

# SCORCHED

Extreme Heat and Real Estate in Asia Pacific



SHUTTERSTOCK



# SCORCHED: EXTREME HEAT AND REAL ESTATE IN ASIA PACIFIC

In 2013, Australia added deep purple, a new colour used for the first time anywhere in the world, to its weather maps to show record temperatures over 54°C<sup>1</sup>; in 2018, Japan declared a disaster when about 30,000 were admitted to hospitals during a heat wave.<sup>2</sup> That same year, South Korea recorded its hottest temperature in over 110 years,<sup>3</sup> and Hong Kong SAR experienced a 15-consecutive-day heat wave, during which indoor temperatures in buildings without air conditioning were 10°C hotter than outdoors.<sup>4</sup>

Soaring temperatures and dangerous heat waves are the uncomfortable reality in communities across the Asia Pacific region. Extreme heat has the potential to cause devastating public health consequences, infrastructure deterioration, and even long-term impacts on local economies. The built environment is both affected by higher temperatures and can contribute to them through the absorption of heat and the emission of waste heat.

ULI's 2019 review *Scorched: Extreme Heat and Real Estate* outlines how real estate and land use practitioners can mitigate the effects of extreme heat on people and infrastructure with thoughtful design and consideration of temperature-related risks. Through 'extreme heat resilience', developers can realize the business benefits of early resilience leadership and contribute to the long-term success and liveability of communities. Implementing heat-mitigation features that reduce temperatures day-to-day also increases resilience by helping prevent infrastructure failures and safeguarding lives during extreme and co-occurring events.

Real estate sector investment in extreme heat management could be especially meaningful in Asia Pacific markets where climates are historically hot and changing rapidly; megacities amplify urban heat dynamics; and a significant number of people are vulnerable to heat-related impacts.

## INCREASING TEMPERATURES, INCREASING IMPACTS

If climate change continues at the 'business as usual' rate, the impacts of extreme heat – especially on economies and health – are projected to be the most severe in Asia Pacific countries and especially in Southeast Asia. Extreme heat is likely to measurably reduce country-level gross domestic product (GDP), potentially by as little as 0.02 per cent in wealthy, developed economies such as Singapore but as much as 10.7 per cent of GDP in countries with larger agricultural markets such as the Philippines.<sup>5</sup> Heat stress during Australia's unusually warm 2013–2014 year, for example, cost the country an estimated A\$7 billion (US\$6.2 billion) from lost productivity and heat illness.<sup>6</sup>

GDP losses could affect cities' ability to raise capital (through taxes, for example) and the availability of capital for developers (as investors move to markets where heat impacts to their real estate investments are less severe or better mitigated by developers and cities).

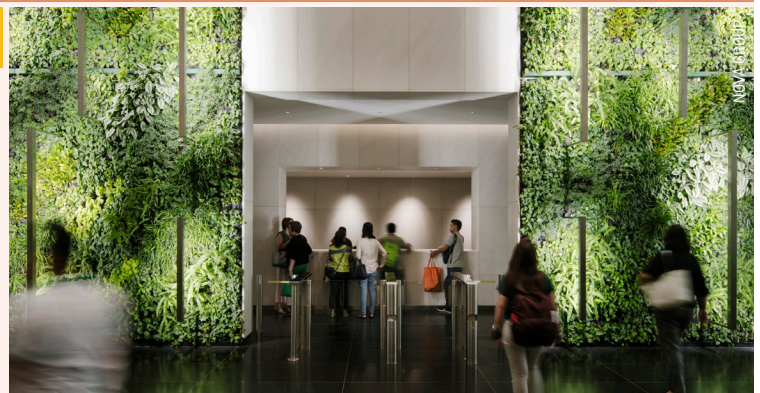
In the near term, the number, duration, and intensity of extreme heat events in Asia Pacific are projected to increase significantly. The World Health Organization estimates an additional 1,500 heat wave-related deaths in Asia Pacific's high-income countries by 2030; in Japan, for example, heat wave-related fatalities (2,000 per year as of 2018) could increase 170 per cent.<sup>7</sup>

By mid-century, average temperatures across Asia Pacific are projected to increase 2°C with as much as 6°C of change in some areas.<sup>8</sup>

## SOLUTIONS FOR BUILDINGS

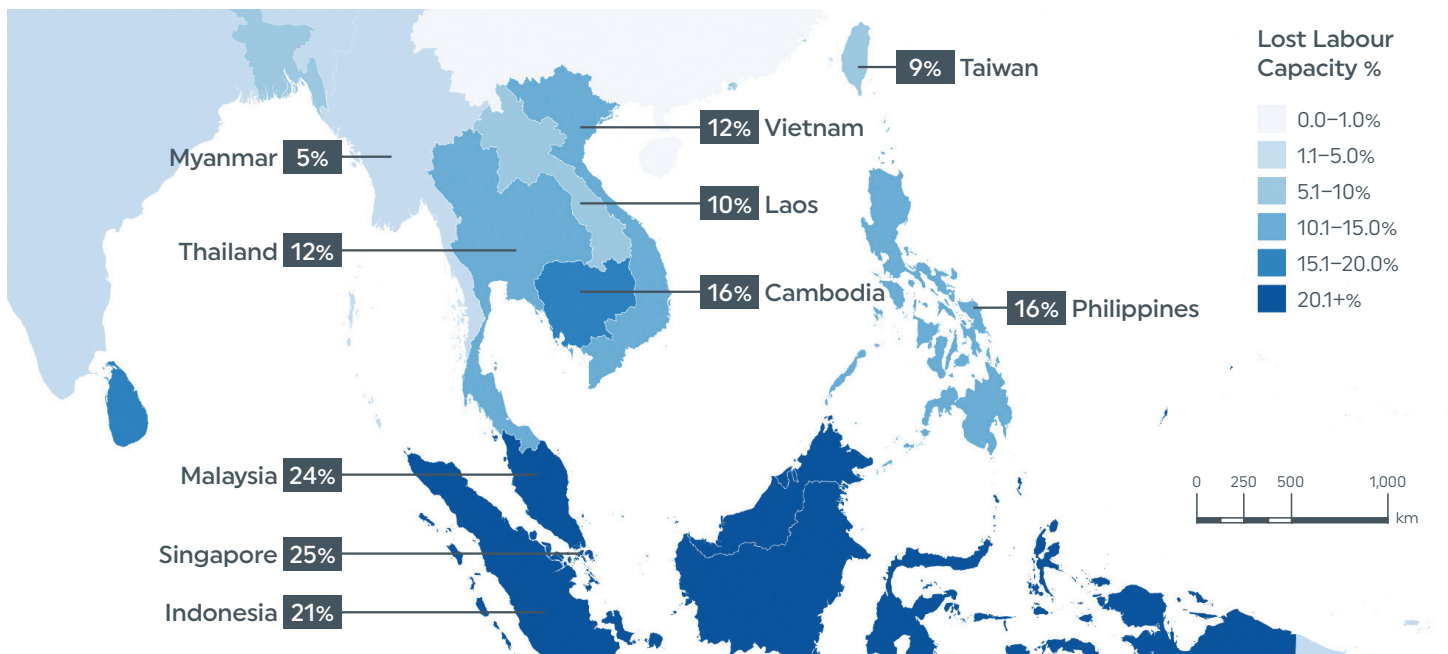
Significant opportunity exists to design and build to alleviate urban heat island effects and safeguard human health. Developments can prevent the absorption of heat with light-coloured surfaces and materials, provide direct cooling with increased shade from built and natural shade canopies, and better cope with extremes through 'heat-aware' building envelopes and HVAC choices that stabilize indoor temperatures even during power outages. Installing cool (light-coloured) or green (vegetation-covered) roofs is almost always an effective way to insulate the building (reducing energy use and preventing heat gain) while potentially adding amenity space.

For a detailed list of extreme heat resilience strategies, visit [uli.org/extremeheat](http://uli.org/extremeheat).



Green roofs and walls, like the one above at NEX Tower in Manila, can help reduce local temperatures and act as attractive amenities.

## PROJECTED LABOUR CAPACITY REDUCTIONS IN SOUTHEAST ASIA BY 2045 FROM HEAT STRESS



High temperatures decrease productivity for both indoor and outdoor workers, with estimated productivity losses caused by heat stress as high as 45 per cent by 2045 across Southeast Asia. (ULI, adapted from Verisk Maplecroft)

### URBANISATION AND EXTREME HEAT

In addition to rising temperatures from climate change, many communities are likely to experience higher-temperature days; longer, more frequent heat waves; and intensified impacts in cities where 'urban heat islands' form because of the heat-absorbing properties of urban surfaces. Individual buildings are affected by external high temperatures, which cause material wear and tear, increase cooling costs, and threaten grid stability contributing to blackouts.

**The size and density of cities influence urban temperatures, which is especially significant in Asia Pacific, which has more than 13 megacities.**

The size and density of cities greatly influence urban heat island formation, a significant factor in Asia Pacific where urban development has occurred at unprecedented rates and which has more than 13 megacities.<sup>9</sup> Cities that are large (in land area and population) and densely developed usually have more significant heat islands than smaller, more sprawling, and less dense cities.<sup>10</sup> However, higher-density cities also offer important opportunities for sustainable and energy-efficient living that can be combined with extreme heat resilient best practices to mitigate the urban heat island effect.

### EXTREME HEAT POLICY

Regulation that addresses extreme heat and the built environment varies from country to country. Urban greening (for flood control and urban heat island mitigation) is a common best practice. Bangkok, for example, set a goal of establishing 50 new city parks,<sup>11</sup> and Tokyo provides subsidies for the greening of rooftops.<sup>12</sup>

Melbourne implemented the world's first target to reduce citywide average temperature – a goal of 4°C reduction by 2030.<sup>13</sup> The city is increasing tree planting and encouraging green roof installation to achieve its goal. To provide a cooling network of open spaces, Melbourne also amended its Planning Scheme with recommendations that developers make land contributions as part of new construction, with higher percentage contributions in rapidly growing areas.<sup>14</sup>

Energy conservation is another focus, and entities such as Singapore, Japan, South Korea, Taiwan, Hong Kong SAR, and China have expanded efficiency programs from the industrial to the building sector.<sup>15</sup> Reducing energy cooling needs can help eliminate the waste heat that contributes to higher urban temperatures. Reduced energy consumption also lessens electricity demand and pressure on the grid during times of high heat stress, helping prevent blackouts. Following the 2011 tsunami and Fukushima nuclear accident, Japan implemented a *setsuden* power-saving campaign and mandated that big power users reduce peak consumption. Many countries have domestic green building rating schemes, although some assess design only and do not verify performance.<sup>16</sup>



## KEY TAKEAWAYS: EXTREME HEAT AND DEVELOPMENT CONSIDERATIONS IN ASIA PACIFIC

Extreme heat is an increasingly common planning consideration in many global real estate markets. Some leading developers, designers, and policymakers in Asia Pacific countries are already considering temperature-related risks in their work, and for others, extreme heat is a newer focus.

Urban trees, such as in Xi'an, China, provide essential environmental services by minimizing the urban heat island effect, reducing air pollution, and managing stormwater.





DANING 1 CHONGBANG

For the development team of Life Hub @ Daning, a large-scale, retail-anchored mixed-use project in Shanghai, creating a comfortable environment was part of attracting users to the site. Trees, green building facades, and shading structures such as umbrellas reduce ambient temperatures, especially in pedestrian areas, and the orientation and massing of the buildings create a 'wind tunnel' through the main plaza for added cooling.

## The urban heat island effect is substantial in many Asia Pacific cities

A 2015 review of temperatures collected in 100 cities across Asia and Australia documented that the urban heat island effect is raising local temperatures as much as 11°C as compared with surrounding more rural areas.<sup>17</sup>

## Extreme heat is a public health risk, particularly for low-income and elderly communities

Extreme heat causes the greatest damage in populations with other vulnerabilities, such as preexisting health conditions or lack of available coping strategies. People with low incomes are at high risk from extreme heat because they typically live in neighborhoods that, lacking green space, are hotter than the city average. People with low incomes also often live in substandard housing (including informal settlements) that lacks weatherproofing and climate control.

Outdoor workers (such as agricultural or construction labourers) are routinely exposed to extreme heat, given the nature of their work. Hot temperatures are also associated with higher incidence of certain diseases (especially when heat waves occur during flooding or heavy rainfall); a rise in vector-borne diseases such as dengue;<sup>18</sup> and droughts, threatening food supply and livelihoods in some rural areas.

Cool design strategies, combined with public health and effective emergency responses, can offset heat-related mortality to a significant degree. In response to market demands for cooler environments, one emerging strategy is to incorporate air conditioning, a life-saving technology in many cases, into new construction or building renovations (although adding air conditioning also has negative cost and environmental implications).

## Leading developers and designers are considering extreme heat when implementing best practices in sustainability and energy efficiency

Extreme heat resilience strategies that contribute to energy conservation (such as orientation to minimize solar heat gain and cool roof installations) often produce cost savings, become preferred tenant locations, and help developers achieve international and country-specific certifications. The CapitaGreen office tower in Singapore, for example, draws in cool air through an artful rooftop 'cool void crown', reducing annual energy bills by 10 per cent and helping the building earn Platinum-level certification under Singapore's Green Mark program. CapitaGreen has been 99 per cent leased since it opened in 2014 and is earning a 10 per cent rental premium.<sup>19</sup>



## Managing extreme heat is a critical component of placemaking and product quality

User experience and comfort is a recurring theme, especially for walkable, transit-oriented, and retail environments. Outdoor spaces designed to provide cooler environments may have enhanced foot traffic, sales, and brand visibility while properties with 'cool design' features may experience similar benefits when available as a productive environment during normal hot-weather months and during extreme heat events.

Link REIT, which operates more than 50 markets in Hong Kong SAR, has implemented a Fresh Market Strategy, renovating many existing buildings by removing internal walls between vendors to improve air circulation and adding air conditioning. 'Simply adding air conditioning has made a big impact in terms of how many people come to and shop longer in the markets,' says Calvin Kwan, general manager of corporate development and strategy. 'The Fresh Market Strategy is a really good business case for dealing with heat and turning a negative issue (heat) into a strong business opportunity. However, with more people coming in to avoid the heat, we have to think about more air conditioning efficiency.'

## Extreme heat is one of the key issues, especially in Asia Pacific.

**CALVIN KWAN**  
General Manager of Corporate Development and Strategy, Link REIT

### Extreme heat mitigation requires balancing temperature reduction with humidity management

Local conditions – especially humidity level, which is a significant human health factor – determine which mitigation and adaptation strategies will be effective and appropriate. The frequently implemented strategies of evaporative cooling (water fountains and misting fans, for example) and vegetation (plants dissipate heat by evaporating water) can sometimes increase humidity locally and are most effective in dry environments. Developers with properties in humid locations can assess the efficacy of evaporative strategies and focus on installing non-vegetative shading, optimizing ventilation and HVAC, reducing waste heat, and choosing building materials that absorb less heat.

### DESIGN INNOVATION

Developers and designers are increasingly implementing green building innovations and testing emerging heat mitigation technologies in Asia Pacific. At Singapore's 101-hectare Gardens by the Bay, futuristic solar-powered "supertrees" are an attraction and a cooling strategy.

Designed by Grant Associates with architect Wilkinson Eyre Architects and engineers Atelier One and Atelier Ten, each supertree is 25 to 50 metres tall. Two trees are connected by a 128-metre aerial walkway.<sup>20</sup> The trees provide shade to pedestrians enjoying the walkways and gardens underneath, and the plants that grow vertically on each tree trunk provide natural cooling and heat dissipation through evapotranspiration (the process by which plants evaporate water). The trees also act as heat exhausts, venting residual hot air from the nearby Energy Centre away from street level.<sup>21</sup>



Inventive 'supertrees' attract visitors and are a cooling strategy, shading underlying recreation spaces and venting waste heat from a nearby building away from pedestrians.

## HEAT-AWARE ENERGY EFFICIENCY

Energy efficiency and heat-aware design at NEX Tower, a 38,000-square-metre premium office building in Manila, are producing cost savings and preparing developer-owner Nova Group for an expanding sustainable building market.

Completed in 2018, NEX Tower features an efficient curtain wall with double-paned glass, the most efficient air conditioning on the market, and LED lighting and automated lighting controls (minimizing waste heat). 'We also studied sun shading devices for the external facade,' elaborates Ricardo Cuerva, managing director at Nova Group, 'but we found they weren't necessary because the building is in shade from the surrounding buildings most of the time, limiting the solar heat gain.'

A shaded rooftop deck also prevents heat build-up on the top floors. Green walls, two of the first in the Philippines, attract significant tenant and media attention, help improve air quality, and likely contribute to lower temperature 'microclimates' where installed in an outdoor meeting space and main lobby.

'It was a holistic approach to sustainability,' says Cuerva. NEX Tower has earned LEED Platinum certification. Cuerva expects that estimated 30 per cent lower electricity costs will be attractive to tenant companies, especially as the market for sustainable building matures.



NOVA GROUP

The cooling design elements at NEX Tower are part of a holistic sustainability strategy to manage operations costs and attract tenant companies.

## Extreme heat mitigation policies often support other regulatory goals, including Asia Pacific focus areas of city greening, air quality improvement, and energy conservation

Air quality improvement initiatives, such as Hong Kong's 2013 Clean Air Plan to cut particulate matter, ultimately reduce the urban heat island effect.<sup>22</sup> Higher temperatures create ideal conditions for the formation of smog, which then acts as a heat-trapping barrier. City policies related to urban forestry, green roofs, and open-space conservation/creation establish 'cool park islands' that do not absorb as much heat as urban surfaces.

## Local climatic conditions determine which mitigation and adaptation strategies will be most effective.

Developers who monitor local policy changes are potentially better positioned to take advantage of incentives and energy efficiency requirements; Singapore offers longstanding tax incentives for energy-efficient equipment and mechanical systems, for example,<sup>23</sup> and requires that official functions be held in Green Mark-certified hotels or convention centers.<sup>24</sup>

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**ULI Asia Pacific**  
Room 3418, Jardine House  
1 Connaught Place  
Central Hong Kong

**ULI Center for Sustainability and  
Economic Performance**  
2001 L Street, NW, Suite 200  
Washington, DC 20036-4948

For more information about extreme heat and real estate as well as ULI's related resilience resources, visit [uli.org/extremeheat](http://uli.org/extremeheat) or email [resilience@uli.org](mailto:resilience@uli.org).