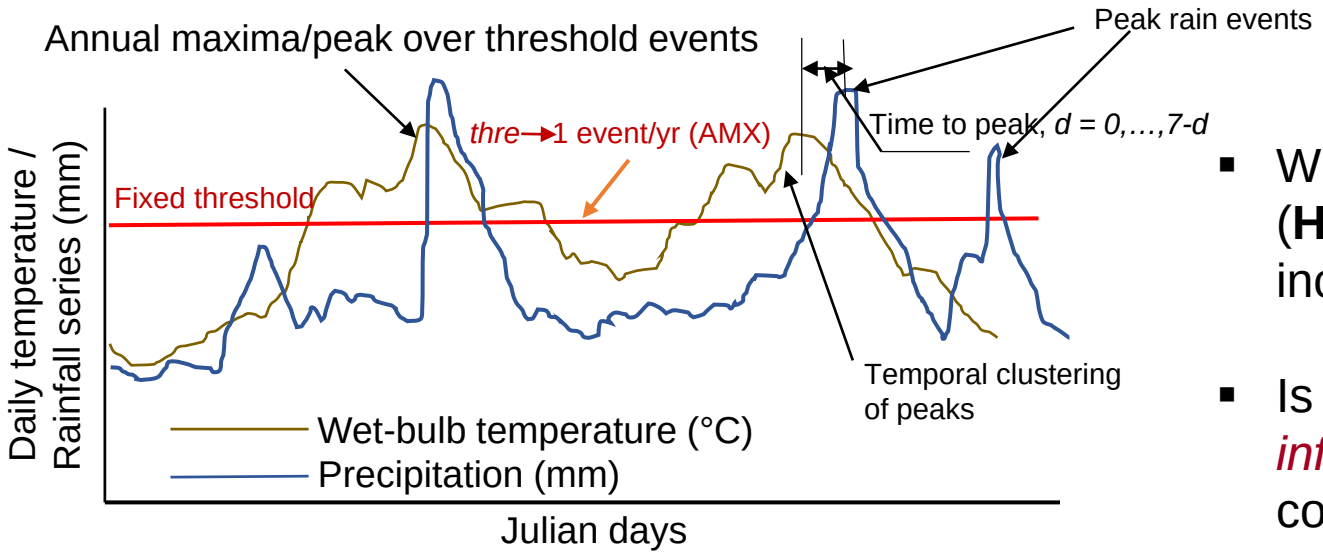
Compound Risk of Heat stress – rain induced floods in Urban India

Problem Statement

Research Questions



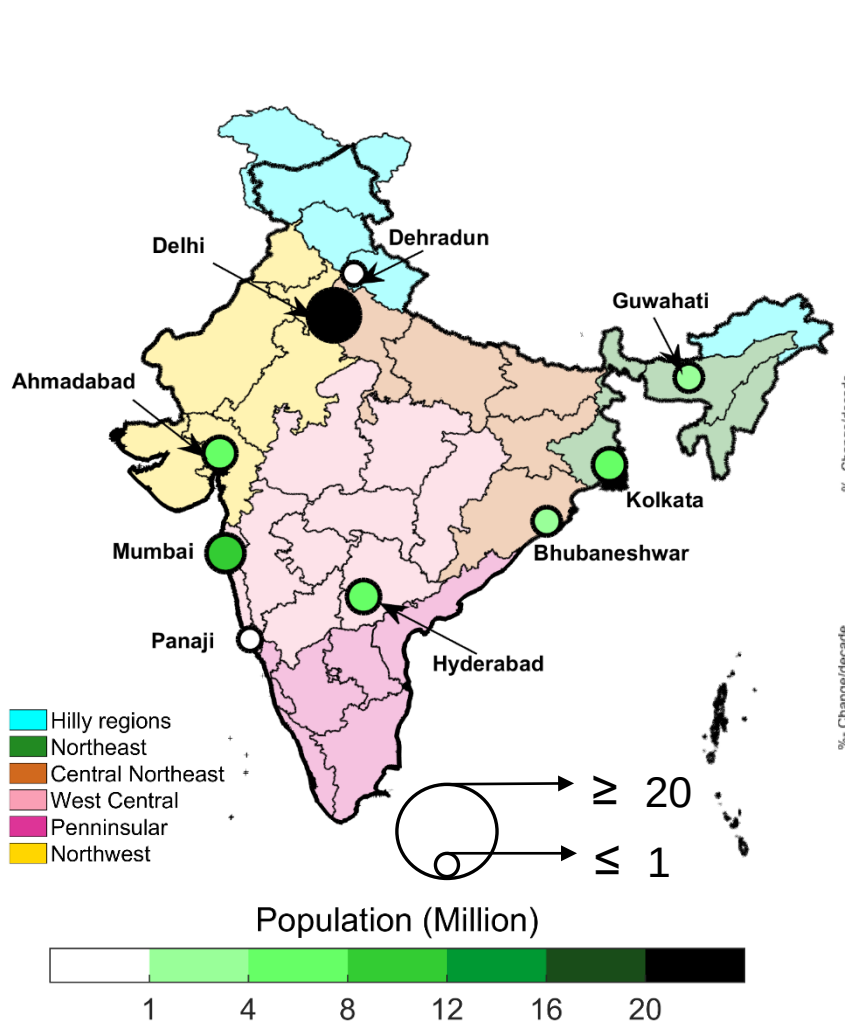
- Whether high temperature *<u>compounded</u>* by humidity (**H**umid **h**eat **s**tress: *HHS*) impact subsequent/co-incidence of *heavy rain events*?
- Is there any potential for developing a 1st-order *climate-informed pluvial flood risk model* considering *HHS* as a covariate?

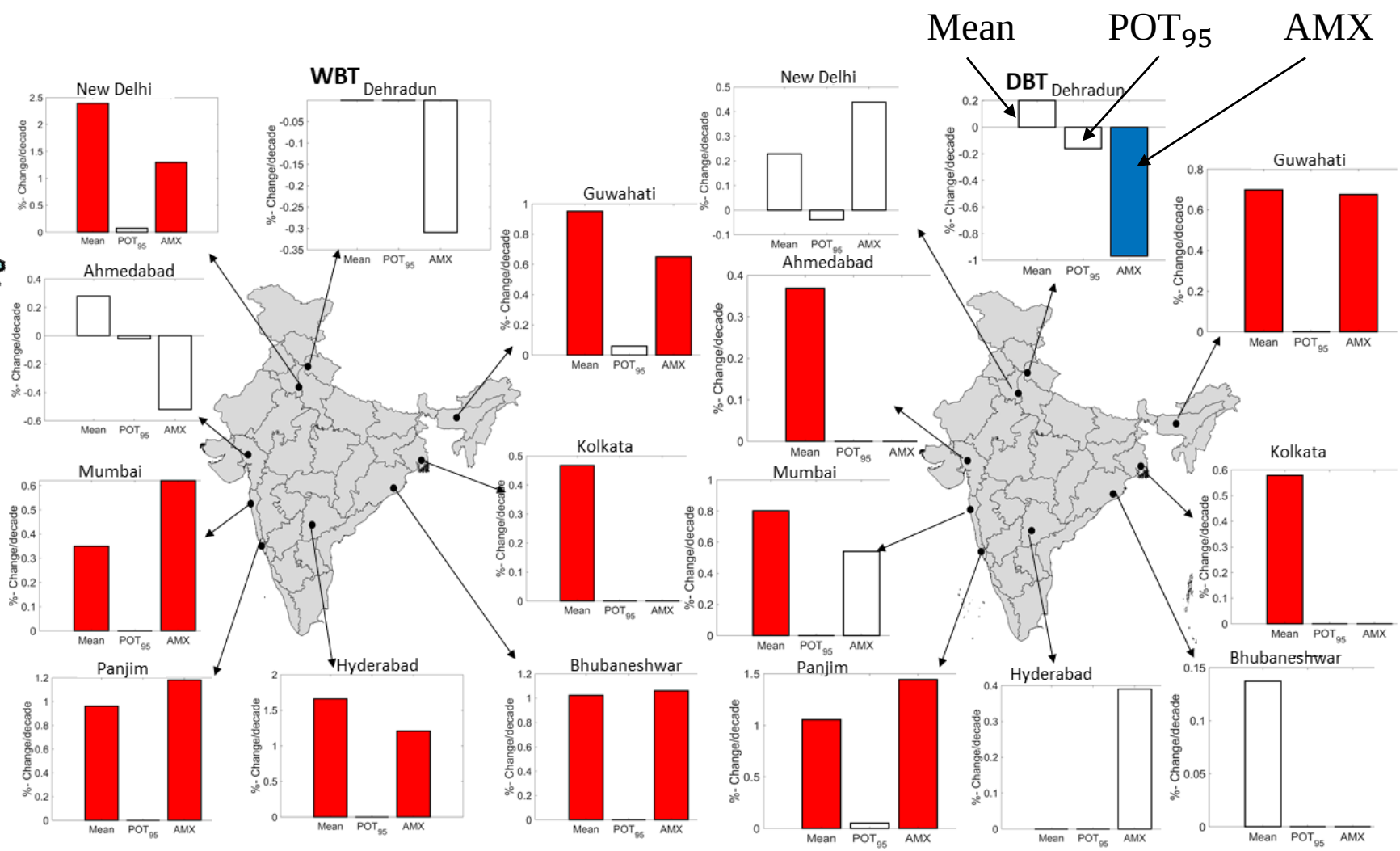
Investigation of hazard cascade – *HHS* has potential to collapse critical infrastructure (e.g., power grid failure), whereas co-incidence of heavy rain endanger storm water drainage system (Rosenzweig, 2018)

Compound Risk of Heat stress – rain induced floods

Trends in Mean & Extreme Dry- vs Wet-Bulb Temperature

Sample Results





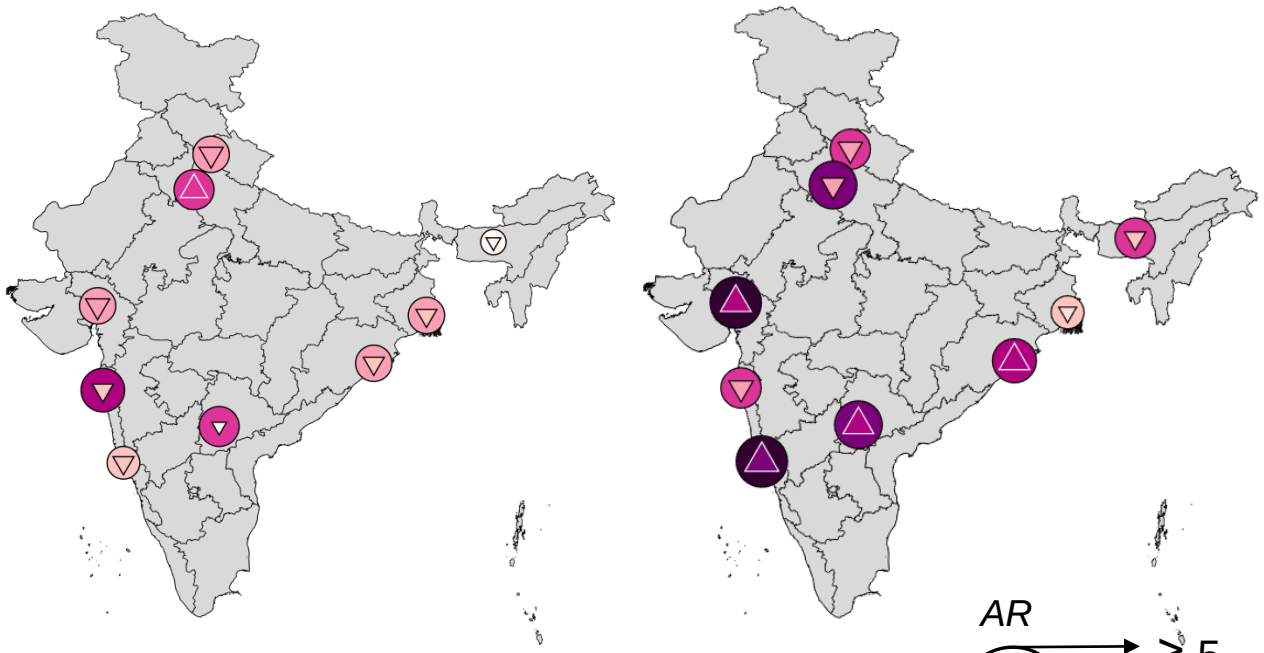
More number of sites show increasing trends in humid heat than the sensible heat stress

Cities are at *Near 'Tipping Point'* with Increase in Humid Heat-Stress

Sample Results

Case I: *POT 96.5p wet-bulb temp. & peak rain*

Case II: *AMX wet-bulb temp. & peak rain*



Amplification Ratio

0.1 0.2 0.5 1 2 5 10

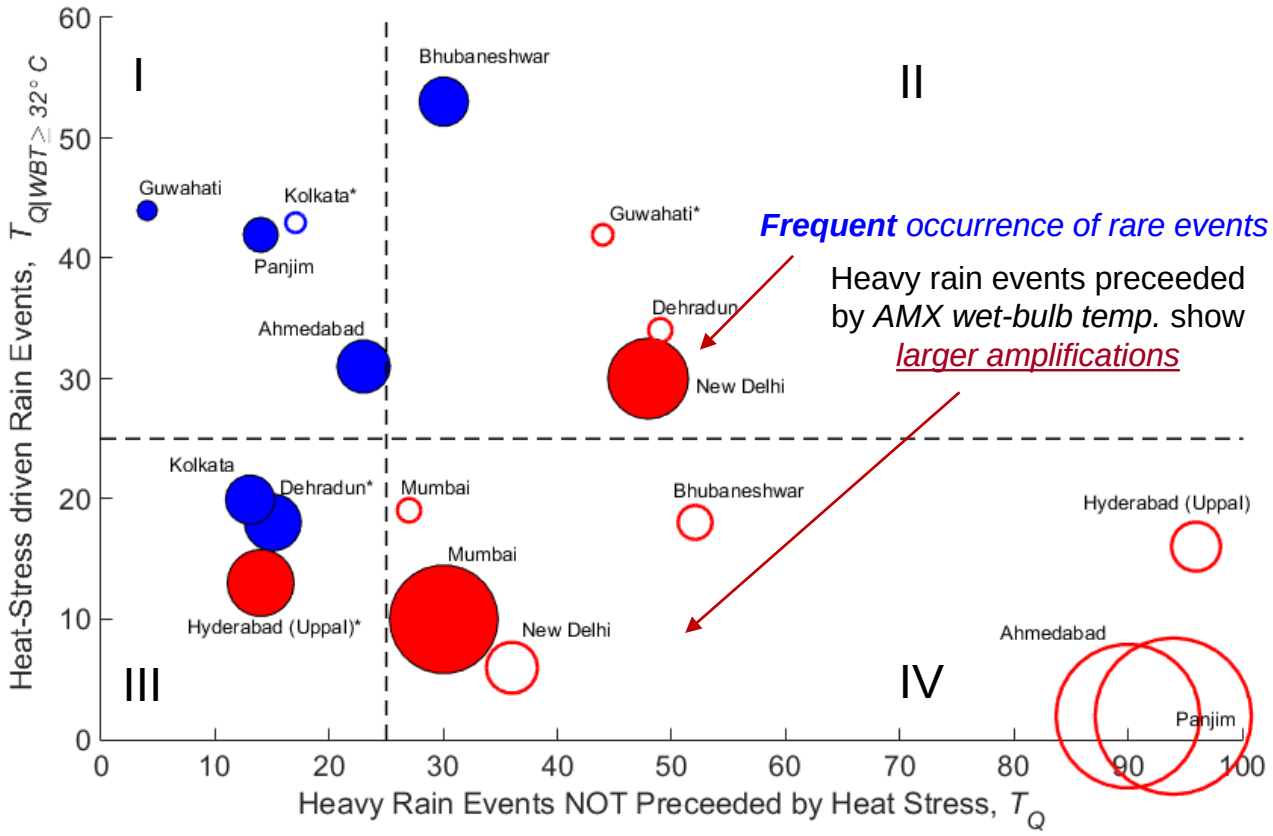
Decreasing hazard *Increasing hazard*

AR ≥ 5 ≤1

△▽ CE driver as 50th*p* WBT ○ WBT ≥ 32°C

Cities at Risk

* Significant dependence, *pvalue* < 0.10



***Frequent** occurrence of rare events*

Heavy rain events preceeded by *AMX wet-bulb temp.* show *larger amplifications*

$$Amplification\ Ratio[AR] = \frac{Peak\ Rain\ Events\ Preceeded\ by\ HHS}{Peak\ Rain\ Events\ NOT\ Preceeded\ by\ HHS}$$