Climate Change & Business: What Every MBA Needs to Know

Executive Summary

Climate change presents one of the biggest challenges to economies in the 21st century. The impacts of climate change will affect where new offices and manufacturing facilities are sited, how leaders plan for and respond to crises, how investors think about the cost of capital, how customers perceive the brands they buy, where and how raw materials are sourced, and even, potentially, what materials are available for new products in the future. Because of the widespread nature of impacts, these risks are relevant to MBAs in functions including finance, strategy, procurement, product development, marketing, real estate, operations/supply chain management, and human relations.

Managers who understand the risks can also envision business opportunities. Companies that act now to mitigate risks in their supply chains, properties, and investment portfolios can gain competitive advantage over industry peers. Acting on climate also minimizes companies’ reputation risk with customers, employees, and policy-makers. Finally, there are a host of multi-billion-dollar growth-market opportunities that entrepreneurs and investors can capitalize on. Every MBA thinking about the future of business should understand the risks—and opportunities—facing their industry from climate change.

The Issue

The climate is changing as carbon dioxide (CO₂) and other greenhouse gases emitted by industrial activity interfere with the earth’s natural climate system. Heat-trapping gases concentrated in the atmosphere are producing an overall rise in average global temperature (‘global warming’), but also disrupting the atmosphere’s typical patterns, producing complicated changes that are interrelated but not uniform.

Effects

The effects of climate change are already visible, and accelerating. The extent and pace of change will depend on how fast policy and business mitigation strategies take effect. Climate change effects include:

- **Rising global temperatures.** At the crux of climate change is a rise in the average global temperature. 2018 was the fourth hottest year on record, with temperatures 0.79°C (1.42°F) higher than average globally. Four of the five hottest years on record have occurred between 2014-2018. (Note that this warming does not necessarily eliminate extreme cold events. As climate change disrupts the flows of air and water around the earth, there can be times of...
Extreme cold—for instance, when warm air displaces Arctic air over the U.S., causing a “polar vortex.”

- **Extreme heat.** In the U.S., up to 26% of U.S. metropolitan areas could see more than 100 days a year of 95°F heat by 2060–2080, versus only 1% today. Extreme heat intensifies the potential for drought and wildfires, raises energy bills, presents health risks to populations, and decreases worker productivity in industries like agriculture and construction.

- **More extreme weather events in more locations.** Climate change affects how much moisture the air can hold, meaning that hurricanes (cyclones), rain storms, and snow storms all increase in intensity. Some regions may experience extreme rainfall and flooding, even as others are experiencing water shortages and wildfires (such as 2018’s Hurricanes Florence and Michael on the East Coast and wildfires in California).

- **Sea level rise.** As land ice in the Arctic melts and warming ocean water expands, sea levels are rising, causing coastlines to move inland and increasing the destructiveness of storm surges. Even in the absence of storms, “sunny day flooding” (or “nuisance flooding”) caused by sea level rise increasingly interrupts business and damages properties in some coastal cities like Miami, FL. In the U.S. 40% of the population (126 million people) live in coastal counties that could be affected by rising sea levels.

- **Agricultural growing region shifts.** With a warming climate, growing regions for crops are shifting. For example, the growing regions for wheat in the U.S., Europe, and Russia are creeping further north each year. Heat, drought, and storms also affect crop yields generally. Some crops that have limited or specialized growing regions—like coffee, cocoa, peaches, almonds, vanilla—are particularly vulnerable.

- **Population displacement.** Sea level rise will force migration of people from coastal areas and island nations to higher ground. Other large population shifts will occur as events like prolonged drought and natural disasters displace inhabitants.

As climate impacts worsen, there are likely to be compounded impacts. Population displacement, drought, and food shortages may threaten local or regional political stability. Extreme heat and expanded ranges for water- and mosquito-borne diseases will bring new public health issues.

**Causes**
The changes to the climate are due to an increase in CO₂, methane, and other greenhouse gases due to industrial activity as well as deforestation (the removal of trees which naturally absorb CO₂ from the atmosphere). The most significant contributors to climate change include:

- The burning of coal, oil, and gas in the production of electricity, which emits CO₂
- The burning of gasoline and diesel in transportation (cars, trucks, airplanes), which emits CO₂
- Deforestation to clear land for agriculture, timber harvesting, and development
- Agricultural and industrial activities which release methane and nitrous oxide into the atmosphere
Business Risks

In KPMG’s 2019 Global CEO Outlook, CEOs from across sectors listed environmental/climate change risk as the number one threat to growth—ahead of disruptive technology risk, cyber security, and operational risk. Climate change impacts present tangible and intangible risks to businesses—some of which might be surprising.

Physical asset risks
In the immediate term, extreme weather events intensified by climate change directly threaten real property assets. When Hurricane Harvey hit Houston, TX in 2017, hundreds of corporate campuses, manufacturing facilities, and refineries were flooded. Businesses lost buildings, vehicles, and equipment. Twenty-five percent of the region’s oil and gas production shut down and corporate productivity was reduced by 10%. Munich Re estimates that natural disasters globally caused $160 billion in damages in 2018 and notes that these disasters, particularly wildfires, are worsened by climate change. Blackrock estimates that extreme weather events also pose growing risks for the credit worthiness of state and local issuers in the $3.8 trillion U.S. municipal bond market. More intense rain and snow events, wildfires, and droughts all have the potential to affect physical assets.

Supply chain disruptions
In a world of global supply chains, a company’s operations can be interrupted even when its own facilities are not directly affected by natural disasters. In 2011, when the country of Thailand was crippled by extreme flooding, Toyota had to suspend production at plants in North America because Thai-made components were unavailable. In another example, a record heat wave in Australia in early 2019 affected the consumer goods manufacturing company Mars. “One of our facilities in Australia had to shut down for a couple of days because the temperature spiked, the price of electricity spiked at the same time, and it was just no longer financially viable for us to have that facility open and running and producing the things that it produces for our consumers in Australia,” said Lisa Manley, Mars’ Senior Director of Sustainability Engagement & Partnerships. She added: “I think that we’ve got very real business risks as a result of climate change.”

Raw material supply & price volatility risks
The growing regions and yields for many agricultural products are shifting because of climate change. For instance, in Brazil and Central America, 80% of the land currently used to grow Arabica coffee will become unsuitable by 2050—a scenario likely to reduce coffee supply and drive up prices globally. Companies that source agricultural inputs need to take a good look at the vulnerability of their suppliers under different climate scenarios. Does their supply chain have redundancy? Are there alternative growing regions for their products? Are there ways to mitigate exposure or adapt? Starbucks, for instance, is working directly with coffee farmers to adapt growing practices and test new plant strains for a warming world.

“Over three-quarters of CEOs (76 percent) say that their organization’s growth will depend on their ability to navigate the shift to a low-carbon, clean-technology economy.”

- KPMG 2019 Global CEO Outlook
Policy risk
When policies (federal, state, or local) are enacted to restrict, penalize, or tax carbon emissions, companies with high emissions face significant business risk. Though the U.S. has failed to adopt a federal climate change policy or a carbon tax in the past, the possibility of new policy exists with every election. Energy companies like electric utilities and oil & gas companies are particularly exposed to policy risk. Companies may find themselves with “stranded assets” if carbon taxes make it too costly to operate carbon-intensive facilities.

Energy cost risk
Commercial energy costs are expected to rise in most U.S. metro areas as temperatures go up and the need for cooling increases (though facilities in some northern cities might actually see costs go down as they reduce their need for heating). Electric utilities with infrastructure vulnerable to flooding, hurricanes, or wildfires are seeing the costs to manage these risks go up, and those with relatively high fossil fuel-based generating assets will also face higher exposure to carbon policy risk—costs which they will pass on to customers. Energy-intensive industries are particularly at risk of rising energy costs.

Reputation risk
In the age of social media, consumers increasingly hold companies accountable for social and environmental positions and are quick to support or abandon brands based on values. Consumer-facing brands that fail to address climate change issues face potential public outcry and even boycotts from some consumer segments. Failure to address climate can also hurt a company’s image with employees. In May 2019, for example, 7,700 Amazon employees made news as they formed a group called Amazon Employees for Climate Justice and spoke at the company’s shareholder meeting to call for stronger climate action.

Access to capital
All of the above risks have the potential to affect a company’s cost of capital. Investors are beginning to require greater disclosure of climate-related financial impacts. The Task Force on Climate-related Financial Disclosures, chaired by Michael Bloomberg, has put forward recommendations for companies to disclose a wide range of risks. Insurance companies are also taking note. “We are very focused on carbon transition risks and how those risks are affecting all kinds of sectors globally,” Jim Hempstead, managing director of the ESG Group at Moody’s, said in an interview in May 2019.

Business Advocacy on Climate
CEO Climate Dialogue
CEOs from Citi, DuPont, Unilever, Shell, Ford, and other companies are advocating for U.S. federal policy action on climate.

We Mean Business
We Mean Business tracks 900+ companies’ corporate climate action commitments like renewable energy, land use, and emissions targets.

Climate Leadership Council
Founded with member companies including Johnson & Johnson, GM, Microsoft, and PepsiCo, this institute advocates policy action including a carbon tax & dividend policy.

“The implications for investors go beyond coastal real estate. Think of agriculture (crop yields), insurance (property and casualty premiums) and electric utilities (risks to plants; peak electricity demand). The damage from storms, floods and heat waves can also disrupt corporate supply chains — and pressure public finances, posing risks to municipal and sovereign bond holders.”

- BlackRock

“Getting Physical: Scenario Analysis for Assessing Climate-Related Risks,” 2019

Business Opportunities
Companies and entrepreneurs who get ahead of climate risk stand to realize tremendous value. Many companies have corporate sustainability departments that are setting climate goals, assessing risks, and communicating with investors. Corporations that adapt their supply chains, operations, and infrastructure can gain first-mover advantages over industry peers and capture new business opportunities. In a June 2019 survey by the nonprofit CDP, 225 of the world’s 500 biggest companies estimated that climate-related opportunities represent potential financial impacts totaling over $2.1 trillion.
There is a tremendous amount of innovation happening in the world’s major cities as they think about resilience strategies (see 100 Resilient Cities and C40 Cities). Companies with real estate assets can identify and fortify buildings that are at risk of flooding (moving electrical and heating/cooling equipment to higher floors, for instance). They might also install onsite solar, wind, and battery storage systems to provide emergency power to facilities in areas where electric power could fail, or might consider relocating altogether. Real estate developers and investors should use climate scenarios and sea level rise projections when thinking about siting new developments. Entrepreneurs with energy-efficient and climate-resilient building technologies will also see new growth opportunities.

Resilient & redundant supply chains
Many companies are examining their supply chains for potential climate-related risks—especially for sites vulnerable to extreme weather events—and developing contingency plans. For example, General Motors (GM) developed supplier mapping to help provide visibility into vulnerable suppliers and developed an active crisis center that monitors the weather and begins contacting suppliers when extreme weather events are forecast.

Low-carbon energy & energy storage
One of the biggest shifts in response to climate change will be a transition from fossil fuel-based power generation to low-carbon energy (solar, wind, hydropower, nuclear). Bloomberg New Energy Finance projects that of $11.5 trillion being invested globally in new power generation capacity between 2018 and 2050, $8.4 trillion will go to wind and solar and a further $1.5 trillion to other zero-carbon technologies such as hydro and nuclear. Energy storage (batteries) and related grid infrastructure are also key to this transition. The Bill Gates-backed fund, Breakthrough Energy Ventures, plans to invest $1 billion in energy storage, liquid fuels, off-grid microgrids, low-carbon building materials and geothermal energy technologies.

Corporations thinking about their climate impacts have to think about where their energy comes from. Through the RE100 initiative, 175+ corporations have committed to achieve 100% renewable status, while some companies like Apple and Google announced in 2018 that they are already meeting that goal through a combination of direct-owned and grid-purchased renewable energy. In many markets, the economics of wind and solar are now at price parity with fossil fuel-generated power, so companies making a switch to renewables can realize cost savings while also maximizing goodwill with customers and employees.

Low-carbon transportation
The transportation sector is likely to undergo a dramatic transformation in a short period of time. McKinsey & Co. predicts that by 2021, more than 50 percent of vehicles sold could have electric power trains (versus 5 percent of vehicles sold in 2016). Experts foresee the rapid adoption of electric and hydrogen-powered buses, light-duty trucks, tractor trailers, ships, and airplanes in addition to cars. Companies developing batteries, charging infrastructure, and alternative fuels technologies will all see market opportunities. Corporations in many sectors are converting their corporate fleets and shifting their shipping and transportation footprint to low-carbon options.
### Agriculture products

Beef and dairy farming is one of the biggest emitters of the greenhouse gas methane. For that reason, there’s a new push for plant-based proteins (like Impossible Burger), lab-grown meat (Memphis Meats), and alternative proteins (like Exo’s cricket protein). Barclay’s predicts the alternative meat market could be worth $140 billion by 2029. Biotech crops that are heat-tolerant and drought-resistant, as well as climate-adaptive agtech innovations will also be big. Companies like McDonald’s and Nestlé are moving to risk-proof their ag supply chains, and other companies are realizing opportunities to address this market. IBM, for instance, is developing AI technologies to help farmers improve yields integrating weather data with “smart” irrigation systems as well as blockchain technologies to make food supply chains more sustainable.

### Climate finance, insurance & risk management

Insurance companies (particularly re-insurers) and investors are beginning to price climate risk into their portfolios. ESG (environmental-social-governance) investing markets are growing, including funds which seek to exclude highly exposed companies and/or include climate leaders. Blackrock’s Global Head of Sustainable Investing, Brian Deese, has said, “The combination of advances in data sciences, including geolocation data and climate modeling, have allowed us to more precisely assess the investment implications of climate-related risks.” HSBC and the Climate Bonds Initiative assess the market for climate-aligned bonds at $1.45 trillion. Startups like Jupiter see opportunities in using predictive analytics to forecast climate risks for companies and investors.

### Carbon solutions

Technologies to remove carbon from the atmosphere (carbon capture and sequestration) are still frontier technologies but they are poised to be huge moneymakers if the technologies pan out. Carbon Engineering, a startup with a system that pulls CO2 out of the air (“direct air capture”), has raised $100 million in VC funding. Other companies, like LanzaTech and NET Power, want to capture and reuse CO2 at the point of emission. The accelerator Y Combinator announced a call in 2018 for entrepreneurs with carbon removal technologies. And, if other solutions fail, some investors are banking on a host of far-out “geoengineering” strategies, like Ice911, which attempt to cool the planet through large systems-level environmental innovations.

### Takeaways for MBAs

1. **Climate change will affect businesses and supply chains in many ways, some of which are foreseen, some of which will be surprising.** Companies may face direct physical risks to their assets, supply chain disruptions, policy and reputation risks, and access to capital risks.

2. **As with any global challenge, there are business opportunities for savvy entrepreneurs, investors, and corporate actors.** Companies stand to gain first-mover advantages in mitigating climate risk exposure now. There are also multi-billion-dollar markets available to entrepreneurs in clean energy, low-carbon transportation, resilient agriculture and real estate, climate finance, and carbon technologies.

3. **Every MBA graduating today should be thinking about how climate change and its related effects will impact their industry, supply chains, and consumers in the future.**

### Further Reading

- ClimateCAP: The Global MBA Summit on Climate, Capital, & Business