Contested Atmosphere: The Architecture of Cooling

Marvi Mazhar


GREE
Haier

As a practitioner and researcher of the built environment, I am interested in documenting active mechanical objects on building façades and rooftops in Karachi, and in reflecting on their relationship with the changing urban ecology. The proliferation of these condensers and mechanical cooling towers has created a contested atmosphere, as air-conditioning units cool interior spaces and simultaneously release heat, thereby degrading the environment around multi-story buildings.

The aesthetics and maintenance of a city like Karachi are mired in a volatile mix of financial imaginaries[¶] and broken infrastructure. For more than a century, social relations in the urban metropolis have been linked to economic circulation and aspirations of becoming a global city. As many urban centres in South Asia have adopted this global outlook, the exigencies of development and urban interventions have not catered to human needs or to the relations among various living inhabitants of the city's environment.

This essay presents extracts from an ongoing conversation between a Heating, Ventilation and Air Conditioning (HVAC) consultant and me. I am the mediator between him and the city as I use a visual ethnographic methodology on my Sunday walks through parts of old Karachi. I document and send the consultant an image, along with my observation and questions, and he responds on WhatsApp via voice notes.

Recently while waiting in the back alleys of I.I. Chundrigar Road, I encountered Akbar Manzil—one of the low-rise corporate buildings from the 1950s occupied by the Jang Media Group. As I stood near the back elevation and observed multiple rows of cooling units, I felt a sheet of hot air around me and was compelled to imagine the internal environment. I noticed that these active mechanical objects were camouflaged by green vines which were drawing sustenance from air-conditioner filters and clogged drains. This juxtaposition of nature with external mechanical infrastructure highlighted the dichotomy between the inside and outside.

In my initial conversations with the consultant, I learnt how the capacity of each HVAC system is calculated using a conversion formula, and that there are two mechanisms for reducing temperatures in interior spaces: air-cooled condensers and cooling towers. Understanding heat and calculating its intensity in the built environment requires information about external parameters such as the relationship among the façade, construction material used in external walls, roofs, appliances, and lighting infrastructure.[♯]

[¶] Financial imaginaries are variously described as sociocultural constructions through which money, credit, and trust circulate.

[♯] The following formula is used to calculate how much heat a cooling infrastructure disperses outwards: each ton of air conditioning= 12000 BTUs/hour = 3.4 KW heat energy produced.

Gradually, my focus shifted towards understanding cooling infrastructure in regards to its heat impact and relation to ecology. I enquired about the problems the city faces due to heat fluctuation and the warming effects of large-scale cooling application methods, especially since climate change has become a focal point for planners, policy makers, and NGOs concerned with heat governance. He responded: 'Refrigerants[¶] contribute majorly to ozone depletion. The Montreal Protocol was signed in 1987 to phase out refrigerants of that time to protect the ozone layer. The Kigali amendment of 2016 further proposed to replace these substances with new, safer and cleaner technologies, but this still awaits implementation.'

Flawed infrastructure planning and the introduction of cooling infrastructures in a congested concrete jungle have brought the heat-exhausted city to a critical juncture. In megacities like Karachi, the responses to overheating by city planners, policy makers, and urban governance remain top-down and counterproductive.[1]

Compared to 1960, night-time temperatures in Karachi have risen by around 2.4 °C and daytime temperatures by 1.6 °C.[2] In 2015, a deadly heat wave killed more than 1,200 people in the city. Human activity has raised global temperatures by approximately 1.1 °C since preindustrial times, and studies show that nearly 70 percent of cities worldwide are impacted.[3] I asked whether central air conditioning is a sustainable response to this increasing heat. '[Its negative impact] can be reduced by using multiple sustainable techniques such as green facades, performance glass, improved lighting design, and the inclusion of generous internal courtyards and wind shafts. Air conditioning is currently the only solution available, and natural ventilation can't help because the outdoor temperature is 42 °C and indoor temperature is 34-35 °C, and it can't come down to 23-24 °C [any other way].'

My experience working with heritage buildings has made me look at construction materials used in the past with greater humility and made me appreciate regional architectural decisions. These include thick walls that naturally cool the inside from outside; the mandatory verandah or *aangan* and semi-covered corridors or courtyards that act as buffers from heat; strategically located skylights or *roshandaans* that ventilate rooms while also allowing in sunlight; lime as a core binding material that strengthens and waterproofs surfaces; and lastly, strategically placed windows that provide cross-ventilation. These characteristics, commonly found in residential buildings along with the use of *brise soleil*[♯] in public buildings, were both easy to maintain and environmentally safe.

[¶] A refrigerant is a chemical substance that absorbs heat and transfers it to another substance, typically in a cycle, to cool air or objects. These are used in a variety of appliances including air conditioners, refrigerators, and other cooling machines.

[♯] An external architectural feature through which sunlight can be deflected.

As my conversation on HVAC systems continued, the consultant verbally described the blueprint of the sophisticated mechanical infrastructure. He listed the locations of this complex technical equipment all over the building: air handling units on each floor; fan units in each window; and chillers and cooling towers in the plant room, on the roof, and in the basement. These units are spread out and require ongoing observation-based maintenance and management: split air conditioning needs filter cleaning every 15 days and deep cleaning every year; chillers need a large technical operating team to clean and maintain the heat levels on a bi-monthly basis.

As I stand on the 14th floor of a newly constructed glass-and-concrete high-rise building and look down at the deck of an adjoining building, I cannot ignore the large cooling towers. I sent an image to the consultant and asked how these are managed and maintained. Amid the vastness of a city with a population of 20 million that's facing massive problems of urban growth, I quietly watch the pigeons play in the water from the chillers—a harsh reminder of the neglected outer environment and ecology's silent relationship with mechanical infrastructure. The stark glare of the sun piercing through large glass panes is enough to make me imagine the heat outside even as my body is cooled by large vents inside.

New buildings are engineered machines, active 24 hours. In a city like Karachi where foliage is scarce, building facades are often used by birds to perch and nest, but the heat released by cooling towers is harmful for them. If these mechanisms are not regularly cleaned, the condensate they produce may become contaminated and unsafe for birds to drink. In this way, mechanical cooling objects have a direct impact on the microclimate around these high rise buildings.

Notes

1. Anwar, et al. Designed to Fail?, 5.
2. Ibid., 12.
3. Bazab et al., Summary of Urban Policy Makers, 11; Carrington, "Climate Crisis Has Shifted the Earth's Axis, Studies Show."

Anwar, Nausheen H., Hassaan F. Khan, Adam Abdullah, Soha Macktoom, and Aqdas Fatima. *Designed to Fail? Heat Governance in Urban South Asia: The Case of Karachi*. April 2022.

Bazaz, Amir, et al. *Summary for Urban Policy Makers: What the IPCC Special Report on Global Warming of 1.5°C Means for Cities*. December 2018. https://doi.org/10.24943/SCPM.2018

Carrington, Damian. "Climate Crisis Has Shifted the Earth's Axis, Study Shows." *The Guardian*, April 23, 2021. https://www.theguardian.com/environment/2021/apr/23/climate-crisis-has-shifted-the-earths-axis-study-shows

Credit: *Contested Atmosphere: The Architecture of Cooling*, 2025, photographs and drone images. Karachi, Pakistan (Photos by Marvi Mazhar and drone assistance by Mohib Hassan).