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Confronting climate risk

The changing climate is poised to create a wide array of economic, business, and social risks over the next three decades. Leaders should start integrating climate risk into their decision making now.

After more than 10,000 years of relative stability—the full span of human civilization—the Earth's climate is changing. Since the 1880s, the average global temperature has risen by about 1.1 degrees Celsius, driving substantial physical impact in regions around the world. As average temperatures rise, acute hazards such as heat waves and floods grow in frequency and severity, and chronic hazards such as drought and rising sea levels intensify. These physical risks from climate change will translate into increased socioeconomic risk, presenting policy makers and business leaders with a range of questions that may challenge existing assumptions about supply-chain resilience, risk models, and more.

To help inform decision makers around the world so that they can better assess, adapt to, and mitigate the physical risks of climate change, the McKinsey Global Institute (MGI) recently released a report, *Climate risk and response: Physical hazards and socioeconomic impact*. (For more on the methodology behind the report, see sidebar "About the research.") Its focus is on understanding the nature and extent of physical risk from a changing climate over the next three decades, absent possible adaptation measures.

This article provides an overview of the report. We explain why a certain level of global warming is locked in and illustrate the kinds of physical changes that we can expect as a result. We examine closely four of the report's nine case studies, showing how physical change might create significant socioeconomic risk at a local level. Finally, we look at some of the choices most business leaders will have to confront sooner than later.

Our hope is that this work helps leaders assess the risk and manage it appropriately for their company. The socioeconomic effects of a changing climate will be large and often unpredictable. Governments, businesses, and other organizations will have to address the crisis in different and often collaborative ways. This shared crisis demands a shared response. Leaders and their organizations will have to try to mitigate the effects of climate change even as they adapt to the new reality it imposes on our physical world. To do so, leaders must understand the new climate reality and its potential impact on their organizations in different locales around the world.

About the research

This article was adapted from the McKinsey Global Institute (MGI) report *Climate risk and response: Physical hazards and socioeconomic impacts*.[1] Its authors are **Jonathan Woetzel** (a director of MGI and a senior partner in McKinsey's Shanghai office), **Dickon Pinner** (senior partner in the San Francisco office and global leader of McKinsey's Sustainability Practice), **Hamid Samandari** (senior partner in the New York office and chair of McKinsey's knowledge council), **Hauke Engel** (partner in the Frankfurt office), **Mekala Krishnan** (senior fellow at MGI), **Brodie Boland** (associate partner in the Washington, DC, office), and **Carter Powis** (consultant in the Toronto office).

The 131-page MGI report, released in January 2020, measures the impact of climate change based on the extent to which it could affect human beings, human-made physical assets, and the natural world. Most of the climatological analysis performed for the report was completed by the Woods Hole Research Center. There are a range of estimates for the pace of global warming; we have chosen the Representative Concentration Pathway (RCP) 8.5 scenario because it enables us to assess physical risk in the absence of further decarbonization. Action to reduce emissions could delay projected outcomes. Download the full report on McKinsey.com.

[1] See "Climate risk and response: Physical hazards and socioeconomic impacts," McKinsey Global Institute, January 2020, McKinsey.com.

The new climate reality

Some climate change is locked in.

The primary driver of temperature increase over the past two centuries is the human-caused rise in atmospheric levels of carbon dioxide (CO_2) and other greenhouse gases, including methane and nitrous oxide. Since the beginning of the Industrial Revolution in the mid-18th century, humans have released nearly 2.5 trillion metric tons of CO_2 into the atmosphere, raising atmospheric CO_2 concentrations by 67 percent. Carbon dioxide lingers in the atmosphere for hundreds of years. As a result, nearly all of the warming that occurs is permanent, barring large-scale human action to remove CO_2 from the atmosphere. Furthermore, the planet will continue to warm until we reach net-zero emissions.

If we don't make significant changes, scientists predict that the global average temperature may increase by 2.3 degrees Celsius by 2050, relative to the preindustrial average. Multiple lines of evidence suggest that this could trigger physical feedback loops (such as the thawing of permafrost leading to the release of significant amounts of methane) that might cause the planet to warm for hundreds or thousands of years. Restricting warming to below 1.5 or 2.0 degrees would reduce the risk of the earth entering such a "hothouse" state.

The nature of climate-change risk

Stakeholders can address the risk posed by climate change only if they understand it clearly and see the nuances that make it so complicated to confront. We find that physical climate risk has seven characteristics:

- *Increasing.* Physical climate risks are generally increasing across the globe, even though some countries may find some benefits (such as increased agricultural yields in Canada, Russia, and parts of northern Europe). The increased physical risk would also increase socioeconomic risk.

- *Spatial.* Climate hazards manifest locally. There are significant variations between countries and even within countries. The direct effects of physical climate risk must be understood in the context of a geographically defined area.

- *Nonstationary.* For centuries, financial markets, companies, governments, and individuals have made decisions against the backdrop of a stable climate. But the coming physical climate risk is ever-changing and nonstationary. Replacing a stable environment with one of constant change means that decision making based on experience may prove unreliable. For example, long-accepted engineering parameters for infrastructure design may need to be rethought; homeowners and banks may need to adjust assumptions about long-term mortgages.

- *Nonlinear.* Physiological, human-made, and ecological systems have evolved or been optimized over time to withstand certain thresholds. Those thresholds are now being threatened. If or when they are breached, the impact won't be incremental—the systems may falter, break down, or stop working altogether. Buildings designed to withstand floods of a certain depth won't withstand floods of greater depths; crops grown for a mild climate will wither at higher temperatures. Some adaptation can be carried out fairly quickly (for example, better preparing a factory for a flood). But natural systems such as crops may not be able to keep pace with the current rate of temperature increase. The challenge becomes even greater when multiple risk factors are present in a single region.

- *Systemic.* Climate change can have knock-on effects across regions and sectors, through interconnected socioeconomic and financial systems. For example, flooding in Florida might not only damage housing but also raise insurance costs, lower property values, and reduce property-tax revenues. Supply chains are particularly vulnerable systems, since they prize efficiency over resilience. They might quickly grind to a halt if critical production hubs are affected by intensifying hazards.

- *Regressive.* The poorest communities and populations of the world are the most vulnerable. Emerging economies face the biggest increase in potential impact on workability and livability. The poorest countries often rely on outdoor work and natural capital, and they lack the financial means to adapt quickly.

- *Unprepared.* Our society hasn't confronted a threat like climate change, and we are unprepared. While companies and communities are already adapting, the pace and scale of adaptation must accelerate. This acceleration may well entail rising costs and tough choices, as well as coordinated action across multiple stakeholders.

How climate risk plays out on a local level

There is already plenty of evidence of the extensive damage that climate risk can inflict. Since 2000, there have been at least 13 climate events that have resulted in significant negative socioeconomic impact, as measured by the extent to which it disrupted or destroyed "stocks" of capital—people, physical, and natural. The events include lethal heat waves, drought, hurricanes, fires, flooding, and depletion of water supply.

More frequent and more intense climate hazards will have large consequences. They are likely to threaten systems that form the backbone of human productivity by breaching historical thresholds for resilience. Climate hazards can undermine livability and workability, food systems, physical assets, infrastructure services, and natural capital. Some events strike at multiple systems at once. For example, extreme heat can curtail outdoor work, shift food systems, disrupt infrastructure services, and endanger natural capital such as glaciers. Extreme precipitation and flooding can destroy physical assets and infrastructure while endangering coastal and river communities. Hurricanes can damage global supply chains, and biome shifts can affect ecosystem services.

The best way to see how this will play out is to look at specific cases. MGI looked at nine distinct cases of physical climate risk in a range of geographies and sectors. Each considers the direct impact and knock-on effects of a specific climate hazard in a specific location, as well as adaptation costs and strategies that might avert the worst outcomes. Let's look at four of those cases (see also sidebar "Global problem, local impact").

Will it get too hot to work in India?

The human body provides one example of the nonlinear effect of breaching physical thresholds. The body must maintain a relatively stable core temperature of approximately 37 degrees Celsius to function properly. An increase of just 0.9 of a degree compromises neuromuscular coordination; 3 degrees can induce heatstroke; and 5 degrees can cause death. In India, rising heat and humidity could lead to more frequent breaches of these thresholds, making outdoor work far more challenging and threatening the lives of millions of people.

As of 2017, some 380 million of India's heat-exposed outdoor workers (75 percent of the labor force) produced about 50 percent of the country's GDP. By 2030, 160 million to 200 million people could live in urban areas with a nonzero probability of such heat waves occurring. By 2050, the number could rise to between 310 million and 480 million. The average person living in these regions has a roughly 40 percent chance of experiencing a lethal heat wave in the decade centered on 2030. In the decade centered on 2050, that probability could rise to roughly 80 percent.

India's productivity could suffer. Outdoor workers will need to take breaks to avoid heatstroke. Their bodies will protectively fatigue, in a so-called self-limiting process, to avoid overheating. By 2030, diminished labor productivity could reduce GDP by between 2.5 and 4.5 percent.

India does have ways to adapt. Increased access to air-conditioning, early-warning systems, and cooling shelters can help combat deadly heat. Working hours for outdoor personnel could be shifted, and cities could implement heat-management efforts. At the extreme, coordinated movement of people and capital from high-risk areas could be organized. These would be costly shifts, of course. Adaptation to climate change will be truly challenging if it changes how people conduct their daily lives or requires them to move to areas that are less at risk.

Will mortgages and markets stay afloat in Florida?

Florida's expansive coastline, low elevation, and porous limestone foundation make it vulnerable to flooding. The changing climate is likely to bring more severe storm surge from hurricanes and more tidal flooding. Rising sea levels could push salt water into the freshwater supply, damaging water-management systems. A once-in-100-years hurricane (that is, a hurricane of 1 percent likelihood per year) would damage about $35 billion in real estate today. By 2050, the damage from such an event could be $50 billion—but that's just the beginning. The accompanying financial effects may be even greater.

Real estate is both a physical and a financial store of value for most economies. Damage, and the expectation of future damage, to homes and infrastructure could drive down the prices of exposed homes. The devaluation could be even more significant if climate hazards also affect public-infrastructure assets such as water, sewage, and transportation systems, or if homeowners increasingly factor climate risk into buying decisions.

Lower real-estate prices could have significant knock-on effects in a state whose assets, people, and economic activity are largely concentrated in coastal areas. Property-tax revenue in affected counties could drop 15 to 30 percent, which could lower municipal-bond ratings and the spending power of local governments. Among other things, that would make it harder for cities and towns to invest in the infrastructure they need to combat climate change.

The impact on insurance and mortgage financing in high-risk areas could also be significant. There's a duration mismatch between mortgages, which can be 30 years long, and insurance, which is repriced every year. This mismatch means that current risk signals from insurance premiums might not build in the expected risk over an asset's lifetime, which could lead to insufficiently informed decisions. However, if insurance premiums do rise to account for future climate-change risk, lending activity for new homes could slow, and the wealth of existing homeowners could diminish.

When home values fall steeply with little prospect of recovery, even homeowners who are not financially distressed may choose to strategically default. One comparison point is Texas: during the first months after Hurricane Harvey hit Houston, in 2017, the mortgage-delinquency rate almost doubled, from about 7 to 14 percent. Now, as mortgage lenders start to recognize these risks, they could raise lending rates for risky properties. In some cases, they might even stop providing 30-year mortgages.

To adapt, Florida will have to make hard choices. For example, the state could increase hurricane and flooding protection, or it could curtail—and perhaps even abandon—development in risk-prone areas. The Center for Climate Integrity estimates that 9,200 miles of seawalls would be necessary to protect Florida by 2040, at a cost of $76 billion. Other strategies, such as improving the resilience of existing infrastructure and installing new green infrastructure, come with their own hefty price tags.

Can supply chains weather climate change?

Supply chains are typically optimized for efficiency over resilience, which may make them vulnerable to extreme climate hazards. Any interruption of global supply chains can

Global problem, local impact

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Will it get too hot to work in India?

Increasing risk: in India, the probability of anyone experiencing a lethal heat wave is effectively 0 today, but by 2030, 160 million to 200 million people could be at risk

Degree of exposure: as of 2017, heat-exposed work in India produced ~50% of GDP, drove ~30% of GDP growth, and employed ~75% of the labor force

Effect on labor productivity: by 2050, some parts of India may be under such intense heat and humidity duress that working outside would be unsafe for ~30% of annual daylight hours

Adaptation: adaptation measures for India could include providing early-warning systems, building cooling shelters, shifting work hours for outdoor laborers, and accelerating the shift to service-sector employment

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Will mortgages and markets stay afloat in Florida?

Increasing risk: rising sea levels, increased tidal flooding, and more severe storm surges from hurricanes are likely to threaten Florida's vulnerable coastline

Physical damage to real estate: in 2050, a once-in-100-years hurricane might cause $75 billion worth of damage to Florida real estate, up from $35 billion today

Knock-on effects: in Florida, prices of exposed homes could drop, mortgage rates could rise, more homeowners may strategically choose to default, and property-tax revenue could drop 15–30% in directly affected countries

Adaptation: adaptation measures in Florida could include improving the resilience of existing structures, installing new green infrastructure, and building seawalls

Case studies based on the Representative Concentration Pathway (RCP) 8.5 scenario

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Can supply chains weather climate change?

Increasing risk: a once-in-100-years hurricane in the western Pacific, which will be 4x more likely by 2040, could shut down the semiconductor supply chain

Potential damage: supply chains are optimized for efficiency, not resilience, so production could halt for months; unprepared downstream players could see revenue dip 35% in 1 year

Upstream mitigation: protecting semiconductor plants against hazards could add 2% to building costs

Downstream mitigation: increasing inventory to provide a meaningful buffer could be cost-effective

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Can coastal cities turn the tide on rising flood risk?

Increasing risk: increased flooding and severe storm surges threaten to cause physical damage to coastal cities, while knock-on effects would hamper economic activity even more

Infrastructure threats: ports, low-lying train stations, and underground metros could be at risk, as could factories close to the coast

Total damage: in Bristol, England, a once-in-200-years flood in 2065 could cause ≤$3 billion in damage; in Ho Chi Minh City, Vietnam, a once-in-100-years flood in 2050 could wreak ~$10 billion in damage

Adaptation: it would take up to $500 million for Bristol to protect itself now from that scenario; Ho Chi Minh City might need seawalls, which could be very costly create serious ancillary effects. Let's focus on two such supply chains: semiconductors, a specialty supply chain, and heavy rare earths, a commodity.

The risk to each is slightly different. Key parts of semiconductor supply chains are located in the Western Pacific, where the probability of a once-in-100-years hurricane occurring in any given year might double or even quadruple by 2040. Such hurricanes could potentially lead to months of lost production for the directly affected companies. Unprepared downstream players—for example, chipmakers without buffer inventories, insurance, or the ability to find alternative suppliers—could see revenue in a disaster year drop by as much as 35 percent.

Mining heavy rare earths in southeastern China could be challenged by the increasing likelihood of extreme rainfall. The probability of downpours so severe that they could trigger mine and road closures is projected to rise from about 2.5 percent per year today to about 4.0 percent per year in 2030 and 6.0 percent in 2050. Given the commoditized nature of this supply chain, the resulting production slowdowns could result in increased prices for all downstream players.

Mitigation is relatively straightforward for both upstream and downstream players. Securing semiconductor plants in southeast Asia against hazards, for example, might add a mere 2 percent to building costs. Downstream players in both the rare-earth and semiconductor pipelines could mitigate impacts by holding higher inventory levels and by sourcing from different suppliers across multiple regions. This can be done efficiently. For buyers of semiconductors, for example, raising inventory to provide a meaningful buffer could be cost effective, with estimated costs for warehousing and working capital increasing input costs by less than 1 percent. Nonetheless, the price of climate prudence will almost always be some decrease in production efficiency—for example, by creating limitations on lean or just-in-time inventory.

Can coastal cities turn the tide on rising flood risk?

Many coastal cities are economic centers that have already confronted flood risk. But the potential direct and knock-on effects of flooding are likely to surge dangerously.

Bristol is a port city in the west of England that has not experienced major flooding for decades. But without major investment in adaptation, extreme flood risk there could grow from a problem potentially costing millions of dollars today to a crisis costing billions by 2065. During very high tides, the Avon River becomes "tide locked" and limits land drainage in the lower reaches of the river-catchment area. As a result, Bristol is vulnerable to combined tidal and pluvial floods, which are sensitive to both sea-level rise and precipitation increase. The likelihood of both are expected to climb with climate change.

While Bristol is generally hilly and most of the urban area is far from the river, the most economically valuable areas of the city center and port regions are on comparatively low-lying land. More than 200 hectares (494 acres) of automotive storage near the port (often harboring up to 600,000 vehicles) could be vulnerable to even low levels of floodwater, and the main train station could become inaccessible. Bristol has flood defenses that would prevent the vast majority of damage from an extreme flood event today. By 2065, however, more extreme floods could overwhelm the defenses, in which case water would reach infrastructure that was previously safe.

We estimate that a 200-year flood today (that is, a flood of 0.5 percent likelihood per year) in Bristol would cause infrastructure-asset damage totaling between $10 million and $25 million. This may rise to $180 million to $390 million by 2065. The costs of knock-on effects would rise even more, from $20 million to $150 million today to as much as $2.8 billion by 2065, when an extreme flood might shut down businesses, destroy industrial stores, and halt transportation.

We estimate that protecting the city from this 2065 scenario would cost $250 million to $500 million today. However, the actual costs will largely depend on the specific adaptation approach.

Vietnam's Ho Chi Minh City is prone to monsoonal and storm-surge flooding. Today, the direct infrastructure-asset damage from a 100-year flood could be on the order of $200 million to $300 million, rising to $500 million to $1 billion in 2050. Here, too, the knock-on costs in disrupted economic activity are expected to be more substantial, rising from between $100 million and $400 million today to $2 billion to $8.5 billion in 2050.

Many new infrastructure assets in the city, particularly the local metro system, were designed to tolerate an increase in flooding. Yet the hazards to which these assets may be subjected could be greater than even the higher thresholds. In a worst-case scenario, of 180 centimeters of sea-level rise, these thresholds could be breached in many locations, and some assets might be damaged beyond repair.

Compared with Bristol, Ho Chi Minh City has many more adaptation options, as less than half of the city's major infrastructure needed for 2050 exists today. But adaptation may carry a hefty price tag. One potential comparison is Jakarta's major coastal-defense plans, which have a potential cost of roughly $40 billion. That is comparable to Ho Chi Minh City's current GDP.

An effective response

Local climate threats are increasing in most of the world. The changing environment is steadily altering the very nature of regions around the world. At the same time, the likelihood of "long tail" climate events that create cascading systemic risk is growing. Physical climate risk will affect everyone, directly or indirectly.

We think there are three steps that stakeholders could consider as they seek an effective response to the socioeconomic impacts of physical climate risk: integrating climate risk into decision making, accelerating the pace and scale of adaptation, and decarbonizing at scale to prevent a further buildup of risk.

Integrate climate risk into decision making

Climate change needs to become a major feature in corporate and public-sector decision making. As we have noted, physical climate risk is simultaneously spatial and systemic, nonstationary, and nonlinear in its effect. Potential impacts are regressive and rising over time, and stakeholders today may be underprepared to manage them. Decision making will need to reflect these characteristics.

For companies, this will mean taking climate considerations into account when looking at capital allocation, development of products or services, and supply-chain management, for example. Large capital projects would be evaluated in a way that reflects the increased probability of climate hazards at their location: How will that probability change over time? What are the possible changes in cost of capital for exposed assets? How will climate risk affect the broader market context and other implicit assumptions in the investment case? Cities will have to ask similar questions for urban-planning decisions. Moreover, while the MGI report focuses on physical risk, a comprehensive risk-management strategy will also need to include an assessment of transition and liability risk, as well as the interplay between these forms of risk.

Changes in mindset, operating model, and tools and processes will be needed to integrate climate risk into decision making. For centuries, we have made decisions based on a world of relative climate stability. We are not accustomed to planning for a world with a changing climate. For example, statistical risk management is often not part of ordinary processes in industrial companies. With the changing climate, it will be important to understand and embrace the probabilistic nature of climate risk and be mindful of possible biases and outdated mental models; experiences and heuristics of the past may no longer be a reliable guide to the future. The systemic nature of climate risk requires a holistic approach to understand and identify the full range of possible direct and indirect impacts.

One of the biggest challenges from climate risk will be rethinking the current models we use to quantify risk. These range from financial models used to make capital-allocation decisions to engineering models used to design structures. There is some uncertainty associated with a methodology that leverages global and regional climate models, makes underlying assumptions on emission paths, and seeks to translate climate hazards to potential physical and financial damage. But exploring new ways to quantify climate risk is not the highest "model risk." Continued reliance on current models based on stable historical climate and economic data may be even riskier.

Indeed, current models have at least three potential flaws. First, they lack geographic granularity, at a time when companies need to know how their key locations—and those of their suppliers—are exposed to different forms of climate threat. Second, they don't consider that the climate is constantly changing, a critical factor in determining such things as how resilient to make new factories, what tolerance levels to employ in new infrastructure, and how to design urban areas. And third, they are subject to potential sample bias, since decision makers are accustomed to trusting their own experience as they make decisions about the future.

Accelerate the pace and scale of adaptation

The pace and scale of adaptation will likely need to increase significantly. But adaptation is challenging. With hazard intensity projected to increase, the economics of adaptation could worsen over time. Technical limits may crop up. Difficult trade-offs may need to be assessed, including who and what to protect and who and what to relocate. Many instances may require coordinated action by multiple stakeholders.

Despite all that, many stakeholders will have to figure out ways to adapt. Key measures include protecting people and assets, building resilience, reducing exposure, and ensuring that appropriate insurance and financing are in place.

Protecting people and assets. In response to the record-breaking 2010 heat wave in India that killed 300 people in a single day, the Ahmedabad Municipal Corporation developed the country's first heat-action plan. Its measures included establishing a seven-day probabilistic heat-wave early-warning system, developing a citywide cool-roof program, and setting up teams to distribute cool water and rehydration pills to vulnerable populations during heat waves. Steps such as these are crucial for protecting people. Stakeholders must also be prepared to prioritize emergency response and preparedness, erect cooling shelters, and adjust working hours for outdoor workers who are exposed to heat.

Measures to make existing infrastructure and assets more resilient can help limit risk. Some of this would address "gray" infrastructure—for example, raising the elevation level of buildings in flood-prone areas—while other moves would protect "green" infrastructure. The Dutch program Room for the River, for example, gives rivers more room to manage higher water levels.

On the other hand, it will sometimes be more cost effective to erect new buildings than to retrofit old ones. Some $30 trillion to $50 trillion will be spent on infrastructure in the next ten years, much of it in developing countries. These infrastructure systems and factories could be designed to withstand the withering storms of the future, rather than what passes for a once-in-200-years event now.

Building resilience. Decisions about strengthening assets will need to go hand in hand with measures to drive operational resilience in systems. An important aspect of this is understanding the impact thresholds for systems and how and when they could be breached. Examples of resilience planning for a world of rising climate hazards include building global inventories to mitigate the risk of food or raw-material shortages, building inventory levels in supply chains to protect against interrupted production, establishing the means to source from alternate locations or suppliers, and securing backup power sources.

Reducing exposure. Adaptation strategies for many physical assets will have to reflect their full life cycle. For example, it may make sense not only to invest in addressing asset vulnerabilities for the next decade but also to shorten asset life cycles. In subsequent decades, as climate hazards intensify, the cost–benefit equation of physical resilience measures may no longer be attractive. At that point, it may become necessary to redesign asset footprints altogether by relocating employees and assets. We have already seen some examples of this, such as the buyout programs in Canada for residents in flood-prone areas. Quebec prohibits both the building of new homes and the rebuilding of damaged homes in its floodplain.

Decisions will need to be made about when to focus on protecting people and assets versus when to find ways to reduce their exposure to hazards, which regions and assets to spend on, how much to spend on adaptation, and what to do now as opposed to in the future. Companies need to develop a long-term perspective on how risk and adaptation costs will probably evolve, and they will need to integrate voices of affected communities into their decision making.

Rethinking insurance and finance. People are reluctant to carry insurance for unlikely events, even if they can cause significant damage. Today, only about 50 percent of losses are insured. That percentage is likely to decrease as the changing climate brings more—and more extreme—climate events. Without insurance, recovery after disaster becomes harder, and secondary effects become more probable. Underinsurance reduces resilience.

To adjust to constantly changing physical risk, insurers will have to reconsider current data and models, current levels of insurance premiums, and their own levels of capitalization. Indeed, the entire risk-transfer process (from insured to insurer to reinsurer to governments as insurers of last resort) may need examination, looking at whether each constituent is still able to fulfill its role. Without changes in risk reduction, risk transfer, and premium financing or subsidies, some risk classes in certain areas may become harder to insure, widening the insurance gap that already exists in some parts of the world. New questions will have to be asked, and innovative approaches will be needed.

Finance will also have to adjust if it is to play a significant role in funding adaptation measures, especially in developing countries. Public–private partnerships or participation by multilateral institutions is needed to prevent capital flight from risky areas. Innovative products and ventures have already been developed to broaden the reach and effectiveness of such measures. They include “wrapping” a municipal bond into a catastrophe bond, to allow investors to hold municipal debt without worrying about hard-to-assess climate risk.

Decarbonizing at scale

There is one critical part of addressing climate change that the MGI report does not examine: decarbonization. While adaptation is urgent, climate science tells us that further warming and risk increase can only be stopped by achieving net-zero greenhouse-gas emissions. Decarbonization is a daunting challenge that leaders will need to address in parallel with adaptation during the years ahead. For a closer look, see “Climate math: What a 1.5-degree pathway would take,” on McKinsey.com.

To prepare for the climate of tomorrow, stakeholders will have to learn, mitigate, and adapt. Individuals, businesses, communities, and countries will need to recognize physical climate risk and integrate it into decision making. The next decade will be critical, as decision makers rethink the infrastructure, assets, and systems of the future, and the world collectively sets a path to manage the risk from climate change. Q