



HOW CLIMATE RESILIENT IS YOUR COMPANY?

MEETING A RISING BUSINESS IMPERATIVE

KEY TAKEAWAYS

1. Climate resilience is the capacity to adapt and succeed in the face of the direct and indirect impacts of climate change. In addition to addressing and managing risks, it encompasses the ability to capitalize on the strategic opportunities presented by the shift to a lower-carbon and resource-constrained economy.
2. Companies often focus narrowly on passively mitigating long-term climate risk and meeting short-term environmental or sustainability compliance standards. This fails to meet the need to go on the offensive to build climate resilience in order to gain competitive advantage.
3. Five major groups are placing pressure on companies to assess, define, and enact strategies that enhance climate resilience. Investors, policymakers and regulators, customers, supply chains, and competitors are increasingly demanding that businesses have an answer to the question: Is your company climate resilient?
4. The five groups are also rapidly reshaping the dialogue on climate risk and shifting the discussion inside boardrooms and C-suites of companies across all sectors – from questioning what impacts their businesses could have on the environment, to how climate change will impact their businesses.
5. The shift to de-carbonization and managing resource constraints is driving dynamic and structural changes across the economy. Companies that identify physical and transitional climate risks and integrate these risks into strategic and operational planning can position themselves to improve their climate resilience and gain a competitive edge.
6. An effective resilience strategy should address how climate and market changes can impact corporate and financial performance. To better understand how climate resilient your company is, we recommend the following steps: (1) Assess climate vulnerability of operations and facilities, (2) embed climate risks into enterprise risk management programs, and (3) undertake scenario analysis to enhance decision making around risks and opportunities.
7. Boards, CEOs, and C-suite executives need to begin a dialogue on climate change to ensure that an offensive approach to risks and opportunities is properly embedded within company strategy and operations.



As the physical and transitional impacts of climate change and the transition to a low-carbon economy become ever more apparent, pressure is growing on companies to evaluate and define their climate resilience. This paper outlines five key factors driving the need for increased climate resilience and sets out three approaches for assessing resilience.

CHANGE IS CLOSER THAN IT MAY APPEAR

How is climate change – both its direct environmental impacts and the indirect risks associated with the transition to a low-carbon economy¹ – impacting your company? Is your company climate resilient? Few organizations are capable of answering such questions with any degree of certainty, yet these issues are being raised with greater frequency and urgency by investors, customers, and supply-chain partners. Policymakers are enacting regulations in response to climate change, and the shift to decarbonisation will drive dramatic structural changes across the economy. Companies that proactively adapt to these changes will have powerful competitive advantages.

Inside the boardrooms and C-suites of companies across all sectors, the discussion has shifted from the question of what impact their business could have on the environment, to how climate change will impact their business.

The 2017 *Global Risks Report*, prepared by the World Economic Forum in partnership with Marsh & McLennan Companies,² maintains that environmental threats – among them water crises, extreme weather

“Inside the boardrooms and C-suites of companies across all sectors, the discussion has shifted from the question of what impact their business could have on the environment, to how climate change will impact their business.”

events, and weak responses to climate change – will constitute the most significant global risks over the next decade.

Companies that focus primarily on climate change’s projected physical impacts expected to play out over the coming decades will have “blind spots” to the indirect risks associated with the transition to a lower-carbon economy. Most companies appear unsure as to how the shifting economy, in conjunction with environmental factors, will produce significant industry disruptions. This may be due to gaps in between the organization’s risk management and its climate expertise, and it can lead to an inadequate understanding of the disruptions associated with climate change and its implications for business. Climate risks are frequently seen as an issue too

¹ According to the definition of the Task Force on Climate-related Financial Disclosures (TCFD) by the Financial Stability Board (FSB), indirect transition risks pose different financial and reputational risks to organizations in the shift to a lower-carbon economy, which entails policy, legal, technology, and market changes. On the other hand, financial implications of direct physical risks resulting from climate change are event-driven (acute) or long-term shifts (chronic) in climate patterns.

² World Economic Forum, 2017. “The Global Risk Report 2017.”

complex and too distant to assess; moreover, such changes may be viewed as too indistinct to justify a given business decision.³

Consequently, most companies simply manage climate risks to maintain compliance with regulatory or market standards. For example, a 2016 study revealed that only a small fraction of CEOs (13 percent) planned to assess the vulnerabilities of existing business models and strategies against climate-related risks.⁴ Further, in a recent survey of US corporate directors, only 6 percent viewed climate change as having a significant impact on their companies over the next 12 months and only 9 percent expected to see its impacts over the next five years.⁵

In other instances, company responses to climate risks are narrowly linked to corporate social responsibility (CSR) goals in the area of sustainability. As the director of a leading food products company noted: "At many companies, sustainability is delegated to the supply chain or regulatory compliance. Results are reported annually to preserve corporate reputation and avoid regulatory risks. This process, while important, is inherently defensive. Ultimately, it may not be enough to ensure competitive success in today's dynamic world."⁶

To consider climate resilience simply in terms of far-off future impacts or just a compliance issue is shortsighted. As businesses around the world prepare to face current and immediate climate-related pressures forward-thinking companies that go on the offensive to build climate resilience will gain a competitive edge.

Since the 2015 Paris Agreement on climate change, more than 190 nations worldwide have indicated their commitments to the goal of limiting the rise in global average temperatures to less than 2°C.⁷ Notwithstanding the announcement that the United States will withdraw from the Agreement, global support for the commitments that were made in Paris has remained steadfast.⁸ Across every industry, the increased focus on climate change is interacting with and accelerating other major global trends, such as disruptive technologies, digitization, urbanization, and evolving demographics. These changing economic activities and shifting technologies, combined with new policies and regulations, are driving toward a lower-carbon economy. This shifting landscape creates many uncertainties, risks, and opportunities beyond managing carbon emissions and energy use, including opportunities for new products, services, supply-chain structures, and improved resource management among many others.

Ensuring that an offensive approach to climate-related risks and opportunities is properly embedded within a company's strategy and operations has become a real business imperative. A focus on climate resilience allows an organization to pursue attendant business opportunities and guard against being caught flat-footed on this important capability.

"At many companies, sustainability is delegated to the supply chain or regulatory compliance. Results are reported annually to preserve corporate reputation and avoid regulatory risks. This process, while important, is inherently defensive. Ultimately, it may not be enough to ensure competitive success in today's dynamic world."

3 Marsh & McLennan Companies. "Unlock Growth by Integrating Sustainability, 2016."

See also, Center for Climate and Energy Solutions, 2013. "Weathering the Storm: Building Business Resilience to Climate Change."

4 The Conference Board. "CEO Challenge, 2016."

5 National Association of Corporate Directors, 2017. "2016-2017 Public Company Governance Survey."

6 BRINK News, 2016. "Sustainability and the Power of 'And'"

7 The Paris Agreement was open for signatories at the UN in New York for one year until April 2017, where over 190 countries signed and indicated their commitment to the Agreement.

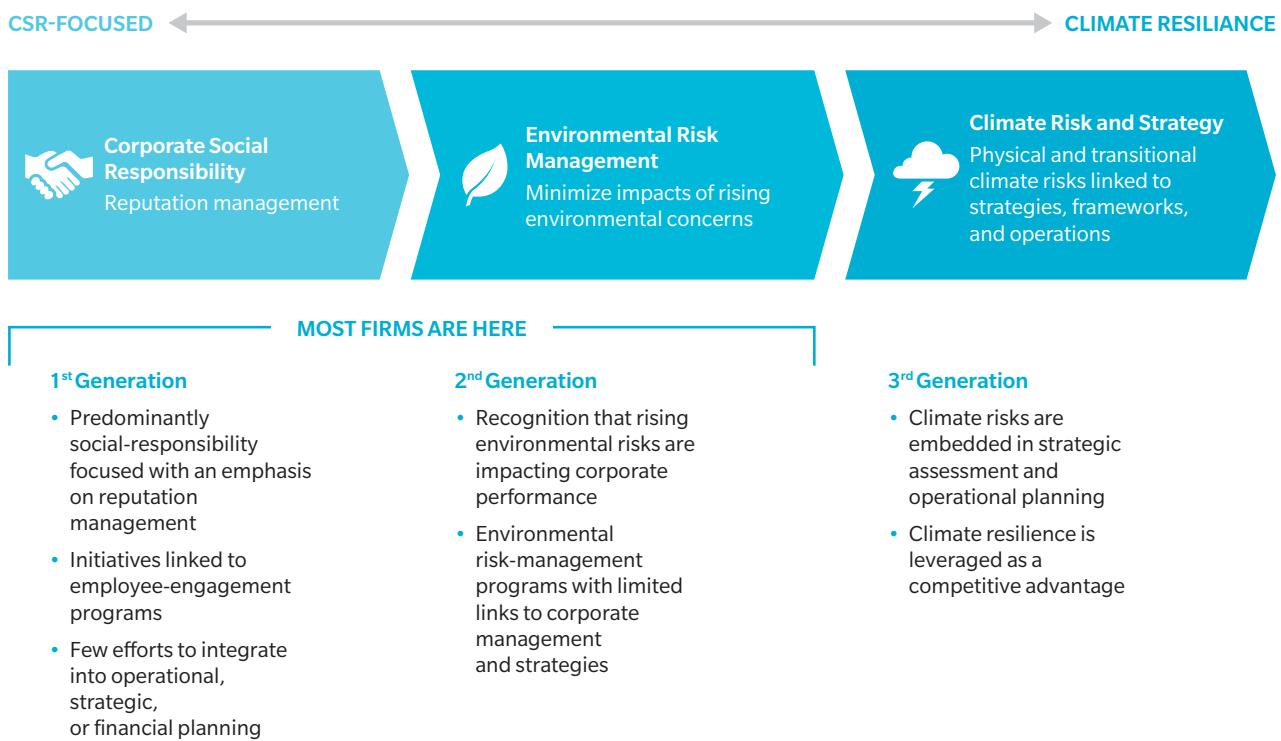
8 Morgan Stanley, June 8, 2017, "The Path Ahead after U.S. Leaves Paris Agreement," http://www.morganstanley.com/ideas/us-path-after-paris-agreement?cid=sm_smsp_lnk_06222017. Since President Trump's announcement to withdrawal from the agreement, which since the USA had already ratified, will take three years to withdrawal, over 1,000 cities, counties, states, universities and businesses in the USA joined the "We are still in" coalition to support actions to meet the Paris goals, see: <http://wearestillin.com/>

CLIMATE RESILIENCE DEFINED

Climate resilience is the capacity not only to survive, but also to adapt and succeed in the face of climate change and its direct and indirect impacts, including changes in regulation and policy. It encompasses the ability to capitalize on the strategic opportunities presented by the shift to a lower-carbon and resource-constrained economy.

To make this change, a paradigm shift in outlook will be necessary. (See Exhibit 1.) In the switch from a primarily defensive CSR focus, to an offense-oriented mindset, companies will need to develop strategies for gaining a competitive edge in climate resilience.

Exhibit 1: Paradigm shift: building a mindset of climate resilience



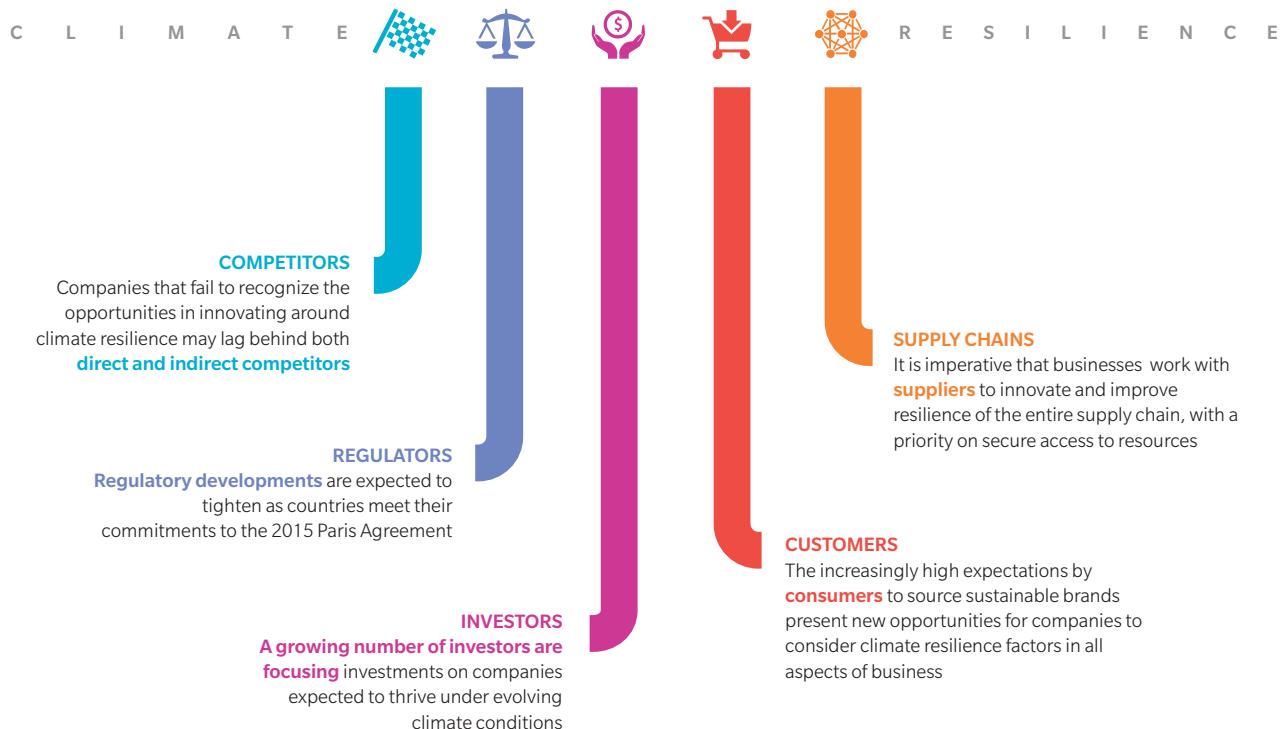
FIVE PRESSURE POINTS DRIVING A GROWING FOCUS ON CLIMATE RESILIENCE

Many companies are taking solid steps to increase their climate resilience and position themselves competitively in the changing marketplace. Since July 2017, more than 100 global companies have committed to powering their operations with 100 percent renewable electricity.⁹ With annual electricity costs running into the hundreds of millions of dollars for many companies, the increased use of renewables could reduce companies' exposure to volatility in energy prices. Other companies are positioning

themselves for growth by offering new and improved products, such as high-efficiency household appliances. Still others are examining ways to increase efficiency and decrease greenhouse gas (GHG) emissions in their supply chains, thereby also reducing total logistics costs.

Five major groups are rapidly reshaping the business environment. (See Exhibit 2.) These factors are driving companies to better assess, define, and enact strategies to increase their climate resilience.

Exhibit 2: Five factors driving the need for increased climate resilience



⁹ RE100, a global collaboration initiated by the Climate Group and the Carbon Disclosure Project, encourages influential companies to commit to 100 percent renewable power. See: <http://there100.org/>

 INVESTORS

A growing number of investors view climate change as a material investment risk. Investors – particularly institutional investors intent on creating and preserving long-term value – are assessing how their portfolios would perform in the transition to a lower-carbon economy.¹⁰ Thus, the resilience of corporate operations to climate-associated risks and opportunities will increasingly affect both the cost and availability of financing.

Investors are considering these emerging environmental risks and allocating their investments accordingly. Indeed, an estimated \$8 trillion was

invested in ESG portfolios in 2016, roughly one-fifth of total assets under professional management in the United States.¹¹

More recently, in March 2017, the \$900 billion Norwegian Sovereign Fund¹² updated its exclusion assessment and removed 10 companies from its portfolio that did not meet new product-based thermal coal criteria. Half of the companies excluded are based in the Asia-Pacific region, and have at least 30 percent of their business activities based on coal, or derive 30 percent or more of their revenues from coal.

10 Already more than 180 institutional investors controlling more than \$20 trillion in assets have pledged to align their investments with climate-compatible growth.

11 US SIF Foundation; see: <http://etfdb.com/etf-education/5-sustainable-investing-trends-2017/>

12 Norges Bank, 2017. "Grounds for decision – Product-based coal exclusions."



NEW INDUSTRY GUIDELINES FOR RESPONSIBLE FINANCING INITIATED BY THE PRIVATE BANKING COMMUNITY

The Association of Banks in Singapore (ABS) released a set of Environmental, Social, and Governance (ESG) guidelines in October 2015¹ that integrate sustainability concerns into the lending and business practices of financial institutions in Singapore. Prompted by the Southeast Asian Haze,² an air pollution crisis in 2015, the new guidelines push for greater disclosure, corporate governance, and capacity building on issues of environmental sustainability. Establishing standards for responsibility in financing practices ensures greater transparency and accountability, which is critical when it comes to investments in forestry companies operating in Southeast Asia, where the illegal practice of slash-and-burn created conditions that caused forest fires to burn out of control in 2015.

1 The Business Times, 2016. "Singapore Haze prompts banks to debate rainforest loan standards."

2 The 2015 SEA haze was an air pollution crisis that resulted from the illegal slash-and-burn practices to clear oil palm plantations in Indonesia that was exacerbated by a severe dry season (that is, the El Nino effect). The episode resulted in record levels of air pollution and several deaths in the region; it also cost Singapore an estimated \$490 million (\$\$700 million) in economic losses, resulting from business interruptions to declines in tourism revenue.

NEW FRAMEWORK TO DISCLOSE CLIMATE RISKS AND ASSOCIATED GOVERNANCE AND RISK MANAGEMENT PROCESS

The June 2017 release of the recommendations of the Financial Stability Board's Task Force on Climate-related Financial Disclosures (FSB TCFD) increased the pressure on organizations to disclose the climate risks of their businesses. The Task Force's mandate was to produce recommendations for voluntary, consistent, clear, and reliable disclosure of the financial impacts of climate change. The report outlines a disclosure framework that calls on corporate boards and company management to consider the following questions:

- **Governance:** Does the board or management oversee climate-related risks, disclosures, and opportunities – and how is the oversight process documented?
- **Strategy:** What are the actual and potential impacts on the organization's businesses, strategy, and financial planning? What processes are used to develop such an assessment?
- **Risk Management:** What processes are used to identify, assess, and manage climate-related risks?

POLICYMAKERS AND REGULATORS

Policymakers and regulators are focused on reducing the risk of manmade, or “anthropogenic,” climate change. In some industries, such as transportation and energy, companies are facing evolving regulations around GHG. Such regulations are expected to expand into other sectors, such as aviation, maritime, and heavy industries as nations look to reduce their GHG emissions. For example, both the United Kingdom and France have announced their intention to ban the sale of new cars with conventional engines beginning in 2040, while Norway has pledged to do the same by 2025 and India by 2030.

Stock exchanges and security regulators are also setting out guidelines mandating or recommending that companies disclose climate risks alongside their financial earnings. For example, since 2010 the US Securities and Exchange Commission (SEC) has recommended that companies disclose how legislation or regulation, international accords, business trends, or the physical impacts of climate change could impact company operations and earnings. Most recently,

the Singapore Stock Exchange has also announced guidelines on sustainability reporting for listed companies on a similar “comply or explain” basis, beginning in the fiscal year 2018.¹³

Countries are also implementing legislation directing institutional investors and fund managers to take climate risks into consideration when managing assets. The French Energy Transition for Green Growth Act¹⁴ mandated that institutional investors disclose in their annual reports how climate change considerations have been incorporated into their investment and risk management policies. The European Union passed legislation in November 2016¹⁵ requiring that pension funds incorporate climate risk into their investment strategies. Valued at about EUR 3 trillion¹⁶ (\$3.17 trillion) and affecting around 75 million people, this regulation establishes a substantial set of reporting and management requirements for capital markets across the world.

13 SGX, 2016. SGX-ST Listing Rules – Sustainability Reporting Guide.

14 UNPRI, 2016. French Energy Transition Law – Global Investor Briefing.

15 Reuters, 2016. EU requires pension funds to assess climate change risks.

16 EU-MACS, 2017. EU law to force pension funds to account for climate risk.



CUSTOMERS

The information explosion, advanced technology shifts, and new consumer preferences are transforming buying patterns for goods and services. Consumers increasingly seek products that have been sourced and manufactured with a reduced carbon footprint. While such products are sold at a premium, consumers have shown a willingness to pay.¹⁷

A recent study revealed that brand-purchasing behaviors are strongly influenced (33 percent) by consumers' perception of the product's environmental or social impact.¹⁸ Surveying over 20,000 individuals across both emerging economies and developed markets – including the UK, US, Brazil, Turkey, and India – the study indicated a strong correlation between stated opinions on sustainability and actual purchasing choices. The study also found that over 20 percent of its respondents would actively choose brands if sustainability credentials were made more visible on the packaging.

As consumers develop increasingly high expectations with respect to sustainable brands, companies must consider their competitive positioning. This trend is further accelerated by the pressures of social media and digital transparency. Increasingly, customers will seek out and do business with those companies whose sustainability and climate risk management practices are robust.



SUPPLY CHAINS

Supply-chain sustainability has become increasingly important for suppliers, vendors, and other third parties trying to stay competitive along the value chain. Many global companies are making sustainability considerations a critical requirement in vendor selection. For example, Walmart's Project Gigaton aims to remove 1 billion metric tons of GHG emissions from its supply chain by 2030, with an intermediate milestone of reducing emissions in its own internal operations by 18 percent before 2025. Initiatives like this are driving changes in all aspects of supply chains, including fleet transportation and operational energy use.

¹⁷ GreenBiz, 2017. Sustainable Retail Trends Watch.

¹⁸ Unilever, 2017. Report shows that one-third of consumers prefer sustainable brands.

Large corporations can drive the long-term resilience of their supply chains in two ways: first, by directly reducing physical exposure to the impacts of possible extreme weather events; and second, by working with suppliers and partners to drive resource efficiencies and innovations throughout the supply chain.

Physical risks to operations and supply chains can result from the immediate impact of extreme weather events and the long-term risks of climate change. Such events, while uncertain, can be met with anticipatory mitigation strategies. In the face of evolving weather patterns, understanding an organization's changing risk profiles is essential for incorporating climate resilience into its supply-chain strategy.

Forward-thinking companies are assessing the climate resilience of their supply chains and are working closely with suppliers to increase the overall resilience in their operations. For example, earlier in 2017, Apple released its 11th Supplier Responsibility Progress Report with the objective to minimize carbon footprint, reduce landfill waste, conserve water, and reduce the use of unsafe chemicals. Apple suppliers that are unable to comply with the new selection criteria face the risk of being dropped from the partnership.



COMPETITORS

Climate change and increasingly constrained resources (such as water, land, and materials) are reshaping businesses and companies that are heavily dependent on energy and water. These range from agricultural and commodity-based sectors, such as food production, transportation, and energy and utilities, to information technology sectors, with water dependent manufacturing and huge energy demands for server farms. With resource security a key consideration, companies must factor in climate change and resource availability into their capital allocation and business model. For example, companies such as Google and Apple are some of the largest purchasers of renewable energy in the world.

Currently, about 20 percent of the world's population lives in regions where water resources are stressed; within the next seven years, that figure is projected to

be as high as 60 percent. Companies across multiple sectors face the challenge of how water stress, critical manufacturing sites, and emerging growth markets overlap. One innovative response to these stresses has come from leading textile manufacturers, which are developing techniques for improved resource management in water-based cloth-dyeing processes: Key resource-constrained risk has been translated into an opportunity, where cost savings through reduced water consumption have improved business throughout the supply chain. Companies from other industry sectors, including Carlsberg, Coca-Cola, MGM Resorts International and Kimberly-Clark, have also invested in innovation to reduce water use.

The deep structural impacts of the transition to a lower-carbon economy are also demonstrated by the expected changes in the automotive sector. Many governments are promoting electric vehicles and /or planning bans on sales of new combustion engines as a means to reduce GHG emissions.¹⁹ Along with this, technical advances and consumer excitement about EVs

have pushed forth the momentum of change, and have started to disrupt the transport and mobility sectors significantly. For example, Tesla's highly anticipated Model 3 generated hundreds of thousands of pre-order sales before production began.²⁰ The impact of EVs will be felt deep into the automotive supply chain. An estimated 70 percent of an EV's component parts are different from those of a gasoline-powered vehicle²¹ and demand for maintenance for the gearboxes, fuel management assemblies, and exhaust systems will begin to dwindle. In contrast, companies providing software, security, and charging station infrastructure will see rising demand.²²

“Currently, about 20 percent of the world’s population lives in regions where water resources are stressed; within the next seven years, that figure is projected to be as high as 60 percent.”

MANAGING DIRECTORS-AND-OFFICERS LIABILITIES ARISING FROM CLIMATE CHANGE

Transition risks may pose additional financial and reputational risks to organizations. Climate change has evolved beyond an ethical environmental or societal issue and is fast becoming a matter of effective corporate governance. For example, in August 2017, an Australian bank was sued by shareholders for what is viewed as a failure to properly disclose the risks to the business posed by climate change. More such cases are expected to follow globally. Shareholders and regulators will be examining companies and directors for purported failures to accurately disclose climate change-related risks to investors.

The increased focus on climate-change exposures to companies presents new and different challenges for directors and officers who now must have a thorough understanding of the risks to the organization. Many current director-and-officer (D&O) policies are designed to protect the personal assets of directors and officers, but they may not be adequate to protect against the exposure from climate risks since these risks do not fit neatly within existing definitions and exclusions, thus producing gaps in D&O coverage.

As such, appropriate D&O insurance policies are needed that provide coverage for any possible climate change exposures. Directors and officers today should carefully analyze their companies' risk profiles and exposures to ensure an enhanced D&O program is structured to meet their needs amid ever-changing climate risks.¹

¹ Marsh, 2016. Climate Change on the Corporate Governance Landscape

¹⁹ For example, Norway has a complete ban of pure ICEVs sales planned for 2025, and both France and the UK have recently announced an end to sales of pure ICEVs by 2040 as part of an ambitious plan to meet targets under the Paris climate accord, and China has noted that it is reviewing such a ban.

²⁰ The Week, 2017. Tesla Model 3: Specs, prices and release.

²¹ Idaho National Laboratory. How do Gasoline and Electric Vehicles Compare?

²² Bloomberg New Energy Finance, 2016. Electric vehicles: It's not just about the car.



GETTING STARTED: THREE WAYS TO ASSESS CLIMATE RESILIENCE

Building an effective resilience strategy must be based on a clear view of climate change's impact on company performance. Put differently, companies must be able to answer the question: "How do climate risks inject volatility into financial performance?"

Being able to answer this question will provide management and the board with significant insights into the threats posed by climate change to the business model, as well as the attendant opportunities. It will allow for informed capital allocation to activities that can drive corporate performance and build climate resilience. Senior management must make operational and strategic decisions that effectively account for climate-derived uncertainties on key objectives, such as cash flow, return on investments, and margins.

The inability to fully assess climate and resource-constrained risks and associated lost opportunities presents greater costs than many companies are

currently aware of. In view of the wide array of knock-on effects of climate and environmental impacts, companies often have great difficulty gaining a complete picture of the risks and opportunities associated with climate change. Moreover, they may respond to risks without fully realizing how their underlying drivers can exacerbate pressure points among investors, regulators, customers, supply chains, and competitors.

Overall, there will be a significant increase in "TRIP" (technology, resources, impacts, and policy) factors that will impact companies. (See Exhibit 3.)

"How do climate risks – both direct physical risks and indirect transitional risks – inject volatility into financial performance?"

Exhibit 3: Climate change is accelerating "TRIP" factors

TRIP FACTOR	DESCRIPTION
T	The rate of progress and investment in the technology supporting a low-carbon economy. Transformation/disruption of existing sectors, or development of new sectors. e.g., transformation of energy production and use, and reduction of carbon and energy intensity (buildings, manufacturing, industry) agriculture, land use etc.
R	Impacts of chronic weather patterns (long-term changes in temperature or precipitation) and related physical change on resource availability (at risk of becoming scarcer or more abundant) and how resources can be used. Agriculture, energy and water are key resources, others are raw earth etc.
I	Impacts of acute weather risk (that is, extreme or catastrophic events). Examples of physical impacts would be property damage and business interruption as a result of more volatile extreme flooding (coastal/inland) exacerbated by sea level rise (SLR) and potential shifts in the distribution of hurricane activity and other severe events (e.g. wildfires, tornados)
P	Regulations meant to reduce the risk of further man-made or "anthropogenic" climate change and associated regulations around resources. Can include developments in climate policy to reduce carbon emissions by increasing the cost of carbon; and/or incentivise low-carbon alternatives, and regulations around greenhouse gas (GHG) emissions). Can also include policies around other resources, e.g., water

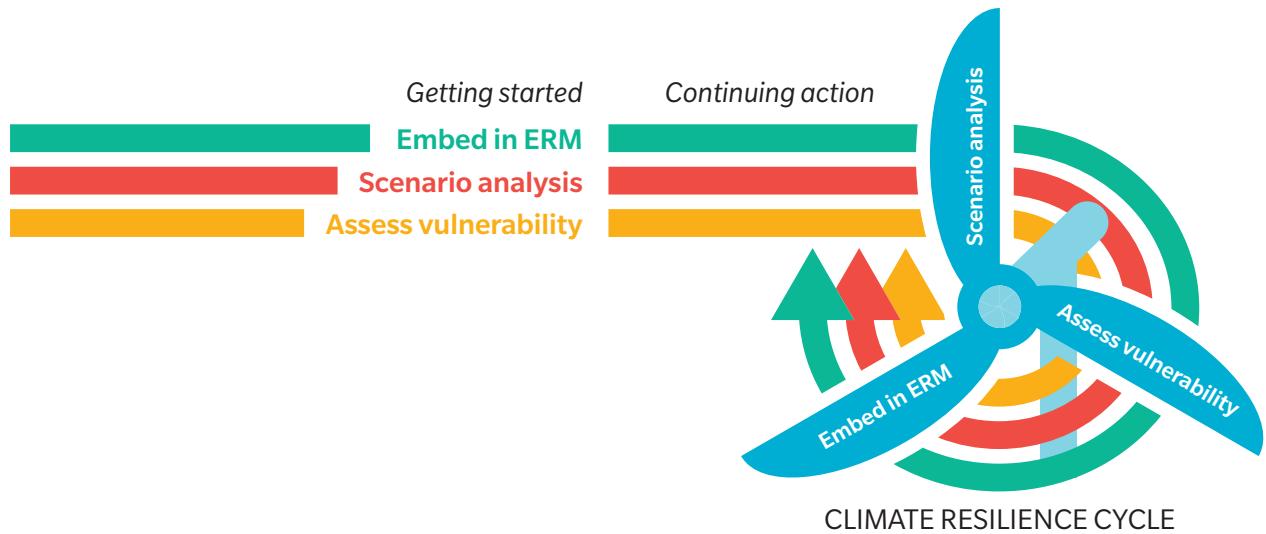
Source: Adapted from *Investing in a Time of Climate Change*, Mercer, 2015

An effective resilience strategy should address how climate and market changes affect businesses and corporate performance. Understanding those effects – with special attention paid to an organization's critical functions, as well as its customers and suppliers – will be essential to adaptation, especially as climate risks evolve. The strategies in place today, such as assessing redundancy issues in supply chains and manufacturing processes to address future business needs and growth projections, may not need to be completely altered; instead, they may require adjustments, so as to take into consideration the climate risks of tomorrow. Corporations deliberating

major capital spending may need to regularly assess their strategies as climate risks continue to develop and evolve. There are a number of steps companies can take toward integrating climate resilience into their decision-making process concerning capital allocations, operation management, and risk mitigation. (See Exhibit 4.) We recommend the following actions:

- Assess the vulnerability of operations and facilities to climate risks and extreme weather events
- Embed climate risks into Enterprise Risk Management (ERM) programs
- Undertake scenario analysis to quantify risks, opportunities, and identify potential responses.

Exhibit 4: Actions create and preserve long-term value in the transition to a lower-carbon economy



Source: MMC Global Risk Center

ASSESS THE VULNERABILITY OF YOUR OPERATIONS AND FACILITIES TO CLIMATE RISKS AND EXTREME WEATHER EVENTS

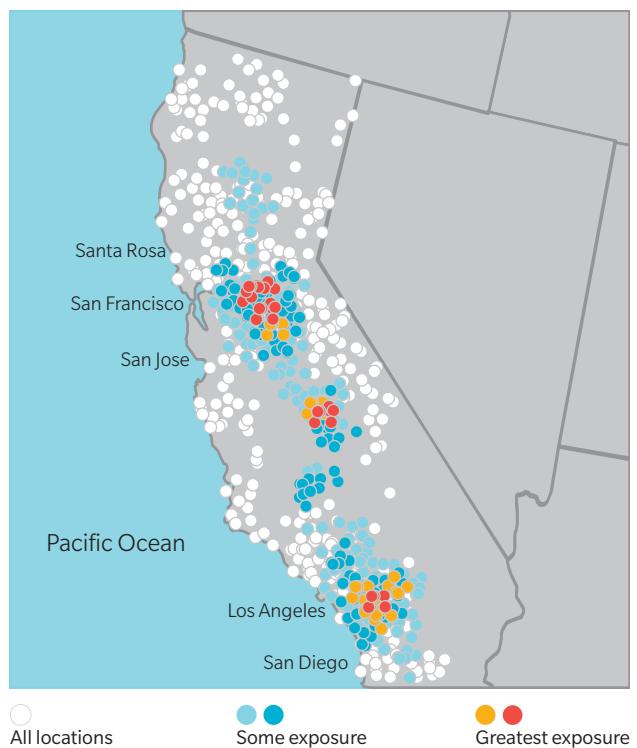
It is increasingly difficult for companies to insulate themselves from the impact of extreme weather events. Over the past 20 years, the frequency and severity of extreme weather events have increased around the world. Events are also shifting in geographic parameters. For example, flood risks are rising in the northern parts of the US and declining in southern areas.²³

Extreme weather events can have devastating effects on property and critical infrastructure with lasting impacts on companies of all sizes. A study conducted by the US National Flood Insurance Program revealed that over 40 percent of US-based small businesses do not recover from weather-related disasters.²⁴ The impacts of extreme weather events are felt throughout local and global supply chains, and can significantly erode an entire sector's profitability. Consider the adverse impact that flooding in Thailand in 2011 had on global hard-drive production.²⁵

Companies must make use of the latest modeling techniques to understand their vulnerability to evolving weather events. Actions can include a number of steps, such as modeling physical asset risk to better understand their location-level risk exposure and the vulnerability of properties, real estate portfolios, and supply chains.

Companies can then draw on a variety of instruments in their risk-mitigation toolkit to enhance their physical, operational, and financial resilience. For example, enhanced business continuity planning – constituting supply-chain analyses and operational recovery strategies – can maximize operational resilience. Companies can also undertake a geographic portfolio review, mapping demographic and infrastructure vulnerabilities to natural hazards, and thereby identify the aggregated weather exposure with respect to location, facility, and asset. (See Exhibit 5.)

Exhibit 5: Mortgage concentration and exposures to natural perils including wind, flood, and wildfire (illustrative)



Source: MMC Global Risk Center

Equipped with such data, firms can improve the physical security of their assets and optimize regional insurance coverage. Specifically, on the issue of insurance, companies can use data to assess insurance policies, placement requirements, and alternative risk-transfer options to test existing insurance policies under loss scenarios with their brokers and insurers.

Companies are also tapping into evolving products to more efficiently transfer extreme weather risk onto the insurance and capital markets. An example of this is the increased use of parametric solutions. Such agreements are designed to insure against extreme weather events, which are often classified as "uninsurable" or "difficult to insure" by the insurance industry and traditionally are excluded from property treaties. These innovative parametric-solution products address climate risks and extreme weather events by setting parameters: using a physical measurement (such as wind speed for typhoons) as the trigger for indemnification. Each

23 <https://now.uiowa.edu/2016/12/flood-threats-changing-across-us>

24 <https://www.fema.gov/protecting-your-businesses>

25 <https://www.ft.com/content/f0f9a234-fb33-11e0-8756-00144feab49a>

coverage is designed to reflect the actual physical exposure of assets, operations, and facilities, and is conditioned upon a pre-agreed payout mechanism that can be used for physical damages and business interruption, as well as post-event repair and recovery in a timely manner. Thus, parametric solutions minimize climate risks to organizations and could constitute an efficient economic hedge.

EMBED CLIMATE RISKS INTO ERM PROGRAMS

Companies can leverage existing enterprise risk management (ERM) and risk assessment processes to increase awareness of climate risks, better assess resilience across the organization, consider additional areas of analysis and risk mitigation, and develop appropriate management approaches.

Our research reveals, however, that few organizations have effectively done so.²⁶ Fewer still have successfully identified connections between climate risks and their underlying drivers. In part, this is due to the vast difference between the pace of climate change and the time frames of the typical corporate risk assessment: Climate change is measured in decades, whereas

company risk assessments typically examine risks over the next 12 to 18 months.

Companies can incorporate the TRIP framework into their risk-identification processes to map how climate affects other dangers and drivers. This would then lead to a reconsideration of the impact of extreme weather events, resource risks, and the transition to a lower-carbon economy. (See Exhibit 6.) The assessment should consider near- and mid-term policy changes, legal implications, technological advancements, and market shifts related to climate change.

Indirect transition risk is a real and complex component of such assessments and should be embedded in ERM programs. For example, carbon-reduction strategies are often deployed under considerations of resource-constraint risks. These additional levels of uncertainty and complexity commonly associated with transition risks need to be addressed by longer-term strategies. Other indirect risks/opportunities include:

- Production restrictions and operational efficiencies
- Irregular weather exposures and emerging technology needs
- Regulatory implications and qualified suppliers and vendors

Exhibit 6: Companies can map how rising pressures for climate resilience accelerate or drive risk on their risk registers and risk maps (illustrative)

IMPACT TO OPERATING PROFIT



Source: MMC Global Risk Center

26 "Unlock Growth by Integrating Sustainability," by Lucy Nottingham, Marsh & McLennan Global Risk Center (November 2016).

Drawing on its risk assessment, an organization can identify means of increasing its climate resilience through direct physical risk mitigation (such as asset reinforcement in coastal areas) or by implementing initiatives (such as sustainable supply chains and operational processes). This analysis can also support the development of more in-depth resiliency analysis.

By ensuring that physical and transition climate risks are incorporated into a company's risk register and management programs, risk managers can identify responses and opportunities to improve corporate performance and financial earnings. (See Exhibit 7.)

Exhibit 7: Risks and opportunities in the transition to a low-carbon economy

RISK FACTORS

Technology

- Substitution of existing products and services with lower emissions options
- Disruption and high up-front costs to transition to lower emissions technology

Resource constraints

- Agriculture, energy, water, and land are some key resources under stress
- Impacts of chronic weather patterns on resource availability and usability

Impacts of extreme weather

- Assessing proposed regulatory frameworks for evolving technology and climate
- Impacts of acute weather risks such as property damage and business interruption

Policy & regulations

- Increased pricing of GHG emissions
- Enhanced emissions-reporting obligations
- Exposure to litigation for failure to comply

OPPORTUNITIES

Resource efficiency & substitutions

- Reduce operating costs through higher efficiency in production and distribution processes
- Develop new technologies and improve energy security

Products & services

- Expand low emission goods and services through R&D and innovation
- Diversify business activities

Markets

- New market share
- Public service incentives
- Community needs and initiatives

Financing

- Diversification of investor base (new investors group)
- Reduction of funding cost (via climate or green bonds)



TAPPING INTO SUSTAINABILITY AND GREEN BONDS TO FINANCE CLIMATE RESILIENCE INITIATIVES

Companies and countries are leveraging sustainability bonds and green bonds to finance climate resilience initiatives and attract new groups of investors. For example, the sustainability bond issued by Starbucks in 2016 focused on programs around coffee supply-chain management, including development and operation of farmer support centers in coffee-growing regions, as well as short- and long-term loans made through Starbucks Global Farmer Fund. The bond attracted a number of new investors to the company.¹

In June 2017, Apple issued its second green bond with proceeds devoted to “green initiatives including renewable energy projects, green buildings, and resource conservation efforts”. Globally, the green bond market is expected to exceed \$200 billion in 2017, more than double the \$93 billion issued in 2016.² Countries, including France and Poland, have also issued green bonds to help finance initiatives related to commitments under the Paris Climate Agreement.³

1 <https://news.starbucks.com/press-releases/starbucks-issues-the-first-u.s.-corporate-sustainability-bond>

2 https://www.moodys.com/research/Moodys-Global-green-bond-issuance-could-rise-to-USD206B-in--PR_360880

3 https://www.moodys.com/research/Moodys-France-goes-green-the-worlds-largest-green-bond-paves--PR_361643

UNDERTAKE SCENARIO ANALYSIS TO ASSESS RISKS, OPPORTUNITIES, AND ACTIONS

Scenario analysis techniques can help in assessing an organization’s climate resilience and risks. Modeling different environmental scenarios gives form to the amorphous problem of climate change and provides mechanisms to discuss potential future states of operation.

The effects of climate change on specific sectors, industries, and organizations are highly variable. Thus, organizations ought to apply scenario analysis in strategic and financial planning, as well as in its risk-management processes.²⁷ Indeed, the FSB TCFD recommends the use of such techniques, noting: “[Scenario analysis] is an important and useful tool for an organization to use, both for understanding strategic implications of climate-related risks and opportunities and for informing stakeholders about how the organization is positioning itself in light of these risks and opportunities.”²⁸ A growing number of companies, asset managers, pension funds, and banks are applying the tool to assess climate resilience.

“[Scenario analysis] is an important and useful tool for an organization to use, both for understanding strategic implications of climate-related risks and opportunities and for informing stakeholders about how the organization is positioning itself in light of these risks.”

In selecting and devising scenarios, companies should consider the appropriate trade-offs in quantification, but also avoid excess complexity and optionality. Scenarios ought to be carefully designed for their intended purpose. When assessing for operational climate-risk resilience, it is critical to include at a minimum one favorable and one unfavorable scenario. This empowers organizations to make informed decisions regarding their longer-term strategies. (See Company in Focus, below.)

27 Mercer, 2015. Investing in a Time of Climate Change.

28 Technical Supplement, The Use of Scenario Analysis in the Disclosure of Climate-Related Risks and Opportunities, 2017, Task Force on Climate-related Financial Disclosure.

An effective analysis would include not only various climate-change scenarios (for example comparing a 2°C temperature change against a 4°C), but also the associated policy and regulatory responses, technological changes, and other factors in response to climate change concerns. The scenario narrative can build on risk assessments and analyses initially developed as part of an ERM process. The analysis of circumstances, drivers, and interconnections

can frame the introduction of assumptions and the detailed articulation of first- and second-order impacts. Even without quantification, such work is valuable in providing a deeper understanding of causation and consequence and in suggesting how changes in the external environment might be monitored. Together, this deeper analytical understanding prompts ideas for mitigation based on the revenues and cost lines affected.

COMPANY IN FOCUS: SCENARIO ANALYSIS OF A MARITIME COMPANY

A transformation scenario is characterized by strong climate change mitigation that limits the rise in global temperatures to less than 2° Celsius since the Industrial Revolution by the year 2100. Under this scenario, the transportation sector will be subject to significant transition risks (such as policy and legal, technology, and market), which could result in financial threats.

Consider the case of a maritime company that is required to identify its pressure points for assessing climate-related risks and opportunities. For example, stricter emission targets may be imposed on maritime carriers as a result of governmental commitments made under the 2015 Paris Agreement.

Conversely, the company may also initiate modal shifts in business strategies by developing electricity-based transport fleet. Such an initiative could open new markets and expand the customer base as a result of shifting market preferences.

On the other hand, a 4°C (fragmentation) scenario with higher physical damages presents the worst outcome, in terms of mitigating environmental and social implications of climate change. Hence, the same maritime company may be subject to more

“Under this scenario, the transportation sector will be subject to significant transition risks (such as policy and legal, technology, and market), which could result in financial threats.”

severe weather impacts, such as storm surges damaging port operations and extreme weather events causing expensive delays and interruptions.

In these scenarios, climate change will also make possible new and more permanent maritime trade routes, such as the Northwest Passage and the Northern Sea Route until then accessible only during the summer months. While the opportunities for these new commercial shipping lanes are plenty, it also presents significant risks.

In response, the maritime company, and the maritime industry, may collectively seek to manage these physical risks by planning for disruptions or uncertainties, such as building deeper berths and allowing for greater redundancy in port infrastructure as they plan for quick response and recovery from the changing weather conditions. Such actions, however, could impair profitability as earnings fall against the high costs of climate-adaptation or risk transfers.



CONCLUSION

Climate risks, in both their direct physical effects and in the impact of transitioning to a lower-carbon economy, have been shown to disrupt normal business operations and severely erode a company's profitability, driving changes in corporate strategies.

In response to the growing threats presented by climate change, companies face increased pressures to define how climate risks are impacting current and expected corporate financial performance. Additionally, companies are under pressure to disclose how they plan to address, adapt, and mitigate these risks (See Exhibit 8.)

As boardrooms and C-Suites begin to examine how a changing climate is affecting their business, the

urgent need to increase corporate climate resilience as a business fundamental is evident. Companies that can successfully identify physical and transitional climate risks, and integrate these risks into strategic and operational planning, can better position their companies to improve climate resilience.

The wide-ranging impacts of climate change reflect the complexity of enhancing climate resilience. This underscores the necessity of commencing discussion about climate change in every company and in every sector, one that is translatable into material action to assess the underlying drivers of climate change and to cope with the challenges – and seize the opportunities it presents.

Exhibit 8: What is our climate resilience? Three questions for the C-Suite and the board

Board

1. Have we defined how the board provides oversight of climate related risks and opportunities?
2. Are the organization's climate-related financial disclosures in (i.e., public) annual financial filings consistent with the recommendations of FSB TCFD recommendations?
3. Have we provided the fiduciary duty to protect and enhance our organization's assets and shareholders' investments against climate risks and opportunities?

CEO

1. Has the company assessed the actual and potential impacts of climate related risks and opportunities on the organization's businesses and strategy?
2. What are the climate-related scenarios and associated time horizon(s) considered in assessing the organization's climate resilience?
3. Can we describe the climate resilience of the organization's strategy?



Chief Sustainability Officer

1. Do we have an initial list of top climate risks facing the organization?
2. What data do we have on these risks (impact and frequency)?
3. In what format are we regularly providing this data to risk management and finance?



Chief Risk Officer

1. How are climate risks captured in the risk identification process?
2. Have we mapped how these risks impact the organization's performance?
3. How do we capture regular updates on these "TRIP" factors?



Chief Financial Officer

1. Do we have data on how climate risks are financially impacting the company?
2. How do climate-related risks serve as an input to financial planning?
3. How do we report on the impact of these risks to the board and investors?



Chief Investment Officer

1. Have we considered climate related risks and opportunities for our investment strategy under different climate scenarios?
2. Are these risks included in investment decisions?
3. How do we report the impact of these risks to our portfolio to investors and is this reporting consistent with the FSB TCD recommendations?

Authors

LUCY NOTTINGHAM

Director, Marsh & McLennan Companies' Global Risk Center

JACLYN YEO

Senior Research Analyst, Marsh & McLennan Companies' Asia Pacific Risk Center

Special thanks to Giulia Pasquale and David Neher (both consultants at Oliver Wyman) for providing additional content support

Contributors

Guy Carpenter: Beverly Adams, Robert Bentley, Imelda Powers; **Lippincott:** John Marshall; **Marsh:** David Batchelor, Ellen Charnley, Duncan Ellis, Mark Pollard, Chris Smy; **Marsh Risk Consulting:** Robert Smith; **Mercer:** Jane Ambachtsheer, Alex Bernhardt, Helga Birgden, Karen Lockridge; **Oliver Wyman:** John Colas, Peter Reynolds, Curt Underwood, Lauren Wylie, Alban Pyanet; **Marsh & McLennan Companies:** Elizabeth Barry, Mae Hsieh; **Global Risk Center:** Richard Smith-Bingham; Alex Wittenberg Asia-Pacific Risk Center: Wolfram Hedrich, Blair Chalmers.

About The Global Risk Center

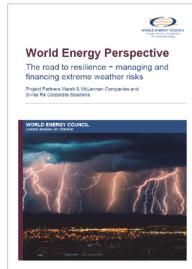
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Related Reading



TASK FORCE ON CLIMATE-RELATED FINANCIAL DISCLOSURES, FINAL REPORT

Recommendations of the Task Force on Climate-related Financial Disclosures. June 2017



THE WORLD ENERGY COUNCIL, THE ROAD TO RESILIENCE - MANAGING AND FINANCING EXTREME WEATHER RISKS. 2015

Project partners Marsh & McLennan Companies and Swiss Re Corporate Solutions



RESPONDING TO CLIMATE RISKS: EXPERT PERSPECTIVES ON THE CHANGING ENVIRONMENT AND CLIMATE

Marsh & McLennan Companies, February 2017



SUSTAINABILITY IN THE CORPORATE WORLD: RESEARCH REPORT

Mercer LLC, July 2014



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World Economic Forum. January 2017. Project partner Marsh & McLennan Companies



GLOBAL WARMING: THE EVOLVING RISK LANDSCAPE

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