The cooling trap: how Asia's air conditioners are making heatwaves worse

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As heatwaves become more frequent and intense across Asia, the region faces a dangerous power paradox. Soaring demand for air conditioning threatens to push electricity grids closer to failure just as extreme heat puts the infrastructure under greater strain, raising the risk of cooling disappearing when people need it most. That risk has been visible across the region this summer.

In South Korea, President Lee Jae Myung called a record heatwave a "national disaster" in August after the death toll rose to 19, ordering officials to inspect power systems as air-conditioning demand surged.

In Japan, 39 people died of heatstroke across Tokyo's 23 central wards in August. Of those deaths, 37 occurred indoors, with 31 involving people who were not using air conditioning.

In India, an extended spell of hot weather pushed peak electricity demand close to a record in May. Cooling needs kept demand at about 267 gigawatts over several days, leaving nearly a third of coal-fired power plants operating with critically low fuel stocks.

Heatwaves drove spikes in electricity demand as more people turned to air conditioning, especially during peak hours from late afternoon to early evening, said Eduard Muljadi, a power systems expert and electrical engineering professor at Auburn University in the United States. "At the same time, the grid's infrastructure, especially transmission lines and transformers, is stressed by the heat itself," Muljadi said on the university's website. "These components can overheat, lose efficiency and become more prone to failure."

He added that the efficiency of both thermal plants and renewable energy sources could drop during peak heat.

Karachi offers one of the starkest examples of what happens when extreme heat and power failure collide. Eleven years ago, as Pakistan endured a record-breaking heatwave, chronic outages left residents with few ways to escape scorching temperatures, contributing to more than 1,200 deaths. The city's grid repeatedly failed for 12 hours or longer, turning fans and air conditioners into useless ornaments.

As air-conditioning ownership expands across Asia, the number of people and power systems exposed to those risks is likely to grow.

Total demand for cooling technologies rose by 50 per cent from 2015 to 2025, according to data from the International Energy Agency. In 2025, global demand reached roughly 2,900 terawatt-hours – more than the European Union's total electricity consumption that year. By 2035, the IEA estimates total global demand for space cooling will reach 4,500 TWh.

In Asia, the combination of intense heatwaves and rising middle-class incomes is set to fuel a rise in air-conditioning ownership over the coming decades, particularly in developing countries.

In Indonesia, the IEA expects the share of the population owning an air conditioner to rise from 14 per cent in 2023 to 85 per cent by 2050.

That growth is not being driven by heat alone. Yuyu Zhou, a geography professor at the University of Hong Kong, said extreme heatwaves and rising incomes across Asia's developing economies both contributed to the cooling demand spike.

Rising household incomes made air-conditioning purchases feasible for more families over time, while extreme heat served as the immediate catalyst for those purchases, he says. "We find that countries like India and Indonesia are right at the steepest part of the curve, where one extreme heat season, combined with rising incomes, can unlock a huge amount of new demand almost overnight," Zhou said. But as more units are installed, they change the urban environments they are meant to make more bearable.

Air conditioning directly adds to the urban heat it is meant to relieve, according to Yuan Chao, an urban climate researcher and architecture professor at the National University of Singapore. Each unit releases hot air back into the atmosphere, contributing to "anthropogenic heat" or heat generated by human activity.

Visitors walk past a cooling fog installation at Gwangmyeong Cave in Gwangmyeong, South Korea, in August (photo by AP)

Zhou adds that air-conditioning use could drive up nighttime temperatures in particular, pointing to Chongqing's 37-day extreme heatwave in 2022 that pushed temperatures to 45 degrees Celsius (113 degrees Fahrenheit), making it the Chinese city's hottest August since records

began in 1961. Urban waste heat – including heat expelled by air conditioners – accounted for almost half of the total nighttime warming during that heatwave, Zhou says.

Simply using less air conditioning is not a viable answer because cooling could also protect health, particularly among elderly and vulnerable people, Chao notes. “If it’s very hot outside, they stay at home 24 hours,” Chao said. “But they don’t want to use AC [air conditioning] for 24 hours, otherwise it will be very expensive. They just tolerate, tolerate, tolerate.”

Singapore offers an example of how governments can address these competing pressures. Under its Climate Friendly Households Programme, eligible households can claim S$400 (US$312) in vouchers towards energy-efficient air conditioners. Meanwhile, the city state’s national heatwave response plan opens air-conditioned cooling centres in public community facilities when extreme temperatures are forecast, prioritising vulnerable residents and older people.

Zhou said making air conditioning more efficient and affordable is an important part of solutions. Models currently on the market vary widely in efficiency, with older, less efficient units typically costing less up front. To encourage people to buy more efficient models, Zhou suggested vouchers, rebates or trade-in programmes. Governments could also enforce minimum energy performance standards to prevent inefficient systems from entering the market entirely, he said.

But reducing the need for mechanical cooling is also important. When implementing urban cooling measures in existing cities, Chao said planners should first identify key air passages that allow wind to ventilate dense neighbourhoods. Those areas could be designated as “no-build zones”, he said, with planners advised against putting up additional structures that could block the flow of cooler air.

Other strategies include strategically planted shade trees, cool roofs painted in light reflective shades and sky gardens.

For cities with tighter budgets, Chao said improving wind ventilation was the most cost-effective first line of defence. “Wind is free,” he said.

Cities could also ease grid pressures by encouraging people to use fans instead of or alongside air conditioners and shifting their non-essential energy use away from peak demand hours, Zhou said. “This integrated approach protects public health while limiting waste heat, emissions and blackout risks during extreme heatwaves,” he adds.