

CHIEF INVESTMENT OFFICE

# Investment Insights



## The Great Clash: The Crisis Doesn't Stop Change

June 2020

The opinions are those of the author(s) and subject to change.

Following on the releases of the Chief Investment Office (CIO) Investment Insights series —The Great Separation, The Great Acceleration and The Great Convergence— comes The Great Clash. The Great Clash is about the collision of two of the most powerful forces in the world right now—climate change and coronavirus (COVID-19). The pandemic and resultant global economic shutdown has sharply reduced the level of global greenhouse gas emissions this year. That is the good news. The bad news: the world keeps getting warmer, ice caps keep melting, sea levels keep rising, glaciers keep receding, and droughts and floods keep coming with increased ferocity and frequency—all the by-product of the decades-long accumulation of greenhouse gases. According to the Copernicus Climate Change Service, a science division of the European Union, the global average surface temperature hit a record high this May.

While the one-off shutdown of the global economy produced dramatic atmospheric results, keeping over 7 billion people “sheltered-in-place” is not a sustainable way to reduce global greenhouse gas emissions. The collision of climate change and COVID-19 reveals the size of the challenge. The Great Clash has also grabbed the attention of the world and driven the point home that health and wealth are intertwined, and that mounting climate risks and debilitating side effects represent clear and present dangers to the overall well-being of the global economy. In our opinion, climate change will remain a central feature of corporate decision making in the years ahead and remain prominently at the forefront of environmental, social and governance (ESG) investment strategies and portfolio considerations.

### Setting the Stage: Climate Change vs. Covid-19

They are both heavyweights—powerful, lethal and seemingly unstoppable. They are both global forces, although one is more ponderous than the other and has been stalking the planet for decades. The other moves at lightning speed and is a more recent nemesis. They are largely invisible, but their global footprints are devastatingly discernible. They are unemotional, don't differentiate between rich and poor nations, and owe their existence to how humanity chooses to live and treat the environment. Finally, these global titans have never met—until now.

The Great Clash is about the collision of two of the most powerful forces in the world right now—climate change and COVID-19. It was a rendezvous by happenstance—climate change wasn't expecting anything untoward this year, just more of the same of rising average temperatures around the world, interspersed with high-frequency heat waves and more intense floods, topped off with rising sea levels. All thanks to the unrelenting rise in greenhouse gas emissions. The status quo of climate change,

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Data as of 6/15/2020 and subject to change.

#### Investment Perspective:

Companies that embrace more climate-friendly business models and operations, as well as consumer products and services, are likely to enjoy sustained growth opportunities over the long-term. Key investment opportunities pivot around renewable energy (solar and wind), electrical vehicles, next-generation batteries, clean technology, energy-efficient electronics and building systems, water/waste management, and semiconductor based light-emitting diode (LEDs), among other areas.

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however, was rocked by a bolt from the blue: the coronavirus that sprang from China in early 2020 and swiftly moved to every corner of the globe, triggering a global healthcare crisis that led to an unimaginable shutdown of humanity, a collapse in global economic activity, and an unprecedented fall in the daily diet of climate change: greenhouse gas emissions.

2020 will be remembered as the year life came to a screeching halt on Planet Earth. It will be remembered as a time when entire industries shut down around the world. When factories shuttered, workers were cashiered, people stopped driving, planes didn't fly, and "shelter-in-place" became the norm. It will also be remembered as the year two titans clashed: climate change and COVID-19, triggering a rethink among investors about the relationship between health and wealth, and how climate change affects both.

## The Immovable Beast (Climate Change)

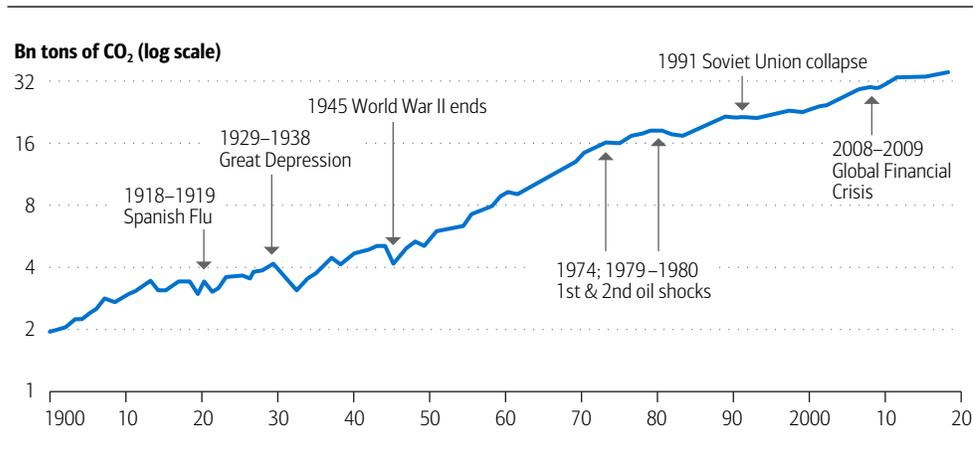
Exact dates are unknown, and still very much open for debate, but it is widely agreed upon that the fuse of human-induced global climate change was lit in the mid- to late 1800s. Since the 1880s, the average global temperature has increased by roughly 1.1 degrees Celsius, with significant regional variations.<sup>1</sup>

The warming of the planet stems from the unrelenting rise in atmospheric levels of carbon dioxide (CO<sub>2</sub>) and other greenhouse gases, like methane and nitrous oxide. These are the by-products of the industrialization, mechanization and modernization of the global economy since the Industrial Revolution.

There are, to be sure, natural causes of climate change—think volcanic eruptions, solar winds, the earth's positioning to the sun, as just a few examples. However, scientific evidence suggests that the bulk of rising concentrations of greenhouse gas emissions over the past century have been induced by human activities, ranging from producing more goods, traveling greater distances and more often, consuming more food, burning more fossil fuels, and crowding into more urban areas. Against this backdrop, global emissions of CO<sub>2</sub> increased from 2 billion tons of carbon dioxide in 1900 to over 36 billion tons some 120 years later (Exhibit 1). The level of greenhouse gases is higher now than at any time in the last 800,000 years.<sup>2</sup>

*"It is worse, much worse, than you think."*—Opening sentence from "The Uninhabitable Earth: Life After Warming" by David Wallace-Wells, February 2019.

### Exhibit 1: Global CO<sub>2</sub> Emissions



Source: World Resources Institute. Data as of February 2020.

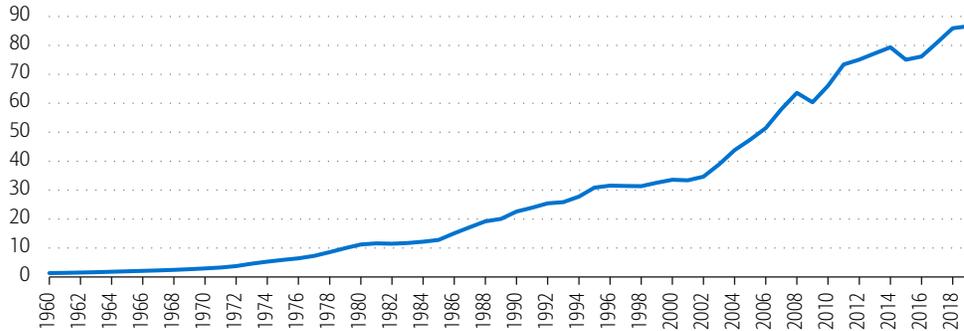
<sup>1</sup> "Climate Risk and Response, Physical hazards and socioeconomic impacts," McKinsey Institute, January 2020.

<sup>2</sup> "What is global warming, explained" National Geographic, January 22, 2019.

## Exhibit 2: World Gross Domestic Product (GDP) Over the Decades

### Global Nominal GDP

Trillions of U.S. \$



Sources: World Bank (1960–2018), International Monetary Fund (2019 estimate). Data as of June 2020.

Global CO<sub>2</sub> emissions accelerated after World War II and soared alongside the growing prosperity of the post-war global economy. Prosperity is a primary catalyst of CO<sub>2</sub>, so when world output rose from \$1 trillion in the late 1950s to \$87 trillion by 2019, greenhouse gas emissions (on both an annual and cumulative basis) soared as well, (Exhibit 2). Emission levels were propelled by the post-war consumption boom in the United States, the re-industrialization of war-ravaged Europe and Japan, the opening of China, and the ballooning middle classes of the emerging markets that increasingly assume the consumption and fossil-burning lifestyles of those in the developed markets. These dynamics have collectively added to the unwavering rise of global greenhouse gas emissions over the past few decades (Exhibit 3).

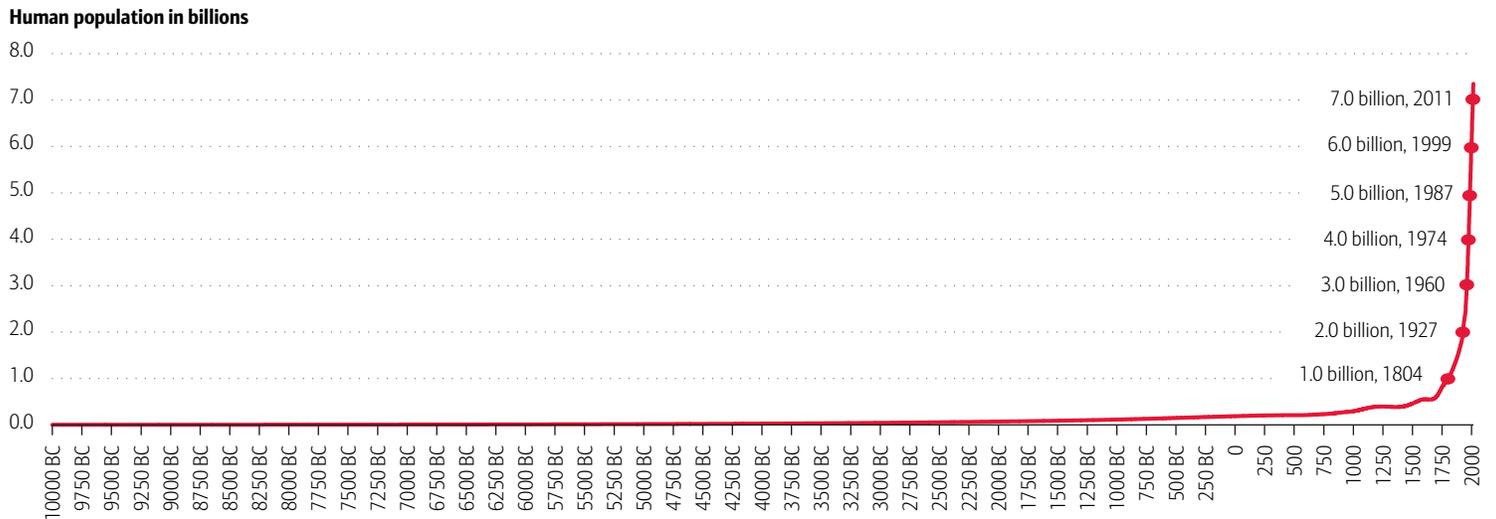
## Exhibit 3: Key Summary of Climate Change

- Global average temperatures have increased by more than 1°C since pre-industrial times.
- CO<sub>2</sub> concentrations in the atmosphere are now well over 400ppm—their highest levels in over 800,000 years.
- Globally we emit over 36 billion tons of CO<sub>2</sub> per year—this continues to increase.
- There are large inequalities in CO<sub>2</sub> emissions: The world's poorest have contributed less than 1% of emissions, but will be the most vulnerable to climate change impacts.
- Today, China is the world's largest CO<sub>2</sub> emitter—accounting for more than one-quarter of emissions. This is followed by the U.S. (15%); European Union (EU)-28 (10%); India (7%); and Russia (5%).
- The U.S. has contributed most to global CO<sub>2</sub> emissions to date, accounting for 25% of cumulative emissions. This is followed by the EU-28 (22%); China (13%); Russia (6%); and Japan (4%).
- A large amount of CO<sub>2</sub> is embedded in traded goods—this means some countries' emissions increase while others decrease when we look at emissions based on consumption rather than production.
- There are large differences—more than 100-fold—in per capita CO<sub>2</sub> emissions among countries.
- The world is not on track to meet its agreed target of limiting warming to 2°C. Under current policies, expected warming will be in the range of 3.1°C to 3.7°C.

Source: Our World in Data. Data as of December 2019.

So too has the ever-rising number of people on Planet Earth. It took from the dawn of humanity to the early nineteenth century for the world's population to reach 1 billion. 1804 was the first year the Earth hosted one billion people. While it took another 123 years before the world population reached 2 billion (1927), it only took 33 years to reach 3 billion in 1960. Then things really accelerated: only 14 years eclipsed to get to the 4 billion mark (1974), just 13 years to reach 5 billion (1987), and 12 years each to get to 6 billion (1999) and 7 billion (2011) (Exhibit 4).

## Exhibit 4: Human Population Over 12,000 Years By the Billions



Sources: United Nations (UN) Population Division; Our World in Data. Data as of October 2019.

In other words, it took over 200,000 years for the world's population to reach 1 billion, but only 200 years more to reach 7 billion. As of March 2020, the world's population stood at 7.8 billion, and according to projections from the UN, some 8 billion people will inhabit the Earth by the middle of this decade. More people, in turn, means more consumption and production, more waste and trash, more energy and water consumption, more stress and strain on Mother Earth's environment and fragile ecosystem, and more emissions of greenhouse gases. It means more climate risks, since climate change is about much more than just warming land and sea temperatures. It's also about more extreme weather events, like severe floods and life-threatening droughts, in addition to rising sea levels and shifting wildlife habitats.

Human-induced global warming has caused multiple observed changes in the climate system, some of which are outlined in brief in Exhibit 5. Changes in both land and ocean temperatures come with dramatic environmental consequences, ranging from epic droughts in Europe, Africa and Australia, and the Missouri River Basin, to massive wildfires in Australia and California. Floods have become more acute, with five of the 10 costliest disasters of 2019 flood-related. Rising sea levels threaten virtually every nation in the world—with flooding and rising sea levels so extreme in Indonesia that the government is considering moving the capital (Jakarta) inland. Melting ice caps, warming oceans, threatened wildlife, frequent hurricanes, deteriorating water quality, rising levels of waste, life-threatening air pollution—all of these dynamics are the hallmarks and footprints of the Immovable Beast, or climate change. And all of which come with staggering cost in terms of lost economic output, increased poverty, frequent famines, and rising costs in terms of production, investment and finance, and insurance.

## Exhibit 5: Devastation Wrought by Climate Change

Droughts	Wildfires	Hurricanes	Melting Ice Caps	Wildlife
Over a 10-year period, droughts cost the agricultural sectors of developing-country economies a staggering \$29 billion in damaged crop and livestock production.	Every year since 2000, an average of 73,000 wildfires burns about 7 million acres, double the average acreage burned in the 1990s.	The U.S. has had 40 hurricanes tagged as billion-dollar disasters since 1980 with a cumulative damage estimate of \$862 billion.	Since 1979, Arctic minimum sea ice levels have been decreasing by as much as 13.7% per decade.	12% of bird species, 23% of mammals, 32% of amphibians and 25% of coniferous plants are currently endangered.
Flooding	Freshwater	Waste	Air Pollution	Insurance Costs
Annually, floods cause \$8 billion of damage a year in the U.S. and \$40 billion worldwide.	An estimated 3.6 billion people live in areas that are water-scarce at least 1 month per year, and that could increase to 4.8 billion–5.7 billion by 2050.	Waste generation in cities is estimated to almost double from 2012 levels to over 6 million tons per day in 2025.	Air pollution contributes to the death of 7 million people each year. The most premature deaths from fossil fuel-related pollution were in China (1.8 million (mn)), India (1 mn), and the U.S. (230,000).	Economic losses from natural disasters topped \$232 billion in 2019—just \$71 billion of that was covered by insurance.

Sources: Droughts: Food and Agriculture Organization of the UN, March 2018. Wildfires: Congressional Research Service, October 3, 2019. Flooding: National Geographic, April 4, 2019. Melting Ice Caps: National Oceanic and Atmospheric Administration, September 26, 2019. Wildlife: International Union for Conservation of Nature, data as of 2019. Hurricanes: National Oceanic and Atmospheric Administration, September 2019. Freshwater: UN World Water Development Report, 2018. Waste: World Bank, 2018. Air Pollution: UN, May 31, 2019. Insurance Costs: AON, data as of 2020.

The toll from all above: Mother Earth is now estimated to be 1 degree Celsius warmer than it was in the mid- to the late 1800s; according to the UN, human-induced warming reached roughly 1 degree Celsius above pre-industrial levels in 2017. That said, many regions of the world are warming faster than other areas. Roughly one-tenth of the world’s surface area has already experienced 2 degrees Celsius of warming — an amount that UN scientists say will trigger dangerous climate impacts. In the end, containing and corralling the seemingly unstoppable rise of the Immovable Beast remains one of the primary challenges of the 21<sup>st</sup> century.

## The Invisible Enemy (SARS-CoV-2 and its disease, COVID-19)

Coronaviruses are not uncommon—they consist of a large and diverse family of viruses that can cause not only common upper respiratory symptoms such as coughs and runny noses, but also far deadlier diseases such as Severe Acute Respiratory Syndrome (SARS) and Middle East Respiratory Syndrome (MERS). The former—SARS—was first detected in November 2002 and spread to roughly 30 nations. Some 8,000 people were affected by the disease, with 774 people dying, a rather high mortality rate of 10% (Exhibit 6). The epidemic ended in July 2003, and no U.S. deaths were reported. Meanwhile, MERS was first identified in 2012, spread to roughly 25 nations, and as Exhibit 6 highlights, the disease infected far fewer people than SARS, although the fatality rate was much higher, 34%.

*“I wish I had done more to call attention to the danger.”—Bill Gates speaking about the potential dangers of global pandemics, May 2020.*

## Exhibit 6: Comparing Past and Present Epidemics and Pandemics.

	SARS	MERS	Swine Flu H1N1	H1N1 (U.S. Only)	SARS-CoV-2	SARS-CoV-2 (U.S. Only)	Current Seasonal Flu
<b>Total cases</b>	8,096	2,499	1.4 billion	60.8 million	7.9 million	2.1 million	39 million – 56 million
<b>Deaths</b>	774	861	151,700 – 575,400	12,469	432,973	117,538	24,000 – 62,000
<b>Fatality Rate</b>	10%	34%	0.01-0.04%	0.02%	5.5%	5.5%	0.06-0.11%

Note: Preliminary Burden Estimate for the Seasonal Flu by U.S. Centers for Disease Control and Protection (CDC) from October 1, 2019 through April 4, 2020. Worldwide total cases/deaths/fatality rate unless otherwise stated. Sources: CDC. Data as of June 14, 2020.

The last pandemic to strike the world emerged in the spring of 2009, when the H1N1 swine flu swept the globe. The virus infected as many as 1.4 billion people between the spring of 2009 and the spring of 2010. H1N1 was significant in that the infection rates—60 million Americans—was quite high, although the mortality rate was quite low. Some 12,000 to 12,500 people died of the disease in the U.S., a mortality rate of 0.02%. One key reason for the low mortality rate: Those ill with H1N1 responded well to anti-viral drugs used to treat the flu. What's more, the anti-viral drugs not only assisted those with the illness but also helped contain the outbreak, since people in close contact with someone who caught H1N1 were commonly given the drugs as a precaution, limiting its spread. And at the time, there were plenty of stockpiles of anti-viral drugs. That pandemic passed.

Enter, SARS-CoV-2 (the virus) and COVID-19 (the disease). The virus is a new pathogen, and, because it's novel, there is no therapeutic drug or vaccine for COVID-19 as of now. It is also highly transmissible, unlike SARS and MERS, which were less devastating to the world because the diseases were not easily passed on from person to person. In addition, neither virus—SARS and MERS—has claimed to be spread through pre-symptomatic transmissions, meaning infected people did not spread the virus before they had the symptoms. COVID-19, in contrast, can be spread by people without symptoms, making the virus far more transmissible and lethal. To note, a great deal of uncertainty surrounds actual rates of asymptomatic transmission rates at this time.

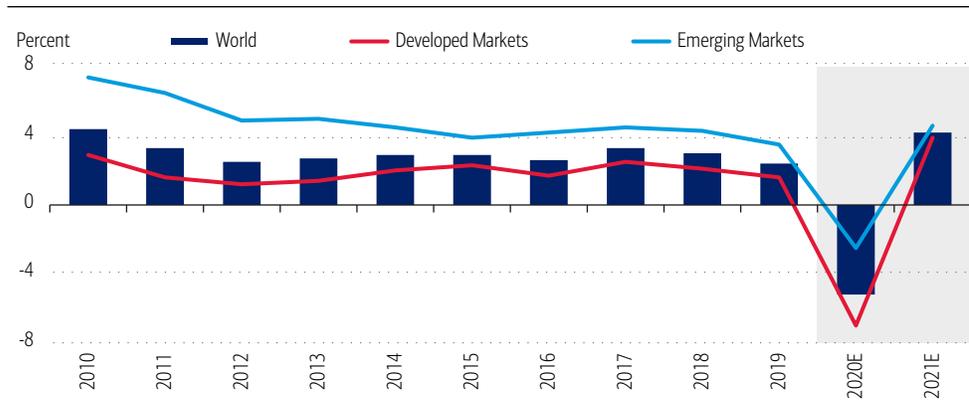
As Angela Rasmussen, a virologist at Columbia University put it, "SARS-CoV-2 is kind of a perfect storm," in that COVID-19 can be mild enough that some people who have it don't know they have it. It's also easily spread, can be transmitted by pre-symptomatic people, and is severe enough to kill a significant share of those who have it.<sup>3</sup>

On March 11, 2020, COVID-19 was declared a pandemic by the World Health Organization. Two days later, on March 13, a national emergency was declared in the United States on account of concerns over COVID-19. Tallying the numbers, as of June 14, 2020, over 7.9 million cases of COVID-19 had been reported globally, with 29%, or 2.1 million cases, reported in the United States. Some 432,973 deaths have been attributed to the disease globally, with 117,538 recorded in the United States.

Against this grim backdrop, however, the number of COVID-19 cases and deaths in the U.S. as of June 10 seemed to have plateaued and declined in many former hot spots like New York State. The United States, like many other parts of the world, has begun to flatten the curve. While risks around COVID-19 remain, state quarantines and social distancing practices, in addition to better testing and tracking techniques, are working to contain the virus in the U.S. and most other parts of the world, with Latin America the outlier. The world has gained an upper hand on the Invisible Enemy but the costs—human, economic, financial, social—have been staggering. The pandemic of 2020 has knocked both the advanced economies and emerging markets into recession (Exhibit 7), the first time this has happened since the Great Depression. In other words, the global COVID-19-induced economic downturn is highly synchronous—according to the World Bank, 93% of countries are projected to face a recession in 2020, the largest share recorded in data going back to 1870. What's more, while the virus flooded the global economy, it's also dealt a blow to the Immovable Beast.

<sup>3</sup> FiveThirtyEight, "Why did the world shut down for COVID-19 but not Ebola, SARS or Swine Flu?" April 14, 2020.

## Exhibit 7: Past and Expected Global Growth



E=Estimate. Source: World Bank. Data as of June 2020.

### When Giants Collide (Immovable Beast meets Invisible Enemy)

No force has ever landed a punch so far to global warming like COVID-19. By bringing the global economy to its knees, by triggering one of the largest shutdowns of the human race in modern history, the Invisible Enemy delivered a stunning blow to the Immovable Beast. It wasn't a knock-out punch, for sure, but it still stung. The Beast thrives on carbon emissions and other greenhouse gases. But COVID-19 denied climate change its lifeline—nasty and toxic gases—by shuttering the global economy and forcing the world to “shelter-in-place.” Superman ran afoul of kryptonite.

COVID-19 so turned back the dial on greenhouse gas emissions that carbon dioxide emissions levels in India dropped for the first time in four decades, falling 15% in March and roughly 30% in April month-over-month. In Delhi, one of the most polluted cities in the world, blue skies unfolded, while in other parts of the country, the majestic Himalayas became visible for the first time in decades. In China, another major global polluter, emissions dropped by roughly 25% at peak shutdown over March, according to the International Energy Agency (IEA).

In some of the largest cities in the world, like Delhi, Sao Paulo and New York, levels of fine particulate matter known as PM2.5 fell dramatically, by 25% to 60% in many cases. According to data gathered by NASA, satellite data of the northeastern part of the United States revealed a 30% drop in air pollution over densely populated metropolitan areas. According to the same source, nitrogen dioxide levels in northern Italy dropped by 40% beginning in early March, when the shutdown began. In Venice, meanwhile, the canal waters suddenly cleared in the absence of thousands of tourists thronging the city.

Something else happened in March: When air travel came to a near halt (at one point, over 16,000 passenger jets were grounded worldwide) and global road transportation activity halved from the 2019 average, the world grew quieter, and the earth vibrated less, with seismometers around the world recording reductions in movement along Earth's crust. Seismologists at the Royal Observatory of Belgium noted a 30% to 50% reduction in ambient seismic noise during the shutdown, which means the earth was vibrating less.<sup>4</sup>

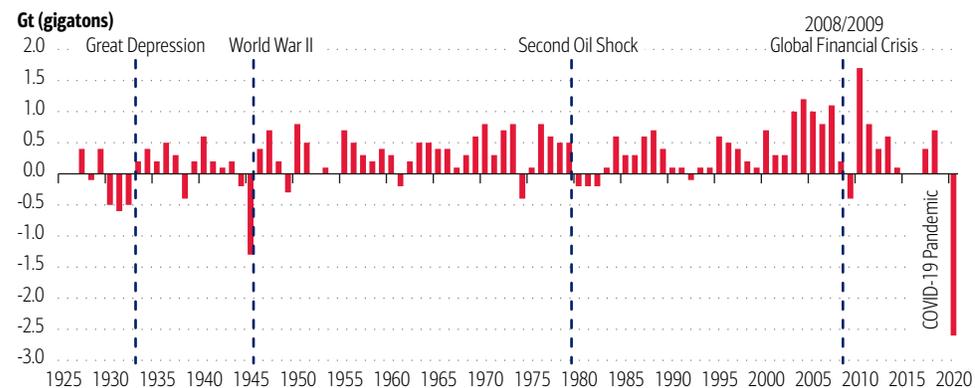
Through mid-April 2020, according to the IEA, countries in full shutdown experienced an average decline in energy demand of 25% relative to typical levels; countries in partial shutdown averaged an 18% fall. Based on IEA estimates, demand for oil—the fuel most affected by this pandemic—fell year-on-year by around 25 million barrels per day (bpd), one of the lowest levels in decades. Demand for coal, nuclear power and natural gas also swooned as global electricity usage plunged along with plummeting economic output.

*“COVID-19 is the most adverse peacetime shock to the global economy in a century.”—The World Bank, Global Economic Prospects, June 2020.*

<sup>4</sup> Spectrum New, “Worldwide shutdown leads to visible, positive environment impacts,” April 6, 2020.

In April, or at the height of the global shutdown, the world's daily carbon dioxide emissions fell by 17% compared to levels of 2019. All in all, the IEA expects global CO<sub>2</sub> emissions to decline by 8% this year, which equates to 2.6 metric gigatons (Gt), the largest one-year reduction in history so far (Exhibit 8). The figure is six times larger than the previous record reduction of 0.4 Gt in 2009 and the aftermath of the Great Financial Recession. Along similar lines, according to CarbonBrief, COVID-19-cum-Global Recession could result in the largest one-year drop in greenhouse gas emissions in history. In the end, nothing has stunned or stunted climate change like COVID-19.

### Exhibit 8: Annual Change in Global Energy-related CO<sub>2</sub> Emissions, 1925–2020



Source: IEA. Data as of April 2020.

### It's Not Over—The Beast Lives

And now the bad news: the Beast lives, staggered by COVID-19 but hardly slain. In reality, it was never a fair fight: climate change has been around for decades, COVID-19 for months.

The world keeps getting warmer, ice caps keep melting, sea levels keep rising, glaciers keep receding, and droughts and floods keep coming with increased ferocity and frequency—all the by-product of the decades-long accumulation of greenhouse gases. It's the cumulative effects of gases over the past century that drives climate risks.

To wit, according to the Copernicus Climate Change Service, a science division of the EU, the global average surface temperature hit a record high this May, thanks in part—*incredibly*—to “hot spots” in Siberia and Antarctica. In Siberia, average temperatures were up to 18 degrees above normal for the month. The January-May period, according to the institution, was the second warmest on record. Also in May, carbon dioxide levels in Mauna Loa Observatory in Hawaii hit a record high, registering a level of 414.7 parts per million. That's the most carbon dioxide that has been in the atmosphere in about 3 million years—nothing speaks louder of the challenge in stopping the Immovable Beast.<sup>6</sup> Meanwhile, as China's economy has rebounded, air pollutants like sulphur dioxide and fine particle matter have reached concentration levels above the same period a year ago.<sup>7</sup>

According to the United Nations, global emissions would have to fall nearly 8% per year every year between now and 2030 if the world is to limit global warming to 1.5 degrees Celsius above pre-industrial levels, the goals set by the 2015 Paris Agreement. That's not impossible but unlikely. Already, as the global economic shutdown comes to an end, as various nations “re-open,” as consumers begin to consume and produce again, global CO<sub>2</sub> emissions are on the rise. The global economic pause that refreshed—or helped clear the skies in April—is fading. The last time the world experienced a crisis-induced drop

*“Climate change is a cumulative problem.”—Glen Peters, climate scientist at the Center for International Research<sup>5</sup>*

<sup>5</sup> National Geographic, “Plunge in carbon emissions from lockdowns will not slow climate change,” May 20, 2020.

<sup>6</sup> Washington Post, “Earth just had its warmest May on record amid startling Siberian heat wave,” June 5, 2020.

<sup>7</sup> Financial Times, “Extreme fall in emissions during lockdown likely to be short-lived,” May 20, 2020.

in greenhouse gases—in the aftermath of the 2009 Great Financial Recession—global carbon emissions were at record levels one year later as economic activity accelerated.

What’s more, thanks to the coronavirus, environmentally friendly policies have been shelved or postponed around the world. This pandemic has either slowed or distracted companies and countries from their carbon targets, goals and standards. In China, the government has dropped a key environmental target as Beijing directs all of its attention to reviving the economy. In Mexico, the government agency overseeing the nation’s electrical grid has suspended critical tests for clean-energy projects due to this pandemic. The U.S. has rolled back vehicle emissions standards; meanwhile, the plunge in oil prices and revenue caused clean-energy deals among the world’s major oil companies to plunge by 82% in the first quarter of this year. California’s economic shutdown has dealt a blow to its cap-and-trade system, slashing the amount of money the state raises to fight climate change. The collateral damage goes on (Exhibit 9).

### Exhibit 9: Pandemic Aftershocks: The Pros and Cons

Positive	Negative
Pandemic-related bond sales are outpacing the issuance of other thematic bonds.	New power from wind and solar is set to fall this year for the first time in two decades.
Some of the world’s most polluted cities, including Delhi, Seoul, Los Angeles and New York, are reporting dramatically cleaner air.	California’s coronavirus shutdown has dealt a blow to its cap-and-trade system, slashing the amount of money the state raises to fight climate change.
The pandemic-ravaged economy probably will give electric vehicles a boost in China, Europe and countries committed to boosting battery power through financial stimulus and infrastructure spending.	Almost 600,000 U.S. clean-energy workers have lost their jobs since the beginning of the COVID-19 pandemic, more than double the number of positions that had been created in the industry since 2017.
The coronavirus pandemic highlights the need for international collaboration to tackle crises posing severe threats to human lives, chief among them climate change, according to the Bank for International Settlements.	Global human development—a measure that combines education, health and living standards—will decline this year for the first time in at least three decades, the UN warned, as the coronavirus upends the global economy.
Two major auto manufacturers are pushing ahead with plans to team up on electric and self-driving vehicles even as the coronavirus derails other projects.	Low-carbon investments by major oil companies dropped because of the oil price shock, with clean-energy deals closed in the first quarter down 82% year-on-year.
The shutdowns have disrupted commercial fishing globally, giving marine life a chance to recover.	China dropped a key environmental target after the global pandemic hurt growth.
Global coal demand is set for its biggest annual drop since World War II as economic activity plunges due to coronavirus shutdowns.	The COVID-19 outbreak is piling pressure on onshore wind construction with many companies warning of project delays of at least one to two years.
The cost of power from battery storage has halved since 2018 because of the pandemic.	Single-use plastics like polystyrene make a comeback in pandemic.
Plant-based protein companies have been trying to sway consumers away from beef for years. Now, meat shortages caused by the pandemic are making their job easier.	Wind turbine makers are finding it increasingly difficult to get the parts they need to build their machines, snarling progress on a global shift toward renewables.
U.S. residential solar gets cheaper with sales moving online.	Concern about climate change among the U.K. public fell to 76% from a peak of 80% last year.

Source: Bloomberg Headlines. Data as of June 2020.

And then there’s the issue of plastics, which has staged a resurgence over the past few months, notably single-use plastics. Many cities around the country have not only halted recycling programs in response to the crisis but also paused or delayed the ban on single-use plastic bags. Given the highly transmissible nature of COVID-19, single-use plastic bags are considered a safer alternative to reusable bags. Adding to the plastic resurgence: increased demand for essentials during this pandemic like bottled water, face masks, medical gloves, and hand sanitizer and wipes. The surge in online shopping and the attendant spike in plastic packaging has also boosted demand for plastics.

On balance, while the one-off shutdown of the global economy produced dramatic results, keeping over 7 billion people “sheltered-in-place” is not a sustainable way to reduce global emissions. The collision of climate change and COVID-19 reveals the size of the challenge. Tackling the Immovable Beast is going to require time, trillions of

dollars, advanced technology and a concerted effort on the part of all stakeholders—countries, companies and consumers. COVID-19, for its part, showed that it could be done—at least in the very short term.

## The Crisis Doesn't Stop Change

One of the causalities of this pandemic is this year's UN global climate change summit in Glasgow. It was scheduled for November 2020 but has been postponed until November 2021. It will be months, in other words, before the world convenes to discuss climate change. But that said, many countries and companies are not waiting for Glasgow to push ahead with decarbonization and other initiatives that would mitigate climate risks. The coronavirus did not halt climate change, but it did demonstrate that the unrelenting rise in greenhouse gas emissions is not inevitable. The globetrotting virus also illuminated how delicate and vulnerable Planet Earth is to ecological shocks.

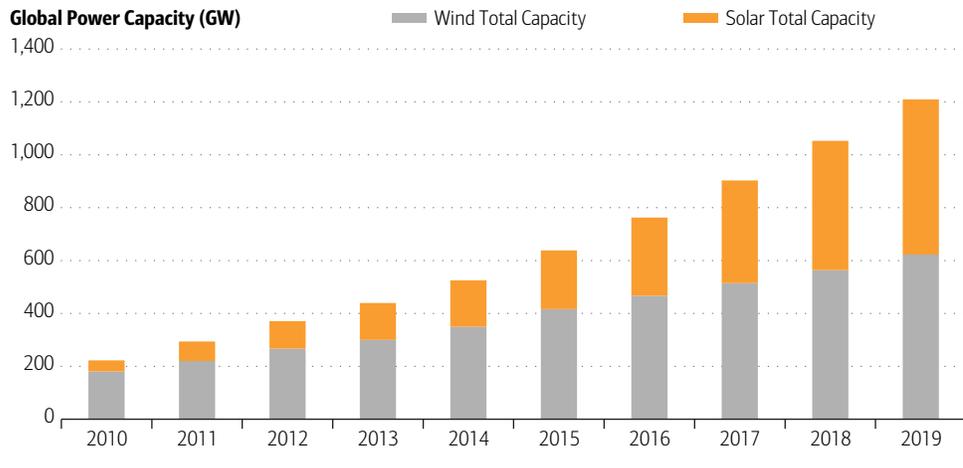
That a coronavirus that causes the disease COVID-19 could jump to a human from a wild animal, travel the world, and bring a \$90 trillion global economy to its knees has not gone unnoticed among major stakeholders. This pandemic has grabbed the attention of the world and driven the point home that health and wealth are intertwined, and that mounting climate risks and attendant side effects represent clear and present dangers to the overall health of the global economy.

Accordingly, there will be some near-term delays in implementing environmentally friendly policies, but mitigating climate risks remains a key objective of governments and corporations and therefore a key long-term investment theme of the Chief Investment Office. The following is what we believe could mean for investors and the investment landscape:

- More investment in solar and wind capacity, as renewable energies rise in importance to governments and corporations around the world (Exhibit 10);
- The continued transition to electrical vehicles, greater energy storage capacity and more demand for cleantech goods and services. Notably, we see strong global demand for manufacturers of next-generation batteries, both for transportation and stationary storage;
- Improvements in energy efficiency for buildings, including more green construction and retrofitting (e.g., the use of recycled materials and better thermal insulation) as well as more energy-efficient electronics, appliances and building systems such as energy demand-response;
- For residential and industrial lighting, semiconductor based LEDs are also expected to see usage increase rapidly over the coming years. LED light bulbs use at least 75% less energy and last 25 times longer than traditional incandescent lighting, wasting very little energy as heat compared with the 90% released by incandescent bulbs;
- More capital outlays in water treatment and waste management treatment systems. Think more investment in irrigation services, watershed management activities, water filtration, drainage systems and desalination;
- More "Green Deals" ala Europe's, where the \$800 billion plus recovery package included green policies that would, for instance, subsidize electric car sales in France, and require Air France, as part of its government bailout package, to cut its overall emissions over a given period of time. Similarly, despite this pandemic and plunge in oil prices, many U.S. cities and states have aggressive renewables goals for the next decade and beyond.

*"A truly healthy recovery will not allow pollution to continue to cloud the air we breathe and the water we drink. It will not permit unabated climate change and deforestation, potentially unleashing new health threats upon vulnerable populations."—  
An open letter to G20 leaders from 200 medical groups representing 40 million health care professionals.*

## Exhibit 10: Solar and Wind Capacity



Source: International Renewable Energy Agency. Data as of March 2020.

In the end, climate change will become a more central feature of corporate decision-making in the years ahead and remain prominently at the forefront of environmental, social and governance (ESG) investment strategies and considerations. Climate activism is on the rise and will continue to mount as key stakeholders come to grips with the multilayered concerns of climate risks—issues that include dead zones in the ocean, increased poverty and malnutrition in many less developed nations, and hotter, debilitating weather patterns around the world. The Immovable Beast touches every aspect of life—politics, economics, finance, ingrained inequalities, demographics, migration, rich vs. poor—the list goes on. Against this backdrop, companies that embrace more climate-friendly business models and operations, as well as products and services, are likely to enjoy sustained growth opportunities over the long term.

To end where we began, one of the key lessons of this pandemic is that climate change can be slowed. The Great Clash of 2020—pitting the Immovable Beast against the Invisible Enemy—proved this point. The battle continues, however. The Beast lives. This disease, like others, will likely be brought under control, leaving it up to humanity to carry on the fight against climate change.

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