

# Concrete Heat: Characterising Heatwave Changes Over 30 Years of Urbanisation

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Urban heatwaves: rising risk for cities



Concrete & rooftops = more trapped heat

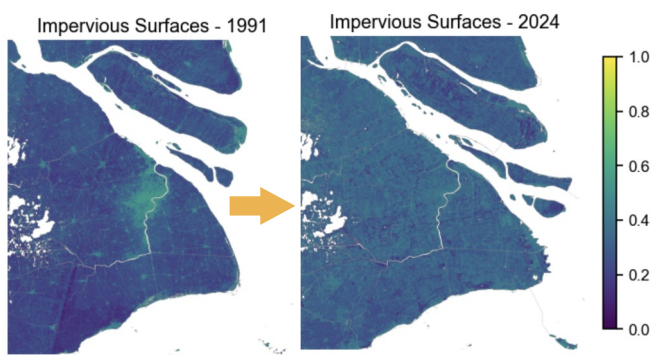


Shanghai: expanding upward and outward

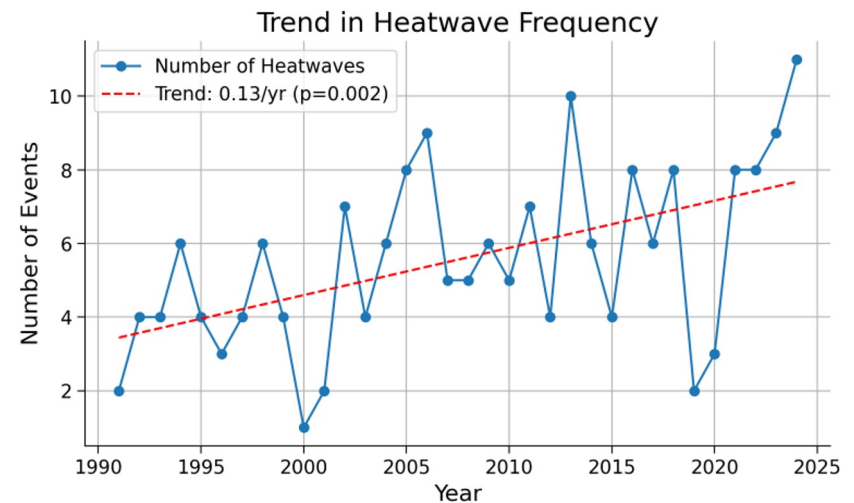


What is the relationship between changing urban land use and heatwave characteristics in rapidly expanding cities such as Shanghai?

# Method - Correlation Urban Land Use & Heatwave Characteristics 1991-2024



Landsat data

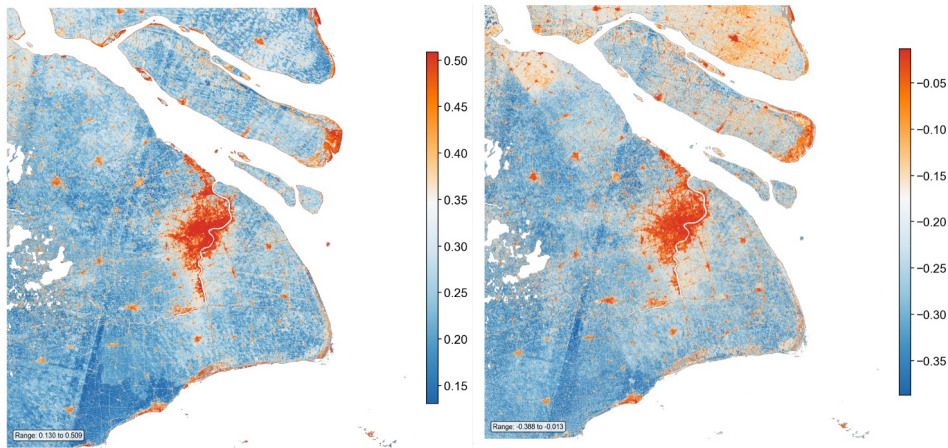


Copernicus Era 5-Land, 2m daily maximum data

How do different measures of urban growth relate to heatwave dynamics?

# Method - Measurements more in depth

## Urbanization



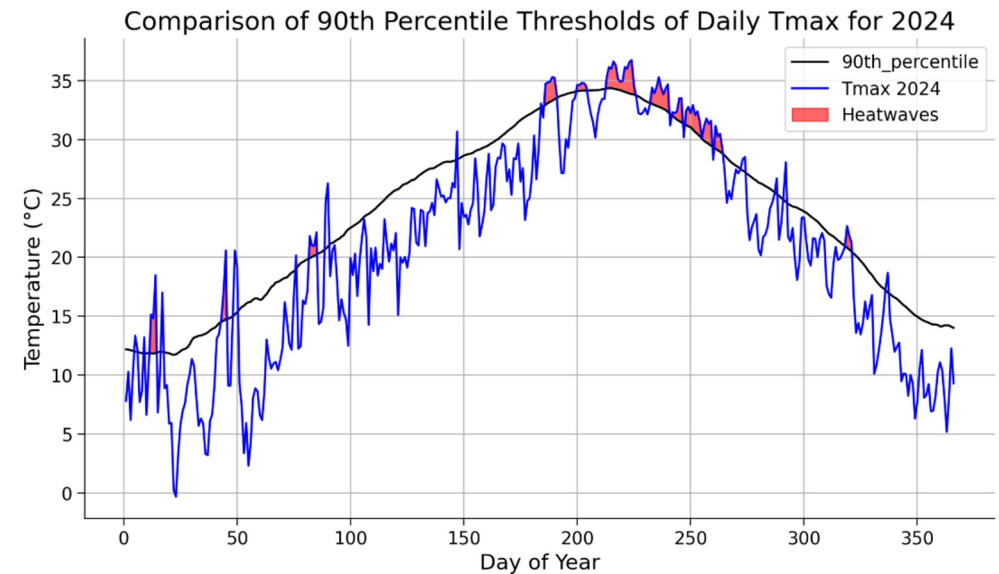
Impervious Surfaces (1991)

Normalized Difference Built-Up Index (NDBI) (1991)

- Captures ground sealing (concrete)
- Absorbs/radiates heat

- Built-up density
- Traps heat + blocks wind

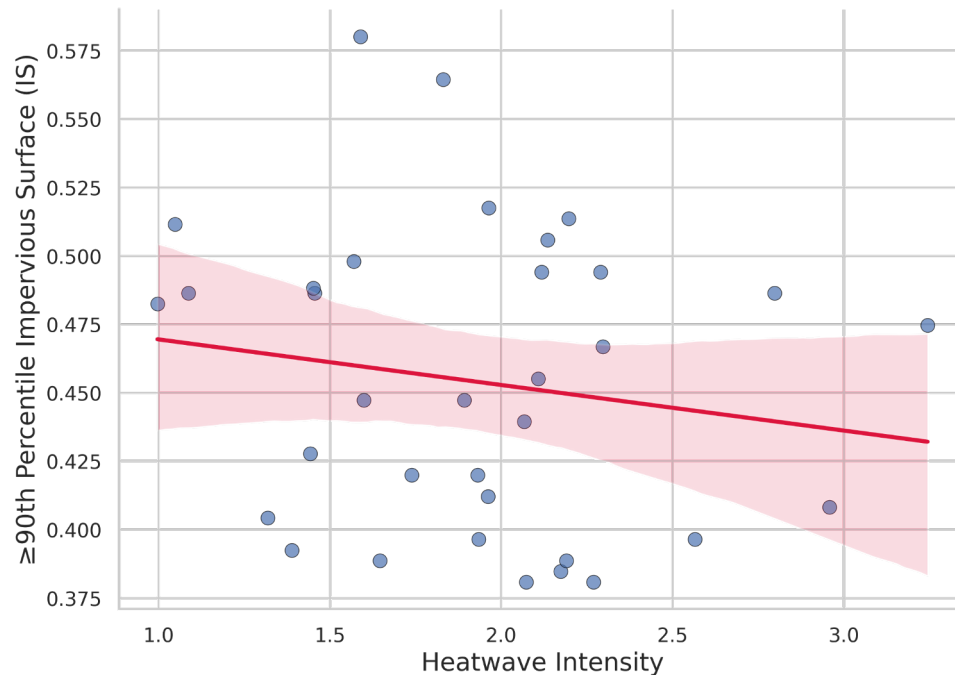
## Heatwaves



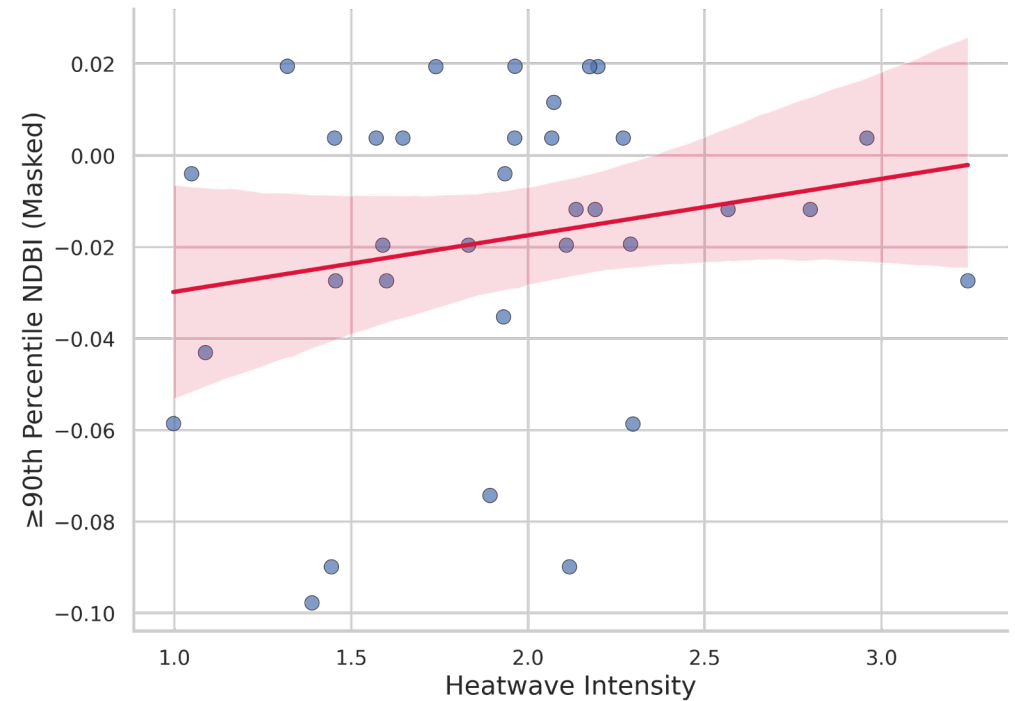
Copernicus Era 5 Land, 2m daily maximum data

# Results - No Correlation between IS & NDBI and Heatwave Intensity

**Impervious Surfaces vs. Heatwave Intensity**  
 $r = -0.16, p = 0.367$

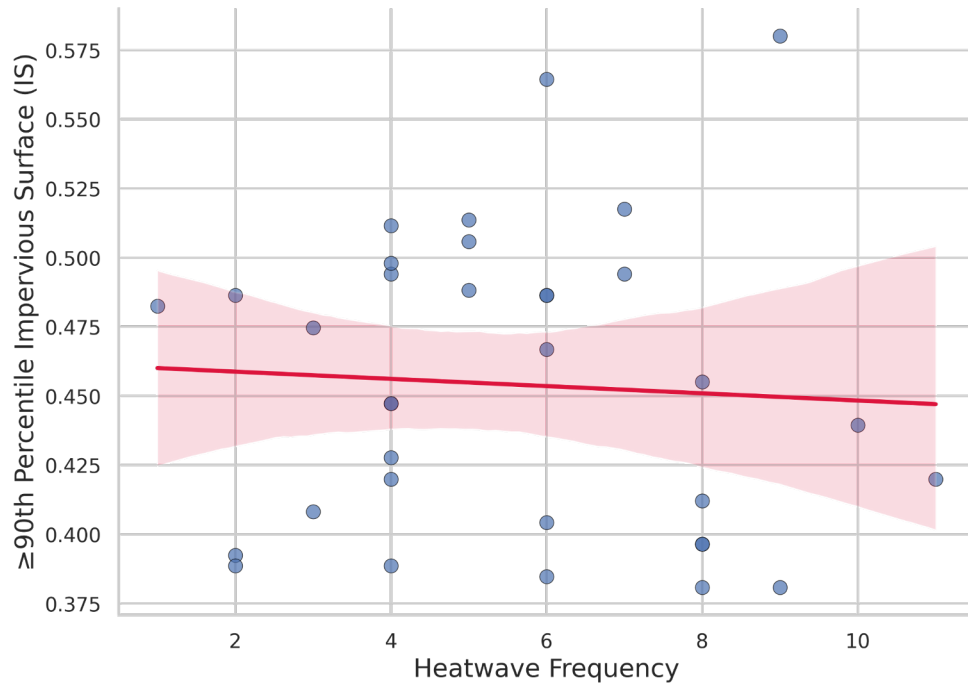


**NDBI vs. Heatwave Intensity**  
 $r = 0.19, p = 0.273$

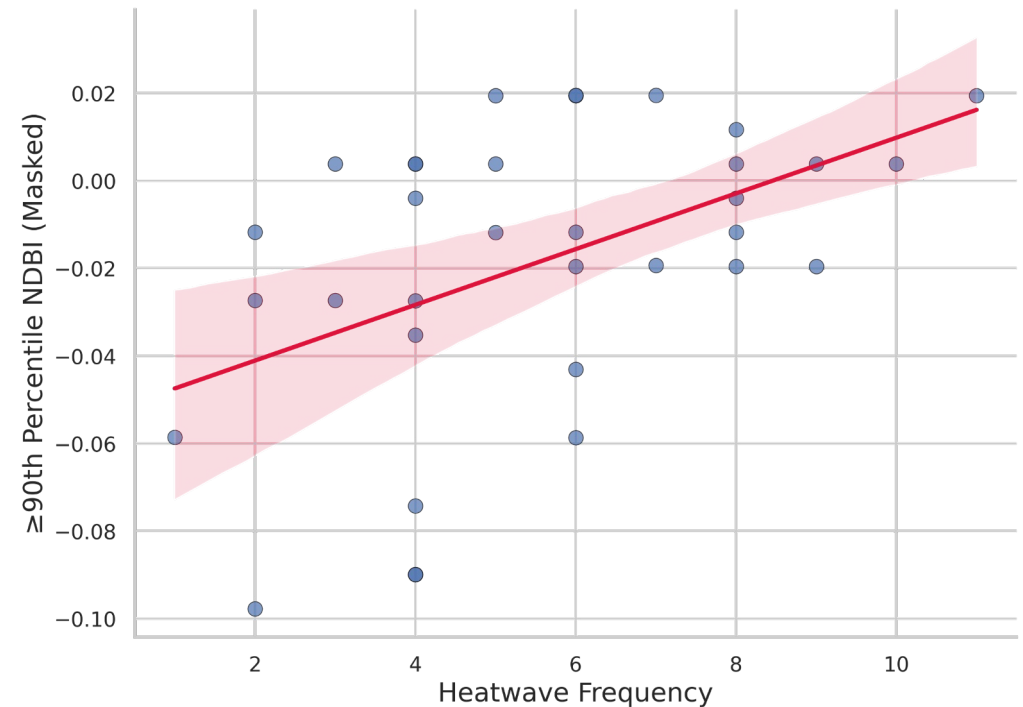


# Results - Correlation between NDBI and Heatwave Frequency

**Impervious Surfaces vs. Heatwave Frequency**  
 $r = -0.06$ ,  $p = 0.739$

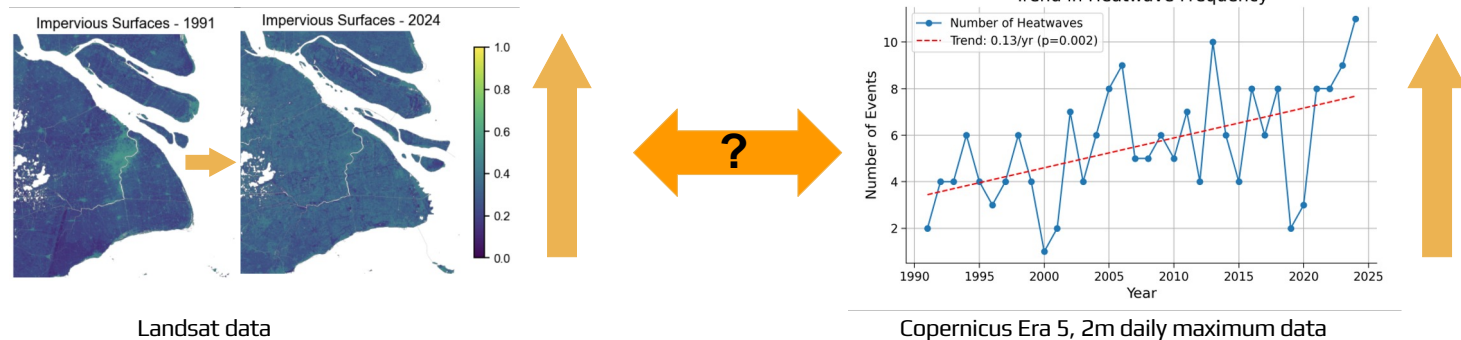


**NDBI vs. Heatwave Frequency**  
 $r = 0.47$ ,  $p = 0.005$





# Conclusion - Urbanisation partly correlates positively with heatwaves



Partly!

Heatwave Intensity ✗

Heatwave Frequency ✓



As heatwave frequency increases, urban planning must evolve to protect public health.

# Future Research



Thank you!