

CLIMATE CHANGE AS SYSTEMIC RISK

BERKELEY BUSINESS LAW JOURNAL (FORTHCOMING)

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ABSTRACT

Hindsight tells us that Covid-19, thought by Trump and others to have come out of nowhere, is more aptly labelled a “gray rhino” event, one that was highly probable and one that we had the power to prevent. Indeed, despite considerable evidence of the impending threats of pandemics, for the most part, pandemic preparation was ignored, resulting in wide-scale social and economic losses.

The lessons from Covid-19 however should remind us of the perils of ignoring gray rhino risks. Nowhere is this more apparent than with climate change, a highly probable, high impact threat that has largely been ignored to date. Despite those who deny climate change, there remains ample evidence of the increasing temperature of the earth, which like Covid-19, has the potential not only to create public health emergencies but also to create wide scale, enormous adverse impacts on the economy.

Indeed, the risks posed by climate change to the economy have the potential to be so far-reaching that it should – as this article argues – be termed a systemic risk. As such, the economic implications of climate change need to be mitigated in order to preserve economic stability. This is necessary not only for prudential and economic reasons, but also to protect citizens’ health and safety, and to ensure that business does not exceed the limits of the planet.

While there has been some attention to addressing the economic implications of climate change at the global level, progress in the US has been minimal. This is surprising, not only because climate change has already caused unprecedented damage in certain parts of the country, but also because, to some extent, existing legislation and models may offer the tools to address the systemic risks of climate change. Drawing inspiration from the Dodd-Frank Act, SEC rules, and the FDIC model, among others, this article proposes regulatory approaches for mitigating climate change systemic risks in hopes that Covid-19 does not foreshadow our fate for climate change.

Keywords: climate change, systemic risk, Covid-19, SEC, disclosure, corporate law, financial institutions, sustainable finance, stranded assets, green investments, greenhouse gases, fossil fuels

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I. INTRODUCTION

On New Year’s Eve 2019, the stock market closed with substantial gains. The S&P 500 posted gains of nearly 30% for the year, the Dow Jones, 22%, and the Nasdaq reflected gains of almost 35%.¹ The market had not seen such gains since 2013.²

On the same day that the markets closed at unprecedented highs, the Chinese government informed the World Health Organization (WHO) that they were treating cases of “pneumonia of unknown etiology” in Wuhan city.³ These cases later became known as Covid-19.⁴ Within three months of the Chinese report to the WHO, over 500,000 people around the world became infected with Covid-19, with over 68,000 confirmed cases in the U.S. alone.⁵ Seven months after the report, the U.S. surpassed 4 million cases of Covid-19.⁶

¹ Sergei Klebnikov, *Here’s How 2019 Turned Out To Be A Historic Year For The Stock Market*, FORBES, Jan 1, 2020; Al Lewis, *The stock market boomed in 2019. Here’s how it happened*, CNBC, Dec. 31 2019.

² Klebnikov, *supra* note 1; Lewis, *supra* note 1.

³ World Health Organization, *Pneumonia of unknown cause – China* (Jan. 5, 2020).

⁴ World Health Organization, *WHO Director-General's remarks at the media briefing on 2019-nCoV on 11 February 2020* (Feb. 11, 2020).

⁵ World Health Organization, *Coronavirus disease 2019 (COVID-19) Situation Report* (Mar. 27, 2020).

⁶ David J. Lynch et al., *U.S. coronavirus deaths top 1,000 for four consecutive days*, WASHINGTON POST, July 26, 2020.

The effect of the pandemic on the economy was equally swift. Within two and a half months of the first confirmed case in the U.S., nearly 17 million Americans lost their job.⁷ On March 23, 2020, the S&P 500 fell by over 30% from the beginning of the year⁸ and by the end of March – only three months since the Chinese reported Covid-19 to the WHO – the S&P 500 and Dow Jones both posted their worst first quarters in history.⁹

The economic situation outside of the U.S. was equally bleak. China's economic growth contracted by nearly seven percent in the first quarter,¹⁰ the UK's FTSE 100 posted its biggest quarterly fall since Black Monday,¹¹ and almost 80 countries began seeking aid from the International Monetary Fund (IMF).¹² At the market's lowest point in March, the global equity markets experienced a loss of 26 trillion dollars.¹³ The IMF director noted that the outlook for global growth was “negative—a recession at least as bad as during the global financial crisis or worse”.¹⁴

The impacts of Covid-19 have caused some commentators to label it a “black swan” event,¹⁵ a rare event with an extreme impact that could not have been predicted.¹⁶ Trump described it as “an unforeseen problem” that “came out of

⁷ Sarah Chaney & David Harrison, *U.S. Jobless Claims Soar for Third Straight Week*, WALL STREET JOURNAL Apr 9, 2020.

⁸ Julie Jason, *The Coronavirus Stock Market: A Market Gone Wild*, FORBES, Apr. 8, 2020.

⁹ Fred Imbert et al., *Stock market live Tuesday: Dow drops 410 points, down 23% in 2020, Worst first quarter ever*, CNBC News, Mar. 31, 2020.

¹⁰ Laura He, *China's economy just shrank for the first time in decades. It could still eke out growth this year*, CNN BUSINESS, April 17, 2020.

¹¹ Richard Partington, *FTSE 100 posts largest quarterly fall since Black Monday aftermath*, THE GUARDIAN, Mar. 31, 2020.

¹² IMF, *IMF Managing Director Kristalina Georgieva's Statement Following a G20 Ministerial Call on the Coronavirus Emergency*, Press Release No. 20/98 (Mar. 23, 2020).

¹³ Adam Tooze, *How coronavirus almost brought down the global financial system*, THE GUARDIAN, Apr. 14, 2020.

¹⁴ IMF, *supra* note 12.

¹⁵ See e.g., Goldman Sachs, *2020's Black Swan: Coronavirus* (Mar. 3, 2020), <https://www.goldmansachs.com/insights/pages/coronavirus.html>; Sequoia, *Coronavirus: The Black Swan of 2020* (March 5, 2020), <https://medium.com/sequoia-capital/coronavirus-the-black-swan-of-2020-7c72bdeb9753>; Robert Stapleman, *Coronavirus is a 'Black Swan' event*, HERALD TRIBUNE, Mar. 23, 2020, <https://www.heraldtribune.com/business/20200323/coronavirus-is-black-swan-event>.

¹⁶ Taleb defines a black swan event as: “an outlier, as it lies outside the realm of regular expectations, because nothing in the past can convincingly point to its possibility”, that carries “an extreme impact”, and “in spite of its outlier status, human nature makes us concoct explanations for its occurrence after the fact, making it explainable and predictable”. See NASSIM NICHOLAS TALEB, *THE BLACK SWAN: THE IMPACT OF THE HIGHLY IMPROBABLE*, 2ND ED. (2010), xxii.

nowhere.”¹⁷ Yet as early as 2005, the Department of Homeland Security was urging private sector businesses to take action in order to be able to prepare for, respond to, and recover from a pandemic.¹⁸ The World Health Organization’s Global Preparedness Monitoring Board made similar pleas for states and businesses to act to prepare for a pandemic¹⁹ as did the U.S. Intelligence Committee.²⁰ Covid-19, as it turns out, was completely foreseeable.

For that reason, it may be more apt to term Covid-19 a “gray rhino”, a “highly probable, high impact yet neglected threat”.²¹ They are not “complete” surprises but rather are something one ought to see coming.²² Despite their size and the obviousness of the threat they pose, gray rhinos tend to be ignored even though they are crises that “we have the power to do something about”.²³

Ignoring threats such as Covid-19 reminds us of the perils of ignoring gray rhino risks. Nowhere is this more apparent than with climate change, a risk that likely perpetuated Covid-19,²⁴ and which is arguably a highly probable, high impact threat that has largely been ignored to date. Despite those who deny climate change, there remains ample evidence of the increasing temperature of the earth, from the tripling of heat waves in large cities,²⁵ to the largest wildfire in Los Angeles in its history,²⁶ to the costliest hurricanes all in one year (Irene, Harvey and Maria) that

¹⁷ Remarks by President Trump at Signing of the Coronavirus Preparedness and Response Supplemental Appropriations Act, 2020 (Mar. 6, 2020), <https://www.whitehouse.gov/briefings-statements/remarks-president-trump-signing-coronavirus-preparedness-response-supplemental-appropriations-act-2020/>

¹⁸ See e.g., U.S. Dep’t of Homeland Sec., *Pandemic Influenza: Preparedness, Response, And Recovery—Guide For Critical Infrastructure And Key Resources* (2006); Homeland Security Council, *National Strategy for Pandemic Influenza* (2005).

¹⁹ Global Preparedness Monitoring Board, *A World At Risk*, World Health Organization (2019).

²⁰ Daniel R. Coats, *Worldwide Threat Assessment of the U.S. Intelligence Community* (Jan. 29, 2019), <https://www.dni.gov/files/ODNI/documents/2019-ATA-SFR---SSCI.pdf>

²¹ MICHELE WUCKER, *THE GRAY RHINO - HOW TO RECOGNIZE AND ACT ON THE OBVIOUS DANGERS WE IGNORE* (2016), 235.

²² *Id.* at 7.

²³ *Id.*

²⁴ Damian Carrington, *Coronavirus: 'Nature is sending us a message', says UN environment chief*, THE GUARDIAN, Mar. 25, 2020 (Noting that climate change forces animals to move which “creates an opportunity for pathogens to get into new hosts”, which is what caused COVID-19). See also Patrick Greenfield, *Ban wildlife markets to avert pandemics, says UN biodiversity chief*, THE GUARDIAN, Apr. 6, 2020.

²⁵ Kendra Pierre-Louis, *Heat Waves in the Age of Climate Change: Longer, More Frequent and More Dangerous*, N.Y. TIMES, July 18, 2019.

²⁶ U.S. Global Change Research Program, *Fourth National Climate Assessment - Vol II, Impacts, Risks and Adaptation in the United States* (2018), 444.

caused a combined \$265 billion in damages.²⁷ Moreover, climate change, like Covid-19, has the potential not only to create public health emergencies but also to create wide scale, enormous adverse impacts on the economy. Indeed, the risks posed by climate change to the economy have the potential to be so far-reaching that it is, in effect, a systemic risk. As such, regulation aimed at curbing climate change must incorporate its systemic risk nature.

This article will make the argument for treating climate change as a systemic risk in five parts. The first part begins by examining climate change as a systemic risk. It defines systemic risk, presents a background on climate change and then examines how these two seemingly disparate areas link together. In the next Part, it moves to look at how climate change should be regulated as a systemic risk. It begins by examining whether regulation is needed in this area, and if needed, whether such regulation can be justified. It then explores existing regulatory approaches focusing, first on the Securities and Exchange Commission's (SEC) approach before looking at global approaches. Having found existing regulatory approaches lacking, in Part IV, it explores other approaches to regulating climate change as a systemic risk. Specifically, it focuses on regulatory approaches that not only address economic stability but also work towards decoupling economic growth from greenhouse gas emissions. Part V concludes.

II. CLIMATE CHANGE AS SYSTEMIC RISK?

To better understand why climate change should be viewed as systemic risk, this Part will examine what precisely systemic risk is as well as explore what climate change entails. The third section discusses how climate change can be conceptualized as systemic risk.

²⁷ Doyle Rice, *2017's Three Monster Hurricanes — Harvey, Irma And Maria — Among Five Costliest Ever*, USA TODAY, Feb. 1, 2018.

A. DEFINING SYSTEMIC RISK

Systemic risk lacks a widely accepted definition.²⁸ Broadly speaking, it involves a shock that causes adverse economic effects that spread the consequences, through a “domino effect”, leading to the material impairment of the market.²⁹

Systemic risk is often thought of mainly in terms of failure of financial institutions.³⁰ In this scenario, the emphasis is on the shock event leading to the failure of one or more financial institutions, which then transmits its adverse effects to other financial institutions.³¹ The shock can be exogenous or endogenous; that is, from outside or inside the financial system.³² An example of systemic risk arising from an endogenous shock is the 2008-09 financial crisis. In the crisis, the interconnectedness between financial institutions led to wide scale instability in the financial markets resulting from defaults of sub-prime mortgages.³³

Systemic risk can also arise in the market itself.³⁴ Generally, risk uncorrelated or negatively correlated with the market can be diversified away. However, risk that is positively correlated with the market, and which cannot be removed through a diversified portfolio, can give rise to systemic risk.³⁵ For this reason, the widespread failure of institutions, even if not financial institutions, can result in systemic risk if their failures are large enough to jeopardize the viability of capital markets.³⁶

²⁸ European Central Bank, *Financial Stability Review - December 2009* (2009), 134; ARON GOTTESMAN & MICHAEL LEIBROCK, *UNDERSTANDING SYSTEMIC RISK IN GLOBAL FINANCIAL MARKETS* (2017), 2.

²⁹ Oliver De Bandt & Philipp Hartmann, *What Is Systemic Risk Today?*, Working Paper for The Second Joint Central Bank Research Conference on Risk Measurement and Systemic Risk Toward a Better Understanding of Market Dynamics during Periods of Stress (1998), 40, <https://www.imes.boj.or.jp/cbrc/cbrc-02.pdf>; Steven L. Schwarcz, *Systemic Risk*, 97 *GEORGETOWN L. J.* 193, 198 (2008); European Central Bank, *supra* note 28, at 134.

³⁰ Schwarcz, *supra* note 29, at 198.

³¹ De Bandt & Hartmann, *supra* note 29, at 40-41.

³² European Central Bank, *supra* note 28, at 134; PAWEŁ SMAGA, *THE CONCEPT OF SYSTEMIC RISK*, SRC SPECIAL PAPER NO 5 (Aug. 2014), 5; Jean-Pierre Fouque & Joseph A. Langsam, *Introduction in HANDBOOK OF SYSTEMIC RISK* xxii (Jean-Pierre Fouque & Joseph A. Langsam eds., 2013).

³³ Iman Anabtawi & Steven L. Schwarcz, *Regulating Systemic Risk: Towards An Analytical Framework*, 86 *NOTRE DAME L. REV.* 1349, 1362-63 (2011).

³⁴ Schwarcz, *supra* note 29, at 200; De Bandt & Hartmann, *supra* note 29, at 43.

³⁵ Schwarcz, *supra* note 29, at 198; RICHARD A. POSNER, *ECONOMIC ANALYSIS OF LAW* 446 (6th ed. 2003).

³⁶ Schwarcz, *supra* note 29, at 202. See also De Bandt & Hartmann, *supra* note 29, at 43.

By drawing these concepts together, a working definition for systemic risk emerges. Systemic risk thus involves a shock, whether exogenous or endogenous, to the economic system that impairs the flow of capital and threatens the stability of the economy.³⁷

B. UNDERSTANDING CLIMATE CHANGE

Climate change is, one of, if not *the* defining challenge of the 21st century. It refers to the change in the earth's climate and the adverse effects that arise from that change.³⁸ It looks at the effects of human activity on climate most notably in relation to the increasing temperature of the earth.³⁹ The rising temperature of the earth is caused by human activities that increase the “atmospheric concentrations of greenhouse gases”, which warm the earth’s surface and “adversely affect natural ecosystems and humankind”.⁴⁰

Since the pre-industrial period, the earth’s temperature has increased by approximately one degree Celsius.⁴¹ The Intergovernmental Panel Committee on Climate Change has warned that exceeding a 1.5 degrees Celsius increase in temperature poses large risks for natural and human systems, some of which may be irreversible.⁴² Indeed, the benefits of limiting global warming to 1.5 degrees Celsius are so crucial that they have been codified in the *Paris Agreement under the United Nations Framework Convention on Climate Change*, although the

³⁷ Fouque & Langsam, *supra* note 32, at xxi.

³⁸ *The United Nations Framework Convention on Climate Change* pmbl, opened for signature May 9, 1992, 1771 U.N.T.S. 164 (1992), reprinted in 31 I.L.M. 851 (1992) [“Climate Change Convention”].

³⁹ *Id.*; INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, 2018: GLOBAL WARMING OF 1.5°C. AN IPCC SPECIAL REPORT, 51 (2019).

⁴⁰ *Climate Change Convention*, *supra* note 38, at pmbl.

⁴¹ INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, GLOBAL WARMING OF 1.5°C - AN IPCC SPECIAL REPORT ON THE IMPACTS OF GLOBAL WARMING OF 1.5°C ABOVE PRE-INDUSTRIAL LEVELS AND RELATED GLOBAL GREENHOUSE GAS EMISSION PATHWAYS, IN THE CONTEXT OF STRENGTHENING THE GLOBAL RESPONSE TO THE THREAT OF CLIMATE CHANGE, SUSTAINABLE DEVELOPMENT, AND EFFORTS TO ERADICATE POVERTY 31 (2019) [hereinafter “IPCC Report”].

⁴² *Id.* at 277.

Agreement allows for an upper limit of “well below” 2 degrees Celsius for global warming.⁴³

The impacts of climate change are already noticeable. Seventeen of the 18 warmest years on record have all occurred during the 21st century,⁴⁴ cloud forests are dying,⁴⁵ and the 2017 hurricane season caused over \$250 billion in damages and over 250 deaths.⁴⁶ Australia has also recently suffered from “unprecedented bushfire activity”⁴⁷ while forest fires have plagued the Arctic and Siberia threatening the melting of the permafrost.⁴⁸

Yet climate change experts predict that the impending impacts of climate change will be even more detrimental. For instance, coastal cities such as New York City, which have already experienced severe flooding, are expected to be partially under water in the near future due to rising sea levels.⁴⁹ Temperatures will continue to rise making extreme heat waves more common, precipitation will be heavy in some regions as will monsoons while droughts will occur in others, and both the risks of fires as well as the frequency of floods will increase.⁵⁰ Experts forecast that local species will be eliminated, the permafrost will thaw, ecosystems will be affected and coral reefs will disappear almost completely.⁵¹ Rice, wheat and other cereal crops yields will be reduced, livestock will be lost, and fisheries and aquaculture important to global food security will face increasing greater risks.⁵²

⁴³ *Paris Agreement to the United Nations Framework Convention on Climate Change*, Dec. 13, 2015, in Rep. of the Conference of the Parties on the Twenty-First Session, art. 2(1)(a)., U.N. Doc. FCCC/CP/2015/10/Add.1, annex (2016).

⁴⁴ World Meteorological Organization, *WMO confirms 2017 among the three warmest years on record* (2018), <https://public.wmo.int/en/media/press-release/wmo-confirms-2017-among-three-warmest-years-record>

⁴⁵ Cleiton B. Eller et al, *Cloud forest trees with higher foliar water uptake capacity and anisohydric behavior are more vulnerable to drought and climate change*, 211 *NEW PHYTOLOGIST* 489 (2016); Pru Foster, *The Potential Negative Impacts of Global Climate Change on Tropical Montane Cloud Forests*, 55 *EARTH-SCIENCE REVIEWS* 73 (2001).

⁴⁶ U.S. Global Change Research Program, *supra* note 26, at 66.

⁴⁷ Geert Jan van Oldenborgh et al., *Attribution of the Australian bushfire risk to anthropogenic climate change*, *NAT. HAZARDS EARTH SYST. SCI. DISCUSS.* 2 (2020).

⁴⁸ Jonathan Watts, *The Swedish town on the frontline of the Arctic wildfires*, *THE GUARDIAN* July 30, 2018; Jin-Soo Kim et al., *Extensive fires in southeastern Siberian permafrost linked to preceding Arctic Oscillation* 6(2) *SCIENCE ADVANCES* 1 (Jan. 8, 2020).

⁴⁹ U.S. Global Change Research Program, *supra* note 26 at 335, 338. See also IPCC Report, *supra* note 21, at 206-208.

⁵⁰ IPCC Report, *supra* note 21, at 187-203

⁵¹ *Id.* at 221-234.

⁵² *Id.* at 236-238.

Humans will face increasing heat-related morbidity and mortality and higher incidences of malaria and dengue fever among other problems.⁵³

However, the Intergovernmental Panel on Climate Change remains cautiously optimistic, despite finding that global warming will cross the 1.5° C threshold within 10 to 20 years if it continues to rise at the current rate.⁵⁴ The Panel concludes that scientifically it is possible to limit global warming to 1.5° C.⁵⁵ However, this would require rapid and far-reaching transitions in most sectors, deep emissions reductions in all sectors, numerous mitigation options and a significant upscaling of investments in those options.⁵⁶ In addition, global net human-caused emissions of carbon dioxide – one of the largest human created greenhouse gases – would also need to decrease by almost half by 2030 and reach net zero carbon dioxide emissions⁵⁷ by 2050.⁵⁸

C. CLIMATE CHANGE AS A SYSTEMIC RISK

It is initially difficult to view the links between climate change and systemic risk, given that they occupy such disparate areas. To do so, it is useful to reason through analogy by revisiting the losses caused by the last systemic crisis, the 2008-09 financial crisis. The Government Accountability Office (GAO) and others estimate that the 2008-09 financial crisis caused trillions of dollars of losses to the U.S.

⁵³ *Id.* at 240-241.

⁵⁴ Intergovernmental Panel on Climate Change, *Headline Statements - Understanding Global Warming of 1.5°C* (2019), <https://www.ipcc.ch/sr15/resources/headline-statements/>.

⁵⁵ IPCC Report, *supra* note 21, at 4.

⁵⁶ Intergovernmental Panel on Climate Change, *supra* note 54.

⁵⁷ Net zero can be achieved by either balancing carbon emissions with carbon removal or by eliminating carbon emissions altogether. See Josh Burke, *What is Net Zero* (2019), <http://www.lse.ac.uk/GranthamInstitute/news/what-is-net-zero/>.

⁵⁸ IPCC Report, *supra* note 21, at 4.

economy⁵⁹ and a 2.5 percent reduction in GDP.⁶⁰ Comparatively, experts predict that climate change will cause an even greater scale of losses than the last financial crisis.

Studies estimate that climate change will cause U.S. GDP to fall by at least 4 percent by 2050 and by over 10 percent by 2100 if global warming increases by over 2 degrees Celsius.⁶¹ An IMF report predicts that the effect on the U.S. will be even greater than the contraction in the world's output from climate change, which is expected to decrease by 2.5 percent by 2050 and 7.2 percent by 2100.⁶² There will also likely be productivity losses. Studies estimate the loss of almost 400,000 jobs by 2030⁶³ and \$160 billion in lost wages per year by 2090.⁶⁴

In short, the economic consequences of climate change are expected to be at least as dire, if not more pronounced, than the effects of the 2008-09 financial crisis. Yet unlike the last financial crisis, climate change will have an added effect on the economy through the loss of labor as well as the loss of workers. In this way, the effects of climate change may be more akin to those arising from Covid-19,

⁵⁹ As the GAO notes, "Studies generally find that the recent crisis was associated with large losses in economic output, but estimates of such losses vary and depend on several assumptions". The GAO estimates output losses at over 10 trillion. See US GOVERNMENT ACCOUNTABILITY OFFICE (GAO), FINANCIAL REGULATORY REFORM - FINANCIAL CRISIS LOSSES AND POTENTIAL IMPACTS OF THE DODD FRANK ACT 12, 15 (2013). The Federal Reserve Bank of Dallas estimates lost household wealth at 16 trillion while Treasury estimated the same losses at 19.2 trillion. See David Luttrell et al, *Assessing the Costs and Consequences of the 2007-09 Financial Crisis and Its Aftermath*, Federal Reserve Bank of Dallas (2013), <https://www.dallasfed.org/research/eclett/2013/e11307.cfm>; Treasury, *The Financial Crisis Response In Charts* (April 2012), https://www.treasury.gov/resource-center/data-chart-center/Documents/20120413_FinancialCrisisResponse.pdf.

⁶⁰ Kimberley Amadeo, 2009 GDP Statistics, Growth, and Updates by Quarter (2020), <https://www.thebalance.com/2009-gdp-statistics-3306037>.

⁶¹ Matthew E. Kahn et al, *Long-Term Macroeconomic Effects of Climate Change: A Cross-Country Analysis*

IMF Working Paper, 35 (October 11, 2019); Tom Kompas et al., *The Effects of Climate Change by GDP on Country and the Global Economic Gains from Complying with the Paris climate Accord*, 6 EARTH'S FUTURE 1153, 1161 (2018) (predicting over six percent loss of GDP by 2047). See also U.S. Global Change Research Program, *supra* note 26, at 26 ("annual losses in some sectors are expected to reach billions of dollars by the end of the century").

⁶² Kahn et al., *supra* note 61, at 35.

⁶³ International Labor Organization, *Working on a Warmer planet - The impact of heat stress on labour productivity and decent work*, 44 (2019).

⁶⁴ Environmental Protection Agency, *Multi-Model Framework for Quantitative Sectoral Impacts Analysis: A Technical Report for the Fourth National Climate Assessment*, EPA 430-R-17-00, 55 (2017).

which is forecast to cause over a 50 percent drop in GDP by the second quarter of 2020, and caused over 140,000 deaths by mid-July.⁶⁵

However, unlike the financial crisis or Covid-19, climate change risks that can result in a systemic crisis fall into two specific categories: physical risks and transition risks. The next two sections further elucidate the nature of these risks in an effort to better clarify the potential for climate change to cause a systemic crisis.

1. Physical Risks

The physical risks of climate change arise from frequent and/or “severe weather events” as well as long-term changes to the environment.⁶⁶ More specifically, physical risks arise “from the interaction of climate-related hazards (including hazardous events and trends) with the vulnerability of exposure of human and natural systems, including their ability to adapt”.⁶⁷ Physical risks from climate change include more frequent and severe floods, droughts, fires, and/or hurricanes; declining arability of farmland, rising sea levels, ecosystem collapse, and worsening levels of water availability and quality.⁶⁸ These risks may be acute – involving event driven risks such as a hurricane – or chronic, such as a sea level rise, that is caused by “longer-term shifts in climate patterns”.⁶⁹

The G20 appointed Task Force on Climate Related Financial Disclosures has identified some of the financial impacts of the physical risks of climate change. These include reduced revenue arising from: decreased production capacity, such as transport difficulties or interruptions to supply chains; impacts on the workforce

⁶⁵ Jeff Cox, *GDP is now projected to fall nearly 53% in the second quarter, according to a Fed gauge*, CNBC NEWS (June 2, 2020); Rachel Treisman, *Global Coronavirus Deaths Surpass 600,000, With U.S. Accounting For Nearly A Quarter*, NPR (July 19, 2020).

⁶⁶ Gregg Gelzinis & Graham Steele, *Climate Change Threatens the Stability of the Financial System*, Center for American Progress (Nov 21, 2019); FINANCIAL STABILITY BOARD, *RECOMMENDATIONS OF THE TASK FORCE ON CLIMATE-RELATED FINANCIAL DISCLOSURES – FINAL REPORT*, 6 (2017) [hereinafter “Task Force Report”]; Yannis Dafermos et al, *Climate Change, Financial Stability and Monetary Policy*, 152 *ECOLOGICAL ECONOMICS* 219 (2018); Brett Christophers, *Climate Change and Financial Instability: Risk Disclosure and the Problematics of Neoliberal Governance*, 107:5 *ANNALS OF THE AMERICAN ASSOCIATION OF GEOGRAPHERS* 1108, 1111 (2017); Michel Aglietta & Étienne Espagne, *Climate and Finance Systemic Risks, More than an Analogy?: The Climate Fragility Hypothesis*, Working Paper No 2016-10, 14-15 (2016).

⁶⁷ Sandra Batten et al, *Let’s talk about the weather: the impact of climate change on central banks*, Bank of England Staff Working Paper No. 603, 5 (May 2016).

⁶⁸ Gelzinis & Steele, *supra* note 66; Christophers, *supra* note 66, at 1111.

⁶⁹ Task Force Report, *supra* n 66, at 6.

such as health problems for workers; and lower sales or output.⁷⁰ Physical risks will also increase costs due to problems with the workforce, arising from health, safety or absenteeism, as well as higher operating costs and increased capital costs from damage to facilities.⁷¹ Damage to property and assets from climate change may also result in write-offs to assets as well as increased insurance premiums and possibly even less availability for insurance on assets that are located in areas that are of high risk to climate change.⁷²

It is easy to imagine scenarios where one or more of these types of physical risks of climate change arise as a systemic risk. The fall of either a systemically important financial institution (SIFI)⁷³ or correlated stress from a number of smaller firms exposed to the same physical risk could cause, for instance, a systemic crisis.⁷⁴ In 1992, at least 16 insurance companies in Florida became insolvent after Hurricane Andrew hit causing 26.5 billion in damages.⁷⁵ While these were small insurers, one can only imagine that when the next major hurricane hits – with damages predicted to exceed \$50 billion⁷⁶ – and systemically important insurers are involved,⁷⁷ the repercussions on the economy could be devastating. Indeed, as insurance companies themselves have realized, climate change may bring about a world that is not insurable anymore.⁷⁸ Without the ability to insure, one

⁷⁰ *Id.* at 10.

⁷¹ *Id.*

⁷² *Id.*

⁷³ Systemically important financial institutions include global systemically important banks, as designated by the Financial Stability Board, financial institutions (bank and non-bank entities) with consolidated assets of more than \$50 million, and those institutions designated as such by the Financial Stability Oversight Council. See Financial Stability Board, 2019 List Of Global Systemically Important Banks (G-SIBs) (Nov. 22, 2019), <https://www.fsb.org/wp-content/uploads/P221119-1.pdf>.

⁷⁴ Gelzinis & Steele, *supra* note 66.

⁷⁵ *Id.*; Swiss Re, *Hurricane Andrew: The 20 miles that saved Miami*, 1 (2017), https://media.swissre.com/documents/Hurricane_Andrew_25_Years.pdf; Amy O'Connor, *25 Years Later... What If an Andrew-Type Storm Hit Florida Today?*, *Insurance Journal* (Aug. 28, 2017).

⁷⁶ Swiss Re, *supra* note 75, at 1.

⁷⁷ The Financial Account Stability Board previously identified systemically important insurers. See Financial Stability Board, *Review Of The List Of Global Systemically Important Insurers (G-SIIs)* (2017). It has now taken an activity rather than an entity based approach to identifying systemic importance although insurers' collective work continues to be identified as systemically important. See S&P Global Market Intelligence, *IAIS to suspend annual identification of 'systemically important' insurers* (2018).

⁷⁸ Arthur Nelsen, *Climate Change Could Make Insurance Too Expensive For Most People – Report*, *THE GUARDIAN* Mar. 21, 2019. See also Mark Carney, *Breaking the tragedy of the horizon – climate change and financial stability*, *Speech by Mr Mark Carney, Governor*

commentator has argued that “the global credit system ... would simply cease to function”.⁷⁹

2. Transition Risks

Contrary to the focus of physical risks on climate change events, transition risks involve the risks associated with society’s response to climate change and typically involve policy, regulatory, technological and market risks.⁸⁰ Policy or regulatory risks include those risks that result from either constraining actions that contribute to climate change or promoting actions that help businesses adapt to climate change.⁸¹ These risks will inevitably lead to increased operating costs for businesses resulting from greater compliance costs and higher insurance premiums.⁸² They may also lead to asset losses.⁸³ For example, bans or limitations on the use of fossil fuels – one of the dominant causes of global warming⁸⁴ – will pose significant risks for several industries including oil, energy, and utilities, among others, which may lead to early retirement of their assets or total write-offs, a concept known as stranded assets.⁸⁵

Improvement or innovations in technology can also pose risks for businesses.⁸⁶ As the Task Force on Climate Change Disclosure notes:

... emerging technologies such as renewable energy, battery storage, energy efficiency, and carbon capture and storage will affect the competitiveness of certain organizations, their production and

of the Bank of England and Chairman of the Financial Stability Board at Lloyd’s of London, London, 5 (Sept. 29, 2015), <https://www.bis.org/review/r151009a.pdf>.

⁷⁹ Adam Tooze, *Why Central Banks Need To Step Up On Global Warming*, FOREIGN POLICY, July 20, 2019.

⁸⁰ Task Force Report, *supra* note 66, at 5; Christophers, *supra* note 66, at 1111; Gelzinis & Steele, *supra* note 66; Aglietta & Espagne, *supra* note 66, at 15.

⁸¹ Task Force Report, *supra* note 66, at 5.

⁸² *Id.* at 10.

⁸³ *Id.*

⁸⁴ IPCC Report, *supra* note 21, at 5.

⁸⁵ See Fergus Green, *The Logic of Fossil Fuel Bans*, 8 NATURE CLIMATE CHANGE 449 (2018) (discussing recent state initiatives to ban or limit fossil fuels). The write off or losses of assets from climate change are termed stranded assets. See Carney, *supra* note 78, at 10.

⁸⁶ Batten et al, *supra* note 67, at 4.

distribution costs, and ultimately the demand for their products and services from end users”.⁸⁷

Technology risks can also lead to loss of assets through write-offs and early retirement as well as reduced demand for businesses’ existing products and services.⁸⁸

Finally, businesses face market risks in relation to climate change. This is the risk of “shifts in supply and demand” as consumer preferences increase for some products and decrease for others and the market landscape changes in response to climate change.⁸⁹ In this regard, one of the most alarming market risks will be not only those faced by certain industries, but also assets and securities tied to such industries.⁹⁰ For instance, by reducing carbon emissions activities in the economy, not only could carbon emission emitting industries become less valuable but the value of securities issued by such firms would also decrease as would “assets exposed to the price of carbon”.⁹¹ Commentators estimate that one-third of equity and fixed income assets are in carbon-intensive industries.⁹² Moving to a carbon neutral goal would “strand those assets” and result in trillion dollar losses.⁹³

Market risks from climate change could further materialize by way of what the former Bank of England’s governor calls a “Minsky moment”, or the “sudden collapse in asset prices”.⁹⁴ This could occur, for instance, if there was a need for a sudden shift away from carbon intensive industries. The revaluation of carbon-intensive assets could result in related assets being offloaded at fire-sale prices, defaults on loans from stressed firms, debt repricing and credit losses, all of which

⁸⁷ Task Force Report, *supra* note 66, at 6.

⁸⁸ Task Force Report, *supra* note 66, at 10.

⁸⁹ *Id.* at 6; Christophers, *supra* note 66, at 1112.

⁹⁰ Christophers, *supra* note 66, at 1112; Gelzinis & Steele, *supra* note 66; Carney, *supra* note 78, at 10; Robinson Meyer, *How Climate Change Could Trigger the Next Global Financial Crisis*, THE ATLANTIC, Aug 1, 2019.

⁹¹ European Systemic Risk Board, *Too Late, Too Sudden: Transition to a low-carbon economy and systemic risk*, Reports of the Advisory Scientific Committee, 11 (No 6/February 2016); Christophers, *supra* note 66, at 1112; Gelzinis & Steele, *supra* note 66.

⁹² Carney, *supra* note 78, 10.

⁹³ Tooze, *supra* note 79.

⁹⁴ Carney, *supra* note 78, at 9; Carney et al., *Open letter on climate-related financial risks*, Bank of England (Apr. 17, 2019), <https://www.bankofengland.co.uk/news/2019/april/open-letter-on-climate-related-financial-risks>.

would cause financial instability.⁹⁵ Recently, major oil producer, British Petroleum (BP) announced that it will reduce the value of its oil and gas assets by \$17.5 billion in anticipation of a lowered demand from oil as more governments and business move to pursue the 2 degree Celsius threshold set out in the Paris Agreement.⁹⁶

3. Conclusion

Climate change thus aligns with the notion of systemic risk.⁹⁷ Apart from the numerous economic risks it poses generally, climate change will inevitably also cause a shock to the economic system, whether that arises from a physical risk – anything from a severe hurricane to a dengue pandemic – or a transition risk, most likely in the form of policy changes to carbon usage once global warming crosses a certain threshold. The shock will likely then impair the flow of capital, for instance, by causing SIFIs to fail or by stranding carbon-intensive assets, leading eventually to widespread financial instability, not only in nation states, but quite possibly globally as well.

Indeed, there are now a number of organizations that recognize the systemic risks posed by climate change. These include the Commodity Futures Trading Commission, the Senate Democrats’ Special Committee on the Climate Crisis, and the Federal Reserve, among others.⁹⁸

III. REGULATING CLIMATE CHANGE AS SYSTEMIC RISK

Despite the numerous risks posed by climate change, both economic and non-economic, climate change regulation has typically faced an uphill battle. Efforts have often been made by one administration, which have then been reversed by subsequent administrations. For instance, the Clinton administration initially signed

⁹⁵ European Systemic Risk Board, *supra* note 91, at 12; Meyer, *supra* note 90; Gelzinis & Steele, *supra* note 66.

⁹⁶ Anjali Raval, *BP to take up to \$17.5bn hit on assets after cutting energy price outlook*, FINANCIAL TIMES, June 15, 2020.

⁹⁷ For an excellent discussion on this issue see generally Graham S. Steele, *Confronting the “Climate Lehman Moment”: The Case For Macroprudential Climate Regulation*, 30 CORNELL J. LAW & PUB. POL’Y 109 (2020).

⁹⁸ Commodity Future Trading Commission, *Managing Climate Risk In The U.S. Financial System*, Report of the Climate-Related Market Risk Subcommittee, Market Risk Advisory Committee of the U.S. Commodity Futures Trading Commission (2020); Senate Democrats’ Special Committee On The Climate Crisis, *The Case for Climate Action* (2020); Board of Governors of the Federal Reserve, *Financial Stability Report* (Nov 2020).

the Kyoto Protocol, which set out targets for developed countries to reduce their greenhouse gas emissions.⁹⁹ However, it failed to ratify the treaty and the Bush administration eventually withdrew its signature.¹⁰⁰ Similarly, the Obama administration entered into the Paris Agreement, which sets out aims for limits to global warming, only for Trump to signal his intention to withdraw the U.S. from the treaty later this year.¹⁰¹ For some time, the U.S. was the only country in the world not to embrace the Paris Agreement.¹⁰²

Domestic efforts to regulate climate change have not fared much better. The Obama administration introduced binding standards for reduced automobile carbon emissions,¹⁰³ limits on greenhouse gas emissions from power plants,¹⁰⁴ and restricted carbon dioxide pollution from future power plants,¹⁰⁵ among other initiatives. The Trump administration later rolled back all of these initiatives.¹⁰⁶

Climate change regulations may face a challenging path, in part, because of their potential effects on the economy. Bush, for instance, proclaimed that the Kyoto Protocol would have limited America's growth and shifted jobs elsewhere.¹⁰⁷ Trump was even more effusive in withdrawing from the Paris Agreement. He lamented the "draconian financial and economic burdens" the agreement would

⁹⁹ Riley Beggin, *The last time a US president dumped a global climate deal*, ABC NEWS, June 1, 2017.

¹⁰⁰ *Id.*

¹⁰¹ The White House, Statement by President Trump on the Paris Climate Accord (June 1, 2017) [hereinafter "Trump Statement"].

¹⁰² Benjamin Hart, *Syria Leaves U.S. As Complete Outlier on Paris Climate Deal*, N.Y. MAGAZINE (Nov 7, 2017); Alexander C. Kaufman, *Syria Vows To Sign Paris Agreement, Leaving U.S. Alone In Climate Denial*, HUFFINGTON POST, Nov. 11, 2017. The US rejoined the Paris Agreement in January 2021. See Alex Leary, *Biden Signs Executive Orders on Face-Mask Mandate, Keystone Pipeline, Paris Accord*, WALL STREET JOURNAL (Jan. 20, 2021).

¹⁰³ Environmental Protection Agency, *Final Determination on the Appropriateness of the Model Year 2022-2025 Light-Duty Vehicle Greenhouse Gas Emissions Standards under the Midterm Evaluation*, EPA-420-R17-001 (Jan 2017).

¹⁰⁴ Environmental Protection Agency, Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, 40 CFR 60 (Oct. 23, 2015).

¹⁰⁵ Environmental Protection Agency, *Standards of Performance for Greenhouse Gas Emissions From New, Modified, and Reconstructed Stationary Sources: Electric Utility Generating Units*, 40 CFR Parts 60, 70, 71, et al. (Oct 23, 2015).

¹⁰⁶ See Juliet Eilperin & Brady Dennis, *EPA to roll back car emissions standards, handing automakers a big win*, WASHINGTON POST, Apr. 2, 2018; Jennifer A Dlouhy, *Trump to Swap Obama's 'Clean Power Plan' for Modest Upgrades*, BLOOMBERG, June 18, 2019; Umair Irfan, *The EPA is lifting greenhouse gas limits on coal power plants*, VOX, Dec. 7, 2018.

¹⁰⁷ The White House, President Bush Discusses Climate Change (April 16, 2008), <https://georgewbush-whitehouse.archives.gov/news/releases/2008/04/20080416-6.html>

impose on the United States¹⁰⁸ and its effect on American workers, who would be forced to absorb the costs of the agreement “in terms of lost jobs, lower wages, shuttered factories, and vastly diminished economic production”.¹⁰⁹

Economic-oriented climate change regulation has not fared much better. The SEC has specifically noted that it is reluctant to introduce climate change-related rules. As an SEC Commissioner stated: “We ought not to step outside our lane and take on the role of environmental regulator or social engineer”.¹¹⁰ Similarly, the Department of Labor recently proposed prohibiting pension plans from being able to incorporate environmental considerations into investment decisions if to do so would subordinate the financial interests of plan participants or beneficiaries.¹¹¹

Given the reluctance to introduce climate change regulation, Section A examines the arguments and justifications for introducing economic-oriented climate change regulations. Section B then moves to examine existing approaches to economic-oriented climate change regulations, beginning with the SEC’s approach before discussing global approaches. Section C then evaluates the most common existing regulatory approach to determine whether it is sufficient. In this regard, it is important to add a caveat here that as this article is part of a broader project in exploring climate change issues through a corporate law lens, the regulatory approach in this Part is limited to only corporate law-related regulations. It therefore does not discuss environmental or (carbon) tax measures that are integral to addressing climate change, but are beyond the scope of this article.

A. IS ECONOMIC-ORIENTED CLIMATE CHANGE REGULATION NEEDED?

The lack of economic-oriented climate change regulation begs the question whether such regulation is needed. This Part argues not only that such regulation is warranted but that it is also justified.

¹⁰⁸ Trump Statement, *supra* note 100.

¹⁰⁹ *Id.*

¹¹⁰ Commissioner Hester M. Peirce, Statement on Proposed Amendments to Modernize and Enhance Financial Disclosures (Jan. 30, 2020), <https://www.sec.gov/news/public-statement/peirce-mda-2020-01-30>

¹¹¹ U.S. Department of Labor, U.S. Department of Labor Proposes New Investment Duties Rule (June 23, 2020), <https://www.dol.gov/newsroom/releases/ebsa/ebsa20200623>.

1. Arguments for Regulation

There are three main reasons why the economic aspects of climate change need regulation. First, because market failures necessitate such regulation in order to ensure the efficiency and stability of the economy as well as to force companies to recognize the limits of the planet. Second, regulation is needed because of the number of companies and industries that continue to deny climate change; and third, because even if companies believe in climate change they underestimate the risks of climate change leaving them woefully under prepared.

a) *Regulation and Market Failures*

Regulation, particularly in the context of economic risk, is considered necessary when there are market failures.¹¹² This need may arise due to information asymmetries;¹¹³ principal-agent problems;¹¹⁴ imperfect competition;¹¹⁵ public goods;¹¹⁶ and in instances of negative externalities, where an individual or firm's action impose costs on third parties.¹¹⁷ Many of these market failures may justify the need for regulation of climate change's economic risk although the most cogent justification is likely climate change's ability to impose negative externalities onto others. For instance, a firm's failure to address climate change in its operational practices can lead to costs being imposed on others. Thus, an insurance company's failure to model extreme climate change scenarios into its pricing and underwriting decisions may leave it unable to satisfy insurance claims from individuals or businesses in the event of a serious climate change event. Regulation for climate

¹¹² Cary Coglianese, *The Law and Economics of Risk Regulation*, Faculty Scholarship at Penn Law 2157, 4 (2020).

¹¹³ Joseph E. Stiglitz, *Markets, Market Failures, and Development*, 79:2 AM. ECON. REV. 197, 197-202 (May 1989); Robert A. Brown, *Financial Reform and The Subsidization of Sophisticated Investors' Ignorance In Securitization Markets*, 7 N.Y.U. J.L. & BUS. 105, 146 (2010).

¹¹⁴ Steven L. Schwarcz, *Regulating Shadows: Financial Regulations and Responsibility Failure*, 70 WASH. & LEE L. REV. 1781, 1785-86 (2013).

¹¹⁵ Joseph E. Stiglitz, *Government Failure vs. Market Failure: Principles of Regulation in GOVERNMENT AND MARKETS TOWARD A NEW THEORY OF REGULATION*, 18-19 (Edward J. Balleisen & David A. Moss, eds, 2010).

¹¹⁶ Gabriel Rauterberg, *The Corporation's Place In Society*, 114 MICHIGAN L. REV. 913, 918 (2016); Harvey S. Rosen, *PUBLIC FINANCE* 47-48 (7th ed. 2005).

¹¹⁷ Stiglitz, *supra* note 114, at 18-19.

change economic risk is thus justified from an efficiency standpoint, because regulation prevents or internalizes individual firm's climate change economic risk-related externalities.¹¹⁸

By recognizing the systemic risks posed by climate change, regulation can also prevent the related economic risks from an individual firm or from a number of firms from being able to cascade throughout the economy. As commentators have observed, even if market participants understand “the risks of their investments, their motivation is to protect themselves but not the system as a whole”.¹¹⁹ From an efficiency standpoint, regulation is thus necessary to ensure that climate change economic risks prevent damage to the system as a whole.

As the Covid-19 crisis demonstrates, systemic crises also generate social costs. Schwarcz argues that systemic crises can engender “widespread poverty and unemployment, which in turn can destroy lives and foster crime” and contends that the protection of health and safety should be a goal in regulating systemic risk.¹²⁰ He subsumes these social costs under the umbrella of stability and concludes that the stability of the financial system should be an additional goal – besides efficiency – of regulating systemic risk.¹²¹

A climate change related systemic crisis would generate many of the same social costs Schwarcz refers to and some of these costs could similarly be subsumed under the general aim of seeking economic stability. However, the potential social costs of a climate change induced systemic crisis could easily surpass economic stability costs because the effects of these costs may be irreversible.¹²² Climate change events could, for instance, eliminate the land mass on which businesses or

¹¹⁸ RICHARD J. HERRING & ROBERT E. LITAN, FINANCIAL REGULATION IN THE GLOBAL ECONOMY, 79 (1995); Schwarcz, *supra* note 29, at 205-06.

¹¹⁹ President's Working Group On Fin. Mkts., Hedge Funds, Leverage, And The Lessons Of Long Term Capital Management, 31(1999). See also Bank for International Settlements - Committee on the Global Financial System, Stress Testing At Major Financial Institutions: Survey Results And Practice), 3-5 (January 2005); David Greenlaw et al, Stressed Out: Macroprudential Principles for Stress Testing, Working Paper No. 71- Chicago Booth Paper No. 12-08, 3 (2012).

¹²⁰ Schwarcz, *supra* note 29, at 207.

¹²¹ *Id.* at 207-208.

¹²² NETWORK FOR GREENING THE FINANCIAL SYSTEM, A CALL FOR ACTION CLIMATE CHANGE AS A SOURCE OF FINANCIAL RISK 4 (April 2019). On the irreversible nature of climate change see generally Susan Solomon et al, *Irreversible Climate Change Due To Carbon Dioxide Emissions*, 106(6) PNAS 1704 (February 10, 2009).

people's home are located or destroy the workers that contribute to the economy. Regulation of climate change economic risks, thus, is necessary not only to ensure efficiency and stability but also because without it companies could exceed the limits of the planet and not physically be able to run their business.¹²³

b) *Denial of Climate Change*

A second reason why regulation is necessary for climate change economic risk is because of the tendency, by some businesses, to deny climate change altogether, and for others, to fail to appreciate the amount of risk climate change poses. Specifically, the fossil fuel industry has had a long history in denying climate change.¹²⁴ For instance, in 1997, ExxonMobil published an advertorial in the New York Times stating “the science of climate change is too uncertain to mandate a plan of action.”¹²⁵ This public proclamation stood in sharp contrast to its own internal research, dating back to 1979, confirming that carbon dioxide emissions were caused by fossil fuel combustion, which in turn was leading to global warming.¹²⁶ Moreover, the research found that the current practice of fossil fuel combustion would cause “dramatic environmental effects before the year 2050”.¹²⁷

Despite this, and other internal research confirming the existence of climate change,¹²⁸ ExxonMobil went on to become one of the most important funders of

¹²³ Brad Plumer, *Humans Are Speeding Extinction and Altering the Natural World at an ‘Unprecedented’ Pace*, N.Y. TIMES, May 6, 2019; David Wallace-Wells, *The Uninhabitable Earth*, N.Y. MAGAZINE, July 2017.

¹²⁴ Benjamin Franta, *Early Oil Industry Knowledge of CO₂ and Global Warming*, NATURE CLIMATE CHANGE, 1 (2018); John Cook et al., *America Mised - How the fossil fuel industry deliberately misled Americans about climate change*, George Mason University Center for Climate Change Communication, 6 (2019). For a good history of climate change denial and the actors involved see generally Riley E. Dunlap & Aaron M. McCright, *Climate Change Denial: Sources, Actors & Strategies in* ROUTLEDGE HANDBOOK OF CLIMATE CHANGE AND SOCIETY 240 (Constance Lever-Tracy, ed.,2010).

¹²⁵ Geoffrey Supran & Naomi Oreskes, *Assessing ExxonMobil’s climate change communications (1977–2014)*,

12 ENVIRON. RES. LETT. 1, 8 (2017).

¹²⁶ Steve Knisely, *CO₂ and Fuel Use Projections* (Oct. 16, 1979), <https://insideclimatenews.org/documents/co2-and-fuel-use-projections-1979>.

¹²⁷ *Id.*

¹²⁸ Supran & Oreskes, *supra* note 124, at 8.

the climate change denial movement.¹²⁹ Yet it did not act alone. Other notable players include companies such as Koch Industries and Peabody Coal and industry associations such as American Petroleum Institute and Western Fuels Association.¹³⁰ Several corporations have also used climate change “associations”, which shielded individual corporate participation from public scrutiny, to facilitate climate change denial.¹³¹ Oil, coal and auto companies were part of the Global Climate Coalition, which employed an aggressive lobbying and public relations campaign denying climate change while the Heartland Institute, a front for several fossil fuel companies, employed tactics such as using mass murders in advertisements to promote the futility of climate change.¹³²

More recently, given public recognition of the perils of climate change, businesses may be obfuscating their denial of climate change. ExxonMobil, for example, publicly claims that it is committed to “advancing effective solutions to address climate change”.¹³³ Its CEOs, past and present, also publicly acknowledge climate change as a serious problem.¹³⁴ However, its corporate strategy has been to increase new investments in oil projects and make only minimal investments to green technologies.¹³⁵ It also funds a lobby group advocating carbon taxes, but spends almost ten times as much funding federal lobby groups that challenge environmental regulation.¹³⁶ Furthermore, it has conveyed to shareholders that there is “no scientific basis” for limiting global warming to 2 degrees Celsius.¹³⁷ Despite

¹²⁹ Robert J. Brulle, *Institutionalizing delay: foundation funding and the creation of U.S. climate change counter-movement organizations*, 122 CLIMATIC CHANGE 681 (2014); Dunlap & McCright, *supra* note 123, at 245.

¹³⁰ Dunlap & McCright, *supra* note 123, at 245-46; CHRISTOPHER WRIGHT & DANIEL NYBERG, CLIMATE CHANGE, CAPITALISM, AND CORPORATIONS 77 (2015); CHRISTOPHER LEONARD, KOCHLAND: THE SECRET HISTORY OF KOCH INDUSTRIES AND CORPORATE POWER IN AMERICA (2019).

¹³¹ Dunlap & McCright, *supra* note 123, at 246.

¹³² Wright & Nyberg, *supra* note 129, at 78; Andrew C. Revkin, *Industry Ignored Its Scientists on Climate*, N.Y. TIMES, Apr. 23, 2009.

¹³³ ExxonMobil, Energy and Environment (2020), <https://corporate.exxonmobil.com/Energy-and-environment/Environmental-protection/Climate-change>.

¹³⁴ Steven Mufson, *Climate Resolutions Fall Short at ExxonMobil's Annual Meeting*, WASHINGTON POST, May 25, 2016; The Economist Briefing, *ExxonMobil gambles on growth*, THE ECONOMIST, Feb. 9, 2019, <https://www.economist.com/briefing/2019/02/09/exxonmobil-gambles-on-growth>.

¹³⁵ The Economist Briefing, *supra* note 133.

¹³⁶ *Id.*

¹³⁷ Mufson, *supra* note 133.

public acknowledgements to the contrary, its corporate actions suggest that ExxonMobil is continuing to deny climate change, or at least, not take it seriously as a risk.

Regulation is therefore needed to compel climate change deniers into mitigating climate change. Without regulation, these businesses would simply not engage in mitigation, even if they publicly declare otherwise.

c) Tendency to Underestimate Risk

Even for those companies not denying climate change, regulation for climate change financial risk may be necessary because of firms' tendency to underestimate risk. That is, even if firms believe in the risks of climate change they may not adequately prepare for that risk.

The Covid-19 crisis has already demonstrated that despite numerous international bodies, individuals and institutions warning of the high risks and costs of a global pandemic, the world was unprepared for Covid-19.¹³⁸ Trump even cancelled an early warning program for pandemics three months before Covid-19 appeared in China,¹³⁹ while UK prime minister Boris Johnson continued to shake hands with everyone, despite being cautioned otherwise, before eventually contacting Covid-19.¹⁴⁰ Moreover, with companies needing a \$454 billion rescue package, it is unlikely that businesses were adequately prepared for Covid-19 either.¹⁴¹

¹³⁸ See e.g., GLOBAL PREPAREDNESS MONITORING BOARD, A WORLD AT RISK - ANNUAL REPORT ON GLOBAL PREPAREDNESS FOR HEALTH EMERGENCIES (Sept 2019); Federal Emergency Management Agency, 2019 National Threat and Hazard Identification and Risk Assessment (THIRA) - Overview and Methodology (July 25, 2019); Bill Gates, *The Next Outbreak: We're not ready*, TEDTalk (March 2015).

¹³⁹ Emily Baumgaertner & James Rainey, *Trump administration ended pandemic early-warning program to detect coronaviruses*, LOS ANGELES TIMES, Apr. 2, 2020; Zachary Cohen, *Trump administration shuttered pandemic monitoring program, then scrambled to extend it*, CNN, Apr. 10, 2020.

¹⁴⁰ Conrad Duncan, *Coronavirus: How Boris Johnson ignored health advice at his peril before Covid-19 diagnosis*, THE INDEPENDENT, Mar. 27, 2020; The Guardian Staff, *I shook hands with everybody,' says Boris Johnson weeks before coronavirus diagnosis*, THE GUARDIAN, Mar. 27, 2020.

¹⁴¹ Jonathan O'Connell, *Congress to bail out firms that avoided taxes, safety regulations and spent billions boosting their stock*, WASHINGTON POST, Mar. 25, 2020; David

Psychologists and behavioral economists have argued that the tendencies for businesses and individuals to underestimate risks are due to a number of systematic biases that impair decision-making.¹⁴² Such biases include optimism bias, or the tendency to “view the world as more benign than it really is, our own attributes as more favorable than they really are, and the goals we adopt as more achievable than they are likely to be”.¹⁴³ Optimism bias can lead to the underestimation of the likelihood of future losses because of the belief that the believer is at less risk than others of experiencing a negative event.¹⁴⁴ Businesses prone to optimism bias will therefore discount the risk of a serious climate change event, believing that losses that occur from climate change will happen, if it happens, to others. In fact, a recent survey of over 1,200 CFOs found that more than half of surveyed companies have not adopted any carbon emission targets and that measures taken to mitigate climate change arise only after pressure from stakeholders.¹⁴⁵ Businesses, it seems, are not being proactive in mitigating climate change.¹⁴⁶

A second bias that impairs proper evaluation of risks is availability bias. This is the evaluation of a specific course of action based on the readiness of examples that comes to the decision-maker’s mind.¹⁴⁷ Availability bias can distort risk evaluation based on how many relevant, recent, or familiar examples of a particular risk are available to the decision-maker.¹⁴⁸ Thus, the risk of a pandemic now will be viewed as more serious after Covid-19, given its familiarity, than other forms of risk. Indeed, given the need to react to the disastrous effects of Covid-19,

Shepardson & Ben Klayman, *U.S. set to grant automakers a lifeline -- but no bailout*, REUTERS, Mar. 25, 2020.

¹⁴² See, e.g., DANIEL KAHNEMAN, *THINKING FAST AND SLOW* (2011); RICHARD THALER & CASS SUNSTEIN, *NUDGE: IMPROVING DECISIONS ABOUT HEALTH, WEALTH AND HAPPINESS* (2009); ROBERT MEYER & HOWARD KUNREUTHER, *THE OSTRICH PARADOX: WHY WE UNDERPREPARE FOR DISASTERS* (2017).

¹⁴³ Kahneman, *supra* note 164, at 255.

¹⁴⁴ Meyer & Kunreuther, *supra* note 164, at 37.

¹⁴⁵ Deloitte, *European CFO Survey - Into the Woods*, 23 (Autumn 2019), <https://www2.deloitte.com/content/dam/Deloitte/uk/Documents/finance/european-cfo-survey-q3-2019.pdf>.

¹⁴⁶ *Id.* at 24.

¹⁴⁷ Thaler & Sunstein, *supra* note 141, at 25; Meyer & Kunreuther, *supra* note 141, at 35. See also Avos Tversky & Daniel Kahneman, *Availability: A Heuristic for Judging Frequency and Probability*, 5 (2) *COGNITIVE PSYCHOLOGY* 207 (September 1973).

¹⁴⁸ Thaler & Sunstein, *supra* note 141, at 25. See also Meyer & Kunreuther, *supra* note 140, at 34-35.

it may be a factor that compounds the lack of companies' attention to climate change risks.

Finally, companies may be underestimating risk because of normalcy bias, or the tendency to expect things to carry on, as they have in the past, as normal.¹⁴⁹ Normalcy bias can result in people proceeding as normal, even when given a disaster warning, because of disbelief that a negative event will occur or an effort to search for alternative messages that will neutralize the impending threat.¹⁵⁰ It can also occur because of the preference to stay with the status quo rather than chart a new course of action.¹⁵¹ Normalcy bias therefore prevents a proper estimation of risks as it can cause individuals to be slow to react to dangers and fail to prepare for such dangers until it is too late. This seems to encapsulate the situation for many companies that are not preparing for climate change and that continue to let the status quo dictate their operations.¹⁵²

Normalcy bias may also result because of herd behavior or the tendency to mimic the actions of others.¹⁵³ This can result in excessive risk taking or risk aversion, depending on the preferences of the 'herd'.¹⁵⁴ Given that the corporate response to climate change risks continues to be muted,¹⁵⁵ herd behavior may further explain why companies continue to underestimate climate change risk.

¹⁴⁹ Meyer & Kunreuther, *supra* note 141, at 43-50; THOMAS E DRABEK, HUMAN SYSTEM RESPONSES TO DISASTER: AN INVENTORY OF SOCIOLOGICAL FINDINGS 72-73 (1986).

¹⁵⁰ Drabeck, *supra* note 148, at 73.

¹⁵¹ Meyer & Kunreuther, *supra* note 141, at 50.

¹⁵² Allie Goldstein et al, *The Private Sector's Climate Change Risk And Adaptation Blind Spots*, 9 NATURE CLIMATE CHANGE 18, 23 (2019) (noting, "[C]ompanies report the costs of both physical climate change impacts and the strategies required to manage them sporadically and inconsistently, while the strategies themselves overall reflect a narrow view of risk that underestimates supply chain and broader societal impacts."); David Kiron et al., *How Serious Is Climate Change to Business?*, MIT SLOAN MANAGEMENT REVIEW, Sept. 17, 2013.

¹⁵³ Thaler & Sunstein, *supra* note 141, at 53-71; Meyer & Kunreuther, *supra* note 141, at 61-65.

¹⁵⁴ Meyer & Kunreuther, *supra* note 141, at 65.

¹⁵⁵ Goldstein et al, *supra* note 151, at 23; Kiron et al, *supra* note 151. See also MIT Sloan Management Review, *How Will Companies Respond to the Risk of Climate Change?* (Jan. 29, 2020) (In which many of the experts note that even if companies are planning for climate change, they are not doing enough).

2. Justifying Regulation

While regulation is necessary because of market failures, climate change denials, and the corporate tendency to underestimate risk, regulation still needs to be justified. One common method for justifying regulation is by reference to enhanced efficiency.¹⁵⁶ Thus, most regulators now engage in a cost-benefit analysis to assess proposed regulation.¹⁵⁷ The purpose of cost-benefit analyses is to improve policy goals without imposing unacceptable or unreasonable costs on society and to ensure that proposed governmental interventions are proportionate to the harm that the intervention is intended to address.¹⁵⁸

Two recent studies have concluded that the mitigation costs for limiting global warming to 2 degrees Celsius or below are less than the anticipated economic damages.¹⁵⁹ These join previous studies that have found that a cost-benefit analysis of climate change mitigation measures supports the introduction of these types of measures.¹⁶⁰ There are, however, some studies that conclude that the costs of climate change mitigation outweigh the benefits.¹⁶¹

Possible reasons for the disparities in these findings are because, as Nobel Laureate William Nordhaus notes, “there is substantial uncertainty about the path of climate change and its impacts” and it is unknown precisely “how damaging

¹⁵⁶ Coglianesse, *supra* note 111, at 6.

¹⁵⁷ See e.g., Executive Order 12866 of September 30, 1993, 58:190 Federal Register (Oct. 4, 1993), <https://www.archives.gov/files/federal-register/executive-orders/pdf/12866.pdf>; Financial Conduct Authority, *How We Analyse The Costs And Benefits Of Our Policies* (July 2018).

¹⁵⁸ Executive Order, *supra* note 156, at 1; Financial Conduct Authority, *supra* note 156, at 4.

¹⁵⁹ See e.g., Nicole Glanemann et al., *Paris Climate Agreement Passes the Cost-Benefit Test*, 11:110 NATURE COMMUNICATIONS 1 (2020); Marshall Burke et al., *Large potential reduction in economic damages under UN mitigation targets*, 557 NATURE 549 (2018).

¹⁶⁰ See e.g. NICHOLAS STERN, *THE ECONOMICS OF CLIMATE CHANGE – THE STERN REVIEW* (2007); Netherlands Environmental Assessment Agency, *Costs and benefits of climate change adaptation and mitigation: An assessment on different regional scales* (2014); David Maddison, *A Cost-Benefit Analysis Of Slowing Climate Change*, 23(4-5) ENERGY POLICY 33 (1995). See also Martin L. Weitzman, *Fat-Tailed Uncertainty in the Economics of Catastrophic Climate Change*, 5:2 REV. OF ENVIRONMENTAL ECONOMICS & POL’Y. 275 (Summer 2011) (arguing in favor of climate change mitigation for catastrophic events).

¹⁶¹ See e.g., Richard S. J. Tol, *Economic Impacts Of Climate Change*, Working Paper Series No. 75-2015 (2015) (arguing that climate change will only have “a limited impact on the economy and human welfare”); Roger Bezdek et al., *Cost Benefit Analysis in CLIMATE CHANGE RECONSIDERED II: FOSSIL FUELS*, NONGOVERNMENTAL INTERNATIONAL PANEL ON CLIMATE CHANGE 671 (C.D. Idso et al. eds, 2019) (arguing “the benefits of fossil fuels far outweigh their costs”).

climate change will be”.¹⁶² The presence of these uncertainties is the reason that some commentators find that the efficacy of cost-benefit analysis as a policy tool for climate change is limited.¹⁶³

Because of the limits of cost-benefit analysis for justifying climate change-related costs, other means of justification may be needed. This could be achieved, for example, by the precautionary principle, a common justification for regulations in the environmental context. The precautionary principle enables governmental intervention “where there are threats of serious or irreversible damage” even if there is a lack of full scientific certainty.¹⁶⁴ Governments can rely on the precautionary principle when the probability of risks from a concern is unknown, but the concern is scientifically plausible and the harm from the concern is serious and irreversible.¹⁶⁵ It allows governmental intervention either before the harm occurs or before certainty about the harm is achieved, but only interventions that are “proportional to the chosen level of protection and the magnitude of possible harm” and that consider the implications of both action and inaction.¹⁶⁶ Certainly, regulation for the systemic risks caused by climate change would fall under the broad heading of the precautionary principle, given the seriousness of damage to economy and society global warming poses, so long as the regulations are proportional to the magnitude of potential harm.

Commentators have further advocated for a third means of justification for regulation. As Sunstein argues, in general irreversible and catastrophic events warrant regulation.¹⁶⁷ In part, such regulation is needed in order to preserve “option

¹⁶² William D. Nordhaus, *Projections and Uncertainties about Climate Change in an Era of Minimal Climate Policies*, NBER Working Paper No. 22933, 4 (2017).

¹⁶³ Eric A. Posner & Jonathan Masur, *Climate Regulation and the Limits of Cost-Benefit Analysis*, U. Chi. Pub. Law. Working Paper No. 315, 2010, 5-6 (2010); Frank Ackerman & Elizabeth A. Stanton, *Climate Risks and Carbon Prices: Revising the Social Cost of Carbon*, 6 *Economics: The Open-Access, Open-Assessment E-Journal* 6, 20 (2012).

¹⁶⁴ Report of the U.N. Conference on Environment and Development, United Nations Conference on Environment and Development, Rio Declaration, U.N. Doc. A/Conf. 151/5/Rev.1 (1992), reprinted in 31 *I.L.M.* 876, Principle 15 (1992).

¹⁶⁵ World Commission on the Ethics of Scientific Knowledge and Technology (COMEST), *The Precautionary Principle*, 13 (2005); Timothy O’Riordan & James Cameron, *The History and Contemporary Significance of the Precautionary Principle in INTERPRETING THE PRECAUTIONARY PRINCIPLE* 17-18 (Timothy O’Riordan & James Cameron eds., 1994).

¹⁶⁶ World Commission on the Ethics of Scientific Knowledge and Technology, *supra* note 164, at 13-14. See also O’Riordan & Cameron, *supra* note 164, at 17-18.

¹⁶⁷ See generally Cass R. Sunstein, *Irreversible and Catastrophic*, *CORNELL L. REV.* 841, 848 (2006).

value”, the paying of a certain amount now for flexibility in the future.¹⁶⁸ Posner explains the utility of the concept of option value in the global warming context. As he notes, making shallower cuts to greenhouse gas emissions “now can be thought of as purchasing an option to enable global warming to be stopped or slowed at some future time at a lower cost”.¹⁶⁹ Moreover, as Sunstein adds, because the irreversible losses from investments in reducing greenhouse gas emissions are less than the anticipated irreversible losses from global warming, this favors investments in reducing greenhouse gases.¹⁷⁰ In other words, only with regulation today, will regulators still have any flexibility, if at all in the future, to counter the potentially irreversible losses from climate change.

Accordingly, economic-oriented climate change regulation can be justified, potentially through a cost benefit analysis, but also from a precautionary perspective, if regulations are proportional to expected harm. Such regulation may further be justified for their “option value” in enabling regulators to control climate change, as needed, in the future.

B. CURRENT REGULATORY APPROACHES

As we have seen, regulation of the financial aspects of climate change is needed and such regulation is justified, not least, as an option of preserving our future ability to regulate in this area if needed. Yet currently in the U.S., there is no specific legislation regulating the economic aspects of climate change. Rather, the SEC relies on existing rules to encourage companies to report on climate change issues. Conversely, at the global level, there are a number of initiatives that offer tailored approaches for regulating the economic risks emanating from climate change.

¹⁶⁸ *Id.* at 858.

¹⁶⁹ Richard A. Posner, *Public Policy Towards Catastrophe in GLOBAL CATASTROPHIC RISKS* 196 (Nick Bostrom & Milan M. Cirkovic eds., 2011).

¹⁷⁰ Sunstein, *supra* note 166, at 863-64.

1. The SEC's Approach

In 2010, the Securities and Exchange Commission began offering guidance for companies on using existing SEC rules to disclose climate change issues.¹⁷¹ The rules were not targeted to climate change. Rather, the SEC advocated their use on climate change matters as a result of its conclusion that climate change has an impact on companies' operating and financial decisions and poses risks to business.¹⁷²

The SEC generally requires companies to disclose a description of their business, any ongoing or prospective legal proceedings, risk factors of the business and management's discussion and analysis and advises companies to disclose climate change issues within these four parameters.¹⁷³ As the SEC has noted, such disclosure can include issues such as climate change compliance costs, climate change litigation, climate change risk factors, the effects of climate change regulations on companies' financial condition or results of operations, the effects of climate change developments on demand and competition, and the physical impacts of climate change.¹⁷⁴

In addition to offering only light touch regulation for the economic risks of climate change, the SEC has further taken a lackadaisical approach to enforcement of climate change disclosure. After it issued the 2010 guidance, companies were initially more motivated to disclose climate change issues and the SEC was more likely to enforce such disclosure.¹⁷⁵ However, in recent years the SEC has taken a step back, issuing less than a handful of climate change enforcement letters since

¹⁷¹ Securities and Exchange Commission, Commission Guidance Regarding Disclosure Related to Climate Change, Release No. 33-9106 (Feb. 8, 2010) [hereinafter "SEC Climate Change Guidance"].

¹⁷² *Id.* at 5-7.

¹⁷³ See SEC, Standard Instructions For Filing Forms Under Securities Act Of 1933, Securities Exchange Act Of 1934 And Energy Policy And Conservation Act Of 1975 - Regulation S-K, 17 CFR Part 229, Items 101, 103, 105, and 303.

¹⁷⁴ SEC Climate Change Guidance, *supra* note 171, at 22-27.

¹⁷⁵ Written Testimony of Mindy S. Lubber, Chief Executive Officer and President, Ceres, Prepared for the U.S. House of Representatives, Committee on Financial Services, Subcommittee on Investor Protection, Entrepreneurship and Capital Markets, "Building a Sustainable and Competitive Economy: An Examination of Proposals to Improve Environmental, Social and Governance Disclosures": Comments on the Climate Risk Disclosure Act of 2019, 11 (July 10, 2019).

January 2017.¹⁷⁶ Not surprisingly, climate change disclosure from companies has often been weak.¹⁷⁷

Recently, the SEC updated some of their rules, parts of which might better capture climate change issues.¹⁷⁸ However, while one SEC commissioner observed that these changes were insufficient to combat climate change,¹⁷⁹ another noted that the SEC should not be taking on a greater role in combatting climate change through disclosure rules.¹⁸⁰ This sentiment may change as the House Financial Services Committee recently approved a bill to introduce the Climate Risk Disclosure Act of 2019, which would mandate the SEC to introduce specific climate change disclosure rules.¹⁸¹

2. Global Approaches

While the SEC has been reluctant to introduce disclosure rules for climate change, economic-oriented climate change initiatives have been progressing at the international level. For instance, the CDP (Carbon Disclosure Project), which has been operating as an international non-profit organization since 2000 in most G20 nations, collects climate change information from companies backed by investor requests.¹⁸² It then makes the collected information publicly available, acting as a year-on-year source for investors on climate change risks, strategies, performance, and greenhouse gas emissions.¹⁸³ Similarly, the Climate Disclosure Standards Board (CDSB), an international consortium formed in 2007, has been providing a

¹⁷⁶ *Id.*

¹⁷⁷ See e.g., the studies cited in Rick E. Hansen, *Climate Change Disclosure by SEC Registrants: Revisiting the SEC's 2010 Interpretive Release*, 6 BROOK. J. CORP. FIN. & COM. L. 487, 522-26 (2012); Alan R. Palmiter, *Climate Change Disclosure: A Failed SEC Mandate* (2015), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2639181.

¹⁷⁸ SEC, *Modernization of Regulation S-K Items 101, 103, and 105*, Rel. No. 33-10668, n.11 (Aug. 8, 2019); Securities and Exchange Commission, *Management's Discussion and Analysis, Selected Financial Data, and Supplementary Financial Information*, Rel. No. 33-10750, n.95 (Jan. 30, 2020).

¹⁷⁹ SEC, *Public Statement by Commissioner Allison Herren Lee, "Modernizing" Regulation S-K: Ignoring the Elephant in the Room* (Jan 30, 2020), https://www.sec.gov/news/public-statement/lee-mds-2020-01-30#_ftn1.

¹⁸⁰ Peirce, *supra* note 109.

¹⁸¹ Ben Maiden, *House Panel Passes Climate Risk Disclosure Bill*, IR MAGAZINE, July 22, 2019.

¹⁸² OECD, *Climate Change Disclosure in G20 Countries - Stocktaking of corporate reporting schemes* 37 (2015).

¹⁸³ *Id.* at 38.

global “corporate reporting model to equate climate change and natural capital information with information about financial capital”.¹⁸⁴ A reporting framework is also the hallmark of the Sustainability Accounting Standards Board, which provides standards for industry-specific sustainability disclosures, including on climate change.¹⁸⁵

However, today the most important global initiative for climate change disclosure is likely the Recommendations of the Task Force on Climate-Related Financial Disclosures. In 2015, the G20 Finance Ministers and Central Bank Governors asked the Financial Stability Board, which is tasked with monitoring the global financial system, to explore how the financial sector could better consider climate change issues.¹⁸⁶ The Financial Stability Board – which includes the SEC, the Federal Reserve and the U.S. Department of the Treasury, among others as members¹⁸⁷ – appointed an industry-level task force, known as the Task Force on Climate-related Financial Disclosures (“the Task Force”).¹⁸⁸ The Task Force was mandated to develop voluntary, climate change financial disclosures.

In its 2017 report, the Task Force made a number of different recommendations for disclosing climate change. It structured its recommendations around four core organizational elements: governance, strategy, risk management, and metrics and targets.¹⁸⁹

Governance involves disclosure of the firm’s governance around climate related risks and opportunities.¹⁹⁰ This includes disclosure of both the board’s oversight of as well as management’s role in assessing and managing climate-related risks and opportunities.¹⁹¹

¹⁸⁴ Sustainability Accounting Standards Board, *Converging on Climate Risk: CDSB, the SASB, and the TCFD - The Emerging Alignment of Market-Based Approaches to Climate-Related Financial Disclosure 5* (Sept 2017).

¹⁸⁵ See generally Sustainability Accounting Standards Board, *Climate Risk Technical Bulletin #: TB001-10182016* (2016).

¹⁸⁶ Task Force Report, *supra* note 66, at iii.

¹⁸⁷ SEC, *Proposed Amendments to Modernize and Enhance Financial Disclosures; Other Ongoing Disclosure Modernization Initiatives; Impact of the Coronavirus; Environmental and Climate-Related Disclosure*, Public Statement of Chairman Jay Clayton (Jan 30, 2020).

¹⁸⁸ Task Force Report, *supra* note 66, at iii.

¹⁸⁹ *Id.* at 13.

¹⁹⁰ *Id.* at 14.

¹⁹¹ *Id.*

The second element, strategy, involves disclosure of the “actual and potential impacts of climate-related risks and opportunities on the organization’s businesses, strategy, and financial planning where such information is material”.¹⁹² The Task Force recommended that specific disclosures in this regard include: identification of the climate-related risks and opportunities over the short, medium and long term; the impact of the identified risks and opportunities on the firm’s businesses, strategy, and financial planning; and the resilience of the strategy, “taking into consideration different climate-related scenarios, including a 2°C or lower scenario”.¹⁹³

For the third element, risk management, the Task Force explained that this relates to how the firm “identifies, assesses, and manages climate-related risks”.¹⁹⁴ This involves providing disclosure on the processes by which a firm ascertains, evaluates and manages climate-related risks as well as how these processes are integrated into the firm’s overall risk management.¹⁹⁵

For the final element, metrics and targets, the Task Force advises firms to “disclose the metrics and targets used to assess and manage relevant climate-related risks and opportunities where such information is material”.¹⁹⁶ This involves disclosing: “the key metrics used to measure and manage climate-related risks and opportunities” in line with the firm’s strategy and risk management process; the firm’s greenhouse gas (GHG) emissions and related risks; and the firm’s key climate-related targets used to manage risks, opportunities and performance against targets.¹⁹⁷

The Task Force further identified supplemental guidance for the financial sector as well as for industries that account for the largest proportion of GHG emissions, energy usage, and water usage.¹⁹⁸ While its focus on the second group is self-evident, the Task Force noted that its guidance for the financial sector was in recognition of the fact that:

¹⁹² *Id.*

¹⁹³ *Id.*

¹⁹⁴ *Id.*

¹⁹⁵ *Id.*

¹⁹⁶ *Id.* at 22.

¹⁹⁷ *Id.* at 22-23.

¹⁹⁸ *Id.* at 15.

... disclosures by the financial sector could foster an early assessment of climate-related risks and opportunities, improve pricing of climate-related risks, and lead to more informed capital allocation decisions.¹⁹⁹

It thus recommended that the financial sector and key industries at risk for climate change also disclose some of the recommended disclosures relating to strategy, risk management, and metrics and targets.²⁰⁰

The Task Force's recommendations have been taken up by "1,027 organizations, representing a market capitalization of over \$12 trillion", including Ford, Dow Chemical, the Bank of America, Bloomberg and Deloitte, among others.²⁰¹ They have also been incorporated by existing disclosure initiatives such as the Climate Change Disclosure Board and the Sustainability Accounting Standards Board²⁰² and used as the basis for mandatory disclosure in the United Kingdom.²⁰³

Apart from disclosure, however, there are other efforts attempting to regulate the financial aspects of climate change. In 2017, eight central banks established the Network for Greening the Financial System (NGFS).²⁰⁴ Since then the NGFS has grown to 34 members and 5 observers, although the Federal Reserve is not one of the participants.²⁰⁵ Recently, however, it has made a request to join the NGFS.²⁰⁶

The mandate of the NGFS is to ensure the success of the Paris Agreement, within their roles, which involves understanding how climate change, as a structural

¹⁹⁹ *Id.*

²⁰⁰ *Id.*

²⁰¹ Task Force on Climate Related Financial Disclosure Supporters (Feb 2020), <https://www.fsb-tcfd.org/tcfd-supporters/>.

²⁰² Sustainability Accounting Standards Board, *supra* note 183.

²⁰³ Climate Disclosure Standards Board, UK expects all listed companies and large asset owners to disclose in line with TCFD by 2022, commits to work with international partners to catalyse market-led action on nature-related financial disclosures (July 2019), <https://www.cdsb.net/mandatory-reporting/937/uk-expects-all-listed-companies-and-large-asset-owners-disclose-line-tcfd>.

²⁰⁴ Network for Greening the Financial System, *supra* note 121, at 7.

²⁰⁵ *Id.* at 7-8

²⁰⁶ Alister Bull, *Fed Set to Join NGFS, the Climate-Change Club for Central Banks*, BLOOMBERG (Nov. 11, 2020).

change, affects the financial system and economy.²⁰⁷ To that end, the NGFS recognizes climate change as a structural change affecting the financial system, with potential impacts that are “larger ... [and] more widespread and diverse than those of other structural changes”.²⁰⁸ It views climate change as being foreseeable in nature, bearing irreversible consequences, and with impacts that are largely dependent on the actions taken today by central banks, governments, firms, and financial participants.²⁰⁹ It also concludes that climate-related financial risks are not fully reflected in asset valuations and accordingly makes a series of recommendations designed to address that problem.²¹⁰

For instance, it recommends that central banks and supervisors, and some financial institutions, integrate climate-related risks into financial stability monitoring and micro-supervision, by “assessing climate-related financial risks in the financial system” and “integrating climate-related risks into prudential supervision”.²¹¹ It also recommends that these institutions integrate sustainability factors into their own-portfolio management, by way of their own funds or pension funds.²¹² The NGFS further supports the Task Force’s work by recommending climate change disclosure as well as the development of a taxonomy of economic activities that either contribute to a decarbonized climate or are more exposed to climate change risks as a way of mobilizing capital for green investments.²¹³ The work of the NGFS is ongoing, although its driving force continues to be its recognition that “climate change presents significant financial risks that are best mitigated through an early and orderly transition”.²¹⁴

C. EVALUATING DISCLOSURE

Whether it is the SEC’s light touch approach, or the Task Force and NGFS’s more prescriptive approach, disclosure appears to be the favored regulatory approach for companies to manage climate change financial risks. Disclosure certainly has many

²⁰⁷ Network for Greening the Financial System, *supra* note 121, at 4.

²⁰⁸ *Id.*

²⁰⁹ *Id.*

²¹⁰ *Id.*

²¹¹ *Id.* at 4-5.

²¹² *Id.* at 5.

²¹³ *Id.* at 6.

²¹⁴ *Id.* at 8.

benefits. It enables companies to make early assessments of climate change financial risks, plan how to mitigate such risks, and make consideration of these types of risks part of their business routine.²¹⁵ Disclosure also enables financial institutions and investors to be better able to price climate-related risks, allowing for a more efficient allocation of capital.²¹⁶ The CEO of BlackRock, Larry Fink, even views climate change disclosure as being integral to a firm's ability to attract capital.²¹⁷

Nevertheless, reliance on disclosure alone remains problematic for several reasons. First, compliance with disclosure provisions relating to climate change has traditionally been low. The Task Force recently reviewed the disclosures of 1,126 companies from 142 companies in eight industries over three years.²¹⁸ On the basis of the reviewed information, it concluded that although the percentage of companies disclosing climate-related information has increased, overall corporate disclosure on climate change-related information is low.²¹⁹ Moreover, it found that even for companies that were disclosing climate change-related information, the disclosure was insufficient and that more and further disclosure was needed.²²⁰ For instance, companies were more prone to disclosing climate risks and opportunities or climate-related metrics, but less likely to report on the resilience of their strategies.²²¹

A worldwide report by KPMG found similar results.²²² After reviewing the annual financial reports of over 4,900 companies worldwide it found that only 28 percent of these companies disclose climate change related financial risk in their annual reports.²²³ Moreover, for those companies disclosing climate change risks, very few of them quantify these risks or model their financial impacts.²²⁴

²¹⁵ Task Force Report, *supra* note 66, at i, 15.

²¹⁶ *Id.*

²¹⁷ Larry Fink, BlackRock Letter to CEOs - A Fundamental Reshaping of Finance (2020).

²¹⁸ Task Force on Climate-related Financial Disclosures: Status Report, 120 (June 2019) [hereinafter "Task Force Status Report"].

²¹⁹ *Id.* at 7.

²²⁰ *Id.* See also Goldstein et al., *supra* note 151, at 18 (noting there are "significant blind spots in companies' assessments of climate change impacts and in their development of strategies for managing them").

²²¹ Task Force Status Report, *supra* note 216, at 8.

²²² KPMG, The Road Ahead - The KPMG Survey of Corporate Responsibility Reporting 2017 (2017).

²²³ *Id.* at 30.

²²⁴ *Id.* at 31.

Incompleteness of climate change disclosure can also characterize SEC required reporting. As one study noted, most climate change disclosures to the SEC ‘are very brief, provide little discussion of material issues, and do not quantify impacts or risks’.²²⁵ Climate change disclosure to the SEC has further been described as vague, nebulous, and boilerplate.²²⁶ One notable reason explaining the poor disclosure on climate change issues to the SEC is because of the SEC’s failure to enforce climate change disclosure, which has tended to take a light handed approach to climate change disclosure enforcement.²²⁷ This may be because, as an SEC commissioner has noted, it views climate change disclosure as beyond its mandate.²²⁸

In addition to poor compliance rates, climate change disclosure poses other problems. For instance, companies often use disclosure in a selective manner to disclose or emphasize information that only shows the corporation in a favourable light.²²⁹ Even where negative information is disclosed, the disclosed information may be marginalized or abstracted in such a way that the disclosure is used as a tool for greenwashing or for public relations.²³⁰ A recent study found that where firms were not required to provide full disclosure in connection with its greenhouse gas emissions, they used “soft stories” to influence judgment of their actions in an

²²⁵ Jim Coburn & Jackie Cooke, *Cool Response: The SEC & Corporate Climate Change Reporting: SEC Climate Guidance & S&P 500 Reporting – 2010 to 2013*, Ceres Report, 5 (Feb. 2014).

²²⁶ Benjamin Hulac, *Inside the Mirage of Good Climate Info at the SEC*, E&E NEWS (Aug. 11, 2016), <https://www.eenews.net/stories/1060041464>; Roshaan Wasim, *Corporate (Non)Disclosure Of Climate Change Information*, 119 COLUM. L. REV. 1311, 1334 (2019); Palmiter, *supra* note 176, at 4.

²²⁷ From 2016 to 2020, the SEC only made a handful of requests for further information on climate change. See SEC, “Climate Change” Uploads, https://searchwww.sec.gov/EDGARFSCClient/jsp/EDGAR_MainAccess.jsp?search_text=%22climate%20change%22&sort=Date&formType=FormUPLOAD&isAdv=true&stemming=true&numResults=10&numResults=10. See also Lubber, *supra* note 174, at 11.

²²⁸ Peirce, *supra* note 109. See also Clayton, *supra* note 186.

²²⁹ Reggy Hooghiemstra, *Corporate Communication and Impression Management –New Perspectives Why Companies Engage in Corporate Social Reporting*, 27 J. BUS. ETHICS 55 (2000); Rudiger Hahn & Regina Lulfs, *Legitimizing Negative Aspects in GRI-Oriented Sustainability Reporting: A Qualitative Analysis of Corporate Disclosure Strategies*, 123 J. BUS. ETHICS 401(2013); Yu Cong et al., *Mandated greenhouse gas emissions and required SEC climate change disclosures*, 247:119111 J. OF CLEANER PRODUCTION (Feb 2020).

²³⁰ Cong et al, *supra* note 227, at 8; Hahn & Lulfs, *supra* note 227; Hooghiemstra, *supra* note 226, at 60–66; Olajo Aiyegbayo & Charlotte Villiers, *The Enhanced Business Review: Has It Made Corporate Governance More Effective*, 2011 J. OF BUS. L. 699, 703 (2011)

attempt to obscure their emissions rate rather than inform stakeholders.²³¹ Disclosure, thus, can be used for goals other than informing stakeholders.

There is also competing evidence as to whether disclosure induces companies to change their behaviour. One of the purported aims of disclosure requirements in relation to climate change is that by disclosing climate change related issues, companies will recognize the risks of climate change and this will “stimulate ingenuity and strategic thinking ... [to] improve sustainability performance”.²³² Certainly, some studies demonstrate that disclosure requirements can prompt corporations to make more commitments to reducing greenhouse gas emissions, be more ethical and improve environmental performance.²³³ However, other studies have found that disclosure did not alter corporate environmental behaviour.²³⁴

Finally, a disclosure regime focuses on market discipline, meaning that its aim is to provide accurate information in order for investors to be able to correctly to price securities.²³⁵ Climate change information, however, is highly uncertain and these uncertainties can impede the market’s ability to discipline actors.²³⁶ Market

²³¹ Cong et al., *supra* note 227, at 8.

²³² Lubber, *supra* note 174, at 6.

²³³ Ceres, *Turning Point - Corporate Progress on the Ceres Roadmap for Sustainability* 50 (2018); Ioannis Ioannou & George Serafeim, *The Consequences of Mandatory Corporate Sustainability Reporting: Evidence from Four Countries* (2011) Harvard Business School Working Paper No. 11–100, 4; Dara O’Rourke & Eungkyoon Lee, *Mandatory Planning for Environmental Innovation: Evaluating Regulatory Mechanisms for Toxics Use Reduction* (2004) 47 J. OF ENVIRONMENTAL PLANNING & MANAGEMENT 181; Bradley C. Karkkainen, *Information as Environmental Regulation: Tri and Performance Benchmarking, Precursor to a New Paradigm?*, 89 GEORGETOWN L. J. 257 (2001).

²³⁴ See e.g., Martin Freedman & Bikki Jaggi, *Global warming and corporate disclosures: A comparative analysis of companies from the European Union, Japan and Canada in SUSTAINABILITY, ENVIRONMENTAL PERFORMANCE AND DISCLOSURES* 129, 132 (Martin Freedman & Bikki Jaggi eds., 2009); Carlos Larrinaga-Gonzalez et al., *The Role of Environmental Accounting in Organizational Change: An Exploration of Spanish Companies* 14 ACCOUNTING, AUDITING & ACCOUNTABILITY J. 213 (2013); Jędrzej G. Frynas, *Corporate Social Responsibility or Government Regulation? Evidence on Oil Spill Prevention*, 17 ECOLOGY & SOCIETY 4 (2012).

²³⁵ Zohar Goshen & Gideon Parchomovsky, *The Essential Role of Securities Regulation*, 55 DUKE L.J. 711, 737-40 (2006); Christophers, *supra* note 66, at 1116-17.

²³⁶ Dimitri Zenghelis & Nicholas Stern, *The Importance of Looking Forward to Manage Risks: Submission to the Task Force on Climate-Related Financial Disclosures*, Policy paper, 4 (June 2016), <http://eprints.lse.ac.uk/67133/1/Zenghelis-and-Stern-policy-paper-June-2016.pdf> (noting climate change risks are “Knightian” or deep uncertainty or “unknown unknowns”); Task Force Report, *supra* note 66, at 25 (noting the “timing and magnitude [of climate change is] uncertain. This uncertainty presents challenges for individual organizations in understanding the potential effects of climate change on their

discipline, via disclosure, also only works when investors are incentivized to use that information, and there is evidence that investors are ignoring climate change risks.²³⁷ Climate change disclosure as a means of market discipline therefore may be inherently flawed.²³⁸

Thus, on the one hand, disclosure may facilitate early corporate recognition of climate change issues and prompt corporate changes in behavior. On the other hand, compliance with climate change disclosure is weak, some companies are using it to obscure poor climate change performance, and it may not be providing adequate market discipline. The equivocal effects of climate change disclosure suggest that while disclosure may be useful as a tool to combat climate change, it should not be relied on *exclusively* to regulate the systemic issues arising out of climate change. Rather disclosure seems to work best as a complementary regulatory tool.²³⁹

Still given governmental preference for light-touch regulation, climate change disclosure remains a good first step in combatting climate change as a systemic risk. The SEC's failure to adopt climate change disclosure rules is thus a noteworthy misstep.

IV. DESIGNING REGULATION FOR CLIMATE CHANGE AS SYSTEMIC RISK

As disclosure alone is insufficient as a solitary regulatory tool, this Part considers other regulatory approaches that could work alongside disclosure in combatting the economic risks of climate change.²⁴⁰ These include reducing financial institutions'

businesses"); Goldstein, *supra* note 151, at 23 (noting that there is no "guidance on reporting the long-term, uncertain risks" of climate change).

²³⁷ Jamie Caruana, Financial stability and risk disclosure - Keynote speech by Jaime Caruana, General Manager, Bank for International Settlements, FSB Roundtable on risk disclosure, 1 (Dec. 9, 2011) at 1, <https://www.bis.org/speeches/sp111222.pdf>; BlackRock, The Price Of Climate Change Global Warming's Impact On Portfolios, 6 (Oct 2015) (noting "many equity investors ignore climate risk and credit investors and ratings agencies do not routinely assess it"); Alan Hsu, Brewing storm: Are investors discounting climate risks and opportunities?, Wellington Management (Dec 2017) (noting "one powerful, non-mean-reverting trend that we think many investors are ignoring is climate change").

²³⁸ Christophers, *supra* note 66, at 1124-25.

²³⁹ BARNALI CHOUDHURY & MARTIN PETRIN, CORPORATE DUTIES TO THE PUBLIC (2019), 88; MICHAEL E. KRAFT ET AL, COMING CLEAN: INFORMATION DISCLOSURE AND ENVIRONMENTAL PERFORMANCE (2011).

²⁴⁰ For other regulatory ideas, see also Steele, *supra* note 97, at 145 et seq.

investments in fossil fuels, introducing climate change stress tests for financial institutions and insurance companies, introducing a climate change fund, and reorienting investment towards “green” investments. While varying in approach, the common denominator among each of these proposals is that they fulfill the twin aims of helping to ensure the economy’s economic stability and work towards decoupling economic growth from greenhouse gas emissions.²⁴¹

A. REDUCING FOSSIL FUEL INVESTMENTS

Without a doubt, the most important regulatory tool for mitigating climate change risks, systemic or otherwise, is to reduce the principal cause of carbon emissions, fossil fuels. There has already been some movement in this area. The G7 nations agreed to phase out fossil fuels by 2100²⁴² and several countries or territories are moving towards banning fossil fuel-powered vehicles in approximately 15 to 20 years,²⁴³ including possibly California.²⁴⁴ Governments have not expressed an interest in making more impending reductions in fossil fuel usage because to do so would result in spiraling increases in fuel and energy prices and because of the increasing demand for energy.²⁴⁵ Nevertheless, since fossil fuels are a finite resource, reducing reliance on them is inevitable and only a matter of time.²⁴⁶

In the context of reducing climate change-related systemic risks, phasing out fossil fuels could come in the form of reducing financial institutions’

²⁴¹ Decoupling “occurs when the growth rate of an environmental pressure [such as carbon emissions] is less than that of its economic driving force”. See OECD, *Indicators To Measure Decoupling of Environmental Pressure From Economic Growth*, SG/SD(2002)1/FINAL, 4 (May 16, 2002).

²⁴² Kate Conolly, *G7 Leaders Agree to Phase out Fossil Fuel Use by End of Century*, THE GUARDIAN (June 8, 2015).

²⁴³ See Isabella Burch & Jock Gilchrist, *Survey of Global Activity to Phase Out Internal Combustion Engine Vehicles*, The Climate Center, 6-9 (March 2020), <https://theclimatecenter.org/wp-content/uploads/2020/03/Survey-on-Global-Activities-to-Phase-Out-ICE-Vehicles-update-3.18.20-1.pdf>.

²⁴⁴ Chris Woodyard, *Is California ready to ban gas-powered cars? Not yet. But they're thinking about it*, USA TODAY (Dec. 16, 2019).

²⁴⁵ See generally MIKE BERNERS-LEE & DUNCAN CLARK, *THE BURNING QUESTION* (2013). See also Duncan Clark, *Why can't we quit fossil fuels?*, THE GUARDIAN (April 17, 2013).

²⁴⁶ Megan Douglah, *Oil States Energy Services v. Greene's Energy Group: The Future Of Inter Partes Review And Its Impact On The Energy Sector*, 3 OIL & GAS, NAT. RESOURCES & ENERGY J. 1343, 1346 (2018); Jared Wiesner, *A Grassroots Vehicle For Sustainable Energy: The Conservation Reserve Program & Renewable Energy*, 31 WM. & MARY ENVTL. L. & POL'Y REV. 571, 575 (2007)

investments in fossil fuels. While fossil fuel companies must reduce their investments into untapped sources of fossil fuels,²⁴⁷ this proposal focuses on reducing financial institutions' investments in this area because they are the primary provider of finance to the fossil fuel industry.²⁴⁸ One study estimates that the four largest American banks financed fossil fuels for over \$583 billion over the last three years alone.²⁴⁹ Indeed, the large role played by financial institutions in supplying financing to the fossil fuel industry has caused commentators to label them as the “de facto enabler of global warming”.²⁵⁰

One approach to reducing investment in fossil fuels would be to draw from measures introduced after last financial crisis. As part of its efforts in addressing the repercussions of the 2008-09 financial crisis, Congress introduced the Volcker Rule.²⁵¹ The aim of the Rule was to counter the excessive risk taken by SIFIs, which was one of the causes of the financial crisis.²⁵² The Volcker Rule, introduced as part of the reforms in the Dodd-Frank Act, thus prohibited financial institutions from engaging in proprietary trading, subject to some exceptions, as a means of preventing them from taking on excessive risk.²⁵³

The Volcker Rule reminds us that the Federal Reserve has the authority to limit financial institutions from taking on excessive risk under the Dodd-Frank Act. On this understanding, if climate change gives rise to excessive risk, then the Dodd-

²⁴⁷ This would be achieved through environmental or tax regulations (by reducing demand for fossil fuel) but these issues are beyond the scope of this article which focuses on supply side regulations.

²⁴⁸ Finance Watch, *Breaking The Climate-Finance Doom Loop - How Banking Prudential Regulation Can Tackle The Link Between Climate Change And Financial Instability*, 14-15 (June 2020).

²⁴⁹ Rainforest Action Network et al., *Banking on Climate Change 2020*, 8 (Mar. 18, 2020), http://priceofoil.org/content/uploads/2020/03/Banking_on_Climate_Change_2020.pdf

²⁵⁰ Finance Watch, *supra* note 245, at 6.

²⁵¹ Dodd-Frank Wall Street Reform and Consumer Protection Act, Pub. L. No. 111-203, 124 Stat. 1376, § 619 (July 21, 2010).

²⁵² Paul Volcker, *How to Reform Our Financial System*, N.Y. TIMES (Jan. 30, 2010); Group of Thirty, *Financial Reform: A Framework for Financial Stability* 27 (2009), http://www.group30.org/images/PDF/Financial_Reform-A_Framework_for_Financial_Stability.pdf at 28;

²⁵³ See the latest exceptions to the Rule at Prohibitions and Restrictions on Proprietary Trading and Certain Interests in, and Relationships With, Hedge Funds and Private Equity Funds, Final Rule, 84:220 Federal Register (Nov 2019), <https://www.fdic.gov/news/board/2019/2019-08-20-notice-dis-a-fr.pdf>.

Frank Act must also enable the Federal Reserve to limit financial institutions' activities in relation to climate change risks.

As mentioned above, whether it is the transition risks or physical risks of climate change that ultimately prompt the retraction from fossil fuel investments, doing so could lead to drastic financial losses. For example, experts predict the losses from having to write off stranded assets will demolish approximately one-half of the value of fossil fuel reserves and possibly even obliterate the fossil fuel industry entirely.²⁵⁴ While the precise amount of financial losses from fossil fuels is difficult to predict, commentators expect it will be well beyond the losses caused by the last financial crisis.²⁵⁵

Accordingly, given the excessive systemic risks posed by financial institutions' investments in fossil fuels, the Federal Reserve could, using the Volcker rule as precedent, prohibit them from investing in this area.²⁵⁶ However, given the existing significant investment in this area, and the fear that a sudden shift away from investments in this area could cause a transition risk-induced systemic crisis, a more prudent approach would be to limit the amount of fossil fuel investments financial institutions can hold, with the aim of gradually decreasing that limit over time, until the investments were in line with the Paris Agreement goals. A more cautious approach would be to limit only new investments in fossil fuels, as this would not impair current energy usage (or pose large transition risks), but would prevent future global warming. Alternatively, a third (and even more cautious) approach would be, in keeping with government preference for a light touch regulatory approach, to introduce a framework for reducing financial institutions' fossil fuel investments over a period of time. However, rather than making compliance with the framework mandatory, financial institutions would

²⁵⁴ Alan Livsey, *Lex In Depth: The \$900bn Cost Of 'Stranded Energy Assets'*, FINANCIAL TIMES, Feb 4, 2020; Carbon Tracker Initiative, *The \$2 trillion stranded assets danger zone: How fossil fuel firms risk destroying investor returns* (2015); Jean-Francois Mercure et al., *Macroeconomic impact of stranded fossil fuel assets*, 8 NATURE CLIMATE CHANGE 588, 591(2018) (noting that lower demand for fossil fuels may lead to the loss of the entire oil and gas industry in the United States).

²⁵⁵ Mercure et al, *supra* note 251; Kompas, *supra* note 61.

²⁵⁶ For non-bank financial institutions, this could be initiated under the Dodd Frank Act which permits the Federal Reserve to establish additional prudential standards as it deems appropriate. See Dodd-Frank Act, *supra* note 248, at s. 165.

report on their progress with the framework as part of their management discussion and analysis reporting obligations²⁵⁷ or in other sustainability reporting.

Regardless of the approach chosen, the recent practices of a number of financial institutions confirm that reducing fossil fuel investments is feasible. Barclays, for instance, has pledged “to be net-zero by 2050” and has committed to align its “financing portfolio to the goals of the Paris agreement”.²⁵⁸ The European Investment Bank, the world’s largest multilateral financial institution, has similarly announced that it will end financing for all fossil fuel energy projects from the end of 2021 and align future financial projects with the goals of the Paris Agreement.²⁵⁹ Businesses therefore seem to be slowly moving in this direction, suggesting that regulation could help prompt laggards.

B. STRESS TESTS

A second regulatory tool for addressing the systemic risks of climate change would be to use climate change-oriented stress tests, particularly for SIFIs. Stress tests are analytic “what if” exercises that gauge how an institution will be affected by a change in variables, the so called “stress”.²⁶⁰ Stress tests identify whether a firm is sufficiently capitalized to withstand the stress and how vulnerable specific aspects of its business is to the stress.²⁶¹ It can also assess system-wide capital adequacy, identifying firms that are sufficiently capitalized in isolation but which may not be adequately capitalized in instances where there is a threat to financial stability.²⁶²

²⁵⁷ See 17 CFR § 229.303.

²⁵⁸ Barclays PLC, AGM Statements - Chairman’s 2020 AGM statement (7 May 2020), <https://home.barclays/content/dam/home-barclays/documents/investor-relations/reports-and-events/AGM2019/RNS%20-%20Barclays%202020%20AGM%20statements.pdf>.

²⁵⁹ European Investment Bank, Press Release - EU Bank launches ambitious new climate strategy and Energy Lending Policy (Nov 14, 2019).

²⁶⁰ Robert Weber, *A Theory For Deliberation-Oriented Stress Testing Regulation*, 98 MINN. L. REV. 2236, 2238 (2014); Robert T. Miller, *Oversight Liability for Risk-Management Failures At Financial Firms*, 84 S. CAL. L. REV. 47, 69-70 (2010).

²⁶¹ Bank for International Settlements - Committee on the Global Financial System, *supra* note 118, at 3-5; Greenlaw et al, *supra* note 118, at 3.

²⁶² Greenlaw et al, *supra* note 118, at 3.

By identifying vulnerabilities, stress tests can guide the strategic directions of both firms and regulators in mitigating the stress.²⁶³

In a climate change stress test, a firm simulates the effects of a climate change event on its business to determine its resilience to the expected losses from the event. Several institutions including the IMF, the European Systemic Risk Board, the Dutch National Bank, the Bank of England, the Bank of France, and the NGFS, among others, are considering or have already implemented climate change stress tests.²⁶⁴

The Bank of England recently set out its proposed model for climate change stress tests, which it intends to apply to the banking and insurance sectors. The stress test relies on the application by firms to three scenarios, using a 30 year modelling horizon. In the first scenario, the Paris Agreement global warming goals are met with early action; in the second, the Paris Agreement global warming goals are met but with a delayed transition requiring a more severe transition to make up for the late start; and in the third, no policy action is taken.²⁶⁵ Based on these three scenarios, the Bank intends to, first, test the resilience of firms' current business models to climate change, by having the firms "quantify the change in the value of their assets and (for insurers) liabilities at different points in each scenario".²⁶⁶ Second, the Bank will assess how firms would "change their business models in response to the risks in each scenario".²⁶⁷ Based on this information, the Bank will

²⁶³ Bank for International Settlements - Committee on the Global Financial System, *supra* note 118, at 4-5; Deloitte, *The Predictive Power of Stress Tests to Tackle Climate Change* 13-14 (2020), https://www2.deloitte.com/content/dam/Deloitte/fr/Documents/sustainability-services/deloitte_climate-risk-assessment.pdf.

²⁶⁴ Adrian Tobias et al, *Stress Testing at the IMF*, IMF Departmental Paper No. 20/04, 45 (Feb. 5, 2020); European Systemic Risk Board, *supra* note 91; Bank of England, *The 2021 Biennial Exploratory Scenario On The Financial Risks From Climate Change*, Discussion Paper (Dec. 2019); Robert Vermeulen et al, *An Energy Transition Risk Stress Test For The Financial System Of The Netherlands* (2018); Banque de France, *Speeches: New Year wishes from François Villeroy de Galhau, Governor of the Banque de France* (Jan. 14, 2020), <https://www.banque-france.fr/en/intervention/new-year-wishes-paris-financial-centre-0>; Network for Greening the Financial System, *Guide to climate scenario analysis for central banks and supervisors*, 18 (June 2020).

²⁶⁵ Bank of England, *supra* note 261, at 8.

²⁶⁶ *Id.* at 9

²⁶⁷ *Id.*

then identify system-wide impacts of firms’ “exposure to climate change, including the main sources of loss by sector and geography”.²⁶⁸

Conversely, the Dutch government has taken a different approach with their climate change stress test. Rather than soliciting information from firms, the Dutch have devised four, extreme but plausible, scenarios which are applied to over 2 trillion assets held by domestic banks, insurers and pension funds and then modelled the risks over a five year time period.²⁶⁹ The scenarios used are as follows: First, that policies designed to reduce carbon dioxide emissions are implemented abruptly leading to a large increase in the price of carbon.²⁷⁰ The second scenario is that technological breakthroughs lead to decreases in the cost of renewable energy enabling the share of renewable energy to double in five years.²⁷¹ The third scenario is that both of the first two scenarios occur simultaneously; while the fourth is that uncertainty surrounding governmental climate change policies causes consumer, producer and investor confidence to drop suddenly.²⁷² The stress test concluded that the losses for financial institutions would be large but manageable. The study recommended that individual institutions incorporate energy transition risks into their overall risk management programs to mitigate the risk.²⁷³

The Bank of England and Dutch approaches offer two options for devising climate change stress tests. However, the overall utility of climate change stress tests will depend on assumptions made in the modelling as well as on the choice of methodology.²⁷⁴ Climate change information is also not similar to the information that is typically used in stress tests as it is forward-looking, characterized by deep uncertainty and dependent on political decisions.²⁷⁵ This distinguishes climate change stress tests from regular stress tests as they must “consider multiple

²⁶⁸ *Id.* at 20.

²⁶⁹ Vermuelen et al., *supra* note 261, at 47.

²⁷⁰ *Id.* at 19, 24, 29 and 32.

²⁷¹ *Id.*

²⁷² *Id.*

²⁷³ *Id.* at 56.

²⁷⁴ *Id.* at 57.

²⁷⁵ Irene Monasterolo, Assessing climate risks in investors’ portfolios: a journey through climate stress-testing, UN Principles of Responsible Investment Blog (Mar. 2, 2020), <https://www.unpri.org/pri-blog/assessing-climate-risks-in-investors-portfolios-a-journey-through-climate-stress-testing/5526.article>; Vermuelen et al., *supra* note 261, at 57.

scenarios and equilibria with unknown probabilities”.²⁷⁶ Nevertheless, despite these limitations, a stress test of a SIFI’s resilience to climate change could help identify systemic tensions and shortcomings which may prevent more severe problems in the future. In particular, the Bank of England’s model is especially noteworthy as it envisions the changes firms would need to engage in to adapt to climate change. This type of stress test would provide a strategy to guide firms in changing their behavior in light of climate change.

The Federal Reserve already has the authority to create climate change stress tests under the Dodd Frank Act.²⁷⁷ The Act enables the Federal Reserve to introduce such tests and to develop at least three scenarios against which they would be conducted.²⁷⁸ This would enable the Federal Reserve to devise scenarios for adverse climate change events against which bank and non-bank financial institutions could conduct stress tests to determine if they would be able to absorb losses from these events. The Dodd Frank Act further enables the Federal Reserve to require companies to conduct their own annual or even semi-annual stress tests.²⁷⁹

The idea of stress tests has recently found support through a bill introduced in the Senate in late 2019, which would require the Federal Reserve to introduce climate change stress tests.²⁸⁰ Known as the Climate Change Financial Risk Act of 2019, the proposed legislation would mandate that the Federal Reserve introduce three scenarios for stress testing: global warming to 1.5 degrees Celsius, global warming to 2 degrees Celsius, and “business as usual” or global warming based on current predictions.²⁸¹ The proposed Act also provides for a newly established subcommittee of the Financial Stability Oversight Council that would be tasked

²⁷⁶ Monasterolo, *supra* note 272. Due to these uncertainties Monasterolo and her colleagues have developed their own climate change stress test. See Stefano Battiston et al, *A climate stress-test of the financial system*, 7 NATURE CLIMATE CHANGE 283 (2017).

²⁷⁷ Dodd-Frank Act, *supra* note 248, at s. 165(i).

²⁷⁸ *Id.* at 165(i)(1).

²⁷⁹ *Id.* at 165(i)(2).

²⁸⁰ Brian Schatz, A Bill to require the Board of Governors of the Federal Reserve System, in consultation with the heads of other relevant Federal agencies, to develop financial risk analyses relating to climate change, and for other purposes (Nov. 20, 2019), <https://www.schatz.senate.gov/imo/media/doc/Climate%20Change%20Financial%20Risk%20Act%20of%202019.pdf>.

²⁸¹ *Id.* at ss. 4 and 5.

with identifying and responding to climate change risks and threats to the stability of the financial system.²⁸² While the bill is widely supported by Democrats,²⁸³ the Republican response has been muted and it is unclear as to whether it will pass.²⁸⁴

C. CLIMATE CHANGE FUND

A third idea is to create a climate change-related systemic crisis fund. As we have seen from Covid-19, the pandemic's decimation of the economy has required Congress to step in and provide aid. This has included around \$750 billion to the fossil fuel industry and \$50 billion in loans and payroll support to the airline industry as part of a \$2 trillion stimulus package.²⁸⁵ The last financial crisis necessitated similar governmental intervention with government bailouts to ailing financial institutions ranging from \$700 billion to \$1 trillion.²⁸⁶ If climate change events create a systemic crisis on par with Covid-19 or the 2008 financial crisis, government intervention will certainly be necessary once again.

At the same time, even though government assistance in times of a systemic crisis can be necessary, there is a fear that bailouts can lead to firms' moral hazard behavior.²⁸⁷ Indeed, in times of profitability, businesses seem to be more interested

²⁸² *Id.* at s. 7.

²⁸³ The bill is co-sponsored by Elizabeth Warren (D-Mass.), Chris Van Hollen (D-Md.), Sheldon Whitehouse (D-R.I.), Michael Bennet (D-Colo.), Jeff Merkley (D-Ore.), Cory Booker (D-N.J.), Amy Klobuchar (D-Minn.), Kamala Harris (D-Calif.), and Patty Murray (D-Wash.).

²⁸⁴ Dean Scott, *Senate Bill Would Extend Bank Stress Tests to Climate Risk*, BLOOMBERG LAW, Nov. 8, 2019.

²⁸⁵ Fiona Harvey, *US fossil fuel giants set for a coronavirus bailout bonanza*, THE GUARDIAN, May 12, 2020; Alan Rappeport & Niraj Chokshi, *Crippled Airline Industry to Get \$25 Billion Bailout, Part of It as Loans*, N.Y. TIMES, April 29, 2020; Timonthy Massad, *Airlines Got the Sweetest Coronavirus Bailout Around*, BLOOMBERG, May 4 2020); Tim Wu & Yaryna Serkez, *These Companies Enriched Themselves. Now They're Getting a Bailout*, N.Y. TIMES, Mar. 27, 2020.

²⁸⁶ US Government Accountability Office, *Federal Reserve System - Opportunities Exist to Strengthen Policies and Processes for Managing Emergency Assistance*, GAO-11-96 (July 2011). (Noting "From late 2007 through mid-2010, Reserve Banks provided more than a trillion dollars in emergency loans to the financial sector to address strains in credit markets and to avert failures of individual institutions believed to be a threat to the stability of the financial system." *Id.* at 1.

²⁸⁷ Antonio E. Bernardo et al., *Designing Corporate Bailouts*, 59 J.L. & ECON. 75,76 (February, 2016); Marilyn Friedman, *To Bail Out Or Not To Bail Out: Moral Hazard And Other Ethical Considerations*, 11 GEO. J. L. & PUB. POL'Y 411, 413-14 (2013); Neel Kashkari, President and CEO, Fed. Reserve Bank of Minneapolis, *Lessons from the Crisis:*

in stock buy backs²⁸⁸ rather than preparing for any gray rhino risks, suggesting that moral hazard behavior is driving firms' failure to adequately mitigate risks, including climate change risks.²⁸⁹

One possibility for countering this behavior is to have firms pay into a fund, which would be used to mitigate the costs of addressing the systemic crisis a climate change event could cause. Commentators have previously advocated for the creation of a systemic crisis fund or safety net as a means of addressing the risks and costs of a systemic crisis.²⁹⁰ As Gordon and Muller note, the fund model can mutualize risk by encouraging firms "to press regulators to rein in firms and practices that pose systemic risks".²⁹¹ The aim of having this model in place is to act as a monitoring device, prompting firms to monitor each other and control risky behavior as a means of not having to increase their contributions to the fund or safety net.²⁹² The fund model could also transfer the losses stemming from the systemic crisis from being paid for by tax payers to, at least partially, firms themselves.²⁹³

In many ways, the fund model is analogous to the Federal Deposit Insurance Corporation (FDIC) model, which uses premiums paid by financial institutions to guarantee deposits as part of a larger goal of maintaining financial system

Ending Too Big To Fail, Remarks at the Brookings Institution, Washington, D.C. (Feb. 16, 2016); Kathryn Judge, *The Truth About The COVID-19 Bailouts*, FORBES, Apr 15, 2020.

²⁸⁸ See e.g., Wu & Serkez, *supra* note 282; Ruben Munsterman, *After \$16 Billion of Stock Buybacks, a Tech Company Seeks Government Aid*, BLOOMBERG, Apr. 24, 2020.

²⁸⁹ The Economist Editorial, *How to think about moral hazard during a pandemic*, THE ECONOMIST, Apr. 25, 2020 (arguing "But the threat posed by climate change means that such extraordinary natural calamities might not be so infrequent. It might thus become harder for governments to credibly declare that aid provided during such disasters is a one-off, as is needed to discourage reckless behaviour and to stop dangerous risks from accumulating"). See also Judge, *supra* note 284 (arguing "The decision by so many large corporations to take on so much debt in recent years did not cause COVID-19, but it did reduce the capacity of the corporate sector to weather this storm").

²⁹⁰ See e.g., Jeffrey N. Gordon & Christopher Muller, *Confronting Financial Crisis: Dodd-Frank's Dangers and the Case for a Systemic Emergency Insurance Fund*, 28 YALE J. ON REG. 151 (2011); Iman Anabtawi & Steven L. Schwarcz, *Regulating Ex Post: How Law Can Address the Inevitability of Financial Failure*, 92 TEX. L. REV. 75 (2013). See also Restoring American Financial Stability Act of 2010, S. 3217, 111th Cong. § 210(n) (2009) (proposing a bailout fund for systemically important financial institutions, that was later abandoned due to political opposition).

²⁹¹ Gordon & Muller, *supra* note 287, at 208.

²⁹² Steven L. Schwarcz, *Misalignment: Corporate Risk-Taking and Public Duty*, 92 NOTRE DAME L. REV. 1, 19 (2016).

²⁹³ Gordon & Muller, *supra* note 287, at 205.

stability.²⁹⁴ Thus, following the FDIC model approach, firms would pay into a climate change fund, which would be managed by a governmental agency. The amount of payment by individual firms into the fund could be determined, for instance, by the amount of the firm's investment in fossil fuels or other leading causes of climate change,²⁹⁵ or it could be determined in line with other criteria.²⁹⁶ The goal would be to have the fund capitalized to a target amount within a specified period of time.²⁹⁷ Payments into the fund, however, could be varied to accord with an individual firm's risk propensity for specified climate change events, with payments lowered for firms working to mitigate specified climate change risks. Once the fund is capitalized and a climate change event occurs that triggers a systemic crisis, the fund would then be used to support firms according to a set of pre-determined criteria.²⁹⁸ In addition, use of fund amounts to support firms could be conditioned on having to achieve prescribed climate change targets, such as reducing emissions or investments in fossil fuels, within allocated time periods.²⁹⁹

The biggest objection to the use of such a fund would likely be the fear that the existence of the fund would institutionalize the moral hazard problem. Certainly, this was the objection to the \$50 billion dollar liquidation fund, proposed

²⁹⁴ *Id.*; Steven A. Ramirez, *The Law and Macroeconomics of the New Deal at 70*, 62 MD. L. REV. 515, 543–44 (2003).

²⁹⁵ The EPA lists the leading causes of greenhouse gas emissions. See Environmental Protection Agency, *Sources of Greenhouse Gas Emissions* (2018), <https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions>.

²⁹⁶ For example, Gordon & Muller suggest that the fund should be scaled to the size of the current US economy. Gordon & Muller, *supra* note 287, at 204. Alternatively, a proposal for a fund attached to the Dodd-Frank Act, which was later abandoned suggests that the fund be capitalized based on several risk-based assessments which the proposal outlines. See Restoring American Financial Stability Act of 2010, *supra* note 257, at s. 210(o).

²⁹⁷ For example, Gordon & Muller suggest capitalization of \$1 trillion over 20 years while the Restoring American Financial Stability Act proposed a \$50 billion target achieved within a 5 to 10 year period. See Gordon & Muller, *supra* note 287, at 204–206; Restoring American Financial Stability Act of 2010, *supra* note 287, at s. 210(n)(5).

²⁹⁸ Anabtawi & Schwarcz, *supra* note 287, at 106. Whether a climate change induced systemic crisis has occurred should be determined by a panel of pre-selected scientists and economists, while disbursements from the fund should be overseen by the Federal Reserve and Treasury acting in concert.

²⁹⁹ Cameron Hepburn et al., *Will COVID-19 fiscal recovery packages accelerate or retard progress on climate change?*, Oxford Review of Economic Policy, 13 May 8, 2020.

under the Dodd-Frank Act, to bail out failing banks.³⁰⁰ Critics noted that the fund “amounted to a permanent bailout fund that would weaken market discipline”.³⁰¹

The climate change fund, however, need not perpetuate moral hazard behavior. First, since the amount of payments made by individual firms is dependent on its climate change risk propensity, firms should be incentivized to minimize, not exacerbate, their individual risks. Second, the climate change target conditionalities added to any amounts used by firms from the fund should also reduce moral hazard behavior. Third, since the aim will be to keep overall payments into the fund low, firms may monitor each other to ensure that risky behavior, such as new fossil fuel investments, is discouraged. In addition, even if moral hazard is not contained, the fund, at least, represents a fairer solution to the public than the status quo since it lessens the burdens on individual citizens – who would otherwise pay the costs of systemic stability with taxpayer dollars – since the firm capitalized fund would be used to support businesses.

It is also unlikely that the availability of a fund, in and of itself, causes moral hazard behavior. As commentators have noted, a fund is simply “a prudential measure against possibilities we may not project, notwithstanding efforts to avoid them, and it is no more causative of failure than a safety net under a tightrope walker”.³⁰² Indeed, since the last financial crisis, firms have continued to engage in moral hazard behavior, even without a fund in place, and some of these firms are the ones asking for bailouts with Covid-19.³⁰³ Moral hazard behavior thus seems to be par for the course for some firms, not necessarily behavior exacerbated by the presence of a safety net.

D. MOVING TOWARDS GREEN INVESTMENTS

A final idea would be to reorient investments from climate change fostering investments to investments that mitigate climate change. This could be done by

³⁰⁰ Restoring American Financial Stability Act of 2010, *supra* note 287, at s. 210(n).

³⁰¹ Greg Hitt & Damian Paletta, *Senate Ends Financial-Bill Standoff*, WALL ST. J., Apr. 29, 2010, at A2.

³⁰² Gordon & Muller, *supra* note 287, at 210.

³⁰³ Judge, *supra* note 284; Wu & Serkez, *supra* note 282.

increasing or decreasing the cost of capital depending on whether an investment furthers or mitigates climate change. That is, banks could be penalized or forced to engage in additional capital requirements for engaging in “brown” (climate change problem causing) investments or have capital charges lowered for “green” (climate change mitigating) investments.³⁰⁴ Alternatively, investments can be reoriented towards green projects by using green bonds.³⁰⁵ Green bonds raise financing for projects that deliver environmental benefits, including climate change mitigation, and can be issued by financial institutions, governments and companies.³⁰⁶ Both of these approaches can encourage and increase the amount of the amount of investments towards climate change mitigating projects, with the aim of reducing investments in areas that foster climate change, and therefore, the systemic risks that these investments pose.

However, at present both approaches are plagued by taxonomy issues, as the definition as to what precisely constitutes a green or brown investment has not yet been determined. This is complicating classification of investments. Efforts are underway to develop a climate change financial oriented taxonomy, although data on the relative riskiness of green versus brown projects remains limited and continues to complicate investment classification.³⁰⁷

A second problem is that the greenness of green bonds cannot be independently verified. Until recently, for instance, China was issuing green bond financing for coal projects, despite coal being a contributor to climate change problems.³⁰⁸ There are a number of different organizations such as the Climate

³⁰⁴ See e.g. Margherita Giuzio et al., *Climate change and financial stability*, European Central Bank – Financial Stability Review (May 2019), https://www.ecb.europa.eu/pub/financial-stability/fsr/special/html/ecb.fsrart201905_1~47cf778cc1.en.html#toc1; Silla Brush & Alastair Marsh, *BOE Considers Raising Capital Costs for Pollution in Green Push*, BLOOMBERG LAW, Mar. 10, 2020; EU High Level Expert Group on Sustainable Finance, *Financing A Sustainable European Economy - Final Report*, 68 (2018).

³⁰⁵ Caroline Flammer, *Green Bonds: Effectiveness and Implications for Public Policy*, 1 ENVIRONMENTAL & ENERGY POLICY & THE ECONOMY 95 (2020); Tooze, *supra* note 78.

³⁰⁶ Flammer, *supra* note 302, at 95; Lyubov Pronina, *What Are Green Bonds and How ‘Green’ Is Green?*, BLOOMBERG, Mar. 24, 2019.

³⁰⁷ See European Commission, *Action Plan: Financing Sustainable Growth*, Communication From The Commission, COM(2018) 97 final (March 8, 2018); Brush & Marsh, *supra* note 301.

³⁰⁸ Christian Shepherd & Don Weinland, *China to stop green bond financing for ‘clean coal’ projects*, FINANCIAL TIMES, May 29, 2020; *China excludes clean coal projects from list eligible for green bonds*, REUTERS, May 29, 2020.

Bonds Initiative, Moody's and the International Capital Market Association's Green Bond Principles that can certify the veracity of a green bond. However, the criteria for certification varies across organizations.³⁰⁹

Yet with over \$185 billion in green bonds financing raised last year alone, and green investments exceeding \$31 trillion, green investing seems to be an increasingly desired strategy by investors.³¹⁰ Moreover, recent studies have found that green investments are outperforming standard investments while green bonds that are independently certified improve both firm performance as well as a firm's environmental performance.³¹¹ There is concern, however, that green investments are not being oriented towards changing the actions of greenhouse gas emitters nor is it being channeled into renewable energy companies.³¹² Thus, while the greening of investments may be redirecting finance towards less risky assets, it is unclear as to whether the greening of investments is sufficient to prompt corporations to begin better mitigating climate change.

V. CONCLUSION

Covid-19 reminds us that gray rhino risks that are ignored are done so at peril. It also provides a glimpse of the devastation on the economy that failing to prepare for climate change could impose. At the same time, Covid-19 has also afforded us an opportunity by pausing the economy. While there is no doubt that the economic engine must be restarted, this halt to the economy allows us to take one of two paths to recovery. The first is one where we return to life pre-pandemic, where the status quo prevails, and where, despite the urgency of addressing climate change risks, we return to business as normal. The second path looks very different. It is premised on a green recovery in which climate change is better incorporated into economic

³⁰⁹ Flammer, *supra* note 302, at 96.

³¹⁰ Elliot Smith, *The numbers suggest the green investing 'mega trend' is here to stay*, CNBC, Feb. 14, 2020; Reed Lamberg et al., *Green Finance Is Now \$31 Trillion and Growing*, BLOOMBERG, June 7, 2019.

³¹¹ Siobhan Riding, *Majority of ESG funds outperform wider market over 10 years*, FINANCIAL TIMES, June 30, 2020 (citing a report by Morningstar); Mark Haefele, *Sustainable investing can propel long-term returns*, FINANCIAL TIMES, Sept. 25, 2018; Flammer, *supra* note 302, at 97-98.

³¹² The Economist Staff, *How much can financiers do about climate change?*, THE ECONOMIST, June 20, 2020.

measures. It would also mean an economy premised on decoupling economic growth from greenhouse gas emissions, which would involve using one or more of the regulatory options explored above alongside enhanced climate change disclosure.

Still, it may be that governments choose to focus only on one crisis at a time. Government attention today seems to center only on economic recovery in the face of containing Covid-19. This could mean that governments overlook or ignore climate change action, even in relation to economic recovery. Yet failure to attend to issues of climate change now may make it impossible to do so later.

This is ardently apparent in relation to the economic aspects of climate change. A failure to mitigate climate change will lead to substantial losses with rippling effects throughout the entire global economy. Moreover, the damage will not be limited to the economy, as the widescale economic effects will likely also cause knock on effects on society. Even worse, once we have reached this stage, it will be difficult or impossible to course correct.

In short, an economy post-Covid-19 cannot ignore the impact of climate change. Covid-19 has already revealed the parts of the economy that are most susceptible to climate change. Moving forward, governments must prioritize an economic model that makes it environmentally resilient. Regulating to ensure that the systemic risks climate change poses are mitigated is just one step in this direction.