Understanding Urban Heat

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Recent scientific studies project that India will experience seasonal heat waves of increasing frequency and severity in the coming years as a result of anthropogenic climate change. These are likely to present several crucial challenges: from loss of life and property to reduced economic productivity, and from resource (food, water, etc.) pressures to rendering certain places uninhabitable over certain periods of time. The impacts of rising temperatures can be felt even more acutely in urban areas because of the creation of heat islands, owing to the density of buildings, roads, and other material infrastructures and the paucity of natural environments such as green spaces and water bodies.

Given that a large chunk of the urban population in cities of the global South live under conditions of informality—in terms of housing, employment, and transportation arrangements, for example—we are interested in understanding how climate change will impact these population groups and what responses can be developed to minimize potential disruptions. While there is recognition of the challenges that extreme heat events will present for India, and Heat Action Plans at various urban, state, and regional levels have proliferated over the past decade, these remain very programmatic in their orientation, offering little guidance for on-the-ground action. We hope our research can help offset these limitations.

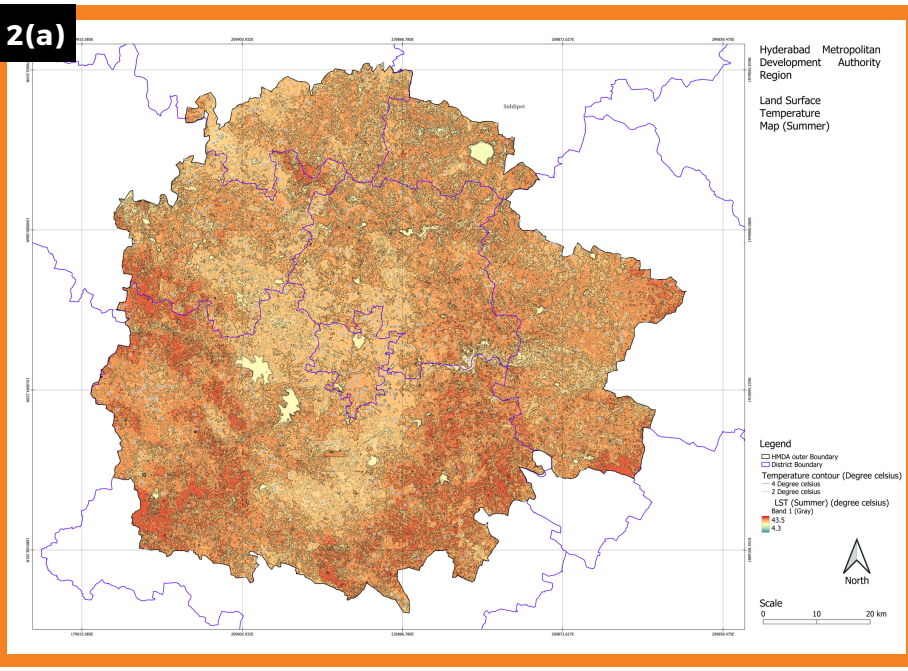
A large portion of the urban population in cities of the global South live under housing conditions that render them additionally vulnerable to the impacts of extreme heat (Image Credit: Goutham Raj Konda).

The effects of adaptive capacities in relation to rising temperatures, however, are unevenly distributed—with some neighborhoods and some residents in better positions than others to shield themselves from harmful thermal exposure.

Our research team explores such issues by focusing on the impacts of and adaptations to rising temperatures among the urban poor in the city of Hyderabad.

Our research approach is highly interdisciplinary, combining city-scale spatial and remote sensing techniques with neighborhood-scale survey techniques and other qualitative methodologies. Based on Land Surface Temperature (LST) data, for example, we have identified slum clusters in the city which are hotter than their immediate surroundings. Through survey work and observational analysis, we have further identified different housing typologies in two urban slums in the city and undertaken software-based modeling of the thermal performance of each housing type based on their construction materials. From this work, we know that houses built with asbestos sheets for both their walls and roofs tend to perform far worse than other houses in such contexts (that variously deploy exposed brick, RCC brick, and tarpaulin sheets). Through qualitative interviews, we have then sought to understand various factors that influence the design of housing in such settings. We know, therefore for example, that concerns over safety and security frequently imply that inhabitants forgo windows in their (already cramped) houses altogether, severely restricting ventilation in indoor spaces. Lack of land tenure in such contexts also implies that inhabitants do not want to invest economic and other resources in housing stock that could potentially better shield them from the elements. Some researchers on the team are examining heat as a gendered phenomenon—focusing on how women in low-income communities experience heat differently (on account of being indoors for a greater portion of their time and undertaking a greater share of domestic work, for example), and the practices and knowledge available to them to adapt to and mitigate the impacts of extreme heat. Another research trajectory is to understand how urban lakes, which are aplenty in Hyderabad, can be conceived as 'cooling infrastructures'. Yet another research theme has been to focus on understanding the emerging health impacts of extreme heat in the region. This research, conducted by N Sai Venkata Sarath Chandra, as part of his MTech research in Climate Change at IIT Hyderabad, makes a case for a dedicated focus on heat health (and climate health more generally) in medical education and practice.

2(a)



Interdisciplinary Climate Change Methodologies:

2(a): Summer Land Surface Temperature (LST) map of the Hyderabad Metropolitan Development Authority (HMDA) territory (Image Credit: Abhijit S. Trimukhe)

2(b): Housing typologies in one informal urban settlement (Image Credit: Abhijit S. Trimukhe)

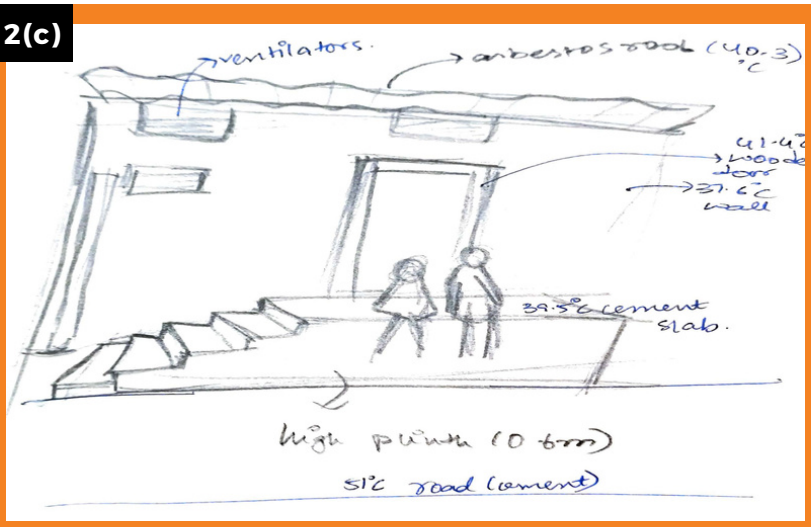
2(c): Hand-drawn sketch documenting temperatures at one house in an informal settlement ((Image Credit: Sanjana Bandaru)

2(d): Factors influencing housing design in an informal settlement (Image Credit: Sakshi Ahuja)

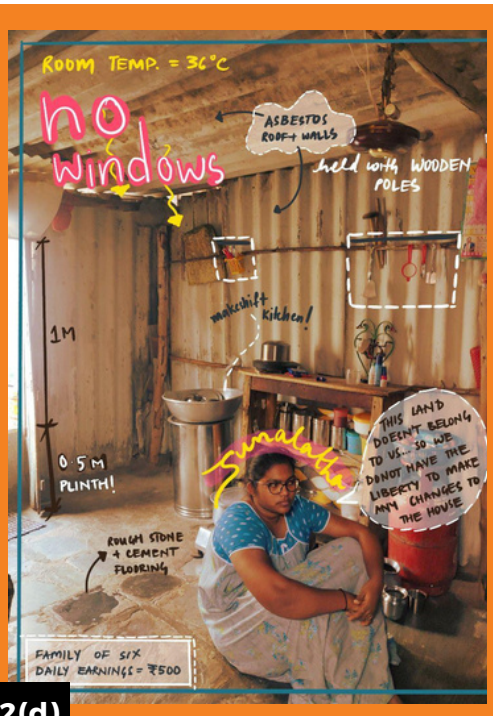
2(b)

Sr. No.	Roof	Wall
1	Asbestos Sheet	Asbestos Sheet
2	Asbestos Sheet	Brick Wall Cement Plaster
3	Asbestos Sheet	Exposed Cement Brick Block
4	Tarpaulin Sheet	Asbestos Sheet
5	Reinforced cement concrete	Brick Wall Cement Plaster

2(c)



Data collection and analysis for this research are still ongoing, but preliminary results are already promising. For us, they underscore the inextricability of climate concerns from other social, cultural, economic, and other considerations. Climate action, in other words, cannot be disconnected from the everyday contexts in which it seeks to intervene. Our research also highlights the need to develop climate methodologies that can move between a bird's-eye view and a worm's-eye view and everything in the middle in order to apprehend the multidimensional nature of the phenomenon that is climate change.



2(d)

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