RESEARCH INSIGHTS
MSCI SUSTAINABILITY AND CLIMATE

October 2026

Too Hot to Work?

How rising heat affects companies, productivity and economic output

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Executive summary

Extreme heat is already affecting companies and the broader economy, and rising temperatures could amplify these effects. The 2026 European heatwaves illustrate how quickly impacts can materialize, disrupting operations and production while affecting workers through heat stress, reduced working hours and changes to working practices. Company disclosures reinforce this link, with workforce impacts the most frequently identified transmission channel for extreme heat, connecting rising temperatures directly to company operations and economic activity.

Our modeling of heat-related labor-productivity impacts across geographies, sectors and companies suggests a substantial drag on global economic output, with pronounced differences in exposure. Asia-Pacific (APAC) faces the highest regional losses, while real estate and consumer staples are among the most heat-sensitive sectors due to their greater reliance on outdoor and physically demanding activities.[1] These factors can compound where heat-sensitive economic activity is concentrated in hotter markets.

For companies, lower labor productivity can mean fewer productive hours, slower production or service delivery and higher costs, putting pressure on revenues and margins and, potentially, earnings and cash flows. For investors, this creates a potential transmission channel from physical heat exposure to company financial performance: even moderate productivity losses can become financially meaningful when they affect a large share of a company's workforce, operations or revenue-generating activity. The ultimate financial impact also depends on companies' ability to adapt — an area where disclosures provide limited visibility. As temperatures rise, assessing the scale of heat-related exposure and companies' capacity to adapt, and comparing these factors across holdings and peers, can help investors identify where heat exposure may warrant closer monitoring, company engagement or consideration in portfolio construction.

Key takeaways

1. Extreme heat was the third-most frequently cited physical climate peril in the company disclosures we analyzed, and workforce impacts were its most frequently identified transmission channel, appearing in 50% of extreme-heat disclosures.
2. Heat-related labor-productivity losses are estimated at roughly USD 3.9 trillion annually, or 2% of global GDP today, under current climate conditions before physiological acclimatization. Holding today's economy constant, the estimated drag rises to 2.5% under SSP2-4.5 and 3.3% under SSP5-8.5 over the next 75 years.[2]
3. APAC records the highest regional losses, while physically demanding and outdoor activities drive greater sensitivity in sectors such as real estate and consumer staples. These effects can compound where heat-sensitive economic activity is concentrated in hotter locations.

[1] Sector definitions are based on the Global Industry Classification Standard (GICS®). GICS is the industry-classification standard jointly developed by MSCI and S&P Dow Jones Indices.

[2] Shared Socioeconomic Pathways (SSPs) are climate scenarios representing different potential socioeconomic and emissions pathways. SSP2-4.5 represents an intermediate-emissions pathway and SSP5-8.5 a very high-emissions pathway.

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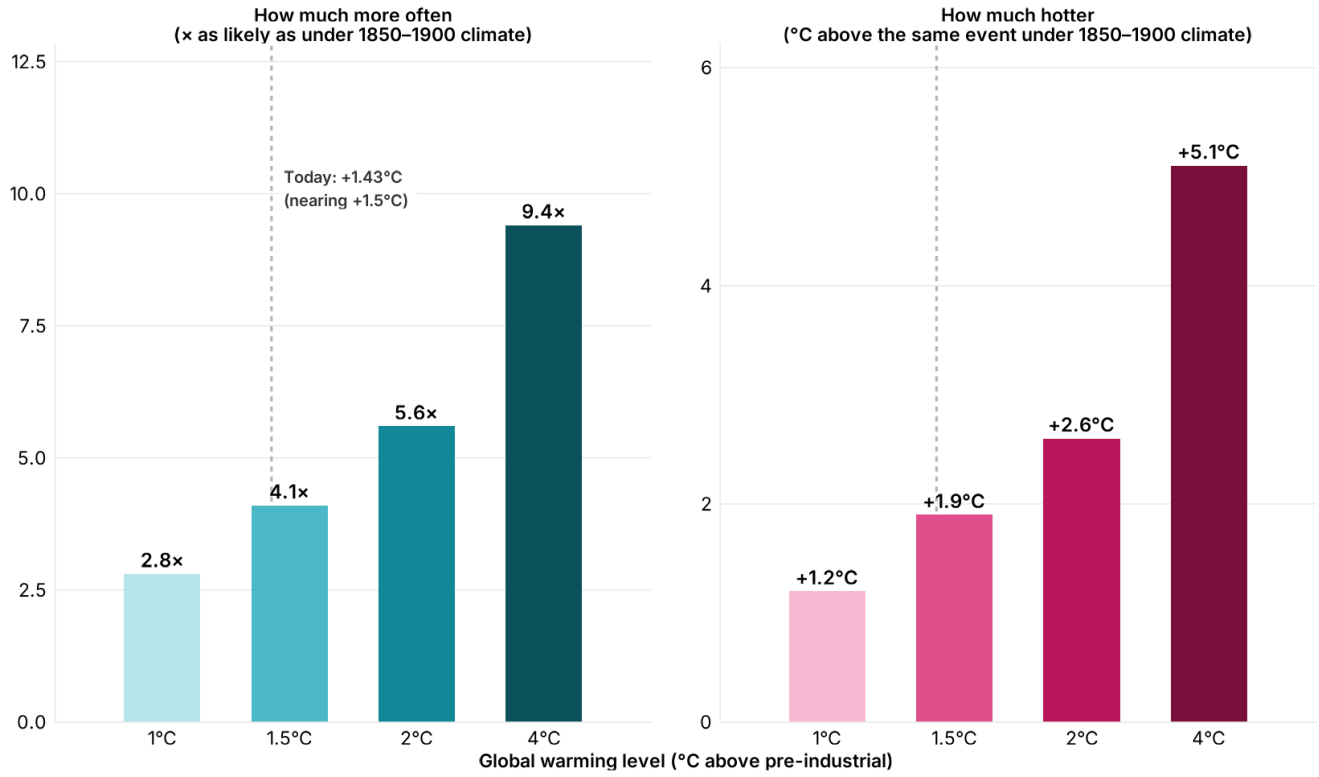
4. Our modeling suggests 81% of MSCI ACWI Index constituents experience some estimated heat-related revenue impact today. Real estate records the highest relative losses, while industrials contributes the largest aggregate dollar loss because of its much larger revenue base.
5. Physiological acclimatization reduces estimated company-level losses across MSCI ACWI Index constituents by around 17%, but company-led measures could provide further protection. Yet nearly 40% of constituents did not disclose heat-related adaptation, while monitoring and assessment accounted for 45% of activities among companies with heat-related adaptation disclosed, leaving uncertainty around how effectively companies are reducing their underlying exposure.

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Rising temperatures, rising heat extremes

Rising global temperatures are making extreme heat both more frequent and more intense. The years 2015-2025 were the 11 warmest on record globally, with temperatures in 2025 approximately 1.43°C above the 1850-1900 pre-industrial average (World Meteorological Organization, 2026).[3] As global warming approaches 1.5°C above pre-industrial levels, the Intergovernmental Panel on Climate Change (IPCC) estimates that extreme heat events that historically occurred once a decade would occur about four times as frequently and be around 1.9°C hotter (IPCC, 2021).[4]

Extreme heat events are becoming more common and hotter as global temperatures rise



Data as of March 23, 2026. The chart shows how the frequency and intensity of a historical 1-in-10-year hot temperature extreme over land are projected to change at different levels of global warming relative to 1850-1900. At 1.5°C of global warming, an extreme heat event that historically occurred once a decade is projected to occur 4.1 times per decade and be 1.9°C hotter. The dashed line indicates the approximate 2025 global temperature level of 1.43°C above the pre-industrial average. Source: IPCC (2021).

[3] The 1.43°C estimate represents the average across several leading global temperature datasets used by the WMO. Individual estimates vary slightly, resulting in a range of uncertainty around the average (±0.13°C).

[4] Extreme heat events are defined relative to local conditions: specifically, daily maximum temperatures that would have occurred only once every 10 years at a given location under the 1850-1900 climate. There is therefore no universal temperature threshold; the temperature considered extreme varies by geography based on the local climate.

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Recent events illustrate what greater heat exposure can mean in practice. Western Europe recorded its warmest summer on record in 2026, with temperatures 2.54°C above the 1991-2020 seasonal average (Copernicus Climate Change Service, 2026). The region experienced repeated heatwaves from May through July, with record summer temperatures observed across much of France, Spain, the UK, Belgium, Switzerland and Italy.

The effects of this prolonged heat extended across the economy. As households and businesses increased their use of cooling, electricity demand rose across Europe's largest economies, contributing to higher wholesale power prices. In France, the heatwave simultaneously constrained electricity supply, as high river temperatures forced EDF S.A. to reduce nuclear generation by 4.1 GW because of limitations on cooling water (Katanich, 2026). The combination of heat and dry conditions also weighed on agricultural production: by September, European Commission estimates suggested yields for several major summer crops could be 7% to 15% below their five-year averages, alongside shortages in livestock feed (Joint Research Centre, 2026). Ultimately, however, the effects of extreme heat are also felt directly by people, including in the workplace. Around 130 million workers in Europe are estimated to be exposed to excessive heat during the year, with outdoor and physically intensive occupations particularly vulnerable (Lory, 2026). These events illustrate how economic activities rely on and therefore may be affected by temperature extremes.

Companies are already reporting heat-related workforce impacts

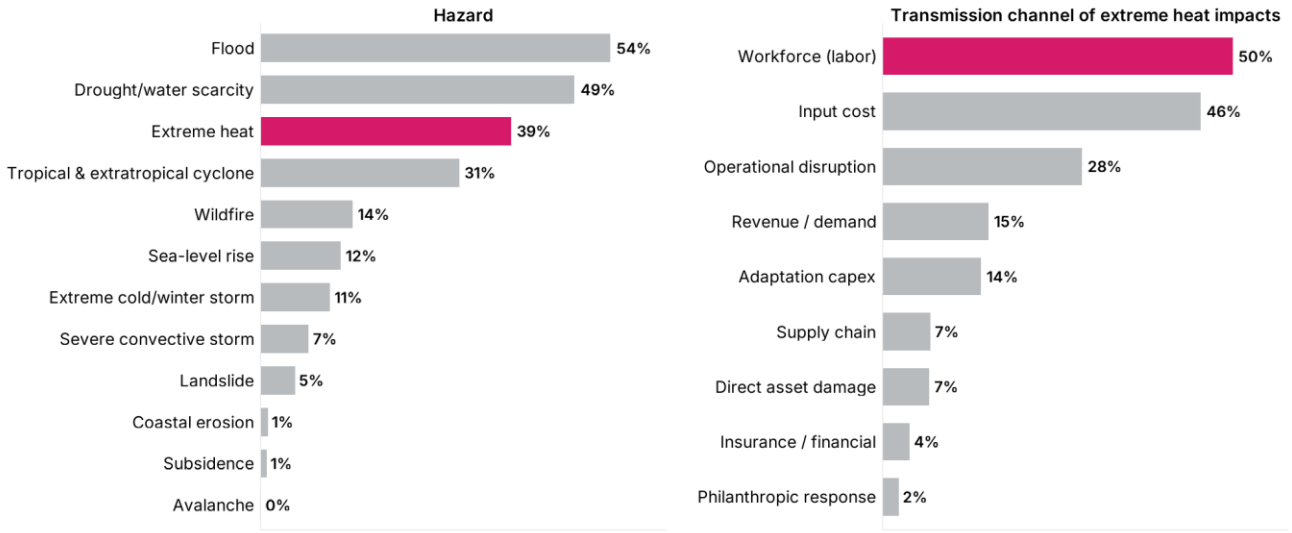
This transmission from heat exposure to workers and operations is increasingly visible in company reporting. Our analysis of annual and sustainability reports from 6,803 companies that disclosed detailed physical climate risk discussions in their reporting from 2023 to 2025 found that extreme heat was the third-most frequently cited physical climate peril, after flooding and drought/water scarcity.[5] Among extreme-heat disclosures, workforce impacts were the most frequently identified transmission channel, appearing in 50%, followed by input costs and operational disruptions.[6]

[5] This analysis of company disclosures was drawn from previous MSCI research detailed in the Price of Not Knowing report. Disclosures include annual financial filings (10-Ks) sourced from the SEC EDGAR API for the calendar years 2023–2025 and public corporate sustainability reporting published over the same period collected in collaboration with SustainabilityReports.com as of Aug. 3, 2026. The latter includes reports classified as Corporate Sustainability Reporting Directive (CSRD) reports, annual reports (AR and AR2) and integrated reports (IR). The dataset is narrowed to the most recent filing per company.

[6] Large language models (LLMs) were used to analyze disclosures through specified prompts, supported by keywords and phrases, to identify the mechanisms through which extreme heat impacts companies, including operational disruptions to production or output (operational disruption); demand-driven effects on sales or revenue (revenue demand); changes in insurance costs, coverage or terms (insurance financial); direct asset damage, supply-chain, workforce implications, input-cost and adaptation effects.

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Extreme heat and workforce impacts led in company disclosures of physical risk

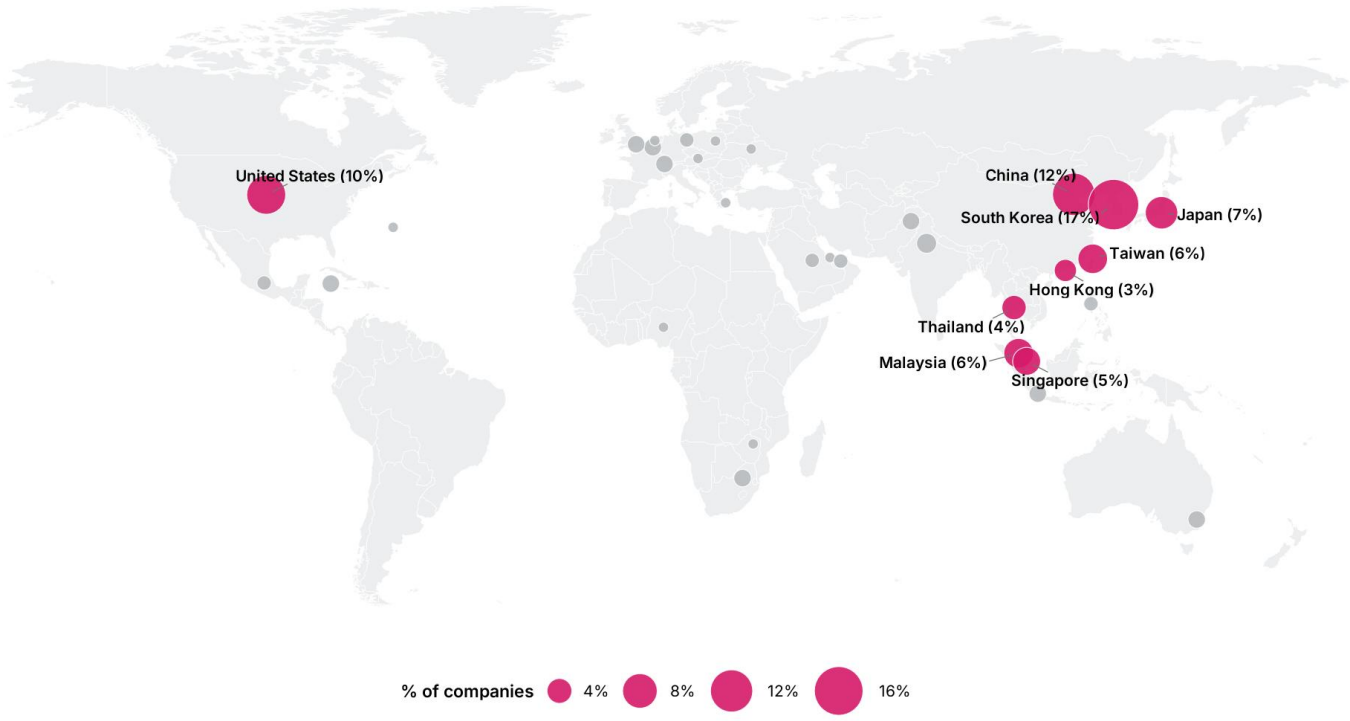


Data as of Aug. 3, 2026. The charts show the share of identified company disclosures discussing each hazard and heat impact pathway across 25,346 company disclosures from 2023 to 2025. Flooding was the most frequently cited hazard (54%), followed by drought/water scarcity (49%) and extreme heat (39%). Among disclosures related to extreme heat, workforce impacts were the most frequently identified transmission channel, appearing in 50% of disclosures, followed by input costs (46%) and operational disruption (28%). Categories are not mutually exclusive, as a disclosure may identify multiple hazards or impact pathways. Source: MSCI Sustainability & Climate. MSCI Sustainability & Climate products and services are provided by MSCI Solutions LLC in the United States, MSCI Solutions (UK) Limited in the United Kingdom, MSCI Solutions (Deutschland) GmbH in the EU and certain other related entities.

The locations detailed in company disclosures indicated that workforce-related impacts from extreme heat were geographically widespread, spanning APAC, North America, Europe and other regions. Disclosures were particularly concentrated in Eastern and Southeastern Asia, which may reflect both greater exposure to extreme heat and greater corporate awareness and reporting of its effects on workers and operations.

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Extreme heat-related workforce impacts were reported globally, with a concentration in Asia



Data as of Aug. 3, 2026. The map shows the geographic distribution of companies reporting workforce-related impacts from extreme heat between 2023 and 2025. Bubble size represents each market's share of the 157 companies identified in the analysis. Where a company has reported impacts in more than one market, it is counted once in each market; therefore, market shares are not mutually exclusive and may sum to more than 100%. Markets representing less than 3% of companies are shown in gray without labels. Source: MSCI Sustainability & Climate.

Recent European heatwaves demonstrate that these effects are not limited to historically hot markets. During the June 2026 heatwave, Hapag-Lloyd AG, a global container-shipping company, reported slower terminal operations across Benelux and German ports as additional hydration breaks contributed to delays (Hapag-Lloyd, 2026). DHL Group, a global logistics company, meanwhile, spent additional operating expenses to provide delivery workers in Germany with cooling equipment, while some construction companies shifted working hours to avoid peak afternoon temperatures (Euronext, 2026). The prominence of heat-related risks was also evident in corporate communications: terms related to extreme heat, drought and wildfires appeared in a record one in 10 earnings calls among European companies with more than USD 1 billion in market value during summer 2026 (Financial Times, 2026).

These examples illustrate how workforce impacts can reach company financials. Lower worker capacity or fewer effective working hours can slow production and service delivery, while protective measures can add operating costs. Companies may compensate through additional labor, technology or changes to working practices, but where they cannot, heat-related productivity losses could put pressure on output, revenues and margins.

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Quantifying the financial impact of heat on labor productivity

To quantify how these heat-related impacts on workers could translate into economic losses, we model labor-productivity effects across locations and sectors. Our approach combines three factors: how much heat a location experiences, how sensitive the work performed there is to heat and how much economic activity is exposed, for both regional economies and company operations. Heat stress is measured using wet-bulb globe temperature (WBGT), which incorporates both temperature and humidity. Using an ensemble of climate models, we estimate the frequency of different levels of heat stress under three emissions scenarios, according to the Shared Socioeconomic Pathways (SSPs) and across current and future climate conditions.

Heat does not affect all work equally. Using peer-reviewed research, we derive heat-productivity relationships for four levels of physical intensity, including sedentary, light, moderate and heavy work, with productivity generally declining more rapidly for physically demanding work as heat stress rises.[7] We combine these relationships with the occupational composition of different industries to estimate heat sensitivity across the 11 GICS sectors. As a result, sectors with larger shares of physically intensive work have greater modeled sensitivity to heat than those dominated by sedentary work. Predominantly outdoor activities, including agriculture and construction, receive an additional heat adjustment to reflect the greater burden of outdoor conditions. These differences in the type and setting of work help explain why modeled productivity losses vary across sectors.

We also account for two factors that can reduce modeled productivity losses. Work performed in air-conditioned environments is assumed to be protected from changes in outdoor heat using a scalar by sector. Separately, the model allows for physiological acclimatization: populations that experience hot conditions more frequently are assumed to become more tolerant of heat, reducing the productivity impact of a given level of heat stress. Acclimatization provides only partial protection, however, and does not eliminate productivity losses at high levels of heat. We therefore show results both before acclimatization, representing a higher loss estimate, and with acclimatization, illustrating the reduction associated with physiological adjustment to repeated heat exposure.

Heat conditions also vary from year to year. We capture this variation using return periods, which describe the likelihood of different levels of annual heat severity. A 1-in-100-year level of heat exposure, for example, has a 1% probability of being reached or exceeded in any given year; higher return periods therefore represent less frequent, more severe heat years.[8] We integrate across these possible annual

[7] The heat-productivity relationships draw primarily on Pilcher et al. (2002) for sedentary and cognitive work and Foster et al. (2021), with adjustments from Smallcombe et al. (2022), for heavy physical work. Light- and moderate-intensity relationships are interpolated between the sedentary and heavy-work curves.

[8] The return periods used as input to this analysis were derived by interpolating coarse-resolution CMIP6 ensemble output directly onto the analysis grid, rather than by downscaling and pooling a properly evaluated set of strictly independent model realizations; this "naive" approach is known to smooth extreme-value tails and to overstate the effective sample size, and it does not include the independence, stability and fidelity checks that the extreme-value literature recommends before pooling ensemble members (Kelder et al., 2020, npj Clim. Atmos. Sci. 3:47; Olonscheck et al., 2023, J. Adv. Model. Earth Syst. 15, e2023MS003790). The resulting return-period estimates should therefore be treated as indicative rather than rigorously quantitative.

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conditions to estimate the expected annual productivity loss rather than basing results on any single heat year.

Finally, we map employment and GDP across roughly one million gridded locations globally and allocate this activity across GICS sectors. For each location and sector, the model combines local heat exposure with the relevant heat-response curve to estimate the share of labor productivity lost, and applies that loss to employment and the labor share of economic output. These location-level estimates can then be aggregated to compare potential losses across markets, regions and sectors under different climate scenarios and time horizons. The same framework can be applied at the company level by linking companies' physical locations to local heat exposure and the type of activity performed at each site. Estimated productivity losses are then applied to the revenue attributed to each location and aggregated across locations to estimate the potential revenue impact for each company.

Extreme heat could place a growing drag on economic output

Our results suggest that heat already represents a meaningful drag on global labor productivity today, with the potential for losses to increase as warming progresses into the future. Under current climate conditions, modeled labor-productivity losses amount to USD 3.9 trillion today, or around 2% of global GDP, before accounting for acclimatization.[9] In economic terms, our estimates suggest that heat reduces workers' productive capacity enough to lower annual global output by around 2%.

Holding the size and composition of today's economy constant, this drag on economic output increases as temperatures rise, with different emissions pathways shaping the magnitude of the impacts. Under SSP1-2.6, modeled productivity losses are estimated to increase modestly from around 2% of global GDP today to 2.2% over the next 75 years. Under SSP2-4.5, they rise to 2.5%, while under SSP5-8.5 they reach 3.3%. The latter represents an increase of around 1.3 percentage points, or roughly 65%, relative to the productivity drag modeled under current climate conditions, reflecting the substantially greater heat exposure associated with higher levels of warming.[10]

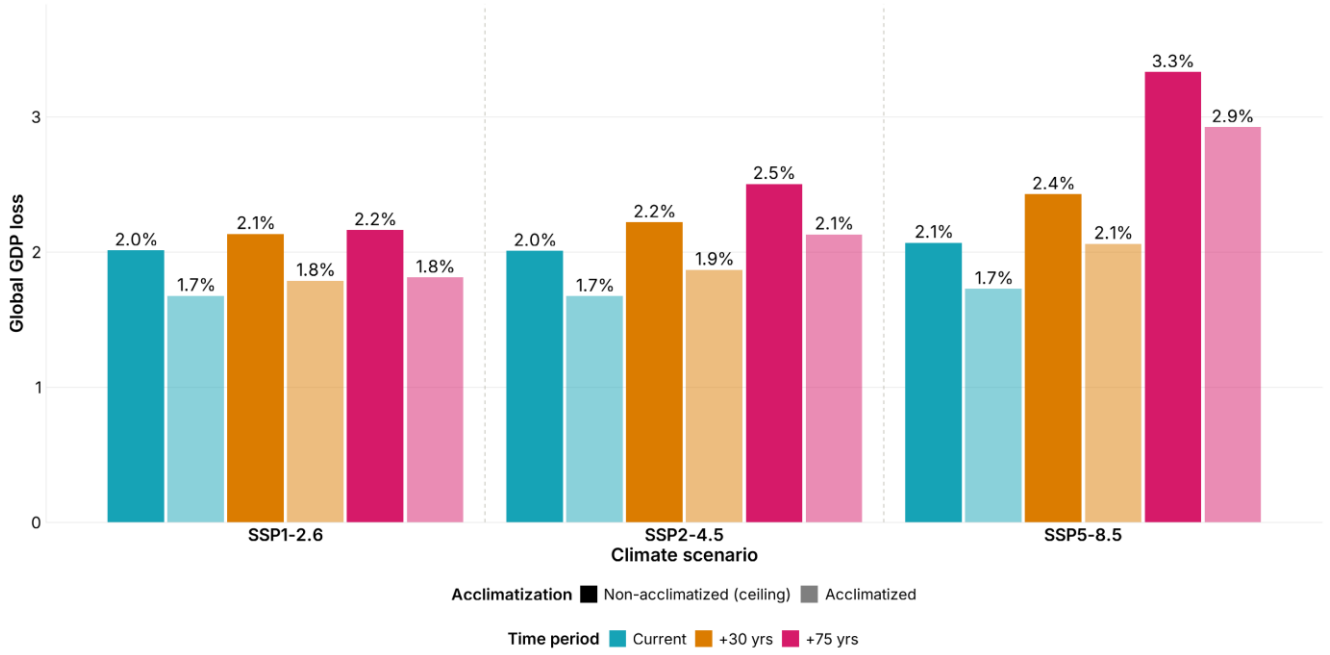
For investors, the widening gap provides an indication of how the economic relevance of heat could change over longer investment horizons. Persistent productivity losses could affect economic growth and sovereign fundamentals at the market level and, for companies dependent on heat-sensitive labor, could feed through to production, costs, revenues and ultimately earnings and cash flows.

[9] We apply a global GDP base of USD 196 trillion in dollars PPP for 2025.

[10] The three scenarios imply progressively higher levels of global warming by 2081-2100 relative to 1850-1900: around 1.8°C under SSP1-2.6, 2.7°C under SSP2-4.5 and 4.4°C under SSP5-8.5. SSP1-2.6 represents a lower-emissions pathway, SSP2-4.5 an intermediate pathway and SSP5-8.5 a very high-emissions pathway.

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Heat-related labor-productivity losses rise as climate scenarios diverge



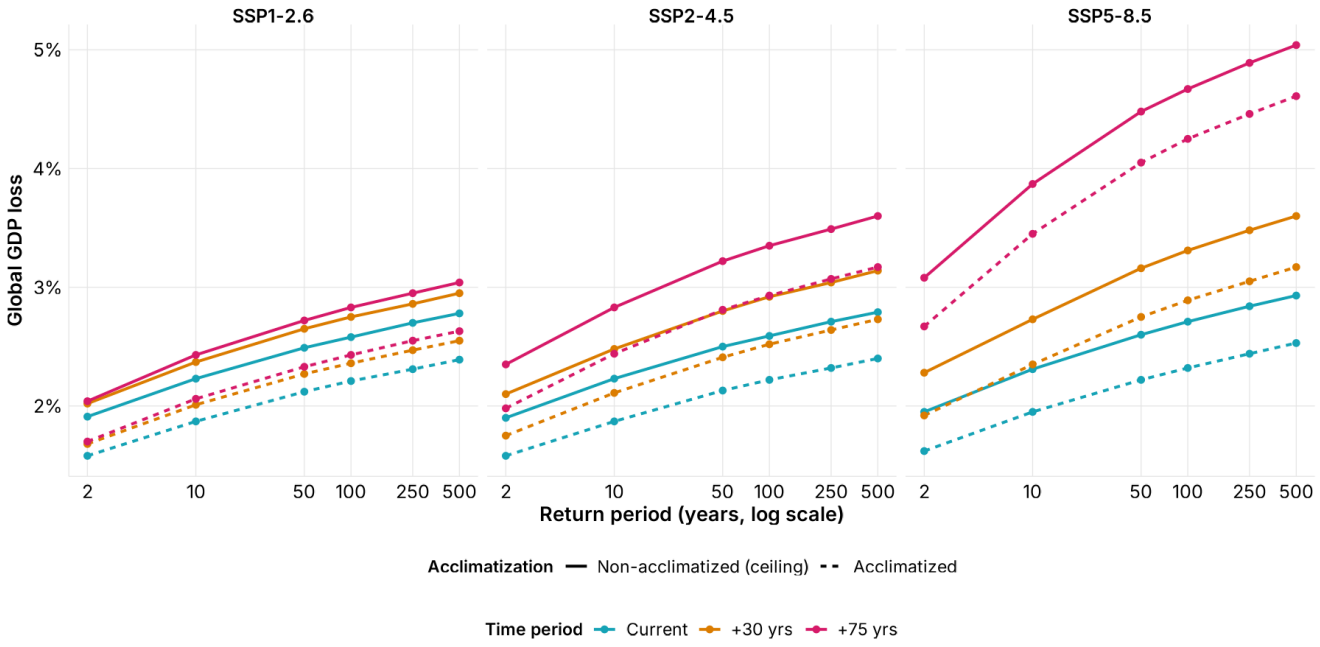
Data as of Sept. 23, 2026. The chart shows modeled annual global GDP losses from heat-related labor-productivity impacts under three climate scenarios and across current, +30-year and +75-year time horizons. Darker bars show losses before physiological acclimatization; lighter bars incorporate acclimatization. Results represent expected losses across modeled heat-event return periods and are expressed as a percentage of modeled global GDP. Source: MSCI Sustainability & Climate.

As higher temperatures become more common, physiological acclimatization could partially offset rising heat-related productivity losses as workers adapt to persistent heat exposure. Under the highest-emissions scenario 75 years from now, for example, estimated losses decline from 3.3% to 2.9% of global GDP when acclimatization is accounted for in the modeling. While the benefit increases somewhat with greater heat exposure, it is not sufficient to offset the additional losses associated with continued warming. This gap also points to the potential relevance of other forms of adaptation, including changes in working practices, cooling, technology and physical infrastructure, in determining how much physical exposure ultimately becomes economic loss.

Heat-related productivity losses can also vary substantially from year to year. Under SSP2-4.5 in 75 years, estimated global losses range from around 2% of GDP for a 1-in-2-year outcome with acclimatization to 3.6% for a 1-in-500-year outcome without acclimatization. Under SSP5-8.5, losses could exceed 5% in the most severe modeled heat years. For investors, this variability means exposure is not limited to a gradual increase in average losses: unusually severe heat years could create episodic pressure on economies and companies well above the long-run expected impact.

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Severe extreme heat events amplify productivity losses, particularly under higher warming



Data as of Sept. 23, 2026. The chart shows modeled global GDP losses from heat-related labor-productivity impacts across return periods, climate scenarios and time horizons. Return periods capture year-to-year variation in the severity of heat conditions and their likelihood; for example, a 1-in-100-year outcome has a 1% probability of being reached or exceeded in any given year. Solid lines show losses before physiological acclimatization and dashed lines incorporate acclimatization. Higher return periods represent less frequent, more severe annual heat conditions. Source: MSCI Sustainability & Climate.

For the remainder of the analysis, we use SSP2-4.5 without physiological acclimatization as the reference case, allowing us to examine how underlying exposure varies across markets, sectors and companies before accounting for this potential reduction in vulnerability.

Physical intensity helps drive differences across sectors

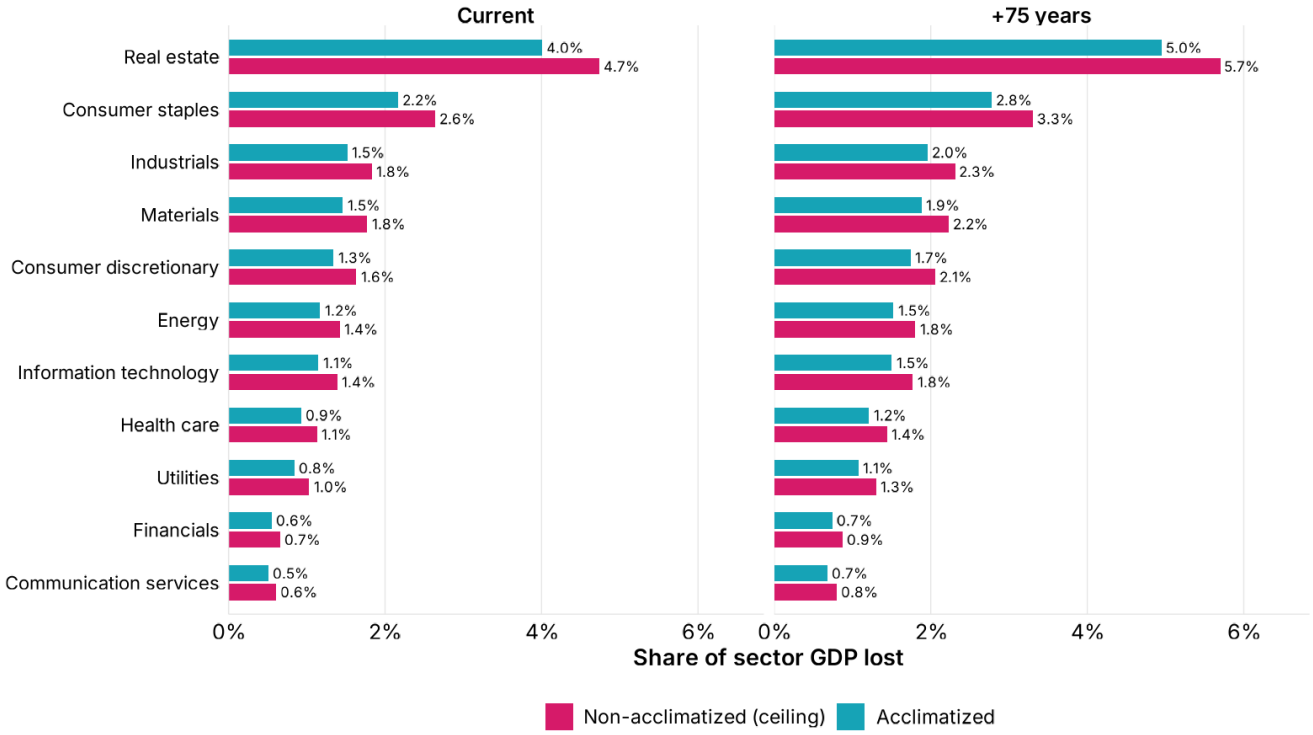
The potential for productivity loss varies considerably across sectors.[11] Real estate faces the largest impact under current climate conditions, equivalent to 4.7% of the global economic output attributed to the sector, followed by consumer staples at 2.6%. The remaining nine GICS sectors experience losses of approximately 0.6% to 1.8%, with communication services recording the lowest impact.

[11] Global GDP and employment are geographically disaggregated and allocated across economic activities using indicators of where different types of activity occur, calibrated to national employment and GDP totals. These activities are then mapped to GICS sectors using industry classifications and market-level employment and economic-output relationships, allowing heat-related productivity losses to be estimated by location and sector.

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These differences reflect the types of jobs associated with each sector and the conditions in which that work is performed, including how physically demanding the work is, whether it takes place indoors or outdoors and the extent to which workers are protected by air conditioning. Real estate's relatively high estimated loss partly reflects construction-related economic activity attributed to the sector, where work is often physically demanding and performed outdoors, increasing workers' exposure to heat. Consumer staples similarly includes heat-sensitive activities such as agriculture and food production, which combine physically intensive work with greater outdoor exposure. By contrast, sectors such as communication services and financials are more heavily weighted toward sedentary and indoor occupations, where workers are generally less physically exposed to heat and more likely to work in environmentally controlled conditions. As a result, the relative differences across sectors persist as temperatures rise: warming increases losses across sectors, but those with greater exposure to physically demanding and outdoor work remain more sensitive to heat.

Heat-related productivity losses vary widely across sectors, led by real estate



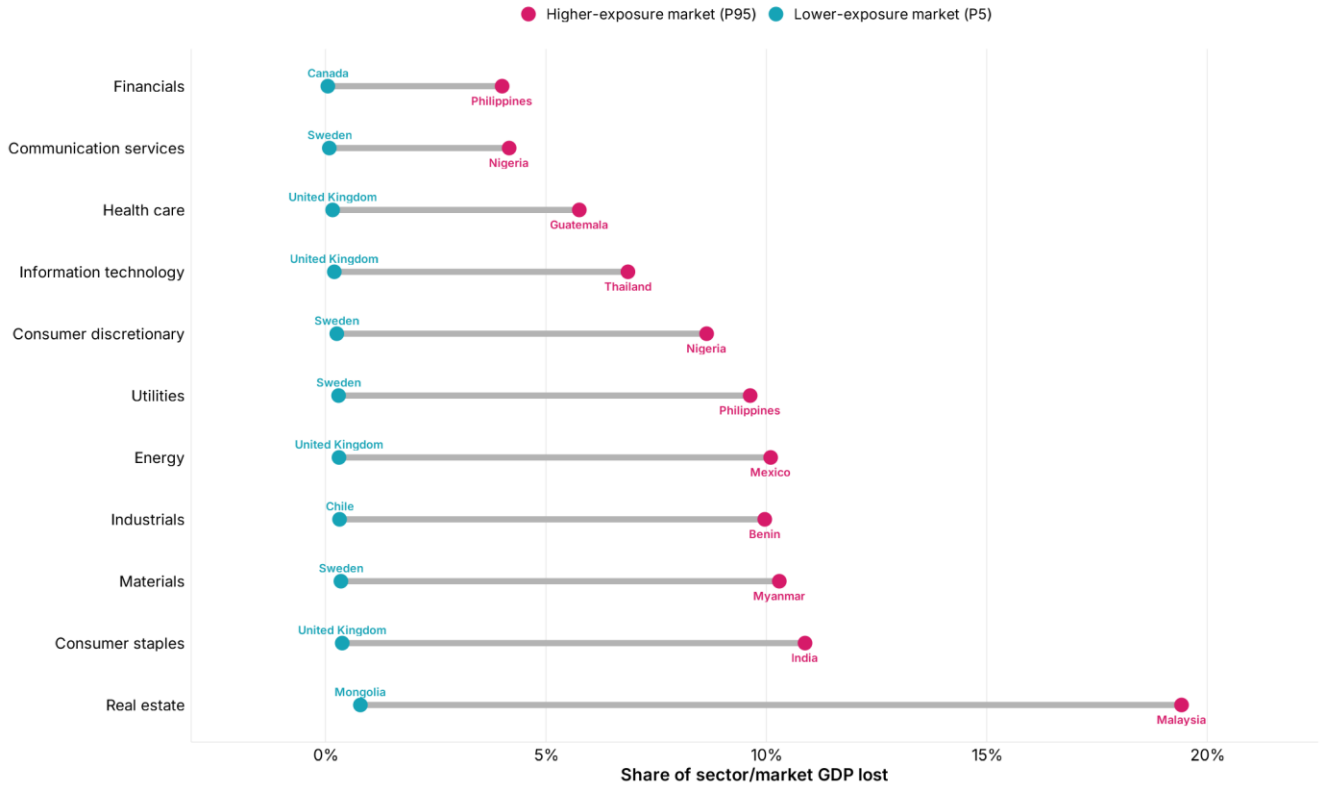
Data as of Sept. 23, 2026. The chart shows modeled heat-related labor-productivity losses as a share of each GICS sector's GDP under SSP2-4.5, for current climate conditions and 75 years from now. Real estate has the highest modeled losses in both periods, increasing from 4.7% to 5.7% of sector GDP before physiological acclimatization, followed by consumer staples at 2.6% and 3.3%, respectively. Communication services and financials have the lowest modeled losses. Pink bars show losses before physiological acclimatization; blue bars incorporate acclimatization. Source: MSCI Sustainability & Climate.

For investors, sector-level sensitivity can provide a useful first screen for where labor-productivity risk may be more pronounced, but it is not sufficient on its own. Companies within the same sector can have

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very different occupational mixes, operating footprints and exposure to cooled environments, while the location of those activities determines the heat conditions workers actually face. This geographic variation can be substantial: across most sectors, estimated losses differ by several percentage points between less- and more-exposed locations, with real estate ranging from less than 1% of sector economic output at the lower end to nearly 20% at the higher end. These differences create the potential for security-level differentiation within sectors: investors can use companies' operating footprints alongside sector sensitivity to identify holdings whose underlying heat exposure may differ materially from that of their peers.

Heat-related productivity losses can vary widely within the same sector



Data as of Sept. 23, 2026. The chart shows the variation in estimated heat-related labor-productivity losses across markets within each sector under current climate conditions, before physiological acclimatization. Points represent lower-exposure (5th percentile) and higher-exposure (95th percentile) country-sector combinations, expressed as a percentage of the economic output attributed to that sector within each country. Countries corresponding to each percentile are labeled. The distance between points illustrates the variation in heat-related productivity exposure that can arise from geography within the same sector. Results represent estimated exposure rather than observed economic losses. Source: MSCI Sustainability & Climate.

Sector and geography exposure compound one another

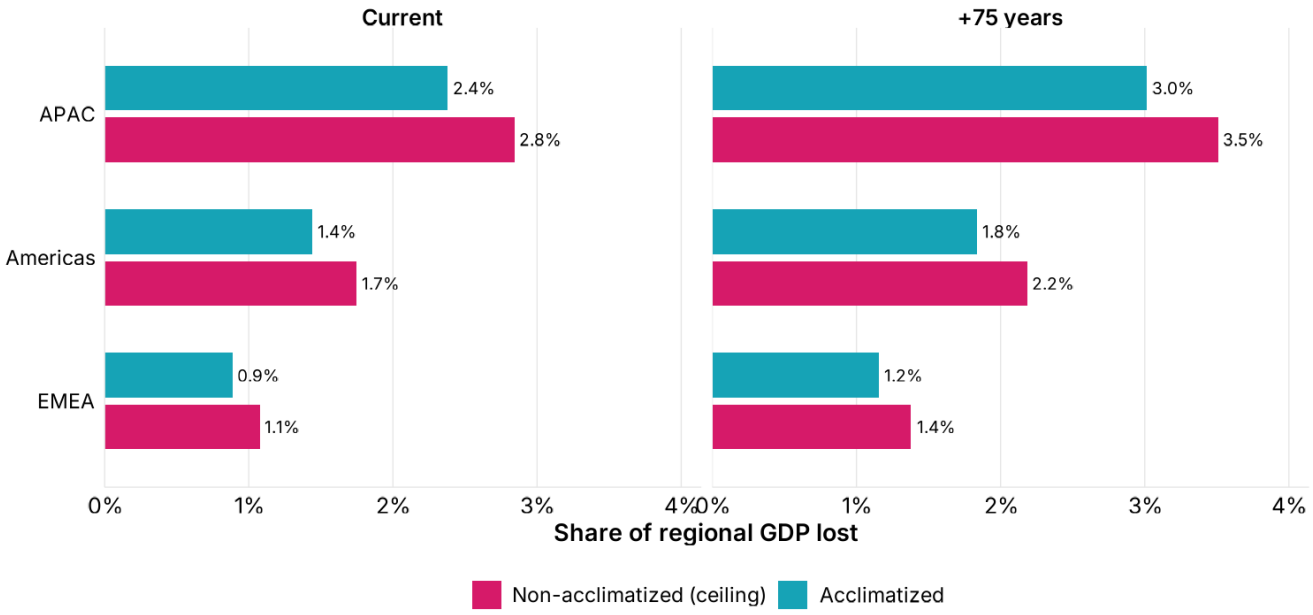
Heat-related productivity losses reflect both where economic activity takes place and the type of activity performed there. Local climate conditions determine the level of heat workers experience, while the composition of an economy influences how much activity is concentrated in sectors and occupations

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that are more sensitive to heat. These factors can reinforce one another, creating substantial differences in exposure across regions and sectors.

These differences are already apparent at the regional level. Under current climate conditions, estimated labor-productivity losses are highest in APAC, at 2.8% of regional GDP, or approximately USD 2.4 trillion, compared with 1.7%, or USD 809 billion, in the Americas and 1.1%, or USD 668 billion, in Europe, the Middle East and Africa (EMEA). The gap widens as temperatures rise; over the next 75 years under SSP2-4.5, losses increase by around 0.7 percentage points in APAC, compared with 0.5 percentage points in the Americas and 0.3 percentage points in EMEA. The result suggests that regions facing greater heat-related productivity pressures today may experience an increasing concentration of those effects as temperatures rise.

Heat-related productivity losses are highest in APAC and increase over time



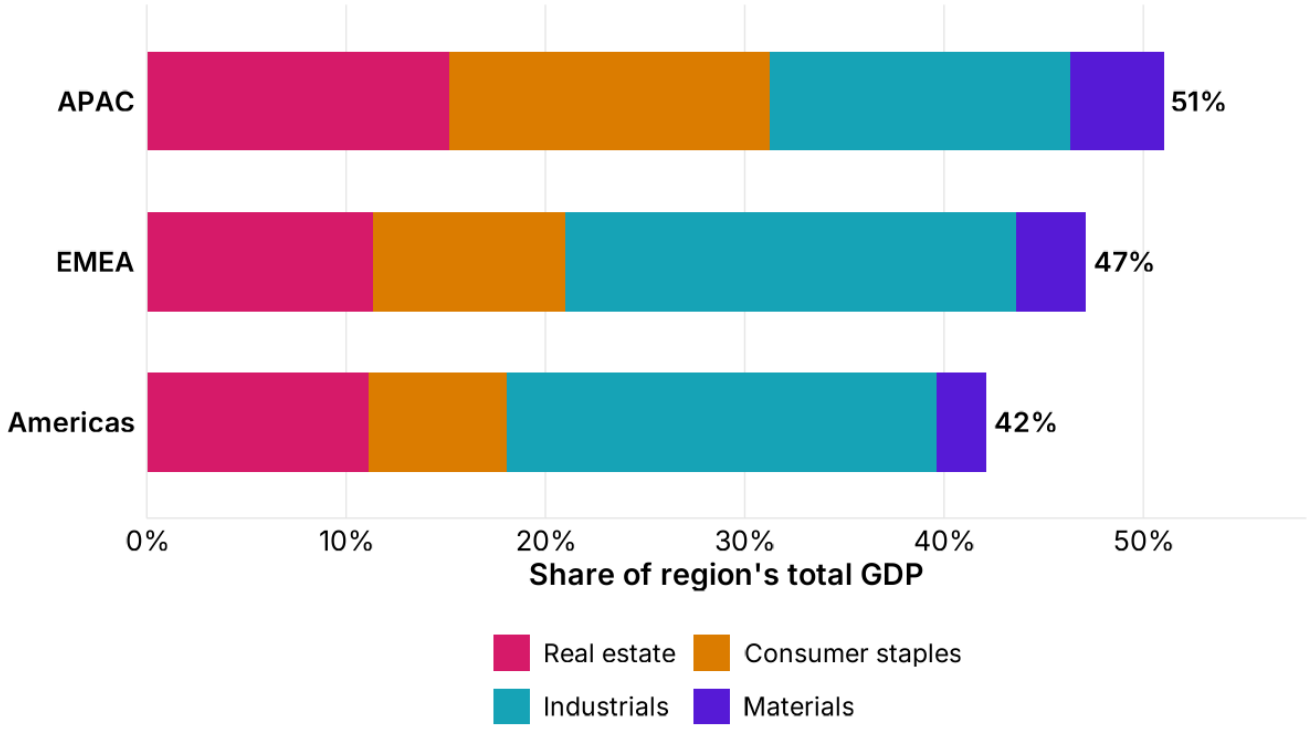
Data as of Sept. 23, 2026. The chart shows modeled heat-related labor-productivity losses as a share of regional GDP under SSP2-4.5, for current climate conditions and 75 years from now. APAC has the highest modeled losses in both periods, increasing from 2.8% to 3.5% of regional GDP before physiological acclimatization, compared with 1.7% to 2.2% in the Americas and 1.1% to 1.4% in EMEA. Pink bars show losses before physiological acclimatization; blue bars incorporate acclimatization. Source: MSCI Sustainability & Climate.

Economic composition can amplify these geographic differences. APAC has the highest concentration of economic activity in the four sectors with the largest estimated heat-related productivity losses (real estate, consumer staples, industrials and materials) which together account for 51% of regional GDP, compared with 47% in EMEA and 42% in the Americas. Consumer staples is particularly prominent in APAC, accounting for 16% of regional GDP versus 10% in EMEA and 7% in the Americas. Sector composition is not sufficient on its own, however: EMEA has a relatively similar concentration of GDP in

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these sectors but substantially lower overall losses, underscoring the importance of local heat conditions alongside economic structure.

APAC has the highest concentration of GDP in heat-sensitive sectors

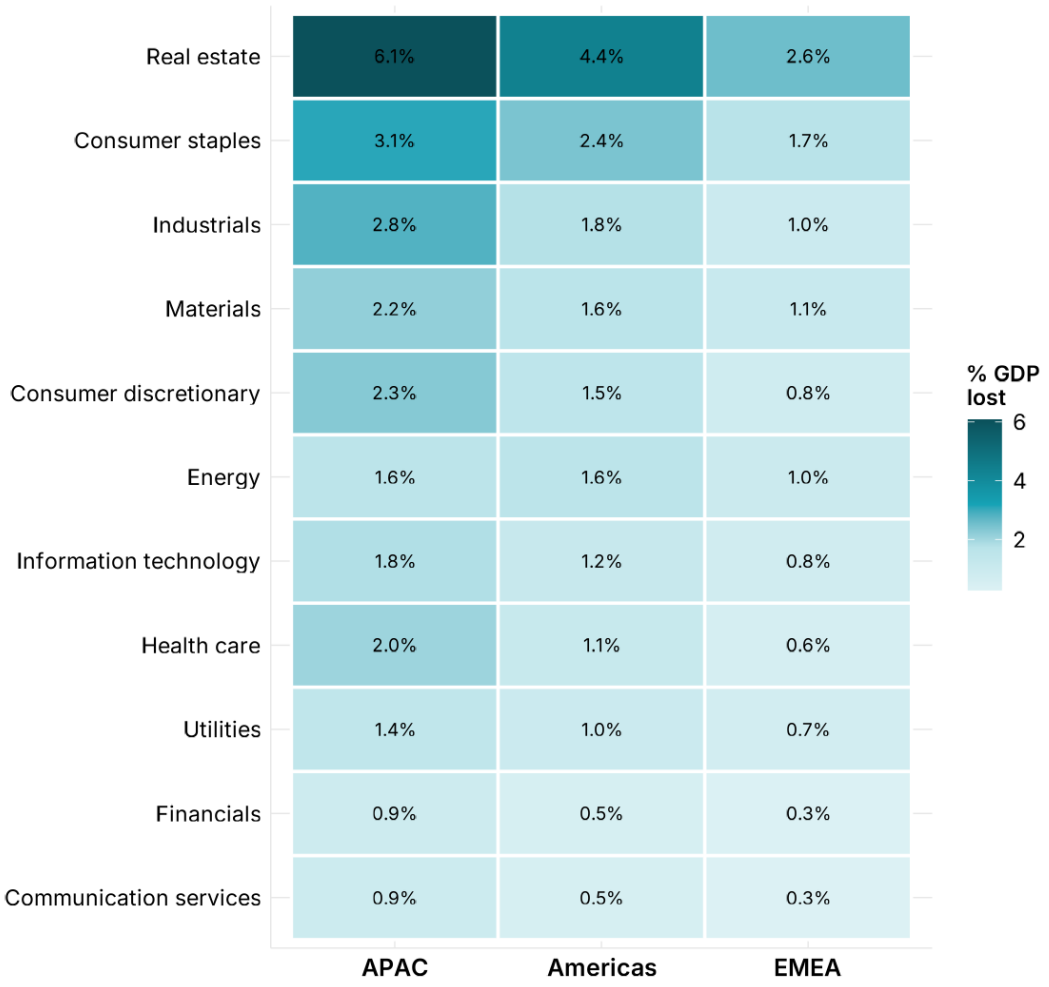


Data as of Sept. 23, 2026. The chart shows the share of each region's estimated economic output attributed to the four GICS sectors with the highest heat-related labor-productivity losses under current climate conditions: real estate, consumer staples, industrials and materials. Together, these sectors account for 51% of APAC GDP, compared with 47% in EMEA and 42% in the Americas. Sector shares reflect economic activity attributed to each sector in the analysis and do not represent the sector composition of listed companies. Source: MSCI Sustainability & Climate.

The interaction between geography and sector becomes even clearer when the two are considered together. Real estate in APAC records the highest sector-region loss in the analysis, at 6.1% of the economic output attributed to the sector, compared with 4.4% in the Americas and 2.6% in EMEA. At the other end of the distribution, communication services in EMEA records a loss of just 0.3%. The same type of economic activity can therefore experience substantially different productivity effects depending on where it occurs. For investors, this means that sector classification alone may provide an incomplete picture of heat exposure: the geographic footprint of a company's workforce and operations can be equally important.

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Heat-related productivity losses are highest for more exposed sectors in APAC



Data as of Sept. 23, 2026. The chart shows modeled heat-related labor-productivity losses as a share of GDP for each GICS sector and region under current climate conditions for SSP2-4.5, excluding physiological acclimatization. Losses reflect the combined effects of regional heat exposure and sector-level sensitivity to heat. Source: MSCI Sustainability & Climate.

Deep dive on the real estate sector

Real estate has the highest estimated heat-related labor-productivity loss of any GICS sector, equivalent to 4.7% of the global economic output attributed to the sector under current climate conditions. This sensitivity partly reflects the sector's link to construction activity. While real estate development companies represent around 18% of real estate companies in the MSCI ACWI Index, development activity relies heavily on construction, where work is typically more physically demanding and performed outdoors. In our heat-productivity relationships, heavy physical work becomes increasingly constrained as heat stress rises, with estimated productive capacity falling to only 8% at an outdoor WBGT of 40°C, corresponding with an approximately 92% reduction in productive capacity.

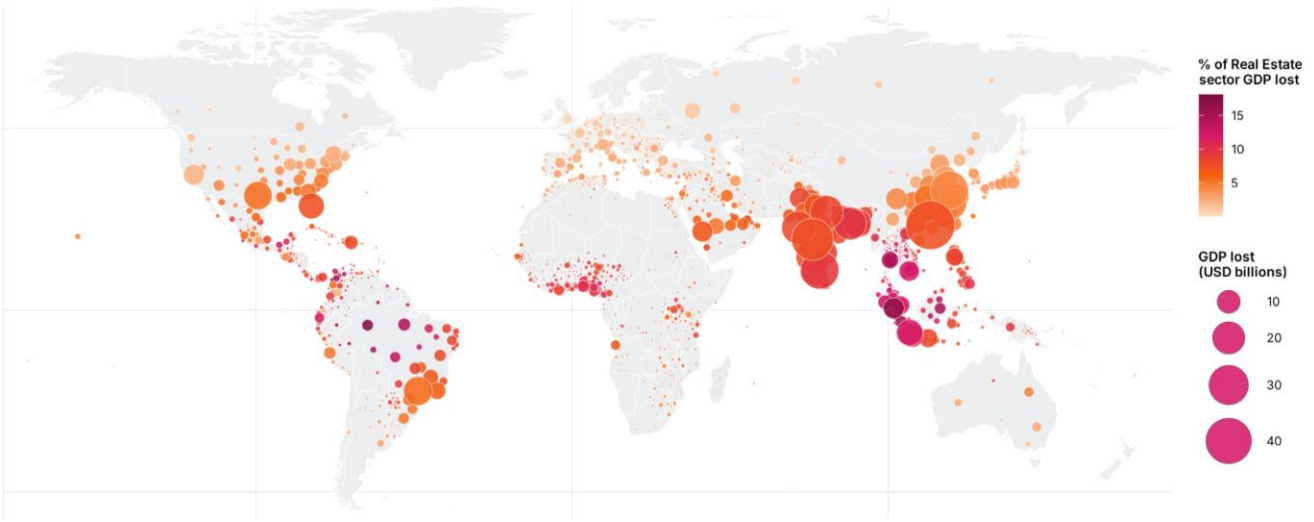
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For a developer, this can create a direct financial transmission channel: fewer effective construction hours or mandatory work-rest practices can slow project completion, while additional shifts, cooling or other protective measures can raise costs. Where delays cannot be recovered, heat-related labor constraints could therefore affect project economics, revenue timing and margins. As a result, real-estate development and therefore the real-estate sector is sensitive to extreme heat impacts on productivity.

National and regional averages can also obscure substantial variation within individual markets. This is particularly relevant for real estate because the location of the underlying asset and associated construction activity is inseparable from its physical exposure. Within the same market, major real-estate markets can experience materially different heat-related productivity effects. Among the largest hotspots globally, estimated losses range from around 4% of real estate economic output in some major markets to 8%-10% in more heat-exposed locations, reaching nearly 12% in Jakarta.

For real-estate investors, this makes asset location an important complement to sector or national-market classifications. Identifying where development pipelines and other labor-intensive activities overlap with high heat exposure could help distinguish companies whose headline sector exposure appears similar, but whose underlying operational risk differs substantially.

Asian real estate markets combine high heat exposure with large economic losses



Data as of Sept. 23, 2026. The map shows modeled heat-related labor-productivity losses for the real-estate sector under current climate conditions and SSP2-4.5, before physiological acclimatization. Bubble size represents the modeled dollar value of real estate GDP lost within each subnational region, while color indicates the loss as a percentage of that region's real estate GDP. Larger and darker bubbles therefore identify locations combining greater economic scale with higher relative exposure. Source: MSCI Sustainability & Climate.

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Company exposure to heat is widespread but uneven

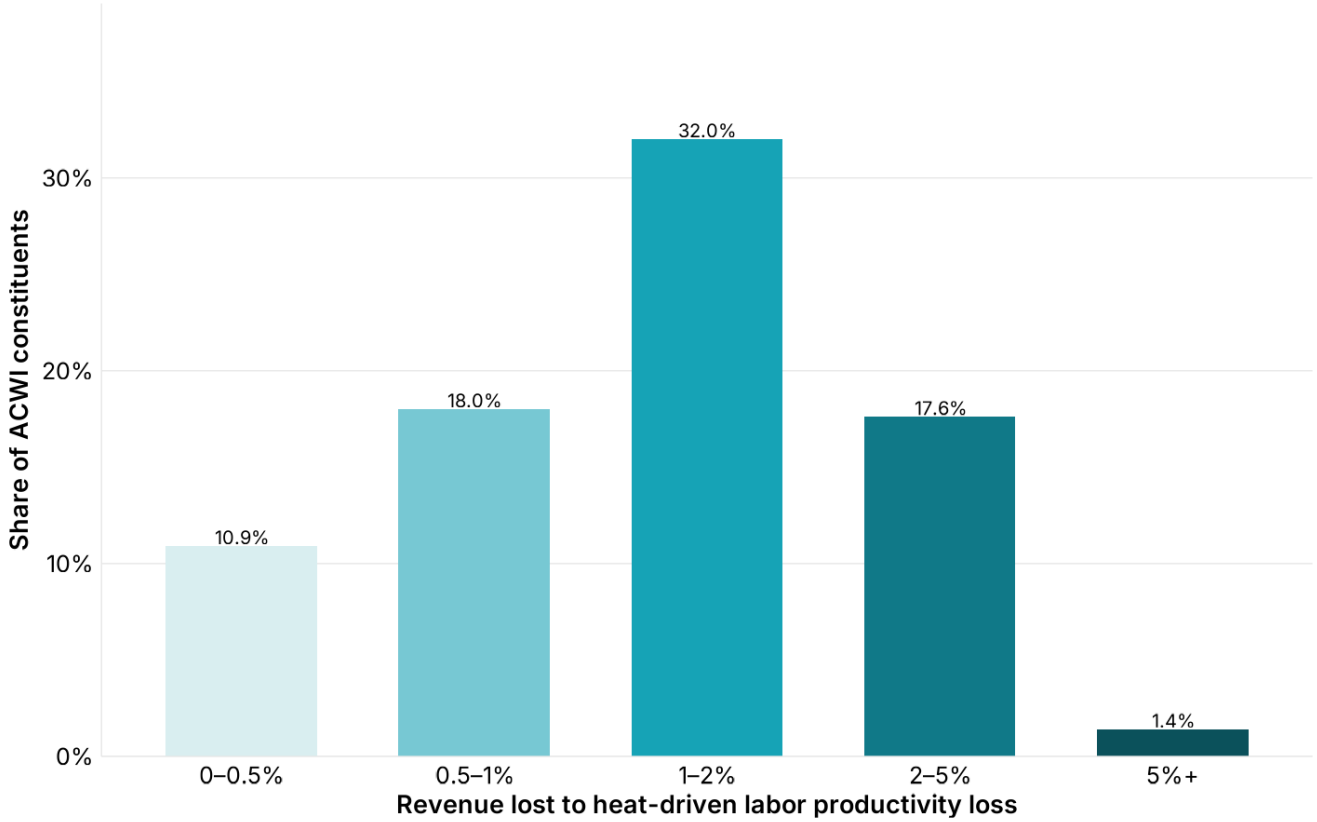
The economy-wide results provide a starting point to understand sector and regional differences, but these impacts are ultimately faced by the companies employing workers. We therefore apply the same framework to MSCI ACWI Index constituents, linking company physical locations to local heat conditions and activity type to estimate the potential revenue impact of lower labor productivity.[12] Moving from economy-level estimates to individual companies allows investors to distinguish between holdings that may look similar by sector or domicile but have different underlying exposure because of where and how they operate. The resulting estimates of potential revenue impact provide a common metric for comparing potential heat-related labor exposure across companies and against sector peers.

Under current climate conditions, around 81% of the companies analyzed show a heat-related revenue impact before physiological acclimatization. For affected companies, the median estimated loss is equivalent to 1.25% of revenue, while 19% have more than 2% of revenue at risk. At the upper end, 32 companies, or 1.4% of MSCI ACWI Index constituents, have more than 5% of revenue at risk, indicating a smaller group where heat-related labor constraints could represent considerably larger operational exposure.

[12] We apply our analysis to the MSCI ACWI Index as of Aug. 31, 2026.

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Heat-related productivity losses are material for a broad share of MSCI ACWI Index companies



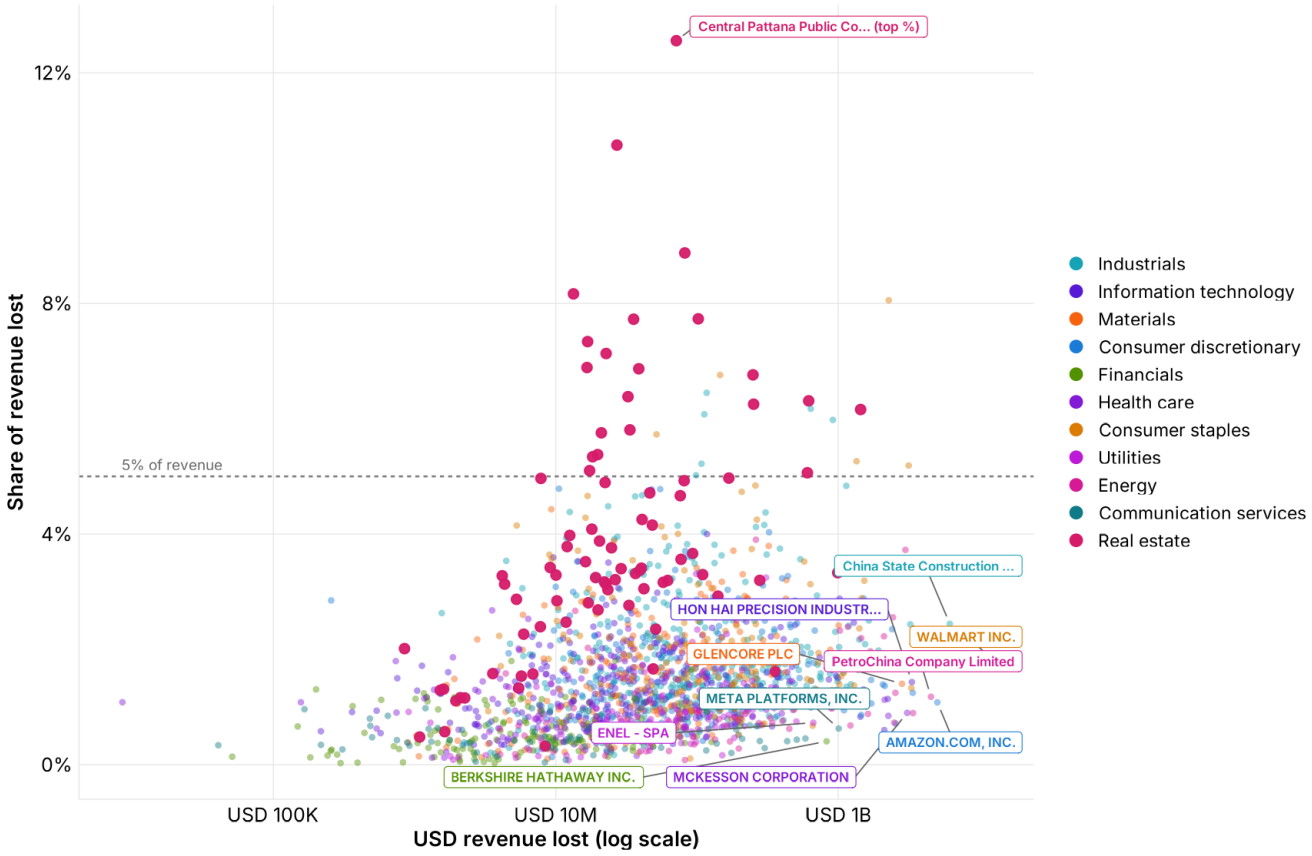
Data as of Sept. 23, 2026. The chart shows the distribution of modeled revenue losses from heat-related labor-productivity impacts across 1,955 MSCI ACWI Index constituents out of the total 2,414 with heat-related revenue losses under current climate conditions, before physiological acclimatization. Results reflect revenue attributed to company physical locations and represent modeled exposure rather than observed revenue losses. Source: MSCI Sustainability & Climate.

The composition of this most-exposed group provides an indication of where that vulnerability is concentrated. Twenty of the 32 companies with more than 5% of revenue at risk are in real estate, predominantly property developers and real-estate companies with physical operations concentrated in APAC markets including Thailand, India, China, Hong Kong and the Philippines. The remainder is concentrated almost entirely in consumer staples and industrials, including food and agriculture-linked businesses, logistics and transport companies.

This tail of highly exposed companies could provide a useful starting point for investor due diligence. Relevant questions include whether the exposure is concentrated in particular facilities or business lines, how frequently working hours are already affected by heat, and whether adaptation plans are sufficient for higher future temperatures. Investors could also compare a company's estimated revenue impact with sector peers to identify potential outliers and assess whether differences in exposure or preparedness are reflected in their broader view of company risk.

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Real estate stands out in relative exposure, but company size shapes dollar losses



Data as of Sept. 23, 2026. The chart compares modeled heat-related labor-productivity losses across MSCI ACWI Index constituents under current climate conditions and before physiological acclimatization. The vertical axis shows modeled losses as a percentage of company revenue, while the horizontal axis shows modeled USD losses on a logarithmic scale. The dashed line marks the 5% threshold; selected companies are labeled for context. Results represent modeled exposure rather than observed revenue losses. Source: MSCI Sustainability & Climate.

However, the companies and sectors facing the highest proportional losses are not necessarily those driving the largest dollar losses. Real estate is the clearest example: heat-related productivity losses amount to about 4% of modeled sector revenue, the highest of any sector, due to the presence of heat-sensitive real-estate development and construction-related activities among constituents.[13] Yet real estate represents less than 1% of revenue across MSCI ACWI Index constituents, resulting in just 2% of total estimated dollar losses across the index.

[13] The MSCI ACWI Real Estate Index includes 90 large- and mid-cap companies as of Aug. 31, 2026. Its largest constituents include Welltower, Prologis, Equinix, American Tower, Simon Property Group and Digital Realty, illustrating that the listed sector spans health-care and logistics real estate, data centers, communications infrastructure, retail property and other activities in addition to real-estate development. Direct exposure to construction labor therefore varies considerably across constituents

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Industrials presents the opposite dynamic. Its estimated productivity loss is lower, at 1.7% of sector revenue, reflecting a diverse mix of activities with varying heat sensitivity.[14] Manufacturing, transportation and other operational activities can involve physically demanding work and greater heat exposure, while engineering, professional services and other office-based roles tend to involve more sedentary work in environmentally controlled settings. But industrials accounts for about 18% of revenue across MSCI ACWI Index constituents, making it the largest contributor to estimated dollar productivity losses, at 24% of the total. Consumer staples combines both dimensions: relatively high heat sensitivity, partly reflecting agriculture, food production and other physically intensive activities, and a sizeable revenue base, resulting in a further 16% of total losses.[15]

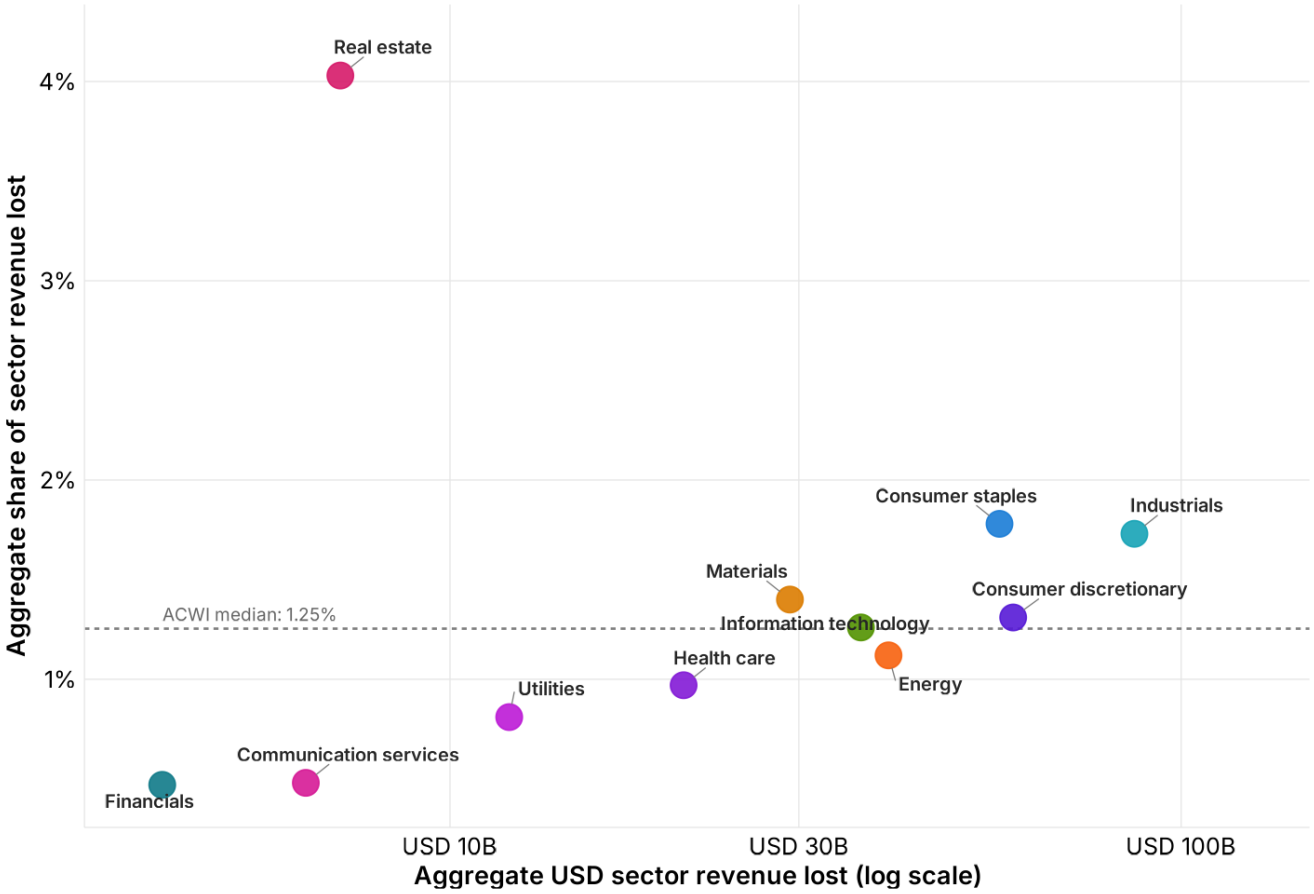
For investors, this distinction matters because the largest portfolio-level exposure may not come from the companies with the highest percentage loss. Moderate productivity effects applied across large revenue bases can create substantial aggregate financial exposure, making both relative vulnerability and economic scale relevant when screening portfolios.

[14] The MSCI ACWI Industrials Index includes 421 companies as of Aug. 31, 2026. Major constituents include Caterpillar Inc., GE Aerospace, RTX Corp., Siemens AG, GE Vernova Inc., Schneider Electric SE, Union Pacific Railroad Co., Rolls-Royce plc and Deere & Co., reflecting exposure to machinery, aerospace, electrical equipment, transportation and other industrial activities with varying reliance on manufacturing, field and operational labor.

[15] The MSCI ACWI Consumer Staples Index includes 162 companies as of Aug. 31, 2026. Major constituents include Walmart Inc., Costco Wholesale Corp., the Coca-Cola Co., the Procter & Gamble Co., Philip Morris International Inc., Nestlé S.A., PepsiCo Inc. and Unilever plc, illustrating the sector's mix of retail, food and beverage production and consumer-products businesses. The degree of direct heat-sensitive labor exposure therefore varies substantially across constituents and their supply chains.

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Sector size can outweigh heat sensitivity in aggregate productivity losses



Data as of Sept. 23, 2026. The chart shows estimated heat-related labor-productivity losses across MSCI ACWI Index constituents, aggregated by GICS sector under current climate conditions and before physiological acclimatization. The vertical axis shows estimated losses as a percentage of each sector's aggregate modeled revenue, while the horizontal axis shows aggregate dollar losses by sector on a logarithmic scale. The dashed line represents the MSCI ACWI Index aggregate loss rate of 1.25% of modeled revenue. Results reflect revenue attributed to company physical locations and represent estimated exposure rather than observed revenue losses. Source: MSCI Sustainability & Climate.

Across the MSCI ACWI Index, estimated revenue drag from labor-productivity losses amounts to USD 357 billion. Physiological acclimatization could moderate these impacts, reducing estimated losses by 17% to USD 298 billion. Acclimatization is distinct from company-led adaptation, but the magnitude of the reduction illustrates the potential economic relevance of reducing worker vulnerability. Companies may have additional options, including cooling, changes in working practices and greater automation, that could further reduce productivity losses but are not explicitly modeled here.

Overall, the company-level results provide three useful dimensions for portfolio analysis: workforce and activity sensitivity, geographic heat exposure and the amount of revenue associated with exposed activity. Investors could use these measures to compare holdings and peers, identify concentrations of heat-related labor risk and prioritize companies for deeper analysis or engagement. For example,

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screening a portfolio for companies combining high estimated revenue impacts with heat-sensitive activities could identify holdings warranting further review; comparing those companies with peers could help determine whether the exposure primarily reflects sector characteristics or a company-specific operating footprint. Adaptation data can then provide an additional lens on whether companies appear to be taking measures to manage that exposure. Depending on an investor's objectives and investment process, these measures could inform engagement priorities, risk monitoring, security selection and portfolio construction.

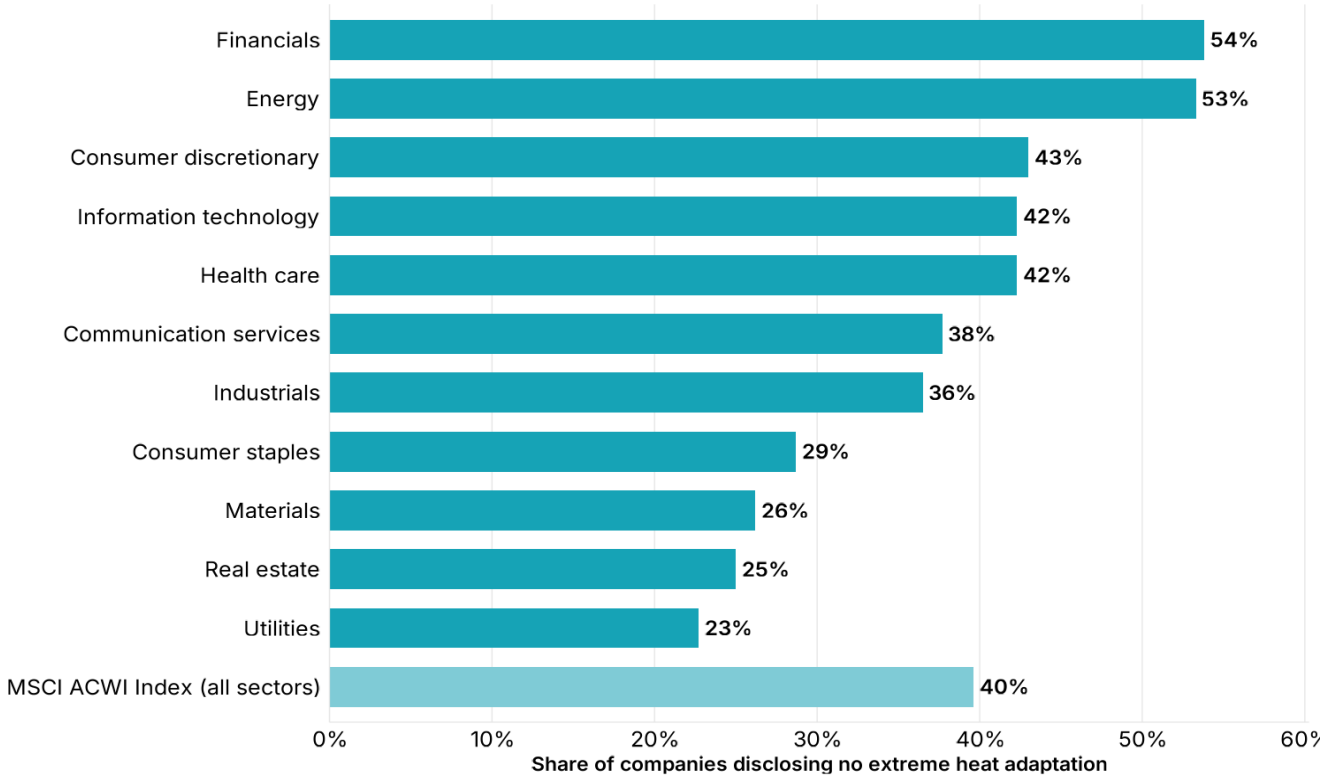
Companies are responding to heat, but adaptation varies widely

Exposure is only one part of the investor question. The financial impact of heat can also depend on companies' ability to protect workers and maintain output as temperatures rise. Public disclosures provide one indication of how companies are responding. Building on prior MSCI research, we analyzed publicly disclosed adaptation measures across MSCI ACWI Index constituents and classified them by physical hazard and type of response to single out extreme heat-related activities.

Nearly 40% of MSCI ACWI Index constituents do not disclose adaptation measures related to extreme heat. Sector-level differences may reflect variation in physical exposure, operational requirements and awareness of heat-related risks. Fewer than one-quarter of utilities and real-estate companies made no mention of heat-related adaptation, meaning that more than three-quarters disclosed some form of response. By comparison, more than half of financials and energy companies did not disclose heat-related adaptation measures. The relatively high prevalence of adaptation disclosures in real estate is notable given the sector's elevated labor-productivity exposure.

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Heat-adaptation disclosures varied considerably across sectors



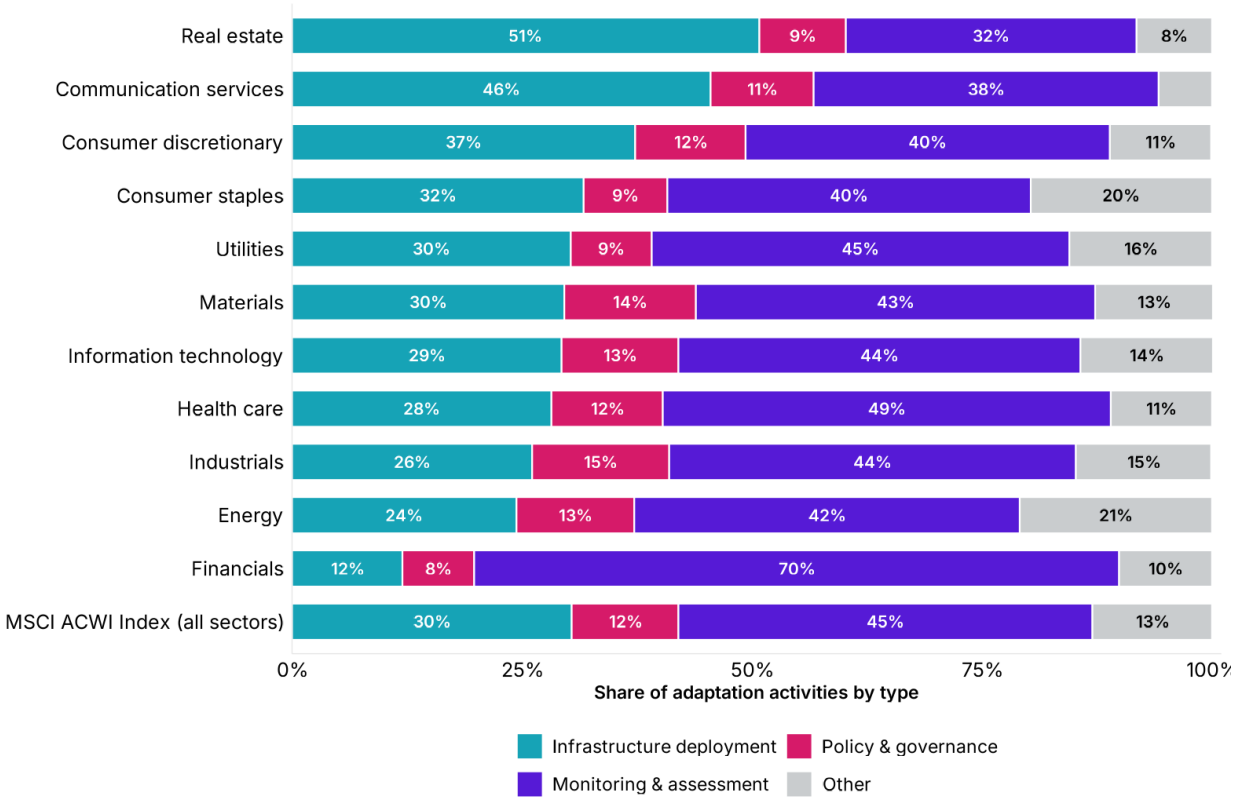
Data as of Sept. 11, 2026. The chart shows the share of MSCI ACWI Index constituents in each GICS sector that did not disclose adaptation measures related to extreme heat. A lower percentage indicates that a greater share of companies in the sector disclosed at least one heat-related adaptation measure. The absence of a disclosure does not necessarily indicate that a company has no adaptation measures in place, nor does the presence of a disclosure indicate the effectiveness or coverage of those measures. Source: MSCI Sustainability & Climate.

The type of adaptation disclosed also matters. Across the MSCI ACWI Index, monitoring and assessment accounted for 45% of identified heat-adaptation activities, compared with 30% for infrastructure deployment and 12% for policy and governance. While monitoring can help companies identify and manage emerging risks, infrastructure and policy measures are more likely to translate into direct changes to workers' heat exposure, through cooling infrastructure, workplace protections or changes to working practices, for example.

The balance varied considerably by sector: infrastructure deployment accounted for more than half of real-estate adaptation disclosures, but just 12% in financials, where 70% related to monitoring and assessment. Even among industrials and consumer staples, where heat-sensitive labor is more prevalent, infrastructure and policy measures together accounted for only around 40% of disclosed activities. The distinction matters financially: measures that reduce worker heat exposure or maintain productive capacity could help limit the pathway from heat to lower output or higher operating costs, whereas monitoring alone does not necessarily reduce the underlying exposure.

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Monitoring dominated heat-adaptation disclosures, but direct interventions varied by sector



Data as of Sept. 11, 2026. The chart shows the distribution of disclosed extreme-heat adaptation activities by type among MSCI ACWI Index constituents that reported heat-related adaptation measures. Activities are classified as infrastructure deployment, policy and governance, monitoring and assessment, or other measures. Percentages represent the share of identified adaptation activities within each sector and sum to 100%. The presence of an adaptation disclosure does not indicate the scale, coverage or effectiveness of the measure. Source: MSCI Sustainability & Climate.

For investors, however, the presence of an adaptation disclosure does not necessarily indicate that heat risk has been fully mitigated. Disclosures generally provide limited information on the scale, coverage or effectiveness of measures, and companies that do not disclose an adaptation may nevertheless have measures in place.

Adaptation data are therefore most useful when considered alongside underlying exposure. Two companies facing similar heat conditions and workforce sensitivity could have different residual risks if one has invested more effectively in cooling, work practices or automation. Combining exposure estimates with evidence on adaptation can help investors identify where further engagement or due diligence may be warranted and which questions to raise with companies about workforce resilience, adaptation spending and operational continuity. For more highly exposed holdings, investors could seek greater clarity on the share of workers and facilities covered by heat-management measures, the costs of those measures, evidence of their effectiveness and whether adaptation plans account for higher future temperatures.

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A warmer climate raises the stakes for workers and investors

Extreme heat is already affecting workers, companies and the broader economy, and rising temperatures could amplify these effects. Our analysis estimates that heat-related labor-productivity losses are equivalent to around 2% of global economic output under current climate conditions, with exposure varying substantially across sectors and geographies.

For companies, the financial impact depends on the interaction of workforce sensitivity, operating location and the scale of exposed activity. For investors, this means heat risk may not be apparent from sector or domicile alone: companies can face exposure through operations and workforces across multiple markets, while larger sectors can generate significant aggregate impacts even where relative productivity losses are more moderate.

Adaptation can reduce these effects, but the disclosures analyzed provided limited visibility into the scale and effectiveness of company responses. Combining asset-level heat exposure, workforce sensitivity, potential revenue impacts and evidence of adaptation can help investors move from identifying physical heat exposure to distinguishing which holdings may face greater financial risk. These measures can support portfolio screening and peer comparison, help prioritize companies for engagement and deeper due diligence and, depending on an investor's objectives and investment process, provide an additional input into security selection and portfolio construction. As temperatures rise, investors may increasingly seek to understand not only which companies are most exposed, but where that exposure could become financially material and which companies are best positioned to manage it.

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