SUBJECT	RESPONSIBLE INVESTING UPDATE – Divestment Financial Justification
SUBMITTED TO	BOARD OF GOVERNORS
MEETING DATE	April 16, 2020
SESSION CLASSIFICATION	OPEN
ACTION REQUESTED	Decision requested: approval of proposed resolution

DECISION REQUESTED

WHEREAS the Board of Governors has requested legal and financial justification for divestment from fossil fuel companies within its portfolios; and,

WHEREAS UBC, which has received reports from Mantle314, UBC IMANT and Deloitte which are based on research and data that are currently available, found that (i) climate change presents financial risks to long term investment assets; (ii) it is possible to construct a public equities portfolio that lowers emissions and the climate risk profile; (iii) the overall risk of constrained and unconstrained public equities portfolios remains similar although the drivers of risk differ; (iv) returns could be materially different in certain market environments, but should converge over a longer time horizon; and, (v) comparable peers are taking a comprehensive ESG approach to portfolio management,

IT IS HEREBY REQUESTED that the Board of Governors approve the following:

i. **that UBC is committed to assuming a role as a global leader in implementing a comprehensive response to the climate emergency, including the application of ESG investment practices as established by the UN Principles of Responsible Investing (UNPRI);**

ii. **that the purpose of divestment is to reduce climate change-related financial risk to the endowment through the reduction of carbon emissions and holding of stranded fossil fuel assets;**

iii. **that divestment is only one of the tactics UBC is incorporating into its investment strategy to reduce climate change-related financial risk to the endowment and drive positive change;**

iv. **that in addition to divestment, UBC's strategic approach will include collaboration with like-minded investors and organizations, and leveraging influence to drive positive change - such as shareholder engagement and proxy voting; and,**

v. **that the Administration be directed to create a plan to mitigate these risks, including establishing clear parameters to move towards divestment in an expeditious and financially responsible manner. The plan will include targets for emission reduction, a proposed timeline for divestment, and quarterly updates to the Finance Committee.**

SUBMISSION DATE	March 25, 2020
LEAD EXECUTIVE	Vice-President Finance and Operations
PRESENTED BY	Peter Smailes, Vice-President Finance and Operations
SUPPORTED BY	Dawn Jia, CEO of UBC IMANT Lisa Pankratz, Chair of the UBC IMANT Board Yale Loh, Treasurer

PRIOR SUBMISSIONS

The subject matter of this submission has been considered previously by the Board of Governors, Finance Committee and Endowment Responsible Investing Policy Committee on the following occasions:

1. February 14, 2020 (OPEN SESSION Board of Governors)

   Action/Follow up: Report progress of financial justification to support divestment together with progress on implementing a comprehensive responsible investing framework that aligns with UBC's sustainability priorities, incorporating climate changes beliefs into UBC's investment policies, establishing baseline portfolio GHG emissions levels on the way to medium and long-term carbon reduction targets, becoming signatories to advocacy groups such as UNPRI and Climate Action 100+ at the April 2020 Board Meeting.

2. February 6, 2020 (CLOSED SESSION Finance Committee)
   Action/Follow up: Provide financial justification to support divestment

3. December 5, 2019 (OPEN SESSION Board of Governors)

   Action/Follow up: Undertake and complete by March 31, 2020 financial analysis for both Main Endowment Pool and Sustainable Future Pool to support transfer of the Trek Endowment assets to the Sustainable Future Pool. Confirm by February 1, 2020 the legal implications of such a transfer. Undertake and report the necessary legal and financial analysis to explore full divestment from fossil fuels in the Main Endowment Pool and report analysis in an expedient manner.

4. November 22, 2019 (OPEN SESSION Endowment Responsible Investing Policy Committee)

   Action/Follow up: Further refine UBC's responsible investing framework and bring forward recommendations on responsible investing climate change beliefs, targets, and implementation plan.

EXECUTIVE SUMMARY

On December 5, 2019, the UBC Board of Governors endorsed the UBC Declaration on the Climate Emergency, along with creating a new Sustainability Committee of the Board of Governors, including in its terms of reference the commitment to fully explore divestment from fossil fuels and support for sustainable investment. The Administration was also directed to undertake and report back to the Board of Governors the necessary legal and financial analysis to support full divestment of fossil fuels in the Main Endowment Pool and the transfer of the $380m Trek Endowment to the Sustainable Future Pool.

The legal advice was provided at the February 6, 2020 Finance Committee meeting.

Further to the financial analysis requested, UBC has now received a report from Mantle 314: *Financial Risk of Climate Change in a Transition to a Low-Carbon World* together with a report from UBC IMANT addressing divestment. UBC IMANT's report, *Risk and Portfolio Analysis on Divestment*, has been developed to help inform recommendations on the path forward to divestment and comprehensive leadership in responsible investing.

Additionally, Deloitte has prepared a report *ESG Investing Landscape (Macro Analysis)* that further expands on the actions taken by UBC's peers and other large asset owners.

Financial risk of Climate Change in a Transition to a Low-Carbon World – Mantle 314 Analysis

Mantle314 ("Mantle") is a boutique consulting firm with over 60 years of combined experience in providing leading expertise in climate risk, resiliency and low-carbon solutions to assist clients in understanding, assessing and developing climate-smart solutions.

Results of Mantle's analysis (full report attached as Appendix A) indicate that the link between climate change and the financial viability of investment assets is clear. Carbon intensive companies will be exposed to climate-related financial risk as the world commits to reduce carbon emissions through regulatory, legal, market or technology shifts away from fossil fuels. Rapidly evolving trends – such as greater corporate disclosure of climate risk, commitment to a "Paris Aligned" future, the acceptance of a "carbon budget" – are greatly increasing the risk in holding shares of companies whose value is derived from the continued growth and expansion of global fossil fuel use.

It is important to note that climate change transition risks do not apply only to fossil fuel extraction companies—different sectors will be impacted in different ways, particularly those that are carbon intensive. For the purposes of this paper, Mantle focuses on fossil fuel companies, but acknowledges that to reach the Paris Agreement targets will require significant changes in how the global economy currently operates and creates value.

It is possible to construct a portfolio with comparable financial return and risk profile while lowering emissions and climate risk profile – UBC IMANT Analysis

In line with leading practices and in keeping with UBC IMANT's investment management responsibilities and expertise, UBC IMANT adopted a four-pronged approach to the financial analysis on divestment by:

1) carrying out a literature review and examining leading academic research investigating the impact of divestment on portfolio outcomes;
2) evaluating the practical implementation considerations of applying climate-related portfolio restrictions, considering the availability of existing investment products offered by the industry;
3) conducting an analysis of investment returns over the past 30 years in ten major regional markets, to determine the effect of excluding certain sectors on long term portfolio risk and return characteristics; and,
4) performing a quantitative analysis of a broad-based global equity portfolio versus divested portfolios in order to estimate the significance of any changes in portfolio characteristics.

Results of the analyses (full report attached as Appendix B) are consistent with the practical observations that limited-scale constraints on public equity portfolio holdings do not materially alter the risk return profile of investment portfolios over the long run. Practitioners and academics report that reasonably constrained portfolios are generating comparable returns to unconstrained portfolios over a longer time horizon. The overall risk of constrained and unconstrained portfolios remains similar although drivers of risk differ. Therefore, returns could be materially different in certain market environments but should converge over a longer time horizon.

The Board of UBC IMANT endorses the risk and portfolio analysis prepared by UBC IMANT and will incorporate the research in future asset mix studies.

Comparable peers are taking a comprehensive ESG approach to portfolio management – Deloitte Analysis

Further research on the broader environmental, social and governance ("ESG") investing landscape (report attached as Appendix C) indicates that a global shift towards ESG investing is evident in higher education institutions and pension funds investors.

There is broad alignment between UBC and peer universities' ESG investing objectives, including alignment with institutional values, financial prudence, and transparency. Higher education institutions have taken varying approaches and actions to execute on their ESG investing principles, such as integrating ESG considerations into investment policies, becoming signatories with socially responsible investing initiatives, and committing to varying

degrees of divestment from carbon intensive companies. Institutions' philosophies on ESG-driven divestment sit on a continuum of divestment focused on a select "list" or types of companies to building ESG into the fabric for long term impact. Financial prudency is a cornerstone consistent across approaches.

There is also broad alignment among major Canadian pension fund investors to integrate ESG factors into investment decision-making processes and policies. Common elements in their approaches include practicing active ownership, enforcing regular reporting and disclosure, and becoming signatories with SRI initiatives.

On a more macro level, a global shift towards ESG investing is evident in investment managers' increasing allocation towards socially responsible funds (i.e. increase of 34% to $30.7 Trillion from 2016 to 2018). A 2019 report by RBC Global Asset Management demonstrates that studies have broadly concluded that socially responsible investing does not hurt returns.

Next Steps:

UBC will apply a strategic approach to developing a plan for divestment as a central part of achieving its ESG and climate-specific targets, taking a "divestment plus" approach. UBC IMANT believes we can manage the portfolio to move towards the University's divestment goals while at the same time applying best practice responsible investment principles and managing fiduciary duty and risk. Following the Board of Governors' April meeting, UBC IMANT will start developing a "divestment plus" implementation plan, as well as reviewing the investment process and governance structure to facilitate such a plan. In the meantime, we will also move forward on a number of other initiatives such as becoming signatories to advocacy groups (e.g. United Nations Principles of Responsible Investing) upon Board of Governors' approval and establishing methodologies for carbon emission measurements. We will provide updates on the implementation plan and other initiatives in the June Finance Committee meeting.

Below is a summary of the project progress updates to date:

Project Categories	Percentage Completion
1. Define the Scope of Divestment Plus	
2. Provide Financial Justification of Divestment	
3. Determine the Optimal Operating Model	
4. Review Governance Structure of On-going Divesting Decision Making	
5. Assess Limitations in Various Asset Classes	
6. Enhance Climate Risk Measurement and Reporting	
7. Investigate Cost Structure of Divesting Strategies	
8. Establish New Due Diligence Procedures and Criteria for Divestment	
9. Review Divestment Timeline and Sequence	
10. Assess Market Capacity and Manager Capacity for Divesting Strategies	

SUPPLEMENTAL MATERIALS

Appendix A: Mantle314 Analysis: "*Financial Risk of Climate Change in a Transition to a Low-Carbon World*"

Appendix B: UBC IMANT Financial Analysis: "*Risk and Portfolio Analysis on Divestment*"

Appendix C: Deloitte Analysis: "*ESG Investing Landscape (Macro Analysis)*"

Financial Risk of Climate Change in a Transition to a Low-Carbon World

A deep-dive into climate-related risks

March 2020

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Table of Contents

Key Messages

- The outcomes of a 4+ degree global temperature rise are severe, society-changing physical impacts. The estimated disruption in livelihoods, destruction of property, human migration, agricultural output and loss of life have prompted world leaders to agree to transition to a low-carbon economy.
- Significant and rapid change to society's combustion of coal, oil and natural gas is needed to achieve the 1.5 degree target. Current government action is not consistent with the amount of change needed, and new policies that would severely impact carbon-intensive companies are a likely outcome between now and 2030.
- In addition to the scale of change needed, certain physical changes are signaling irreversible tipping points. This indicates that the potential speed of implementing the transition towards a low-carbon economy may be faster and/or more disorderly than previously thought or would be ideal for markets.
- Climate change models' scientific outputs are not easily translated to economic decision-making, and this makes model conclusions difficult to apply to corporations. By translating these outputs into sectoral GHG emissions, the relationship between the economic activities and climate change mitigation becomes clear. GHG emission limits derived from warming scenarios can be translated into a yardstick to measure the necessary reductions from the energy sector.
- There is a large discrepancy in the GHG emissions associated with any of the 2 degree or below climate scenarios for the oil and gas industry as compared to the amount of fossil fuels yet to be burned – this is a carbon bubble. This discrepancy points to the possibility of a market correction in the viability and value of coal, oil and gas companies.
- Policies targeted at fossil fuel combustion can be powerful tools for climate mitigation and a strong signal of the transition to a low-carbon economy. There are a plethora of tools worldwide on this topic. However, given the urgency of what science tells us and the agreed upon actions from the Paris Agreement, there is a sense that further, more stringent and focused policies will be inevitable.
- At the same time as governments and markets take action, there continues to be advancements in clean, alternative technologies. These technologies are increasing market penetration. Renewable energy for electricity is now competitive with fossil fuels, and electric vehicle adoption shows increasing momentum. Under low-carbon scenarios, renewable energy severely undermines coal and oil demand, while electric vehicles also contribute to declining oil demand.
- The financial sector's understanding of climate change has grown by leaps and bounds in recent years. However, action across the sector lacks coordination. Various actors, such as credit rating agencies and banks, are integrating climate risk into their

analysis, and large institutional investors are calling for stronger action on climate change. Fossil fuel companies will find securing credit to be more difficult or restricted to a smaller set of lenders. These actions foreshadow a difficult environment for fossil fuel companies as the financial sector coordinates their climate-related risk management approaches.

- The market is moving to incorporate climate-related financial issues and many initiatives will exclude fossil fuel companies entirely. Some initiatives provide alternatives to fossil fuels such as green taxonomies, benchmarks and indexes. Other initiatives are focused on increasing transparency of climate-related risks and their impacts on financial value, which should drive fossil fuel company action or devaluation.
- Companies are still allocating capex to fossil fuel production projects. Overlaying the funded projects with carbon budgets for the different climate scenarios shows that there are projects that would not be economically viable in the long term. In fact, the majority of planned projects would not proceed under a below 2-degree scenario.
- Capital expenditure will also be needed to develop and implement alternative energy sources. Much of this can come from traditional fossil fuel companies who are diversifying their business, however, research shows that levels of investment are far below what is needed. This indicates that diversification is also not at the levels needed to protect value in these companies.
- Another signal of how companies might be reacting to the transition to a low economy is how companies are incenting behaviour at the highest levels. Remuneration of oil and gas executives is still largely tied to growing the production of fossil fuel reserves with no sign that these companies are assessing their forward-looking strategy and preparing to hold their value in a low-carbon scenario.

Executive Summary

Science leads to global decision

Climate change is a systemic risk that will drive an economic, social and sectoral upheaval. Climate-related financial risk has its roots in the global acknowledgement that physical impacts from unchecked climate change were untenable. The global consensus for a desired climate outcome, as set out at the 2015 Paris Climate Agreement, is to limit global warming to well below 2 degrees C[1] above preindustrial levels, and to pursue efforts to further limit the temperature increase to 1.5 degrees.[2] Human activities have already increased warming by 1 degree, and so meeting the Paris Agreement's targets will require a rapid decarbonization of the global economy over the next decade – also known as the transition to a low-carbon economy.

Global goal translated into industry metric that signals stranded asset risk

The goal of decarbonization can be expressed a budget of carbon emissions in order to apply it to industry. When this budget – or amount of carbon emissions available under a low-carbon scenario – was compared to current emissions and potential emissions in the form of proven fossil fuel reserves, a carbon bubble was noted. The emissions associated with the proven reserves were far over the budget associated with the desired 2 degree or below scenario. In fact, estimates of the value of unburnable reserves could be as high as 100 trillion USD by 2050. These "stranded assets" would result in large amounts of value of fossil fuel based companies becoming unrealized.

Urgency points to a disorderly transition

Several tipping points can indicate whether the climate system has passed the point of no return. This includes various impacts from ice thawing, such as Arctic sea ice reduction and melting of the Greenland ice sheet, the J. Wilkes Basin in Antarctica and the West Antarctic ice sheet, as well as impacts on various ecosystems such as Amazon rainforest dieback, Boreal forest dieback, permafrost thawing and dying coral reefs. Recent research shows that tipping points may be reached as soon as 2021 with full collapse of the ecosystem in 49 years. These developments increase the urgency of the needed decarbonization and increase the chance of an abrupt and disorderly transition.

Multiple signs point to a transition away from fossil fuels

Risk to fossil fuel-based companies becomes clearer when considering the potential transition to a low-carbon economy. Several direct drivers of the transition are found to be well underway. Policy drivers such as coal-plant phase outs and carbon pricing directly impact the use of fossil fuels as an energy source. Alternative, clean technology costs are on par or lower than fossil fuel power generation while electric vehicles are steadily making inroads in the market. Both renewable energy and electric vehicles are forecast to continue

[1] Unless otherwise noted, all temperatures referenced in this paper are in degrees Celsius.
[2] United Nations Framework Convention on Climate Change. Paris Agreement. 2015.

to grow and become more affordable displacing fossil fuel use. Credit rating agencies and banks are increasing the cost of credit for fossil fuel companies or simply restricting access.

Several drivers are placing fossil fuel companies out of favour

Growing awareness in the finance industry of climate-related financial risk is fueling multiple market developments. Climate disclosure is becoming the industry standard and is supporting the pricing of climate-related risks into investment decisions. Financial stress testing by federal banks are explicitly looking at the viability of fossil fuel producers and other sectors in portfolios. Green taxonomies, benchmarks and indexes are excluding fossil fuel companies and others who are not prepared for the transition to a low-carbon economy.

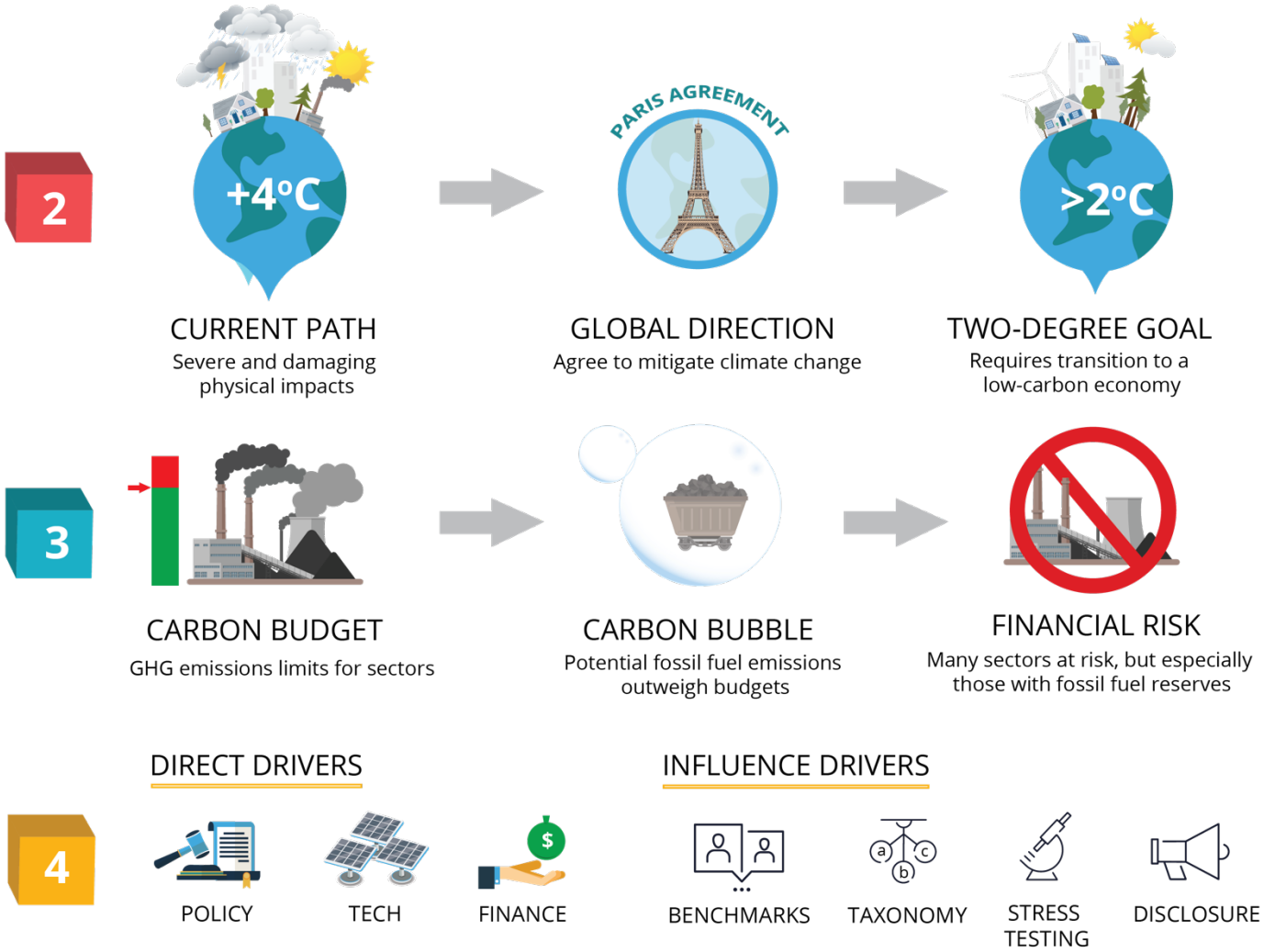
Fossil fuel companies are not showing signs of change

While a very few fossil-fuel-based companies are acknowledging the transition to a low-carbon economy, most have not shifted fundamental structures. Capex continues to be funneled to fossil fuel products with very little allocated towards diversification into clean technologies. Remuneration of top executives continue to be based in bringing fossil fuels to production. This raises serious doubts about whether the best way to support a low-carbon transition is to keep investing in large oil and gas companies, and about whether large oil and gas companies will remain profitable in a low-carbon economy.

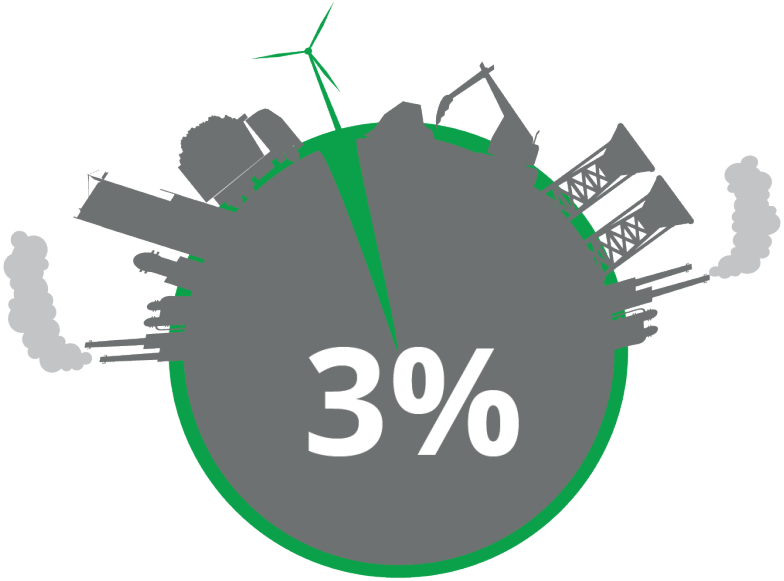
Where to go from here?

The concepts in this report are foundational to understanding the link from climate science to climate-related financial risk and opportunity. These can be used as a jumping off point to being formulated an approach to climate change management in an investment portfolio. This exercise usually begins by looking at the most directly and immediately affected companies, on which this report has focused. However, in order to consider comprehensive portfolio resilience in multiple climate change scenarios, further consideration of other climate impacts is needed. Other climate impacts may include physical impacts and adaptation, as well as a focus on a broad range of sectors. This focus on other sectors could range from ancillary sectors supporting fossil fuel based companies, to sectors affected by completely different climate change challenges, such as disruption to global supply chains.

Executive Summary Infographic 1: Link from Physical Impacts to Financial Risk (Mapped to report sections 2, 3 and 4)



Executive Summary Infographic 2: Fossil Fuel Companies Showing Little Sign Of Change as Indicated by Capex Allocation to Diversification.



BUSINESS RIGIDITY

Fossil fuel companies should be adapting their business, but their capital spend and incentive structures indicates otherwise.

Except for a handful of leading companies, oil companies seem to be rooted in an expectation that demand will continue to grow.

Section 1: Introduction and Context

This Report

Climate change presents a threat to the global economy, human health, and natural ecosystems. It is directly linked to the combustion of fossil fuels, which produces carbon emissions that trap heat in the atmosphere and warm the planet. Policy, technology innovation and financial sector initiatives that are meant to reduce carbon emissions pose significant financial risk to businesses. This is particularly true for businesses that represent large carbon emissions and are sensitive to the transition to a low-carbon economy, such as thermal coal, oil and gas companies.

This report examines the interaction of climate change and finance, and how rapidly evolving trends – greater corporate disclosure of climate risk, commitment to a "Paris Aligned" future, the acceptance of a "carbon budget" – are greatly increasing the exposure of companies to climate-related risk. The companies that will be immediately and, arguably the greatest, affected in financial terms are generally high-emitting and/or produce fossil fuels, but they are by no means the only source of climate-related risk in a portfolio. Depending on the portfolio construction, they might not even by the largest source of climate-related risk. However, the concepts in this report are the foundations in understanding climate-related financial risk and opportunity to any sector.

Companies at Immediate Risk

The question then becomes, how does one determine what investments would be most at risk due to climate change? Both physical and transition climate risks will impact a broad range of economic sectors both directly and indirectly. Most direct and immediate impacts are keenly felt by those companies in the energy sector whose business model centres around fossil fuels. To this end, a starting place is to identify publicly traded coal, oil and gas companies with the largest reserves of fossil fuels – these companies are highly exposed to legislation, technology, market and reputation transition risks. One example is the Carbon Underground 200. This list, compiled by the research and investment product organization, Fossil Free Indexes, tracks the largest companies with proven reserves on a quarterly basis, allowing investors to choose mutual funds that avoid companies listed in the 200.[3] Another example is the list of 161 companies that are targets for engagement by the initiative Climate Action 100+.[4] These companies represent the largest GHG emitters.

[3] http://fossilfreeindexes.com/divestinvest/
[4] http://www.climateaction100.org/

These types of companies are exposed to transition-related financial risk of stranded assets. This is a scenario whereby fossil fuel companies will be unable to monetize their reserves due to policy or market shifts as the world seeks to decarbonize:

> *Stranded assets are now generally accepted to be fossil fuel supply and generation resources which, at some time prior to the end of their economic life (as assumed at the investment decision point), are no longer able to earn an economic return (i.e. meet the company's internal rate of return), as a result of changes associated with the transition to a low-carbon economy.* [5]

How to Read this Report

Section 2 will discuss the climate science that led to the Paris Climate Agreement. This demonstrates how the physical impacts have driven the policy direction and the implications of the global agreement for a structural change in the global energy sector that impacts the entire market.

Section 3 will define the concepts of a "carbon budget" and "carbon bubble" that lead to stranded assets. This demonstrates how science and policy can be translated to a metric useful for business.

Section 4 will examine both direct drivers of the transition to a low-carbon economy and drivers that influence the financial attractiveness of companies. These drivers include policy, technology, financial initiatives and more. Taken together, they show a definite direction and momentum that directly affects high-emitting and fossil fuel based companies.

Section 5 applies the above understanding to current actions of fossil fuel companies to understand if they are recognizing and managing transition risks.

Climate change is a systemic issue that cannot be avoided through diversification. Therefore, while this paper focuses on directly and immediately impacted fossil fuel-focused companies, investors cannot ignore the fact that the fundamental issues (physical and transition) remain no matter the industry. As a result, reaching the Paris Agreement targets will requires significant changes in how the global economy currently operates and creates value. The forecasts and shifts outlined in this paper, while focused on reducing emissions from fossil fuel combustion, are applicable to a wide variety of industries, which we will identify throughout this report for further research.

[5] Carbon Tracker. "Stranded Assets." 23 Aug 2017.

Section 2: Climate-related Physical and Transitional Issues

Risks from climate change are generally separated into two categories: physical risk and transition risk. Physical risks comprise acute weather events (extreme heat waves, hurricanes) and long-term weather changes (seasonal temperature changes, sea level rise). Transition risks refer to those risks posed by society adapting to and mitigating the impacts of climate change. These include policy changes (i.e. new taxes or laws), increased legal liabilities, market changes, technology breakthroughs and reputational risk.

While this paper will outline how physical risks are driving climate action, it will focus on transition risks as the main element of financial risk to high-emitting and fossil fuel producing companies.

Physical Impacts – Why the World Has Agreed to Work Towards 1.5 Degrees

The outcomes of a 4+ degree global temperature rise are severe, society-changing physical impacts. The estimated disruption in livelihoods, destruction of property, human migration, agricultural output and loss of life have prompted world leaders to agree to transition to a low-carbon economy.

According to the International Panel on Climate Change[6] (IPCC), the physical impacts of unchecked climate change are dire. IPCC analysis of climate impacts has utilized a scenario known as Representative Concentration Pathway 8.5 (RCP 8.5), which is the pathway if emissions growth remains unchecked. RCP 8.5 corresponds to a global temperature increase of 4.1 degrees by 2100.[7]

As an example of physical impacts under RCP 8.5, research by the McKinsey Global Institute estimates that in a once-in-fifty-year rainfall event will be four times more likely in China and the east coast of the North America. Severe hurricanes are expected to double in the southeastern United States and triple in some parts of Southeast Asia by 2040. The Mediterranean region and Central and South America could spend up to 80% of a decade in drought conditions by 2050. By 2050, India and Pakistan are projected to be the first places on Earth to experience heat waves that exceed a level survivable by a healthy human. Mexico, the southern US and the Mediterranean are expected to see a 70% decrease in surface water by 2050, leading to increased competition for control of water resources.[8] Without efforts to

[6] The International body that provides objective, scientific information on the impacts of climate change relevant to decision-making.
[7] Climate Nexus. "RCP 8.5: Business-as-usual or worst-case-scenario?" https://climatenexus.org/climate-change-news/rcp-8-5-business-as-usual-or-a-worst-case-scenario/
[8] McKinsey Global Institute. "Climate Risk and Response Executive Summary." 2020

reduce emissions, Sub-Saharan Africa, South Asia, and Latin America could see upwards of 140 million internal "climate refugees" by 2050.[9]

Box 1 Physical Risks Will Have Far Reaching Impacts to Many Sectors

Broad Impacts from Physical Risks

The atmosphere already has a certain amount of physical risks "locked in" until about 2050, due to carbon already emitted. These locked-in risks will include a continuation and worsening of changes such as extreme weather, seasonal temperature changes, and precipitation changes, to name a few. These will disrupt businesses ranging from global retail supply chains to agricultural products. Additionally, these risks will negatively impact operating conditions for any exposed infrastructure, such as utilities, roads, airports, etc.

The changes resulting from locked-in risks will have significant effects on the economy, society and life in general. Heat stress affects the ability of humans to work outdoors and can reduce labour capacity. Increasing temperatures could shift disease vectors. Food production could be disrupted as drought conditions, extreme temperature or flooding affect land and crops. In terms of physical assets, buildings could be damaged or destroyed by extreme precipitation, flooding, forest fires and other hazards. These hazards can affect an entire network of assets such as a central business district, reducing its economic output. Climate change will damage natural capital such as glaciers, forests, and ocean ecosystems, which provide services and economic activity for multiple different communities.[10] Further, if meaningful action is not taken by 2030, scientists believe that these impacts will be irreversible.[11]

The projected economic impacts associated with these outcomes are substantial. Economic losses from both weather events influenced by climate change and health damages due to air pollution caused by fossil fuel energy production currently amount to $240 billion per year in the United States.[12] In a business as usual scenario, rising heat and humidity could lead to a decrease of up to 20% of human working hours, putting $4 trillion to $6 trillion a year at risk by 2050.13 By 2090, current emissions trajectories could potentially cost the United States $500 billion annually in crop damage, lost labour, and extreme weather damages.[14]

Even more concerning is the conclusion of a growing body of research showing that current estimates of financial losses due to climate change are vastly underestimating the scale of impacts. Economic models that go beyond a 2-degree increase are at risk of underestimating

[9] World Bank Group. "Groundswell: Preparing for Internal Climate Migration." March 2018. Page xix
[10] McKinsey Global Institute. "Climate Risk and Response, Executive Summary." 2020
[11] UN. "Only 11 Years Left to Prevent Irreversible Damage from Climate Change, Speakers Warn during General Assembly High-Level Meeting." March 2019.
[12] https://feu-us.org/case-for-climate-action-us/
[13] McKinsey Global Institute. "Climate Risk and Response, Executive Summary." 2020, page 23.
[14] Vox. "3 big takeaways from the major new US climate report," Umair Irfran, Nov 12 2018.

climate impacts. This is due to the uncertainty of temperature tipping points that lock in irreversible changes, such as accelerated ice sheet collapse or melting permafrost.[15] A leaked client report from JP Morgan outlined how the climate crisis will impact the world economy, human health, water stress, migration and the survival of other species on Earth, stating "we cannot rule out catastrophic outcomes where human life as we know it is threatened".[16] Nouriel Roubini, an NYU economist famous for predicting the 2008 financial crisis, declared in early 2020 that "climate change is not just a lumbering giant that will cause economic and financial havoc decades from now. It is a threat in the here and now, as demonstrated by the growing frequency and severity of extreme weather events".[17]

Despite international negotiations using 2 degrees as a "safe" benchmark against a 4.1-degree world, the IPCC determined that if we hold global temperature rise at 1.5 degrees, many of these physical impacts could be greatly reduced.[18] The benefits of this would include:

- reducing the number of people both exposed to climate-related risks and susceptible to poverty by up to several hundred million by 2050[19]
- reducing species loss in vertebrates (by 50%), plants (by 50%) and insects (by 67%)[20]
- reducing the proportion of the world population exposed to a climate change-induced increase in water stress by up to 50%[21]
- reducing the average length of drought globally by 50% and reducing annual flood damage losses by $1 trillion.[22]

Countries party to the Paris Agreement[23] agreed to strive to limited temperature rise to below 2 degree, acknowledging that anything above this could result in impacts that are unacceptable and potentially unlivable for large parts of the population. The growing understanding about the irreversibility of climate effects means that significant effort is needed to reduce global carbon emissions before 2030.[24]

[15] Yale Climate Connections. "New report finds costs of climate change impacts often underestimated." Dana Nuccitelli. November 2019.
[16] The Guardian. "JP Morgan economists warn climate crisis is threat to human race." 20 Feb 2020.
[17] The Guardian. "The white swan harbingers of global economic crisis are already here." Nouriel Roubini. 19 Feb 2020.
[18] IPCC. "Special Report: global Warming of 1.5°C." 2018.
[19] IPCC, 2018: Summary for Policymakers. In: Global Warming of 1.5°C.
[20] World Resources Institute. "Half a Degree and a World Apart: The Difference in Climate Impacts Between 1.5˚C and 2˚C of Warming." 2018.
[21] IPCC, 2018: Summary for Policymakers. In: Global Warming of 1.5°C.
[22] Carbon Brief. "The impacts of climate change at 1.5 degree, 2 degree and beyond." https://interactive.carbonbrief.org/impacts-climate-change-one-point-five-degrees-two-degrees/?utm_source=web&utm_campaign=Redirect#
[23] 195 parties to the United Nations Convention on Climate Change signed the Paris Agreement and as of March 2020, 187 parties have ratified, thus passing the threshold for the agreement to come into force.
[24] IPCC, 2018: Summary for Policymakers. In: Global Warming of 1.5°C.

Transition Impacts – What Has to Happen to Achieve the Paris Agreement

Significant and rapid change to society's combustion of coal, oil and natural gas is needed to achieve the 1.5 degree target. Current government action is not consistent with the amount of change needed, and new policies that would severely impact carbon-intensive companies are a likely outcome between now and 2030.

Significant reductions of greenhouse gas (GHG) emissions are required to achieve a 1.5 degree world. The energy sector produces the most GHG emissions of any global sector,[25] and therefore large-scale efforts to reduce emissions over the next decade will need to focus on thermal coal, oil and gas slated for combustion.

The IPCC states that to stay below 1.5 degrees, global emissions from fossil fuel and industrial processes need to be slashed by 45% from 2010 levels by 2030. Given that emissions have increased 10% since 2010, this is comparable to a 60% reduction from current levels.[26] In a 1.5 degree scenario, renewable energy is projected to supply 70-85% of electricity by 2050; gas is projected to be just 8% and coal would be close to zero. For transportation, low-emission energy would rise from 5% currently to as high as 65% by 2050. All of these shifts required for a 1.5 degree world will significantly overhaul the global demand for fossil fuels in their current form. While national governments have made various commitments to achieve Paris targets, they fall short for what is needed—government climate action needs to effectively double from where it is now.[27] This could mean rapid change for coal and oil and gas companies.

There is growing research into climate change not just being an economic risk, but a devastating force that could lead to financial disaster or system collapse. The Bank of International Settlements has named climate change a "green swan" – an unpredictable and non-linear series of events that could create enormous damage to the global economic system.[28] Climate change is a new form of financial instability that cannot be anticipated from traditional backwards-looking risk assessments. Whether it is physical or transition risks associated with climate change, the green swan of climate change could lead to an immediate and system-wide transition that could affect "every single agent in the economy and every single asset price", and it represents "a colossal and potentially irreversible risk of staggering complexity".[29]

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[25] This includes transportation, electricity and heat, buildings, manufacturing and construction, fugitive emissions and other fuel combustion. World Resources Institute. "4 Charts Explain Greenhouse Gas Emissions by Countries and Sectors." February 2020.
[26] IPCC Special Report: Global Warming of 1.5 Degrees. October 2018.
[27] International Energy Agency. "World Energy Outlook 2019". November 2019.
[28] Bank of International Settlements. "The Green Swan: Central banking and financial stability in the age of climate change." Jan 2020.
[29] Bank of International Settlements. "The Green Swan: Central banking and financial stability in the age of climate change." Jan 2020. Pages viii, 6.

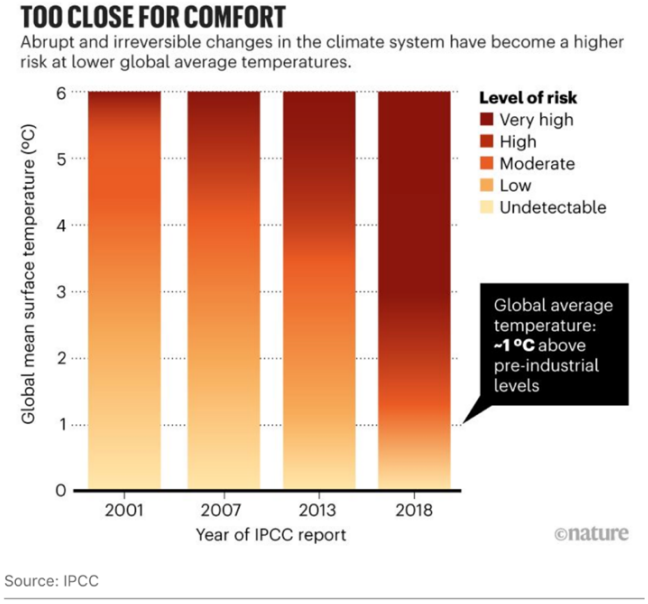
This paper touches on several methods for mitigating the widespread impacts climate-related risks such as: disclosures providing decision-useful information to the finance sector, policies incentivizing clean technologies and discouraging fossil fuel combustion, market and technology developments and carbon budgeting.

Tipping Points Lead to Urgent Action

In addition to the scale of change needed, certain physical changes are signaling irreversible tipping points. This indicates that the potential speed of implementing the transition towards a low-carbon economy may be faster and/or more disorderly than previously thought or would be ideal for markets..

Although the Paris Agreement identified 2 degree or lower as an ideal target, more than one-fifth of the world population lives in regions that have already reached 1.5 degree average surface level warming.[30] This may be a signal that we are approaching a climate "tipping point", which represents the altering of the climate equilibrium: "when the climate system is forced to cross some threshold, triggering a transition to a new state at a rate determined by the climate system itself".[31] The IPCC has suggested these events may occur within warming rates of 1 and 2 degrees, suggesting that, in some cases, we may have already passed a point of no return with some of the world's natural carbon sinks and climate equilibrators, as shown in Figure 1 below.

Figure 1: Likelihood of Tipping Points[32]



[30] https://climate.nasa.gov/news/2865/a-degree-of-concern-why-global-temperatures-matter/
[31] https://www.pnas.org/content/pnas/105/6/1786.full.pdf
[32] https://www.nature.com/articles/d41586-019-03595-0

Tipping points are irreversible, and scientists have focused on nine tipping points they currently consider to be "active" (meaning they are already occurring to some degree). [33]

Four of the nine tipping points involve ice thawing, which is unstoppable:[34]

- Arctic sea ice reductions
- Greenland ice sheet melting
- J. Wilkes Basin in East Antarctica melting
- West Antarctic ice sheet melting

Once ice thawing begins, the surface of the ice sheet is lowered, increasing its exposure to warmer air at lower altitudes. [35]

Impacts on the Earth's biosphere, which helps to regulate the chemical composition of the atmosphere and the water cycle, are represented through another four active tipping points:

- Amazon rainforests dieback caused by droughts and deforestation
- Boreal forest dieback from fires and pests
- Permafrost thawing
- Coral reefs dying

These four tipping points impact "carbon sinks", which help to regulate our atmospheric composition through storing or absorbing CO_2. Surpassing the tipping points noted above could result in carbon being released back into the atmosphere. For example, the release of carbon and methane emissions previously trapped in the Arctic's permafrost could contribute approximately 20% of our current GHG emissions allowance. Staying within GHG emissions allowance goals is necessary for reaching the Paris-aligned 1.5 degree warming goal. [36] Such an addition of GHG emissions reduces the amount of emissions allowed under a given emission scenario, also known as a carbon budget (discussed in Section 3). In turn, this will make mitigation goals harder to reach.

According to recent research on the timescales of large ecosystem collapses, ecosystems such as the Amazon rainforest and Caribbean coral reefs may take only a few decades to collapse once triggered. [37] Specifically, the study found the Amazon rainforest, with its declining rates of carbon sequestration attributed to deforestation and soil degradation resulting from decreased moisture and vegetation coverage, may endure a system-wide tipping point as soon as 2021, with full collapse taking 49 years. [38]

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[33] https://www.nature.com/articles/d41586-019-03595-0

[34] https://e360.yale.edu/features/as-climate-changes-worsens-a-cascade-of-tipping-points-looms

[35] https://e360.yale.edu/features/as-climate-changes-worsens-a-cascade-of-tipping-points-looms

[36] Nature Communications. "Regime shifts occur disproportionately faster in larger ecosystems". 2020 https://www.nature.com/articles/d41586-019-03595-0

[37] Nature Communications. "Regime shifts occur disproportionately faster in larger ecosystems". 2020 https://www.nature.com/articles/d41586-019-03595-0

[38] Nature Communications. "Regime shifts occur disproportionately faster in larger ecosystems". 2020 https://www.nature.com/articles/d41586-019-03595-0

The paper goes on to say that these implications mean, "humanity now needs to prepare for changes in ecosystems that are faster than we previously envisaged…including across Earth's largest and most iconic ecosystems, and the social-ecological systems that they support." [39]

The combined result of these tipping points would be to increase the urgency, magnitude and speed of mitigation tools – perhaps leading to a disorderly transition - and increase the risk exposure of companies that are transition sensitive.

[39] Nature Communications. "Regime shifts occur disproportionately faster in larger ecosystems". 2020 https://www.nature.com/articles/d41586-019-03595-0

Section 3: Translation of Climate Science into Industry-useful Metrics

Science clearly indicates the trajectory the world is on with regards to physical changes in climate. Socioeconomic studies outline needed changes in society and the economy to mitigate climate change. These kinds of studies, however, are difficult to translate to sector or individual corporate entities. Therefore, the concept of a carbon budget is the widely-used tool to understand the implications for carbon intensive companies.

A Carbon Budget – The Universal Metric for Climate Mitigation

Climate change models' scientific outputs are not easily translated to economic decision-making, and this makes model conclusions difficult to apply to corporations. By translating these outputs into sectoral GHG emissions, the relationship between the economic activities and climate change mitigation becomes clear. GHG emission limits derived from warming scenarios can be translated into a yardstick to measure the necessary reductions from the energy sector.

The IPCC's 2014 Fifth Assessment Report (AR5) established a linear relationship between global warming temperature outcomes and CO_2 emissions.[40] As a result, we can estimate by mid-century the allowable cumulative GHG emissions associated with different global warming outcomes such as 1.5 degree, 2 degree and higher. These cumulative allowances are referred to as carbon budgets. The IPCC's Special Report on Global Warming of 1.5 degree (SR15)[41] calculated the remaining global carbon budget from 2018 to 2050 at 580 gigatonnes of CO_2 ($GtCO_2$), which would achieve a 50% chance of a 1.5 degree warming outcome. This represents less than 15 years at our current global CO_2 emission rates.[42]

Box 2 Planetary versus Sector Budgets

Carbon Budgets as a Useful Metric

While the focus of this paper is on carbon budgets for fossil fuel companies, there is a larger carbon budget for the planet. This planetary carbon budget incorporates emissions from other sectors and sources. While some sectors such as transportation will be under more pressure than others, all industries have a role to play.

[40] CO_2 is the primary source of GHG emissions representing around three quarters. See also https://www.carbonbrief.org/guest-post-a-new-approach-for-understanding-the-remaining-carbon-budget
[41] IPCC. "Special Report on Global Warming of 1.5C". 2018.
[42] https://www.carbonbrief.org/guest-post-a-new-approach-for-understanding-the-remaining-carbon-budget

The energy industry is the largest contributor to global GHG emissions, responsible for almost 50%, making it a major focus in global decarbonization efforts.[43] The IEA sets out demand scenarios that can be used to determine carbon budgets specific to the global energy industry. Published in its annual World Energy Outlook (WEO), two scenarios are relevant here:[44]

- **Stated Policies Scenario (STEPS):** reflects the impact of existing and stated climate policy plans with a 50% probability of a 3-degree warming outcome by 2050[45]
- **Sustainable Development Scenario (SDS):** reflects ambitious policy plans to meet the Paris Agreement with a 50% probability of 1.65 degree warming outcome by 2050

It is important to note that carbon budget calculations can be sensitive to a variety of variables:[46]

- The likelihood of the outcome – scenarios use different probability inputs that are impacted by the likelihood of any given outcome
- Scope of the carbon budget – global, national, subnational, industry and company
- Climate sensitivity – changes in understanding regarding the warming effect of atmospheric CO2 concentrations
- Inclusion of non-GHG emissions – methane and other gases also contribute to global warming. New research has found that methane emissions from fossil fuels have been severely underestimated in recent studies and scenarios[47]
- Time frames – determining whether "pre-industrial" is 1720-1800 or 1850-1900
- Reliance on technology – if negative emissions from carbon capture and storage (CCS) are relied upon
- Earth systems models (ESM) – non-anthropogenic emissions, such as from melting permafrost

In their report, "Unburnable Carbon: Wasted capital and Stranded Assets (2013)",[48] Carbon Tracker Initiative (CTI) found that regardless of the carbon budget used, significant reductions in energy-related emissions are essential to meeting the global climate goals.

[43] IPCC. "Fifth Assessment Report". 2014.
[44] https://www.iea.org/commentaries/understanding-the-world-energy-outlook-scenarios & https://www.iea.org/reports/world-energy-model/sustainable-development-scenario
[45] With the WEO 2019, the IEA has renamed their New Policies Scenario (NPS) to STEPS.
[46] https://www.carbonbrief.org/analysis-why-the-ipcc-1-5c-report-expanded-the-carbon-budget & Carbon Tracker Initiative. "Carbon Budgets Explained". 2018.
[47] https://www.carbonbrief.org/methane-emissions-from-fossil-fuels-severely-underestimated
[48] Carbon Tracker Initiative. "Unburnable Carbon: wasted capital and stranded assets". 2013.

A Carbon Budget Leads to a Carbon Bubble

There is a large discrepancy in the GHG emissions associated with any of the 2 degree or below climate scenario for the oil and gas industry as compared to the amount of fossil fuels yet to be burned – this is a carbon bubble. This discrepancy points to the possibility of a market correction in the viability and value of coal, oil and gas companies.

A "carbon bubble" is the basis for the theory of stranded assets. Stranded assets are assets that lose value or become liabilities before the end of their expected economic lives.[49] As fossil fuel companies face increasing risks from climate policy, volatile oil prices and renewable technology, the potential for stranded assets is growing.[50] One estimate by Citi Bank found that, at 2015 prices, "the value of unburnable reserves could amount to over USD 100 trillion out to 2050".[51]

A carbon budget becomes a "carbon bubble" when the potential expended GHG emissions are greater than the budget allowance, but this is not recognized financially in asset values, representing potential value decline and an inability to meet future liabilities. CTI compared fossil fuel reserves to the carbon budget for the energy industry under a 2-degree scenario. Based on the IEA's 2-degree Sustainable Development Scenario (SDS) and reserves data for listed fossil fuel companies, CTI calculated[52] the fossil fuel industry globally to have a carbon budget of 125 – 275 $GtCO_2$ if it were to be aligned with a 2-degree world by 2050. However, total GHG emissions from only proven reserves on listed company balance sheets were estimated to be 752 $GtCO_2$ – roughly *500 $GtCO_2$* over the budget. This deficit highlights that 60-80% of proven coal, oil and gas reserves are "unburnable" and present the risk of a carbon bubble to the shareholders of these companies.

In another study focused on the reserves of the top 200 globally listed fossil fuel companies (known as the "Carbon Underground 200" or "CU2000), Fossil Free Indexes' 2017 research found similar results. Using the IPCC's 2015 "energy sector only" carbon budget of 598 $GtCO_2$ (using a 2-degree target at 80% probability), which includes the IEA's reported industry emissions through to 2016, Fossil Free Index calculated the carbon budget for CU200 companies to be 80.8 Gt CO2 between 2017 to 2050. The reserves represent embedded emissions of 491.9 $GtCO_2$ indicating a bubble of over 400 $GtCO_2$.[53] In Figure 2, the potential total emissions from CU200 reserves is shown on the left, while the carbon budget is shown on the right.

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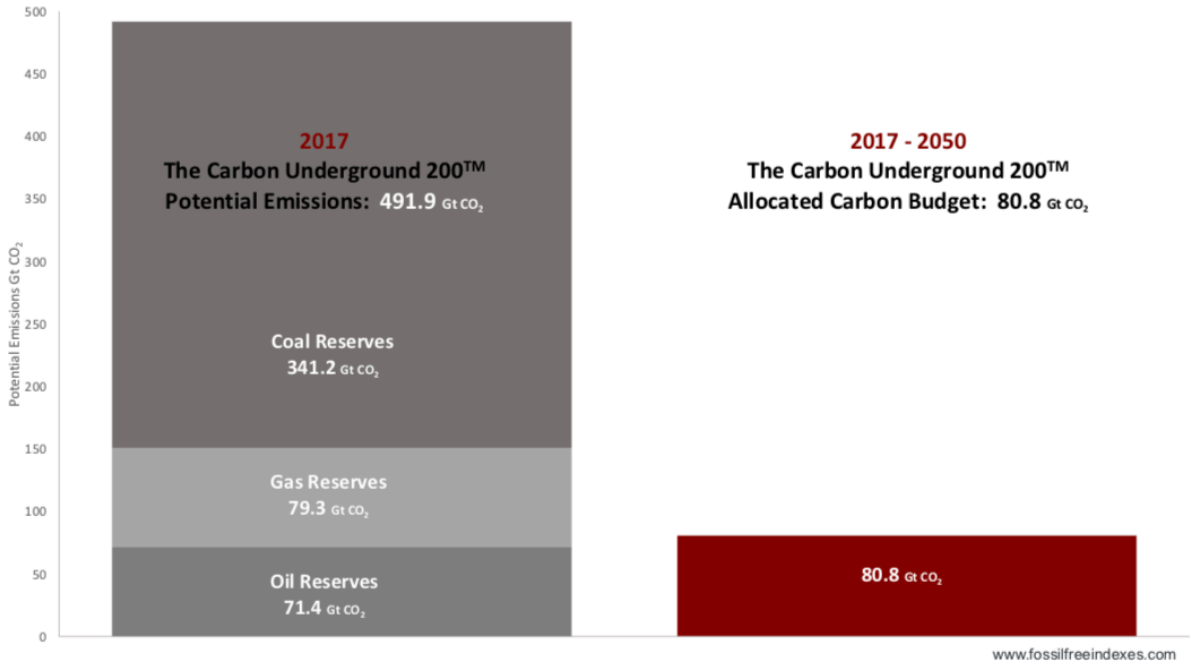
[49] HSBC Global Research. "Stranded Assets: what's next." 2015. https://www.research.hsbc.com/midas/Res/RDV?p=pdf&key=myvAGZ6YRG&n=456399.PDF
[50] HSBC Global Research. "Stranded Assets: what's next." 2015. https://www.research.hsbc.com/midas/Res/RDV?p=pdf&key=myvAGZ6YRG&n=456399.PDF
[51] Citi. "Energy Darwinism II." 2015. https://ir.citi.com/E8%2B83ZXr1vd%2Fqyim0DizLrUxw2FvuAQ2jOlmkGzr4ffw4YJCK8s0q2W58AkV%2FypGoKD74zHfji8%3D
[52] Calculated using total fossil fuel reserves (proven and potential) data from the IEA's World Energy Outlook 2012 which represented potential emissions equivalent to 2860GtCO2, with 1541GtCO2 coming from companies listed on global stock exchanges.
[53] Fossil Free Indexes. "The Carbon Underground 2017." 2017.

Figure 2: Carbon Underground 200: Emissions from Fossil Fuel Reserves vs. Allocated Carbon Budget[54]



Most recently in their "Balancing the Budget" report,[55] CTI analyzed the world's seven largest listed oil and gas companies. CTI found that combined cuts to production by 35% and to emissions by 40% by 2040 are required to keep these companies within the carbon budgets set out in the IEA's SDS scenario (equivalent to 2 degrees).

As politics and economics continue to cause volatility in fossil fuel markets, stranded assets remain a risk to investors. However, carbon bubbles are not restricted to the energy sector; they represent a systemic risk that could affect valuations across many transition-exposed industries. Investors should be prepared for an abrupt transition to a low-carbon economy through a variety of political and market drivers which could see these risks quickly manifest across investment portfolios.

Ultimately, regardless of how a carbon budget is applied, the viability of fossil fuel reserves, and therefore the value of the companies which hold them, are in question if the goals of the Paris Agreement are to be met.

[54] Fossil Free Indexes. "The Carbon Underground 2017." 2017.
[55] Carbon Tracker Initiative. "Balancing the Budget". 2019.

Section 4: Implementation Drivers to a Transition

In this section, we will review the drivers of the transition to a low-carbon economy. We have split them into two groups: those that directly affect the operations of companies who are high GHG emitters or who produce the fossil fuels for combustion (Direct" drivers), and those that work to move financial decisions away from fossil fuel-based value (Influence" drivers).

Direct drivers include:

1. Policy action to reduce the use of fossil fuels
2. Technology developments that replace the use of fossil fuels
3. Financing initiatives making credit more expensive for fossil fuel based companies.

Influence drivers include:

1. Green taxonomies that support environmentally friendly economic activities
2. Climate risk disclosures that shed light on company exposure to climate-related risks and opportunities
3. Financial stability stress testing that quantifies risk from climate-related issues
4. Benchmarks and indexes

Direct Drivers

The following are a mix of government and market developments that are targeted to reduce production and use of fossil fuels, the main source of climate change. This is accomplished by direct "command and control" policies, greater cost to companies and alternative, competitive technologies.

Policies to Support Climate Change Mitigation

Policies targeted at fossil fuel combustion can be powerful tools for climate mitigation and a strong signal of the transition to a low-carbon economy. There are a plethora of tools worldwide on this topic. However, given the urgency of what science tells us and the agreed upon actions from the Paris Agreement, there is a sense that further, more stringent and focused policies will be inevitable.

There are increasing signals that the transition to a low-carbon economy is underway, and the risks for stranded assets are heightening. The Principles of Responsible Investment (PRI) has put forward the "Inevitable Policy Response (IPR) framework, which identifies the likely policy markers for transitioning away from business as usual towards Paris Agreement targets. Key questions for investors are not if governments will act, but when they will act, what policies they will use and where the impact will be felt. The PRI forecasts that a global response should be anticipated by 2025 at the latest, and will be "forceful, abrupt, and disorderly because of the delay."[56] There are several markers that the IPR tracks, including

[56] Principles for Responsible Investment. "What is the Inevitable Policy Response?" https://www.unpri.org/inevitable-policy-response/what-is-the-inevitable-policy-response/4787.article

coal phase-outs, bans on the sale of internal combustion engines, carbon pricing, and carbon capture and sequestration.

For example, under the IPR forecast, coal demand for electricity, currently at 35% globally, drops to 17% by 2030 and closes to zero by 2040.[57] In 2018, permits in China and India for new coal plants dropped to record lows, and the US led a record pace in the retirement of existing coal plants.[58] As of 2019, there were 31 countries with coal phase-out plans. Within the G20, Canada, France, Italy and the United Kingdom have Paris-aligned plans for phasing out coal before or by 2030.[59] Other significant announcements on coal phase-outs include a commitment by Germany in January 2020 to end coal-fired power by 2038, as part of a $45bn compensation to utilities and workers.[60]

As well, the IPR forecasts wider adoption and increases to carbon pricing globally, which will place renewable energy in a more cost-competitive position compared to fossil fuels. As of the end of 2018, the IPR found 57 jurisdictions had carbon pricing initiatives underway or set to be implemented, covering 20% of global emissions.[61] The IPR projects a carbon price of US$40-60/tCO2e prices by 2030, with a global price of ≥US$100/tCO2e by 2050, driven in part by global border carbon adjustments.[62] The expansion of carbon pricing, both in terms of scope and value, will make alternatives to fossil fuels more financially attractive while increasing costs on coal and oil and gas companies.

Accelerated Technology Change Proving Fossil Fuel Alternatives

At the same time as governments and markets take action, there continues to be advancements in clean, alternative technologies. These technologies are increasing market penetration. Renewable energy for electricity is now competitive with fossil fuels, and electric vehicle adoption shows increasing momentum. Under low-carbon scenarios, renewable energy severely undermines coal and oil demand, while electric vehicles also contribute to declining oil demand.

One of the trends that increases the risk of stranded assets are technical and economic developments related to alternative energy fuel sources (clean technologies). This section will discuss two of these major developments: renewable energy for electricity and electric vehicles.

[57] Principles for Responsible Investment. "The Inevitable Policy response: Preparing financial markets for climate-related policy/regulatory risks." Page 15.
[58] Global Energy Monitor. "Boom and Bust 2019: Tracking the Global Coal Plant Pipeline." Page 3.
[59] Climate Transparency. "Managing the Phase-Out of Coal: A Comparison of Actions in G20 Countries." May 2019. Page 3.
[60] BBC. "Germany agrees plan to phase out coal power by 2038." 16 Jan 2020.
[61] Principles for Responsible Investment. "The Inevitable Policy Response: Policy Forecasts." Dec 2019. Page 14.
[62] Principles for Responsible Investment. "The Inevitable Policy Response: Policy Forecasts." Dec 2019. Page 17.

Energy Technologies

Wind and solar are the two renewable energy sources with the most information, history and attention in the power generation sector and broader financial markets.[63] However, they have also been historically more expensive that conventional coal, oil and natural gas power generation. Nevertheless, renewable energy is essential to the transformation to a low-carbon energy system and has been one of the main targets of climate-related policies.

Renewable energy now comprises 62% of new, annual power generation capacity, with over 200 large global companies committing to going 100% renewable.[64] Renewables also contribute 26% of the global power supply.[65] Additionally, renewables are a large focus for national policies with 67% of current climate-related policies in over 50 countries or regions now including renewable targets.

A key milestone in this global energy transition is that the cost of renewables is now competitive with, or, in some cases, cheaper than fossil fuels. The International Renewable Energy Agency (IRENA)[66] predicted in 2018 that the cost for renewable energy would be on par with fossil fuel sources by 2020. IRENA's latest analysis of renewable costs has confirmed this prediction.[67] Globally, the average of new renewable power plants is usually below $0.10/kWh.[68] At this level, renewable power plants are competitive with the cost of new fossil fuel-based power plants, which typically range from $0.05/kWh to over $0.15/ kWh.[69] Figure 3 presents related data from 2018.

Looking to the future, the IEA's 2019 WEO[70] shows that renewable energy takes a larger share of the global energy system, which is also shifting from oil to electricity, mainly due to electric vehicles. It examines three possible futures for the global energy system based on policy indications today, as shown in Table 1.

The IEA has clarified that these scenarios are not probabilistic forecasts, but rather are constructed to reveal consequences of different choices. It is interesting to note, however, that in the 2019 WEO, the IEA deprioritized the CPS compared to earlier versions.[71]

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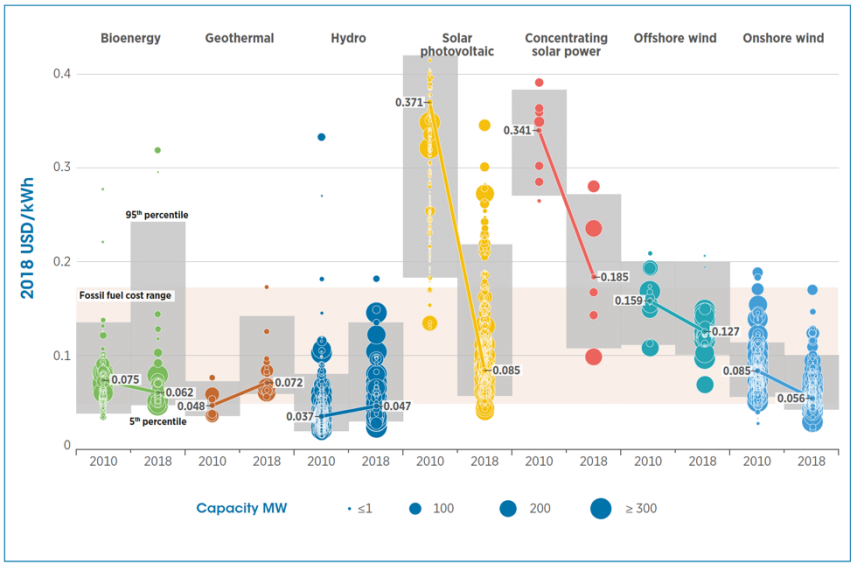
[63] In the last decade, solar and wind represent over 90% of the $2.6 trillion USD invested in renewables https://www.bloomberg.com/news/articles/2019-09-05/clean-energy-investment-is-set-to-hit-2-6-trillion-this-decade
[64] "10 Years Progress to Action." IRENA. January 2020.
[65] "10 Years Progress to Action." IRENA. January 2020.
[66] An intergovernmental body with over 160 members.
[67] "Renewable Power Generations Costs in 2018." IRENA. May 2019.
[68] Based on onshore wind, solar PV, biomass or geothermal energy. Offshore wind is slightly higher at $0.13/kWh.
[69] "Renewable Energy Costs Take Another Tumble, Making Fossil Fuels Look More Expensive Than Ever." Forbes. May 29, 2019.
[70] "World Energy Outlook 2019." IEA. November 2019.
[71] "'Profound shifts' underway in energy system, says IEA World Energy Outlook." Carbon Brief. November 13, 2019

Figure 3: Global LCOE of utility-scale renewable power generation technologies[72]



Note: This data is for the year of commissioning. The diameter of the circle represents the size of the project, with its centre the value for the cost of each project on the Y axis. The thick lines are the global weighted-average LCOE value for plants commissioned in each year. Real weighted average cost of capital (WACC) is 7.5% for OECD countries and China and 10% for the rest of the world. The single band represents the fossil fuel-fired power generation cost range, while the bands for each technology and year represent the 5th and 95th percentile bands for renewable projects.

Table 1: What the IEA scenarios mean[73]

IEA Scenario	Global Average Temperature Rise
CPS (Current Policies Scenario)	In the absence of policies, global warming is expected to reach between 4.1 and 4.8 degrees
STEPS (formerly NPS or New Policies Scenario)	Includes the Nationally Determined Contributions under the Paris Agreement, which likely results in below 3 degrees. Also includes other pledges but does not achieve the same reductions as seen in the SDS.
SDS	Below 1.8 degrees with a 66% probability

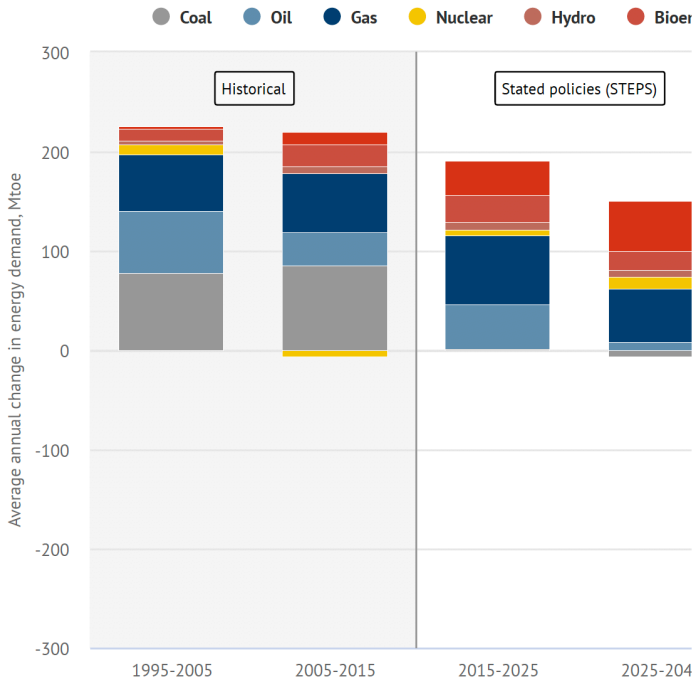
Some notable conclusions in the STEPS scenario include:

- Wind and solar PV provide more than half of the additional electricity generation to 2040 and overtake coal in power generation mix in the mid-2020s
- Oil demand slows post-2025 and flattens in the 2030s. Some of this is due to fuel efficiency improvements and electric vehicles, although a rising preference for SUVs could offset some of this
- Electricity consumption as a share of energy demand grows to 2040 mainly due to electric vehicles, and overtakes oil's share in final consumption by 2040

[72] "Renewable Power Generation Costs in 2018." IRENA. 2019.
[73] IEA https://www.iea.org/reports/world-energy-model#scenarios-in-weo-2019 and Climate Action Tracker https://climateactiontracker.org/global/temperatures/

- While gas usage is still expected to rise, coal use will plateau and then decline. Note that WEO 2018 already posited that coal demand may have peaked. Oil will slow in the late 2020s and flatten out in the 2030s

Figure 4: Share of Fuel in Energy System Today and in STEPS[74]



In the SDS scenario:

- Wind and solar PV provide almost all the growth in electricity generation to 2040
- Energy efficiency measures are deployed across sectors including buildings, industries and transport
- Offshore wind success based on Europe's learnings in the North Sea contributes to a full decarbonization of Europe's power sector and could attract a trillion dollars of investment to 2040
- Existing coal systems will need to be modified to reduce their emissions. Modification options include carbon capture use and storage, or biomass co-firing

WEO 2019 identified a number of conditions to watch that might further reduce the use of fossil fuels:

- Africa becomes increasingly influential for global energy trends. While this could drive a rise in oil consumption and expansion in natural gas, it is also the continent with the richest solar resources in the world. Solar PV would provide the cheapest source of

[74] "World Energy Outlook 2019." IEA. 2019.

electricity for 600 million people across Africa, especially in areas without traditional electricity access

- Current energy efficiency activities seem to have slowed since 2010 due to a lack of new policies. However, with the right policies, energy efficiency improvements could reduce global energy intensity by more than 3% per year
- Natural gas pipelines continue to provide flexibility in the energy system but may be looking to blend with low-carbon hydrogen and biomethane in the future
- A more rapid decline in battery costs is possible and, combined with solar, battery storage would be a compelling proposition in some parts of the world such as India

Box 3 Risks and Opportunities Associated with New Technology

Risks and Opportunities Associated with New Technology

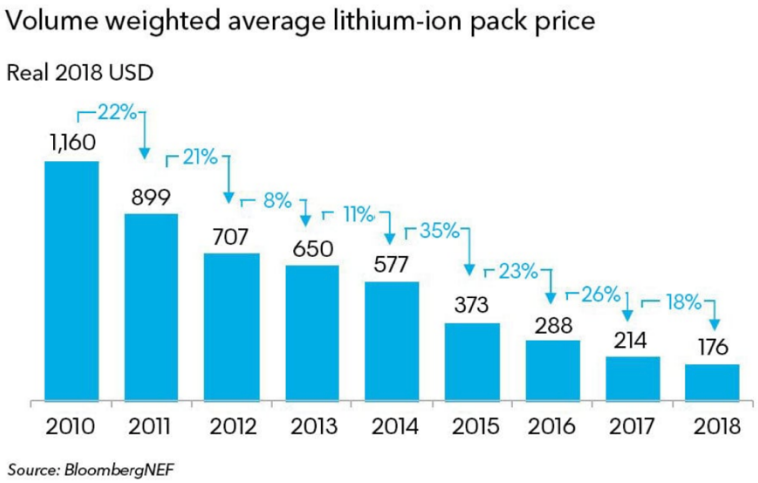
Although the emphasis in this review is on companies with large fossil fuel reserves, the emergence of renewable technology has far reaching implications for other sectors. For example, the spread of distributed energy resources driven by consumer level renewables is challenging utilities in keeping the power grid balanced. However, climate change is not just creating risks, but also opportunities such as growing demand for certain precious metals in the mining sector.

Electric Vehicles

Electric vehicles, once a luxury item, have seen rapid growth over the past 10 years. In 2018, the global electric vehicle stocks passed 5 million units, an increase of 63% from the previous year. The IEA's analysis shows that this growth rate is double what is needed under the SDS scenario and is one of the few trends currently "on track" for a Paris-aligned transition. Other transport electrification such as buses, trucks and shipping continue to make progress as well.

For electric vehicles, batteries are a major cost component. In 2018, the average battery price fell 18% from the year before. IEA believes that economies of scale are on the horizon due to the growing size of the market. BloombergNEF believes the falling battery prices (Figure 5) and tightening of the emissions standards, among other related policies, are supporting increasing vehicle sales.

Figure 5: Volume Weighted Average Lithium-Ion Pack Price[75]



BloombergNEF projects that 57% of all passenger vehicle sales (56 million) will be electric by 2040, translating to over 30% of the global passenger fleet.[76] Further, BloombergNEF has found that sales of internal combustion engines may have already peaked. There are similar projections for light commercial vehicles (56% by 2040 in China, US and Europe). The Electric Vehicle Initiative[77] has similar projections of market penetrations at annual sales of 46 million vehicles by 2030 under the EV30@30 Campaign.[78] A less aggressive outlook under the current Paris Agreement pledges has sales reaching 23 million vehicles by 2030.[79]

The implications of the rise of passenger electric vehicles coupled with fuel economy improvements could mean a displacement of 13.7 million barrels of oil a day by 2040.[80] Bolstering the growth of electric vehicles is the growing number of jurisdictions seeking to limit or outright ban the use of internal combustion engine (ICE) vehicles. These include:

- The UK has a ban on ICE vehicles for 2035, and is consulting on moving it up to 2032[81]
- France has a ban on gasoline or diesel vehicles by 2040[82]

[75] "Electric Vehicle Outlook 2019" BloombergNEF. 2019. https://about.bnef.com/electric-vehicle-outlook/#toc-viewreport
[76] "Electric Vehicle Outlook 2019" BloombergNEF. 2019. https://about.bnef.com/electric-vehicle-outlook/#toc-viewreport
[77] A multi-government policy for him dedicated to accelerating the introduction and adoption of electric vehicles. https://www.iea.org/programmes/electric-vehicles-initiative
[78] 11 countries and 29 organisations support the campaign to reach 30% market share for electric vehicles by 2030. Countries are Canada; China; Finland; France; India; Japan; Mexico; Netherlands; Norway; Sweden and United Kingdom.
[79] "Global EV Outlook 2019." IEA. May 2019.
[80] "Electric Vehicle Outlook 2019" BloombergNEF. 2019. https://about.bnef.com/electric-vehicle-outlook/#toc-viewreport
[81] The Guardian. "UK could ban sale of petrol and diesel cars in 12 years, says Shapps." 12 Feb 2020.
[82] BBC. "France set to ban sale of petrol and diesel vehicles by 2040". 6 July 2017.

- The Netherlands will only sell zero emission vehicles by 2030, with Norway and India set for 2030[83]
- Singapore is phasing out ICE vehicles by 2040[84]
- British Columbia has committed to 100% of vehicles sold be zero emissions by 2040
- Auckland, Berlin, Cape Town, Copenhagen, London, Los Angeles, Milan, Seattle and Vancouver have all committed to creating a significant area of their cities as emission free by 2030.[85]

Financial Organisations Begin to Acknowledge Climate Risk

The financial sector's understanding of climate change has grown by leaps and bounds in recent years. However, action across the sector lacks coordination. Various actors, such as credit rating agencies and banks, are integrating climate risk into their analysis, and large institutional investors are calling for stronger action on climate change. Fossil fuel companies will find securing credit to be more difficult or restricted to a smaller set of lenders. These actions foreshadow a difficult environment for fossil fuel companies as the financial sector coordinates their climate-related risk management approaches.

The financial sector is showing early signs that holding fossil fuel reserves and/or basing primary business activities on combustion of fossil fuels equates to higher risk. This section will discuss three recent developments: impact on credit ratings, transparent and pointed engagement, and access to finance.

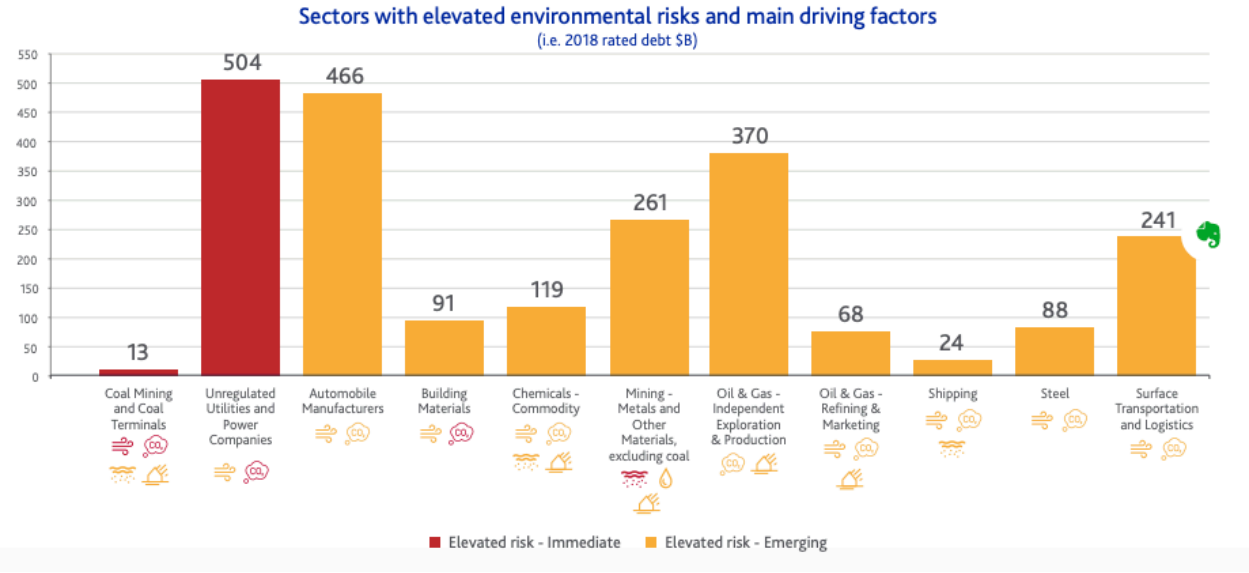
In the past year, credit ratings agencies have begun to explicitly link ESG issues to risk, particularly as it relates to climate change. This creates a consequential connection to credit ratings, which has resulted in some strategic moves by the credit ratings agencies including: acquiring niche ESG or climate data firms, releasing research on the topic and just recently, downgrading corporate credit ratings.

Since 2016, Moody's has been identifying sectors that have very high or high exposure to carbon regulations.[86] Their conclusion from this research shows that for three of the industries, coal mining, coal terminals, and unregulated utilities, carbon regulation was material to credit quality at that time. For six other industries, Moody's concluded that credit would become material by 2021. Those industries include transportation, exploration and production oil and gas, and downstream oil and gas.

[83] Business Insider. "These countries are banning gas-powered vehicles by 2040." 23 Oct 2017.
[84] Autoblog.com. "Singapore aims to phase out internal combustion vehicles by 2040." 18 Feb 2020.
[85] C40. "Fossil Fuel Free Streets Declaration." https://www.c40.org/other/green-and-healthy-streets
[86] "Moody's To Analyse Carbon Transition Risk Based On Emissions Reduction Scenario Consistent with Paris Agreement." Moody's Investor Service. June 2016.

In 2019, shortly after updating their 2016 report on exposure to carbon regulations,[87] Moody's changed ExxonMobil's outlook to negative (from stable). Figure 6 shows Moody's environmental heat map, highlighting several sectors at risk.[88]

Figure 6: Factors with Elevated Environmental Risks



S&P, another large rating agency, produces a similar report but places oil and gas as the most at-risk sector.[89] Fitch has introduced an ESG relevance scores as well.

Additionally, Moody's acquired Four Twenty Seven, a climate data and modelling company focused on physical risks in order to help them "go deeper into and refine how we assess physical risks caused by environmental factors".[90] Additionally, S&P acquired a controlling stake in Trucost ESG Analysis, another leading firm in carbon and environmental data such as GHG footprints. More recently, S&P also bought the ESG ratings arm of RobecoSAM.[91]

On the investor side, engagement has moved from behind closed doors to organized initiatives with transparent goals and results. Climate Action 100+ (CA 100+) is an investor initiative that focusses on 161 companies that account for two thirds of global industrial emissions. It now has the participation of more than 450 investors representing USD $40

[87] "Announcement: Moody's: Eleven sectors with $2.2 trillion of debt have elevated credit exposure to environmental risk." Moody's Investors Service. September 2018.
[88] "Environmental Risks Global Heatmap Overview." Moody's Investors Service. 2018. https://www.moodys.com/sites/products/ProductAttachments/Infographics/Environmental-Risks-Global-Heatmap-Overview.pdf.
[89] "Sector Risk Atlas." S&P Global. 2019. https://www.spglobal.com/en/research-insights/articles/navigating-the-esg-risk-atlas
[90] Climate Change Becomes an Issue for Ratings Agencies." Inside Climate News. August 2019.
[91] "S&P Dow Jones boosts ESG data capabilities with Trucost acquisition." Pensions&Investments. October 2016. And "Credit rating agencies focus on rising green risks." Financial Times. November 2019.

trillion in assets under management including Canadian entities like AIMCo, Vancity, BMO Global Asset Management, BCI, and TD Asset Management as well as the new and significant addition of BlackRock.[92] Through targeted engagement, companies are asked to implement a climate governance framework, reduce GHG emissions across their value chain, and provide enhanced disclosure. The underlying assumption is that climate change is a systemic risk that cannot be dealt with only through diversification, and investors require companies to respond. In just under two years, CA 100+ has resulted in industry leading public commitments from some of the major industrial companies, such as Royal Dutch Shell, Glencore, Rio Tinto, and Duke Energy.

Box 4: Repsol - A Sign of Things to Come? Or A Unique Example of Foresight?

Repsol - A Sign of Things to Come? Or A Unique Example of Foresight?

Repsol was founded in 1927 as a joint venture and in managing the oil monopoly in Spain. Today, it is one of the world's largest energy companies with over 2 billion barrels of oil equivalent in reserves and producing 715,000 barrels a day. It also has operations in natural gas, biofuels, and a new power generation business.

In response to climate-related risks, Repsol has changed its strategy to:

- Become net zero emissions by 2050 (including scope 3, which factors in the burning of its fuels)
- Adjust oil and gas outlooks to be consistent with the climate targets of the Paris Agreement, and as a result, wrote down 4.849 billion Euros of the company's assets
- Prioritize generation of value and cash over volume in upstream
- Expand low-carbon electricity generation targets.

In many areas of climate risk, Repsol is an industry leader. They would be the first oil and gas company to assume a net zero target and they are only one of two companies in this sector to be deemed Paris-compliant by the Transition Pathway Initiative. The vast majority of the oil and gas sector are not incorporating these considerations into strategy.

Lastly, banks have been slowly moving to recognize higher climate-related risk in their loan portfolios. Several banks have made individual announcements regarding restrictions to lending due to climate-related transition impacts. These include:

- European Investment Bank – November 2019 announcement to stop funding fossil fuel companies, citing: "From both a policy and from a banking perspective, it makes no sense for us to continue to invest in 20-25-year assets that are going to be taken over by new technologies and do not deliver on the EU's very ambitious climate and energy targets" [93]

[92] Climateaction100.org
[93] "Moral Money: A warning shot for investors on fossil fuels." Financial Times. November 2019.

- UBS (Switzerland) – will no longer finance new oil sands projects, new offshore Arctic oil sites or coal mines, and will apply greater scrutiny on liquified natural gas and deep water drilling. According to UBS Chairman Axel Weber: "We aim to be the financial provider of choice for clients who want to engage toward the achievement of the United Nations sustainable development goals, while helping achieve an orderly transition to a low-carbon economy…"[94]
- UniCredit (Italy) – pledged to halt all lending for thermal coal projects by 2023, banned financing of new Artic oil and offshore Arctic gas, shale oil and gas and limits financing for clients active in these areas. According to UniCredit's CEO: "Of course, if oil companies were to disappear right now we would have a problem … we also have to finance the transition…"[95]
- BNP Paribas (France) – plans to exit financing related to thermal coal by 2030 in the EU and 2040 worldwide[96]
- RBS (UK) – will stop making loans and underwriting debt for companies with more than 15% of activities related to coal, unless they have credible transition plans in line with the Paris Agreement[97]
- Goldman Sachs (US) – will stop financing projects that directly support coal mining and Arctic oil exploration[98]
- JPMorgan (US) – ending loans for Arctic oil drilling and phasing out loans for coal mining.[99]

Collectively, 130 banks launched the Principles for Responsible Banking (PRI) in September 2019.[100] The PRI includes six principles that will help banks be transparent about how they are aligning their business strategy with society's goals. The initiative includes a Collective Commitment to Climate Action, meaning signatories will commit to line their business with international climate goals, including:

- Aligning their portfolios to reflect and finance the low-carbon, climate-resilient economy required to limit global warming to well-below 2 degrees, striving for 1.5 degrees
- Taking concrete action, within a year of joining, and using their products, services and client relationships to facilitate the economic transition required to achieve climate neutrality
- Being publicly accountable for their climate impact and progress on these commitments.

[94] "Switzerland's biggest bank backs away from the oilsands." National Observer. March 2020.
[95] "Italy's UniCredit to exit thermal coal financing by 2023." CNBC. November 2019.
[96] "Italy's UniCredit to exit thermal coal financing by 2023." CNBC. November 2019.
[97] "RBS Plans to Cut Fossil Fuel Loans, Be Climate Positive by 2025" Bloomberg Green. February 2020.
[98] "Goldman Sachs becomes first major US bank to stop funding Arctic drilling, pulls back on coal." Marketwatch.com. December 2019.
[99] "JP Morgan to withdraw support for some fossil fuels" The Guardian. February 2020.
[100] https://www.unepfi.org/banking/bankingprinciples

Influence Drivers

The market is moving to incorporate climate-related financial issues and many initiatives will exclude fossil fuel companies entirely. Some initiatives provide alternatives to fossil fuels such as green taxonomies, benchmarks and indexes. Other initiatives are focused on increasing transparency of climate-related risks and their impacts on financial value, which should drive fossil fuel company action or devaluation.

Green Taxonomies

"Green" taxonomies are used to help investors make capital allocation decisions towards environmentally friendly economic activities. Currently, the European (EU) Commission, as part of its Action Plan on Sustainable Finance, has put forward a green taxonomy to "list economic activities with performance criteria for their contribution to six environmental objectives." For an economic activity to be included in the green taxonomy, it "must contribute substantially to at least one environmental objective and do no significant harm to the other five, as well as meet minimum social safeguards."[101] The taxonomy is intended to help market participants define what qualifies as green economic activities which support the EU Commission's emission reduction goals.

The six environmental objectives of the taxonomy are: [102]

- Climate change mitigation
- Climate change adaptation
- Sustainable use and protection of water and marine resources
- Transition to a circular economy, waste prevention and recycling
- Pollution prevention and control
- Protection of healthy ecosystems

Notably, the Technical Expert Group (TEG), tasked by the EU Commission to develop the green taxonomy, has excluded energy generation from solid fossil fuels and has stated they cannot be considered environmentally sustainable. In addition, activities related to the dedicated storage and/or transportation of any fossil fuels (solid, liquid and gaseous) won't be included in the green taxonomy as they "may create lock in of these assets for [future] fossil fuel purposes".[103] The TEG makes an exception for energy generation from gaseous or liquid fossil fuels if it meets its technical screening criteria, which they propose as <100g CO2e/kWh reducing to 0g CO2e/kWh over time, which would require significant use of carbon capture and storage (CCS) technologies, thereby increasing costs and breakeven price requirements.[104]

[101] EU Commission. "Using the taxonomy, supplementary report." 2019.
[102] EU Commission. "TEG final report on the EU taxonomy." 2020.
[103] EU Commission. "TEG final report on the EU taxonomy." 2020.
[104] EU Commission. "TEG final report on the EU taxonomy." 2020.

In their most recent iteration, the TEG wrote in support of a "brown" taxonomy to help identify economic activities inconsistent with the EU's emission-reduction goals.[105] As opposed to previously being left out of the green taxonomy, companies and issuers operating in transition sensitive industries such as fossil fuels, would now have their activities explicitly labelled as brown, or a shade of it. For example, the exclusions from the green taxonomy shown above are likely to be included in a future "brown" taxonomy. The TEG envisions eventually having three overarching categories of economic activities: green, brown and one for activities that do neither good nor harm, thereby labelling brown economic activities from fossil fuel companies as "harmful" to the EU's emission-reduction goals.[106] With most economic activities associated with fossil fuels being excluded from the green taxonomy, and instead being classified as "harmful" to the EU's emission reduction goals, market forces are likely to begin shifting capital allocations as the EU looks to implement incentives to support them with their climate goals.

Similar taxonomies have also been discussed in Canada, Malaysia, China, Japan, and Australia. The Canadian Expert Panel on Sustainable Finance recommended that Canada adopt international taxonomies, but also develop a transition taxonomy that reflects critical segments of Canada's economy such as natural gas resources.[107]

Climate Risk Disclosures

There is a growing movement amongst governments and investors to expect the disclosure of climate risk from the businesses they regulate and invest in. New standards and regulations are increasing pressure on companies to explain how they will operate in a 2 degree-aligned world, and companies that do not have a low-carbon plan can expect the cost of capital to rise.

Climate risk disclosure aims to help financial market participants price climate-related risks, such as transition risks (i.e. technology changes, carbon pricing, regulation, shifts in market preferences, etc.) and physical risks (i.e. heat waves, droughts, sea-level rises, etc.), into capital allocation decisions.

In 2015, the Financial Stability Board (FSB), chaired by former-Governor of the Bank of England Mark Carney, established the Task Force on Climate-related Financial Disclosures (TCFD) at the request of the G20. The TCFD was tasked with developing "voluntary, consistent climate-related financial risk disclosures for us by companies in providing information to investors, lenders, insurers, and other stakeholders".[108] Representing more than USD $12 trillion in market capitalization, over 1,000 global organizations have now publicly signed on in support of the framework.[109] While still used on a voluntary basis, some

[105] EU Commission. "TEG final report on the EU taxonomy." 2020.
[106] EU Commission. "TEG final report on the EU taxonomy." 2020.
[107] Expert Panel on Sustainable Finance. "Final Report." Canada. 2019.
[108] TCFD. 2020. https://www.fsb-tcfd.org/about/#
[109] https://www.fsb-tcfd.org/tcfd-supporters/

countries and industry associations have made, or are looking at making the TCFD (or a similar climate risk disclosure framework) mandatory (see Table 2).

Table 2: Initiatives to Increase Adoption of Climate Disclosure

Region	Climate-related Financial Disclosure Initiative
United Kingdom	A 2020 amendment to the Pension Schemes Bill would require pension trustees to review the impacts of the physical and transitional risks of climate change on their investment strategy, managing exposure to these risks and to set reduction targets for their exposure.[110]
France	In 2015, France adopted a law on the energy transition and green growth called Article 173 (or Energy Transition Law). This law strengthened mandatory carbon disclosure requirements for listed companies in France and requires investors to disclose how they integrate climate-related risks into their investment policies. The law was implemented on a comply-or-explain basis.[111]
Canada	Two recommendations from the Expert Panel on Sustainable Finance are relevant: recommendations five and eight. Recommendation five calls for a Canadian approach for implementing the recommendations of the TCFD. Recommendation eight seeks to embed climate-related risk into monitoring, regulation and supervision of Canada's financial system.[112]

While the above initiatives are helping investors better scrutinize companies that are highly exposed to climate physical and transition risks, there is global recognition that climate-related disclosures are currently insufficient for investors, lacking clarity and a link to financial impact.[113] In an August 2019 staff notice, the Canadian Securities Administrators noted that there were several issues with disclosures in Canada, including the use of boilerplate language and the omission of key information.[114] In Europe, disclosures are improving but issues such as treating reporting only as a compliance exercise, and the disclosure of key metrics and targets, remain.[115]

The stated goal of the TCFD was to provide investors with enough information on the financial impacts of physical and transition climate-related risks to make informed investment decisions.[116] The TCFD determined that decision useful disclosures would discuss the potential transition risks to a company's fossil fuel reserves, shining a light on those

[110] https://www.ftadviser.com/pensions/2020/02/27/lords-back-esg-amendments-to-pensions-bill/
[111] Principles for Responsible Investment. "French Energy Transition Law". 2016. https://www.unepfi.org/fileadmin/documents/PRI-FrenchEnergyTransitionLaw.pdf
[112] Government of Canada. "Final Report of the Expert Panel on Sustainable Finance". 2019 http://publications.gc.ca/collections/collection_2019/eccc/En4-350-2-2019-eng.pdf
[113] TCFD. "2019 Status Report." June 2019.
[114] Canadian Securities Administrator. "Staff Notice 51-358 Reporting of Climate Change-Related Risks." August 2019.
[115] European Reporting Lab. "How to Improve Climate-related Reporting." February 2020.
[116] https://www.fsb-tcfd.org/about/

companies whose business strategy involves continued growth in fossil fuel consumption. While more work needs to be done, the movement to make TCFD the standard in climate risk disclosure is growing. Mark Carney, now serving as the UN Special Envoy on Climate Action and Finance, has stated he is pushing for all countries to commit to mandatory TCFD reporting by COP26 in November 2020.[117]

Financial Stability Stress Testing

Central banks and other financial stability regulators are increasingly recognizing the threat that climate change poses to the global economy. As a result, they have begun to implement or discuss climate stress testing their portfolios on specific sectors and the economy at large. The Network for Greening the Financial System (NGFS), launched in 2017, is "a group of Central Banks and Supervisors willing, on a voluntary basis, to share best practices and contribute to the development of environmental and climate risk management in the financial sector…".[118] The NGFS currently has 55 members from across the world.

In December 2019, the Bank of England published a discussion paper outlining its proposed framework for climate risk stress testing on the financial stability of the UK's banks and insurers.

The impetus for such a stress test was stated:

> *Transition risks arise from the adjustment towards a carbon-neutral economy, which will require significant structural changes to the economy. These changes will prompt a reassessment of a wide range of asset values, a change in energy prices, and a fall in income and creditworthiness of some borrowers…In the UK, loan exposures to fossil fuel producers, energy utilities and emission-intensive sectors amount to around 70% of the largest UK banks' common equity Tier 1 (CET1) capital.*[119]

The Bank of England has stated that they will share their climate change stress test scenarios with the NGFS for use by all members.[120]

France's Banque du France will begin to climate stress test their banks and insurers in 2020, as announced by the Bank's Governor Francois Villeroy de Galhau in late 2019.[121] Other

[117] Mark Carney. "Speech: The Road to Glasgow." 27 Feb 2020.
[118] https://www.ngfs.net/en
[119] Bank of England. "The 2021 biennial exploratory scenario on the financial risks from climate change." 2019 https://www.bankofengland.co.uk/news/2019/december/boe-consults-on-proposals-for-stress-testing-the-financial-stability-implications-of-climate-change
[120] https://www.centralbanking.com/central-banks/financial-stability/4601001/boe-climate-stress-tests-results-to-be-shared-with-ngfs
[121] https://www.reuters.com/article/us-france-climate-finance/france-to-stress-test-banks-insurers-climate-risks-next-year-idUSKBN1Y30CS

prudential regulators around the world such as Australia's Prudential Regulation Authority (APRA) have also announced climate stress testing measures will take place soon.[122]

The results of this systematic stress testing will help to define the exposure to sectors at high risk to the transition to the low-carbon economy, such as coal, oil and gas. The goal of stress testing is for banks and insurers to have the information necessary to act to mitigate or avoid climate risk in their portfolios.

Benchmarks and Indexes

Carbon risk is increasingly being integrated into financial markets which, theoretically, will begin to hurt the valuations of the world's highest-emitting companies who are misaligned with global emission reduction targets for a low-carbon world. The growth of "green" and "low-carbon" indexes will potentially shut out fossil fuel companies form large pools of capital, driving up the cost of capital from equity and debt markets. The initiatives highlighted in this section help to show how this reality could manifest.

As part of the EU Action Plan on Sustainable Finance, two regulated climate benchmarks have been proposed for equities and corporate bonds:[123]

- Paris Aligned Benchmarks (PABs), provide exposure to climate opportunities associated with the low-carbon energy transition and require a GHG intensity reduction threshold of 50%. This excludes fossil fuel companies
- Less ambitious indexes are aimed at hedging climate transition risks. Climate Transition Benchmarks (CTBs) have similar emissions reduction targets but allow for fossil fuel companies to be constituents. CTBs require minimum 30% reduction of GHG intensity compared to their parent indexes

Both of the above benchmarks require that companies reduce their GHG intensities by 7% year-on-year on aggregate in order to align with the IPCC's 1.5 degree scenario. Index products that fail to meet these requirements run the risk of losing their labels. Major index providers MSCI and S&P Dow Jones Indices have already created indexes that are compliant with the new index regulation.[124]

As investors increasingly integrate climate risk into their investment strategies and risk management processes, low-carbon or fossil fuel free indexes used as benchmarks or index-linked investment products will be a key tool. These trends present significant challenges for fossil fuel companies to remain within investment portfolios going forward.

[122] https://www.apra.gov.au/understanding-and-managing-financial-risks-of-climate-change
[123] https://www.ipe.com/reports/climate-benchmarks-brown-to-green/10043511.article?utm_campaign=23608_14.2.20%20ipe%20top%2010&utm_medium=email&utm_source=IPE&dm_i=5KVE,I7S,C7TK1,1NZF,1
[124] https://www.ipe.com/news/climate-roundup-more-providers-anticipate-eu-climate-benchmark-rules/10043634.article

Section 5: Fossil Fuel Company Structures Not Reflecting Mitigation Need

Given the advanced understanding of climate change physical impacts and transitional linkages to the financial sector, fossil fuel companies should be taking steps to ensure their resilience and relevancy for the long term and these are signals investors can look for. However, information on company capital spend and incentive structures points to the opposite outcome in many cases today. Current practices seem to be rooted in historical behavior and an expectation that demand will continue to grow. This does not signal a recognition of risk except for a handful of leading companies.

Capital Expenditure Deployed into Fossil Fuel Projects

Companies are still allocating capex to fossil fuel production projects. Overlaying the funded projects with carbon budgets for the different climate scenarios shows that there are projects that would not be economically viable in the long term. In fact, the majority of planned projects would not proceed under a below 2-degree scenario.

The previously mentioned CTI research focused on the medium- to long-term asset stranding risk posed to reserves held by coal, oil and gas companies that sit outside the carbon budget. Another CTI report, "Breaking the Habit 2019", alternatively focused on how companies' current capex programs provide insight into whether their short-term actions are aligned with the potential low-carbon scenarios required to reach the Paris Agreement.

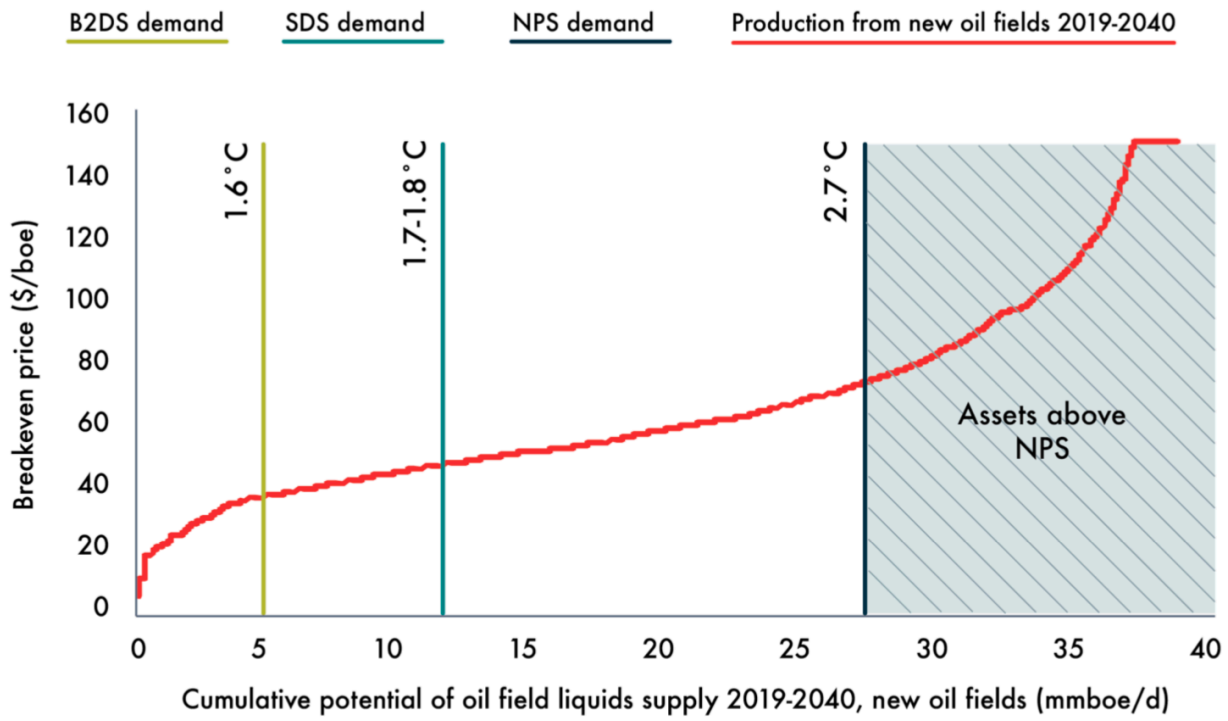
CTI overlay Rystad Energy's[125] upstream oil and gas database, UCube[126], with the carbon budgets they calculated from the IEA scenarios. UCube provides information on what breakeven prices are required at the individual project level from both sanctioned projects (in production or development) and unsanctioned projects (exploration discoveries). This allowed CTI to compare the universe of potential fossil fuel supply to the demand scenarios to find which supply options will be most cost competitive to satisfy future demands.[127] For example, the below graph shows assumed breakeven prices required for unsanctioned oil projects under various demand scenarios.

[125] Rystad Energy is an independent energy research and business intelligence company providing data, tools, analytics and consultancy services to clients exposed to the energy industry across the globe: https://www.rystadenergy.com/aboutus/

[126] CTI uses UCube, a product of Rystad Energy, for data on breakeven costs of various sanctioned and unsanctioned energy projects around the globe. By using IEA demand scenarios, CTI can calculate the supply needed to meet that demand and then overlay UCube data to see which projects would represent the supply assuming the most cost-efficient projects would be used as supply to meet the various demand levels.

[127] Carbon Tracker Initiative. "Breaking the Habit." 2019.

Figure 7: Unsanctioned Oil Fields Supply Cost Curve[128]



Source: Rystad Energy, IEA, CTI analysis
Note: potential oil supply with a breakeven of >$150/boe has been aggregated at that level

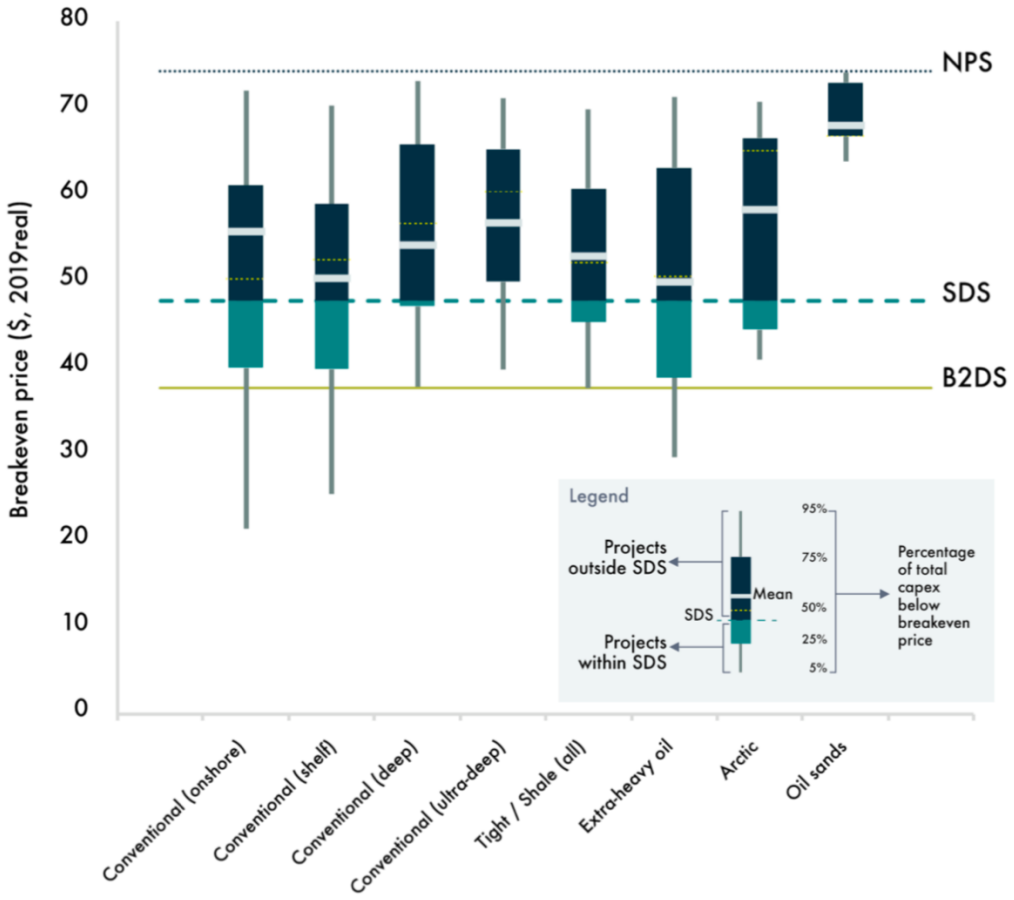
As the graph shows, any projects with required breakeven prices outside of the NPS (now called STEPS by IEA) demand scenario would not be economic to develop (i.e. at the upper end of the cost curve), and thereby should not be allocated capital expenditure. Note that the NPS scenario is representative of only holding global temperature rise to below 3 degrees, well above the 2 degree or lower Paris Agreement target, making these relatively conservative conclusions.

In this analysis, CTI calculated that to meet the IEA's B2DS[129] 1.75 degree demand scenario, an 83% reduction in planned capex on new (unsanctioned) oil and gas projects is required, while under the SDS 2 degree demand scenario, a 60% reduction is required.[130] These results show that the industry's current capex programs for unsanctioned projects are significantly misaligned with a low-carbon future.

[128] Carbon Tracker Initiative. "Breaking the Habit." 2019.
[129] The B2DS (Below 2 Degrees Scenario) was a precursor to the less stringent SDS scenario that was previously discussed. It is equivalent to a 50% probability of achieving a 1.75 degree world.
[130] Carbon Tracker Initiative. "Breaking the Habit." 2019.

Figure 10 below shows the various types of oil and gas projects and highlights capex that would be compliant with the three IEA demand scenarios, and the assumed breakeven price ranges required to be economic. For example, CTI finds that no new oil sands projects are cost-competitive under carbon budgets associated with B2DS 1.6C and SDS 1.7-1.8C demand scenarios. [131]

Figure 8: Breakeven oil price sensitivity for unsanctioned oil projects by theme[132]



Source: Rystad Energy, IEA, CTI analysis

Recall: NPS: 2.7 Degree, SDS: 1.7-1.8 Degree and B2DS: 1.6 Degree

Interestingly, as part of this 2019 analysis, CTI analyzed Teck Resources' Frontier oil sands project and found that this project was not cost-competitive under the NPS demand scenario with the company assuming an oil price of $79.50 per barrel. In February 2020, Teck Resources withdrew the application and suffered a CAD $1.13 billion asset write down.[133]

[131] Carbon Tracker Initiative. "Breaking the Habit." September 2019.
[132] Carbon Tracker Initiative. "Breaking the Habit." September 2019.
[133] https://www.reuters.com/article/us-teck-resources/teck-drops-c20-6-billion-oil-sands-frontier-project-to-take-writedown-idUSKCN20I06E

Without the substantial use of CCS technology, CTI found that we are already locked into a 1.5 degree warming outcome by projects that have already been sanctioned and sit on the balance sheets of oil and gas majors. CTI acknowledges that some new capital will be required for sanctioned projects, as some new gas production in certain regions will be required, but that not all of the sanctioned projects will be completed if we are to achieve a 1.5 degree world.

CTI found that in 2018, "all the major oil companies sanctioned [gave final approval to fund] projects that fall outside a "well below 2 degrees' budget on cost grounds", highlighting USD 50 billion of recently approved expenditures on oil projects that are not "Paris-aligned".[134]

Capital Expenditure Lacking in Alternative Energy Sources

Capital expenditure will also be needed to develop and implement alternative energy sources. Much of this can come from traditional fossil fuel companies who are diversifying their business, however, research shows that levels of investment are far below what is needed. This indicates that diversification is also not at the levels needed to protect value in these companies.

Research into the capex of major oil and gas companies finds that it falls well short of the scale of investment required to meet the growth in renewable energy required to achieve a Paris-compliant future. In a January 2020 report "The Oil and Gas Industry in Energy Transitions," the International Energy Agency looked at what role the world's oil and gas industry could play in the transition to deliver low or zero-carbon energy necessary to meet the Paris targets. The IEA found that currently less than 1% of capital investment by oil and gas companies is going towards low-carbon businesses.[135] Despite the various transition signposts that have been identified – government agreements to reduce emissions, policies to discourage or phase out carbon-intensive activities – the IEA found that "there are few signs of a major change in company investment spending."[136]

The IEA's findings were reiterated by the law firm CMS,[137] who recently prepared a report titled "Energy Transition: Evolution or Revolution? The role of oil and gas companies in a net-zero future". The report highlighted that the top 15 oil and gas companies in the world, on average, committed only 3% of their 2018 capex budgets towards alternative and new energy investments. While this research finds a slightly higher figure for capex going towards oil and

[134] Carbon Tracker Initiative. "Breaking the Habit." September 2019.
[135] International Energy Agency. "The Oil and Gas Industry in Energy Transitions." World Energy Outlook: special report. Jan 2020.
[136] International Energy Agency. "The Oil and Gas Industry in Energy Transitions." World Energy Outlook: special report. Jan 2020.
[137] https://cms.law/en/int/

gas alternatives, it reinforces the fact that the industry is not preparing to play a leading role in the coming energy transition.[138]

As CTI notes "the shift to a Paris-compliant world will require a dramatic change in behavior from the ingrained growth model [of fossil fuel companies]".[139] In the next section, we will consider whether there is any divergence from this growth model within the executive remuneration of fossil fuel majors.

Executive Remuneration Rewarding Production Growth

Another signal of how companies might be reacting to the transition to a low-carbon economy is how companies are incentivizing behaviour at the highest levels. Remuneration of oil and gas executives is still largely tied to growing the production of fossil fuel reserves with no sign that these companies are assessing their forward-looking strategy and preparing to hold their value in a low-carbon scenario.

In another research paper by CTI titled, "Paying With Fire: How oil and gas executives are rewarded for chasing growth and why shareholders could get burned", the largest 40 listed companies with upstream operations from United States (20), Europe (10), Canada (6) and Australia (4) had their current CEO executive remuneration practices analyzed to see how they are being incentivized.[140] CTI found that in 2017, 92% of the oil and gas companies analyzed included remuneration measures that specifically incentivized growth in the development of fossil fuels, either through increased production, reserves or both.[141] The research found that only one company, Diamondback Energy, was incentivized entirely on returns and cost metrics, notably excluding incentives to grow reserves and production.

While fossil fuel companies will be required to play a massive role in mitigating climate change, CTI's research found that only nine of the 40 companies analyzed have performance metrics related to mitigating climate change. CTI notes, however, that while these companies have included climate change mitigation incentives, most of these companies also simultaneously included metrics that encourage fossil fuel production and/or reserves growth.[142]

CTI believes that investors should require these companies to move away from incentivizing greater volumes of reserves and production towards focusing on maximizing returns as the low-carbon transition continues.[143]

[138] CMS. "Energy Transition: Evolution or Revolution". 2019.
[139] Carbon Tracker Initiative. "Breaking the Habit." 2019.
[140] Carbon Tracker Initiative. "Paying with Fire." 2019.
[141] Carbon Tracker Initiative. "Paying with Fire." 2019.
[142] Carbon Tracker Initiative. "Paying with Fire." 2019.
[143] Carbon Tracker Initiative. "Paying with Fire." 2019.

CTI followed up their research in 2020 to analyze 2019 remuneration policies for the 30 largest listed oil and gas companies and found limited progress has taken place. Rather than incentivizing value-focused business strategies, 26 out of 30 companies were found to still have policies which include growth metrics such as production or reserves replacement metrics (i.e. continued growth of reserves).[144]

The research categorizes metrics into four main groups.[145]

- Direct growth: metrics which directly incentivize oil and gas volume growth without incorporating any other dimensions that executives can control, e.g. reserves replacement ratio, production growth, revenue growth
- Indirect growth: metrics which amount to an implicit incentive to increase oil and gas volumes albeit in conjunction with other factors, e.g. absolute levels of free cash flow, share price (rather than total return)
- Growth neutral: metrics which do not incentivize volume growth either explicitly or implicitly, e.g. Return on Average Capital Employed, total shareholder return (TSR), safety
- Climate measures: measures which incentivize behaviour seen as positive from a climate point of view, e.g. carbon intensity reduction in tons of CO2 per unit of production, growth in low-carbon businesses

Using the above four metrics, the research found that, globally, the variable pay portion of remuneration policies average 15% of performance metrics directly incentivize growth and 19% on indirect growth, meaning 34% of variable pay is tied to growth-related performance metrics.[146] Highlighting only 1% of variable pay, on average, is directly linked to climate-related performance metrics such as CO_2 reduction, it becomes clear that remuneration policies have not begun to reflect necessary company transitions. [147] With large European companies such as Repsol[148] and BP[149] making net-zero emission target commitments in the past year, the shift in corporate incentive strategies tied to climate-related targets will remain an area to watch for investors.

[144] Carbon Tracker Initiative. "Fanning the Flames." 2020.
[145] Carbon Tracker Initiative. "Fanning the Flames." 2020.
[146] Carbon Tracker Initiative. "Fanning the Flames." 2020.
[147] Carbon Tracker Initiative. "Fanning the Flames." 2020.
[148] https://www.repsol.com/en/press-room/press-releases/2019/repsol-will-be-a-net-zero-emissions-company-by-2050.cshtml
[149] https://www.bp.com/en/global/corporate/news-and-insights/press-releases/bernard-looney-announces-new-ambition-for-bp.html

Section 6: Conclusion

Climate change is a difficult issue to summarize because it crosses boundaries, sectors, regions and disciplines. It is systemic in that it will fundamentally change our physical environment to a degree that we have collectively deemed unacceptable if unchecked. However, global agreements on limiting global warming also have the potential to fundamentally change how we do business, what we value and how we live. This also introduces climate-related risks and opportunities for investors to consider.

This review has focussed on the potential transition to a low-carbon economy and shown that it is both already well underway, and a source of direct and immediate climate-related financial risk to companies that rely on fossil fuels as a business model.

These transition-sensitive companies are a common starting place for investors to begin climate change management in their portfolios. Investment motivations will lead to specific risk management processes. For example, if the goal is to reduce headline risk, the investor could focus on divesting stranded assets since fossil fuel based companies not only represent a large, definable climate risk, but also a very visible one to beneficiaries and clients. At the other end of the spectrum, a goal of portfolio resiliency under systemic change may include a strategy for transition-based companies (possibly divestment), but also may seek to review the broader portfolio against a range of climate-related risks and opportunities and incorporate multiple risk management and investment strategy tools.

Further, investors also need to consider knock-on effects of a transition to a low-carbon economy beyond the immediately affected transition-sensitive companies. This may include sectors that will need to reduce energy demand or that provide support products and services to fossil-fuel based companies. However, there will be opportunities as well to provide new technologies and supporting inputs. This then includes sectors such as utilities, mining and manufacturing.

Additionally, investors will need to consider the physical impacts of climate change. These give rise to additional risk from more severe physical conditions as well as additional opportunity to provide adaptation solutions. All sectors can be affected, but particularly, infrastructure, agriculture, property, and transport.

Understanding the links that tie the high-level, global climate goals to individual investments is foundational to a deeper analysis of climate risks and opportunities throughout a portfolio. This knowledge can then be applied to investment judgement in processes such as engagement, constructing an investment thesis, portfolio construction, asset allocation, and risk management in order to build a more resilient portfolio.

Section 7: Abbreviations

B2DS – Below 2 Degree Scenario
CPS – Current Policies Scenario
CTB – Climate Transition Benchmarks
CTI – Carbon Tracker Initiative
GHG – Greenhouse Gas
CO_2 – Carbon Dioxide
IEA – International Energy Agency
IPCC – Inter-governmental Panel on Climate Change
IRENA – International Renewable Energy Agency
NPS – New Policies Scenario
PAB – Paris Aligned Benchmarks
SDS – Sustainable Development Scenarios
SR15 – Special Report 1.5 Degrees
STEPS – Stated Policies Scenario
TCFD – Task Force on Climate-Related Financial Disclosures
WEO – World Energy Outlook

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Risk and Portfolio Analysis on Divestment

March 19, 2020

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Abstract

In response to climate emergency, the UBC Board of Governors committed to divest its endowment portfolio from companies that unduly contribute to CO2 emissions without a clear path to curb those emissions going forward.

Consistent with their fiduciary responsibility to deliver returns that are required to support University's charitable academic activities through the UBC Endowment, Governors tasked UBC IMANT with providing the Board with financial analysis discussing the expected impact of introducing such constraints on the risk and return profile of the endowment investment portfolio.

In line with best-practices and UBC IMANT thought leadership, UBC IMANT implemented a four-pronged approach to such analysis by;

1) carrying out a literature review, examining leading academic research investigating the impact of divestment on portfolio outcomes;
2) evaluating the practical implementation considerations of such portfolio restrictions, considering the availability of existing investment products offered by the industry;
3) conducting an analysis of investment returns over the past 30 years in ten major regional markets, to determine the effect of excluding certain sectors on long term portfolio risk and return characteristics; and,
4) performing a quantitative analysis of a broad based global equity portfolio versus divested portfolios, in order to estimate the significance of any changes in portfolio characteristics.

Results of this review are consistent with the portfolio theory and practical observations that limited-scale constraints on portfolio holdings do not materially alter the risk return profile of investment portfolios.

Practitioners and academics report that reasonably constrained portfolios are generating comparable returns to unconstrained portfolios. The overall risk of constrained and unconstrained portfolios remains similar although drivers of risk differ. For instance, constrained portfolios are often reported to have slightly lower sensitivity to market moves while having greater exposure to a more volatile technology sector.

1. Literature Review

Portfolio construction approaches are subject to numerous constraints. The most common constraint imposed by institutional investors is the long-only constraint requiring that portfolios do not take short positions in underlying assets. Other common constraints include diversification requirements.

In response to climate risk institutional investors are evaluating the impact of similar constraints on fossil fuel investments on portfolio returns and risk profile. In the course of our review of literature covering this subject, IMANT staff examined papers from a substantial cross-section of academic and industry authors. We will discuss a selection of notable findings in detail below.

In perhaps the first academic study[1] that "systematically investigates the impact of excluding fossil fuel stocks at the portfolio level," Plantinga and Scholtens examine the returns of fossil fuel stocks on a standalone basis in comparison with other industries, as well considering implications for investment portfolios with and without energy stocks. The authors observe that "the difference in returns between the fossil fuel and other stocks does not generate a significant risk-adjusted return, although there are statistically significant differences in exposure to systematic risk." This study relies on a global industry index data provided by Datastream and spanning the period of over 40 years, allowing for robust analysis.

The authors report that over the period 1973-2015 the fossil fuel industry has the highest average mean return and consumer sector has the lowest performance. The difference between the best and the worst industry is 0.22% over the entire period, suggesting that excluding the fossil fuel industry from a global stock portfolio has a limited impact on portfolio performance. This is primarily due to the observation that the fossil fuel industry displays higher than average level of equity market risk and higher sensitivity to small cap and growth stocks thus return benefits appear to be offset by risk increases.

The study also highlights that there are periods of underperformance of the fossil fuel free portfolio. During the period starting at the beginning of 1995 and ending at the end of 2000, when oil prices increased from $20 to $30, the fossil fuel free portfolio delivered on average 0.25% less per month, and at the end of that period the value of the portfolio excluding fossil fuel stocks was 24% lower compared to the portfolio with all stocks. The authors point out that their study relies on historical observations taking place in a "period when the fossil fuel industry served an important role in the economy". Looking ahead, the use of fossil fuels is likely to be impacted by both increased competition from alternative energy sources and escalating policy interventions by governments. They provide a comparison of two opposing scenarios where fossil fuels are either increasingly important due to scarcity or less relevant due to alternative energy sources or efficiency improvements. In both scenarios, after adjusting for changes in expected returns and risk of the fossil fuel industry the authors

[1] Plantinga A. and Scholtens B., 2016. Financial impact of divestment from fossil fuels. Working Paper, University of Groningen

conclude that the fossil fuel investment restriction does not appear to meaningfully harm investment performance.

This conclusion agrees with other studies (i.e. Bello (2005)[2]) that examined the performance of mutual funds with restrictions on the investment universe which were in-line with unrestricted portfolios when reductions of the investment universe was limited to 5% - 10%.

In addition to materials that approached portfolio construction under fossil fuel constraints through the lens of traditional portfolio theory, IMANT staff reviewed scholarship approaching portfolio construction using Bayesian techniques. [3]. The Bayesian approach allows for incorporation of prior expectations into portfolio construction and lends itself to analysis where there is an increasing likelihood of government action through taxation or emission limits that can be expected to target the fossil fuel industry and users.

Benedetti et al. adopt such an approach to capture the potential impact of carbon pricing on fossil fuel stocks. In this study, the authors go beyond suggesting that excluding fossil fuel exploration and production companies from portfolios does not have a material impact on the risk/return profile of the portfolio, instead concluding that excluding such investments offers risk reduction without compromising returns. An extension of this approach to include the Utilities and Basic Materials sectors is left for future research.

As a counterpoint, our literature review included publications that were critical of restricting the investment universe to exclude fossil fuel stocks. Cornell examines the effect of divestment on the portfolios of major US endowments, estimating that fossil fuel constrained endowment portfolios are generating, on average, annual returns that are 0.50% lower than unconstrained portfolios[4]. Cornell concludes: “Over a 50-year time frame, the value of a divested portfolio would be 23 percent lower than a non-divested portfolio.” However, it is worth noting that the conclusions appear to be dependent on assumptions regarding endowment holdings, asset class proxies and the construction of fossil fuel free portfolios.

Portfolio constraints are commonly associated with concerns regarding reduction in portfolio diversification, increasingly different return behaviour compared to market indexes expressed through higher tracking error estimates and introduction of factor exposures that are different from market indexes and unintended bets.

All of the above considerations are valid but based on our literature review and familiarity with existing investment vehicles, we believe it is possible to address those concerns through thoughtful and careful implementations.

[2] Bello Z.Y., 2005. Socially responsible investing and portfolio diversification. Journal of Financial Research 28.
[3] Benedetti D., Biffis E., Chatzimichalakis F., Fedele L.L., Simm I., 2019. Climate Change Investment Risk: Optimal Portfolio Construction Ahead of the Transition to a Lower-carbon Economy. Imperial College London and Impax Asset Management.
[4] Cornell B., 2015. The Divestment Penalty: Estimating the Cost of Fossil Fuel Divestment to Select University Endowments, Working Paper.

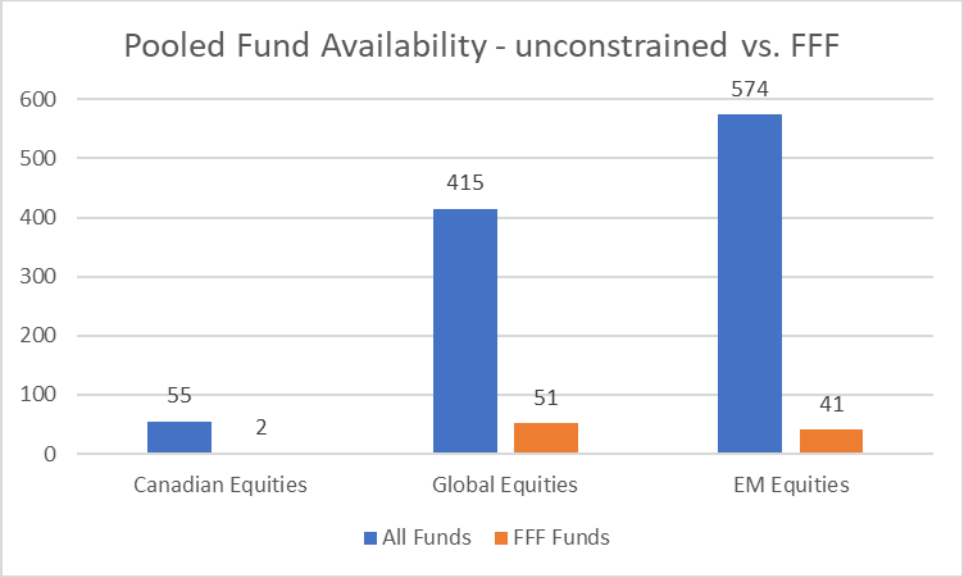
First, as long as the constraint affects only a small portion of available investment universe, ranging between 5% and 10%, reduction in diversification should be limited.

Second, when building a fossil fuel free portfolio, one is constraining investments in a higher than average expected return, higher than average volatility and higher than average market beta industry sector. On its own, it might lower the beta of a constrained portfolio resulting in lower expected return (and lower risk). However, a thoughtful redeployment of the risk budget made available by the elimination of high beta sector could create an opportunity to bring additional returns from other high beta sectors.

Third, energy sector stocks typically display small cap and value characteristics, therefore a constrained portfolio will have a lower exposure to those factors. During portfolio rebalancing, investment managers will need to ensure that factor exposures are adjusted to avoid unintended bets.

2. Fossil Fuel Free Investment Vehicles

As part of the evaluation of the practicality of implementing fossil fuel constraints on the endowment portfolio we reviewed a commonly used industry database of investment managers. We observed that the breadth of available fossil fuel free investment vehicles is notably smaller than that investing in broad mandates.



With respect to global equity investments, there are existing solutions enabling investors to establish positions in fossil fuel free global equities through MSCI global equity indexes that are among the longest commercially available fossil fuel constrained investment vehicles. The All Country World Index ex Fossil Fuels is calculated since 2011 and is constructed to closely replicate the MSCI ACWI Index, its parent index. It includes large and mid-cap stocks across 23 Developed Markets and 26 Emerging Markets countries. The index represents the performance of the broad market while excluding companies that own oil, gas and coal reserves. It is a benchmark for investors who aim to eliminate fossil fuel reserves exposure from their investments due to concerns about the contribution of these reserves to climate change.

The index is constructed to avoid unintended exposures and to maintain low tracking error versus its parent index.

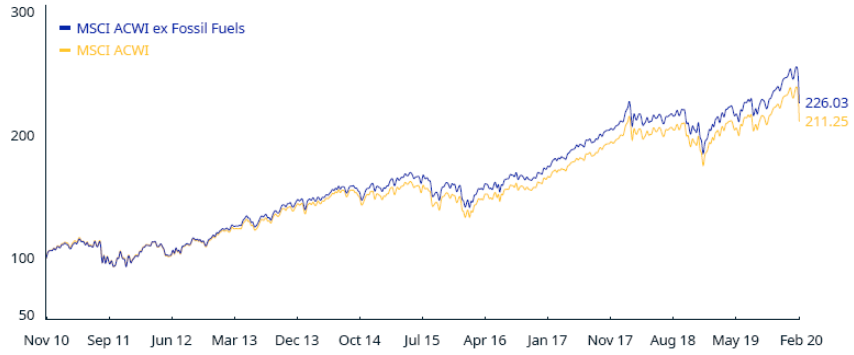
INDEX RISK AND RETURN CHARACTERISTICS (NOV 30, 2010 – FEB 28, 2020)

				ANNUALIZED STD DEV (%) [2]			SHARPE RATIO [2,3]				MAXIMUM DRAWDOWN	
	Beta	Tracking Error (%)	Turnover (%) [1]	3 Yr	5 Yr	10 Yr	3 Yr	5 Yr	10 Yr	Since Nov 30, 2010	(%)	Period YYYY-MM-DD
MSCI ACWI ex Fossil Fuels	0.98	0.92	5.35	12.36	12.09	na	0.54	0.49	na	0.71	18.95	2018-01-26—2018-12-25
MSCI ACWI	1.00	0.00	3.48	12.46	12.19	na	0.50	0.45	na	0.64	18.90	2018-01-26—2018-12-25

[1] Last 12 months [2] Based on monthly gross returns data [3] Based on ICE LIBOR 1M

Since inception, the ex-fossil fuel index delivered comparable returns to its unconstrained parent index.

CUMULATIVE INDEX PERFORMANCE — GROSS RETURNS (USD) (NOV 2010 – FEB 2020)



ANNUAL PERFORMANCE (%)

Year	MSCI ACWI ex Fossil Fuels	MSCI ACWI
2019	28.19	27.30
2018	-8.92	-8.93
2017	25.45	24.62
2016	7.18	8.48
2015	0.03	-1.84
2014	6.60	4.71
2013	25.00	23.44
2012	18.69	16.80
2011	-7.01	-6.86

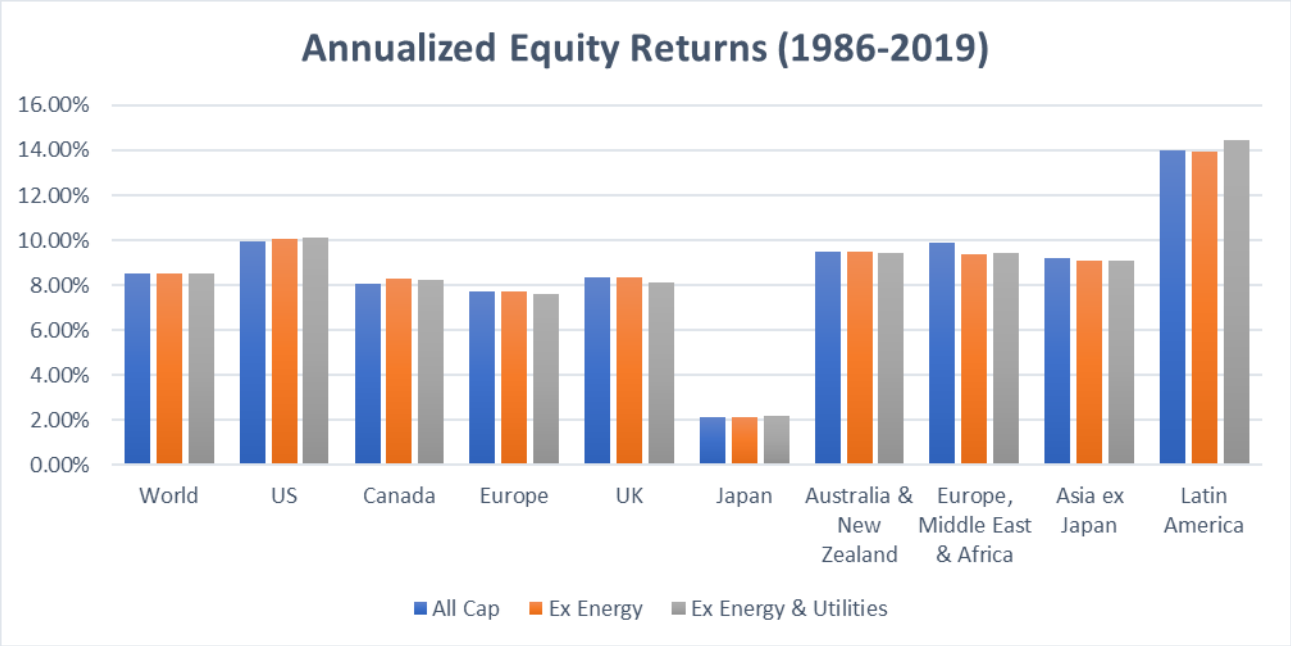
We caution about drawing return expectations from this short history of the MSCI ex fossil fuels index as it overlaps with a period of weakness in oil prices.

In our contacts with investment managers we see an increasing number of providers that incorporate fossil fuel constraint while maintaining risk and return characteristics of unconstrained equity portfolios. Furthermore, we reached out to our existing investment managers to discuss their capabilities to implement fossil fuel free versions of their strategies. Through that engagement we learned that most of the current managers would be prepared to develop fossil-fuel-free implementations of their strategy.

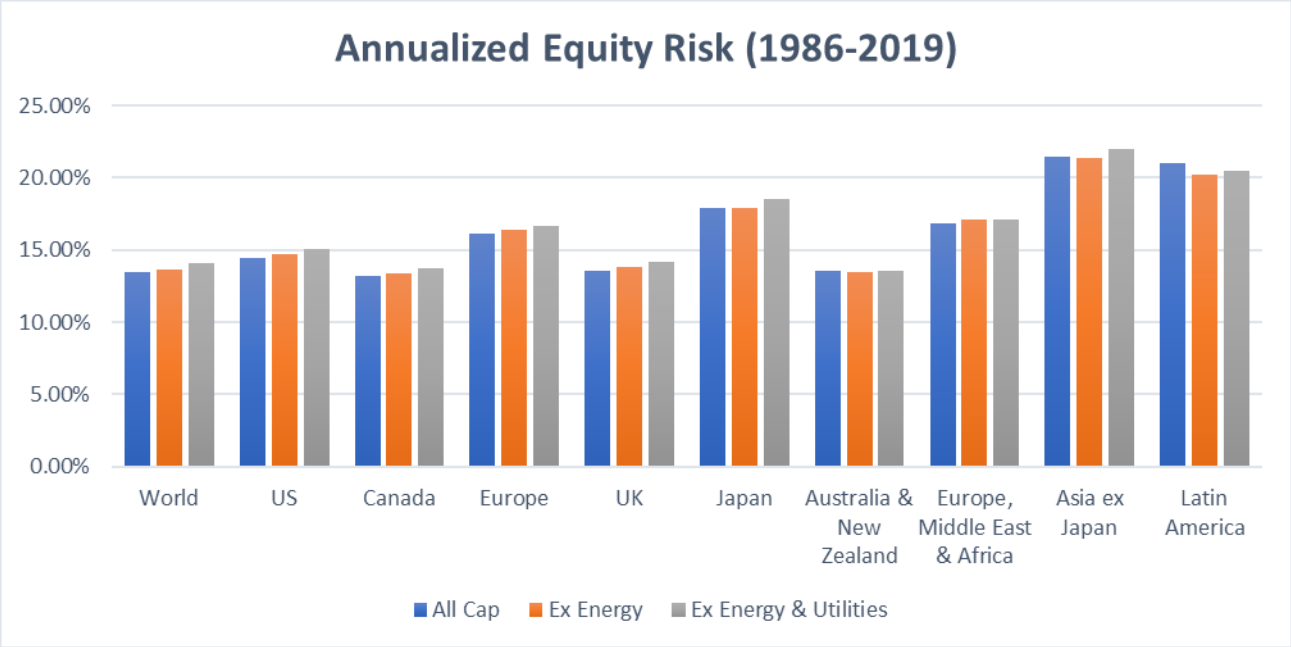
3. Constrained and Unconstrained Performance Comparison

In order to assess the historical effect of constraining portfolio sectors, UBC IMANT obtained data from Wolfe Research, detailing monthly equity returns for ten major regions between 1986 and 2019. The monthly returns were further divided into All Cap, All Cap ex Energy, and All Cap ex Energy & Utilities portfolios.

Beginning with this monthly data, we calculate the cumulative total return for each subset of data, before transforming returns to annual figures. Over this time horizon, we observe slightly higher returns for the All Cap portfolio in some regions, with slightly higher returns for the constrained portfolios in others, resulting in no clear conclusion as to the effect of excluding energy and utility stocks on returns.



Conversely, calculating the portfolios' annual standard deviation on the same basis results in higher levels of observed volatility in the ex Energy and ex Energy & Utilities indices in almost all regions, reflecting reduced diversification within the constrained portfolios.



To verify these results, UBC IMANT additionally calculated rolling twelve-month intervals with 407 observations, in turn estimating the mean and standard deviation of annual returns for each region and index subset. For each region, the means and standard deviations of All Cap ex Energy and All Cap ex Energy & Utilities were compared to those of the All Cap index to establish statistical significance, using Student's t-test and Levene's test, respectively. Finally, staff estimated the annual tracking error of the two constrained indices relative to the All Cap index.

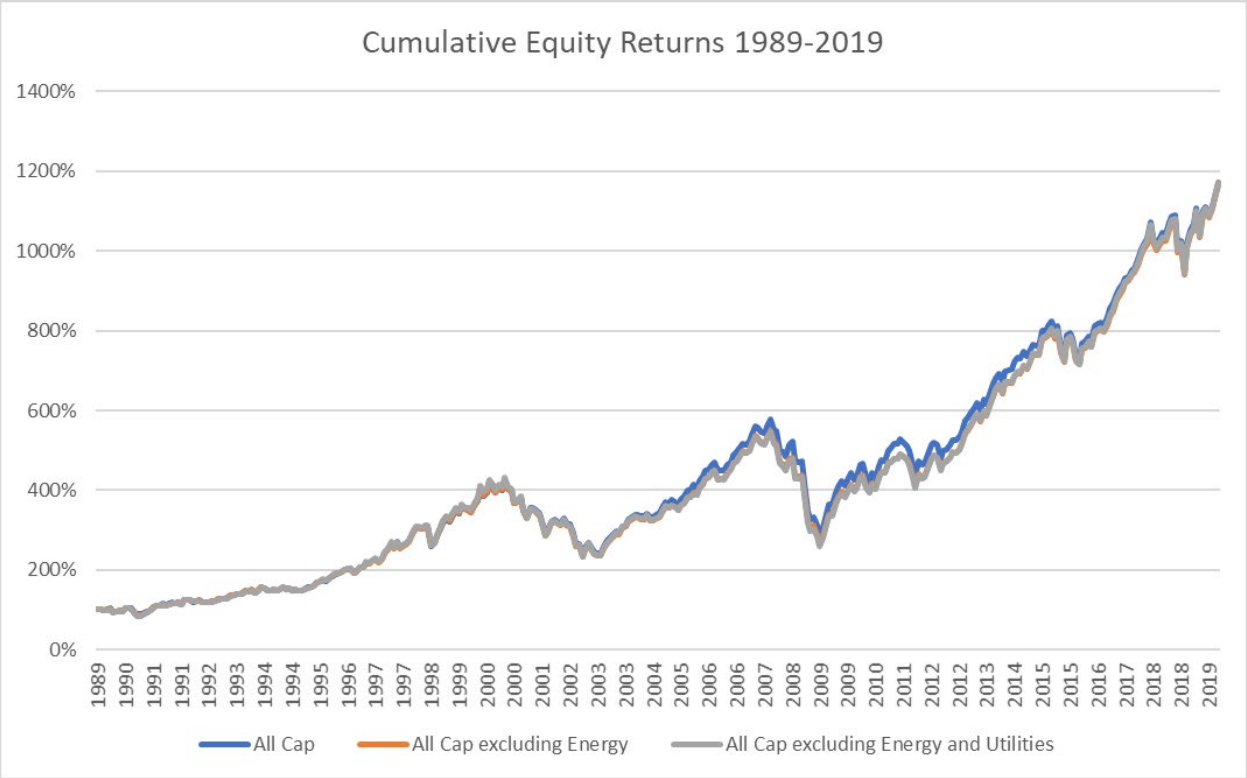
Global Equity

In the case of the broad global index, the constrained portfolios again exhibited minimal differences in return relative to the All Cap benchmark (-1bp and +9bps, respectively), with modestly greater differences in standard deviation (+36bps and +72bps). None of these results however rise to the level of statistical significance.

In terms of tracking error, the naïve implementation of reweighting the remaining sectors according to cap weights nevertheless yields tracking errors of 1.25% and 1.57% for the ex Energy and ex Energy & Utilities portfolios respectively, roughly in line with the realized tracking errors of existing ex Fossil Fuel equity products.

Similar outcomes are found for US and European equity indices, reflecting the relatively small weight of energy and utilities in those markets.

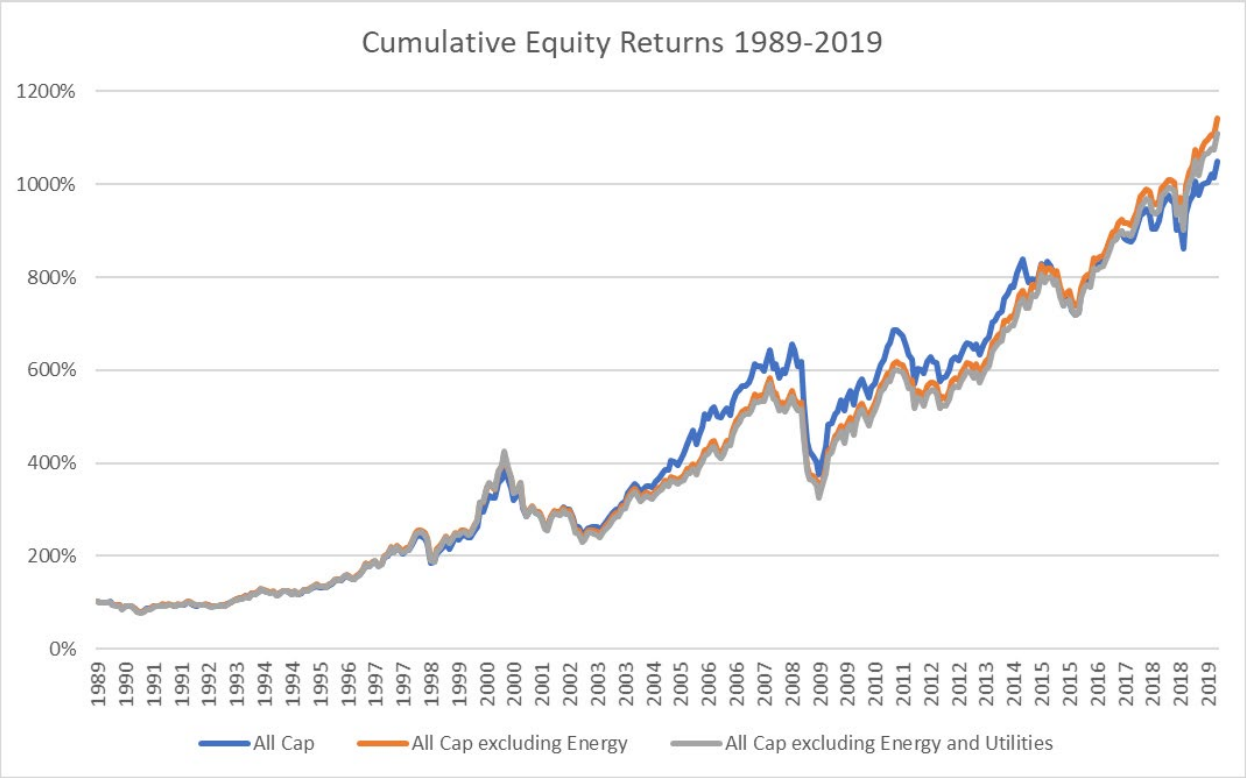
World	**All Cap**		**All Cap ex Energy**		**All Cap ex Energy & Utilities**	
	%	P-value (μ = μAC)	%	P-value (μ = μAC)	%	P-value (μ = μAC)
Mean 12 Month Return	10.13%	-	10.12%	0.994	10.22%	0.935
Mean 12 Month Standard Deviation	15.54%	-	15.90%	0.747	16.26%	0.516
Tracking Error			1.25%		1.57%	



Canadian Equity

In the case of regions with a greater component of energy and utilities in the market index, the effects of constraining portfolio sectors is somewhat greater. For the Canadian market, the exclusion of energy and utilities resulted in increased mean annual return of 27 and 28bps, while also increasing standard deviation by 27 and 73bps. Tracking error increases to 3.33% and 3.59%, respectively.

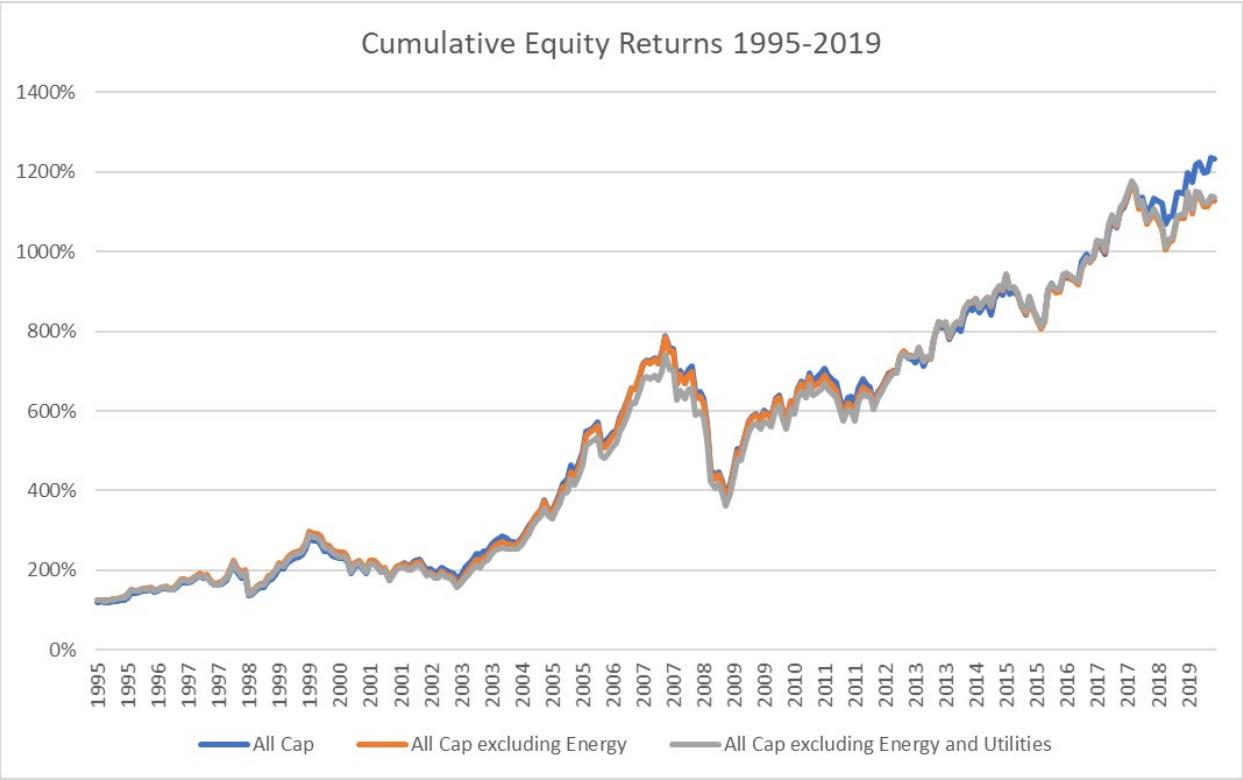
Canada	**All Cap**		**All Cap ex Energy**		**All Cap ex Energy & Utilities**	
	%	P-value (μ = μAC)	%	P-value (μ = μAC)	%	P-value (μ = μAC)
Mean 12 Month Return	9.48%	-	9.75%	0.811	9.76%	0.810
Mean 12 Month Standard Deviation	15.85%	-	16.12%	0.741	16.58%	0.374
Tracking Error			3.33%		3.59%	



Europe, Middle East and Africa (EMEA) Equity

In the EMEA region, excluding energy and utilities resulted in decreasing mean annual return by 35 and 29bps, while increasing standard deviation 86 and 76bps, respectively. As with Canadian equities, constraining sectors resulted in a relatively high tracking error of 2.75% and 3.23%.

EMEA	All Cap		All Cap ex Energy		All Cap ex Energy & Utilities	
	%	P-value (μ = μAC)	%	P-value (μ = μAC)	%	P-value (μ = μAC)
Mean 12 Month Return	11.94%	-	11.59%	0.839	11.66%	0.867
Mean 12 Month Standard Deviation	20.42%	-	21.28%	0.330	21.18%	0.356
Tracking Error			2.75%		3.23%	



4. Evaluating the Impact of Removing Fossil Fuel Sectors

Turning to Mean-Variance analysis, UBC IMANT staff obtained daily returns for each of the ten subsectors of the MSCI World Index between 1995 and 2020, calculating annualized expected returns, standard deviations and correlations for each.

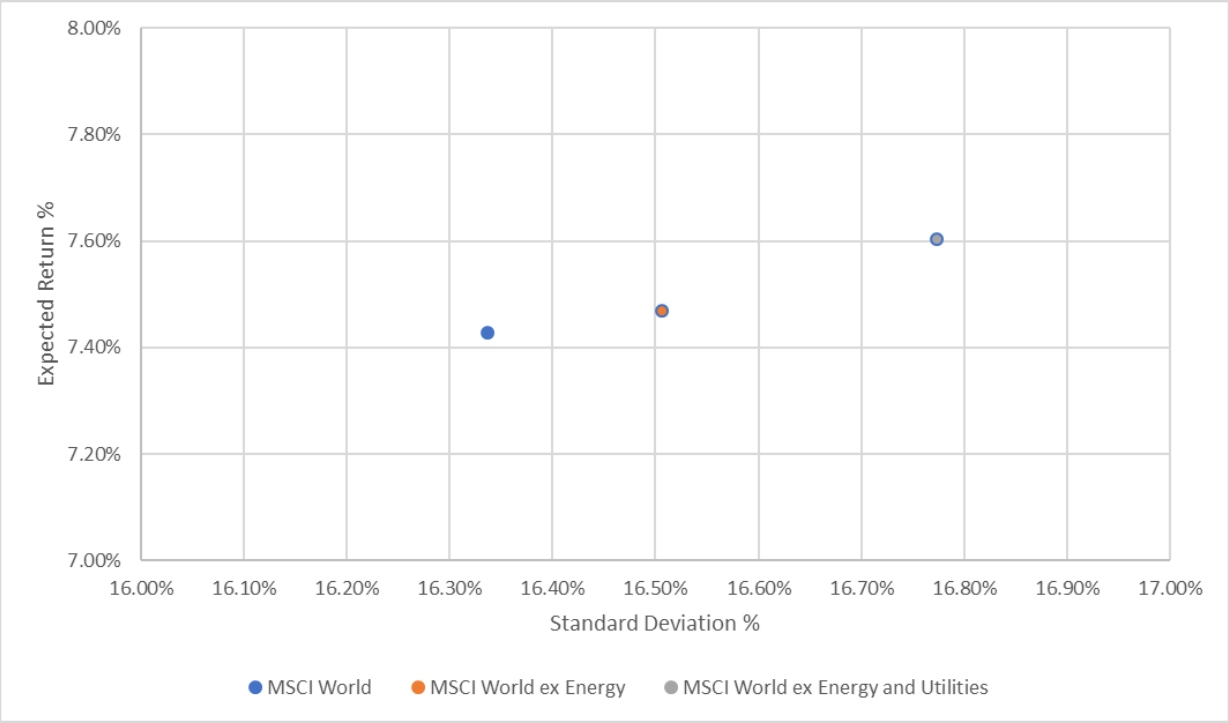
Within this framework, staff constructed portfolios excluding Energy and Energy & Utilities sectors, rebalancing the remaining sectors according to their capitalization weights. In the resulting portfolios, the exclusion of these two sectors resulted in slightly higher expected returns, relative to the global equity index. However, the loss of diversification benefit resulted in a corresponding increase in portfolio risk.

Expected Returns, Standard Deviations and Correlations

	Communications	Consumer Discretionary	Consumer Staples	Energy	Financials	Healthcare	Industrials	Materials	Technology	Utilties
Expected Annual Return	4.1%	7.6%	7.1%	6.2%	4.5%	8.8%	6.4%	5.8%	12.6%	4.1%
Standard Deviation	20.8%	17.9%	12.3%	18.4%	20.2%	14.8%	17.9%	21.3%	28.7%	14.5%
Sharpe Ratio	0.15	0.37	0.49	0.28	0.17	0.53	0.30	0.23	0.40	0.22

Correlations	Communications	Consumer Discretionary	Consumer Staples	Energy	Financials	Healthcare	Industrials	Materials	Technology	Utilties
Communications	1.00	0.75	0.45	0.49	0.57	0.58	0.65	0.45	0.81	0.64
Consumer Discretionary	0.75	1.00	0.61	0.57	0.86	0.69	0.90	0.68	0.77	0.59
Consumer Staples	0.45	0.61	1.00	0.54	0.71	0.76	0.62	0.55	0.26	0.68
Energy	0.49	0.57	0.54	1.00	0.66	0.49	0.73	0.76	0.46	0.62
Financials	0.57	0.86	0.71	0.66	1.00	0.74	0.89	0.73	0.58	0.69
Healthcare	0.58	0.69	0.76	0.49	0.74	1.00	0.60	0.32	0.52	0.60
Industrials	0.65	0.90	0.62	0.73	0.89	0.60	1.00	0.85	0.68	0.70
Materials	0.45	0.68	0.55	0.76	0.73	0.32	0.85	1.00	0.46	0.60
Technology	0.81	0.77	0.26	0.46	0.58	0.52	0.68	0.46	1.00	0.40
Utilties	0.64	0.59	0.68	0.62	0.69	0.60	0.70	0.60	0.40	1.00

Expected Portfolio Returns & Standard Deviations



UBC/IMANT ESG INVESTING

MACRO ANALYSIS

MARCH 2020

DRAFT FOR DISCUSSION PURPOSES ONLY

ESG Investing Has Broad Considerations

ESG investing considers a wide breadth of environmental, social, and governance issues impacting company and investment value

While there is **no one exhaustive list of ESG factors**, there are a **wide breadth of broadly recognized ESG matters** impacting company and investment value. The **UN Global Compact identifies a selection of such ESG issues**:

	Near Term Objective	Longer Term Objective	Longer Term Objective
	ENVIRONMENTAL	**SOCIAL**	**GOVERNANCE**
ISSUES	• **Climate change** and related risks • The need to reduce **toxic releases and waste** • New regulation expanding the **boundaries of environmental liability** with regard to products and services • **Emerging markets** for environmental services and environment-friendly products	• **Workplace** health and safety • **Community** relations • **Human rights issues** at company and suppliers'/contractors' premises • **Government and community relations** in the context of operations in developing countries • Increasing **pressure by civil society** to improve performance, transparency and accountability	• **Board** structure and accountability • **Accounting and disclosure** practices • **Audit** committee structure and independence of auditors • Executive **compensation** • Management of **corruption and bribery** issues
SAMPLE METRICS	• Average carbon emissions per $M revenue • Construction waste generation per $M revenue • Water usage per $M revenue • Non-renewable resource consumption per $M revenue	• Employee satisfaction • Volume of production per labour unit • Degree of barrier-free accessibility of buildings/infrastructure	• Gender diversity in Board and Leadership • Board and Committee attendance • Committee Independence (e.g. Audit Committee, Compensation Committee)

Universities in Canada and Globally are Shifting to more ESG Investing

There is broad alignment between UBC and peer higher education institutions' ESG investing objectives, including alignment with institutional values, financial prudence, and transparency

COLUMBIA UNIVERSITY

… **longstanding commitment to addressing climate change** … **divest from companies deriving more than 35% of their revenue from thermal coal production** … divestment of this type is an action the University takes only rarely and **in service of our highest values** … **very careful and deliberative process** leading up to any decision … continue to **strengthen efforts to reduce its own carbon footprint**, as well as to further support research, educational efforts, and policy analysis in the field of climate change and carbon emissions reduction

McGill UNIVERSITY

… Board approved recommendations to **reduce the carbon footprint**, **which will result in divesting from carbon intensive companies**, incl. those within the fossil fuel industry … intensify holdings in low-carbon funds, as well as funds that contribute to de-carbonization … **increase investment in the University's existing fossil-fuel-free fund** … take an active stewardship role … amend the Statement of Investment Policy's investment objectives to reflect the University's environmental commitment … **communicate McGill's socially responsible investment activities** incl. include metrics such as the percentage of portfolio managers that are signatories of the UNPRI…

HARVARD UNIVERSITY

… strongly believes that considering ESG data is not only in line with our fiduciary duty, but **something that thoughtful investors do** … The degree to which ESG factors are relevant to an investment **depends on the company or asset, the industry , and the type of investment strategy and vehicle** … aims to be a good steward of the land we own and manage … we do not require our external managers to share our views on every issue, but to be informed and have a general approach to ESG … **report on a regular basis and in sufficient detail** regarding their investment activities, including ESG integration

UNIVERSITY OF TORONTO

… define **responsible investing as the incorporation of environmental, social and governance (ESG) factors** into investment decision-making processes, active ownership and disclosure … **we believe that material ESG factors can have a significant impact on investment returns**, and are an integral part of our decision-making processes, particularly selection of investment managers, and commitment to active ownership and transparency … **we are an active owner**, applying an ESG view to proxy voting and engaging with companies on ESG-related risks … we **regularly disclose our responsible investing activities**, on our website and in our annual responsible investing reports

UNIVERSITY OF CALIFORNIA

… committed to environmental sustainability, social responsibility and prudent governance at every level of the university's ten campuses … commitment is embodied in the university's research, academic programs, business practices and governance structure … has launched numerous sustainability initiatives that will guide UC's efforts to **achieve carbon neutrality by 2025 …** avoids unnecessary losses that could come from **arbitrarily divesting from holdings without due diligence** … begun to apply **oversight and monitoring** of ESG policies of external managers

Source: Official websites of institutions mentioned

Peer Institutions' General Approach to ESG Investing

Higher education institutions have taken varying approaches/actions to execute on their ESG investing principles

	Columbia University	McGill University	Harvard University	University of Toronto	University of California
Carbon Emitter Divestment	**Yes** – Companies deriving more than 35% revenue from thermal coal	**Not Yet** – Commitment to divest carbon intensive companies (undefined)	**No** – Views endowment as an economic vs. political or social tool	**No** – Engagement rather than divestment approach	**Yes** - CU200, Extended Custom List
ESG Policies	None	**No** - Commitment to integrate ESG into investment policies	**Yes** – ESG integration*, active ownership, collaboration, reporting & disclosures	**Yes** - ESG integration, active ownership, collaboration, reporting & disclosures	**Yes** – ESG integration, active ownership, collaboration, reporting & disclosures
Investing Approach	None	Commitment to increase investments in clean technologies, renewable energy infrastructure and fossil-fuel-free funds	ESG as tailored asset class process; ESG questions are assessed during the due diligence process	ESG factors in investment due diligence/management; development of ESG-related tools & metrics	Criteria for off-limits investments; ESG deeply integrated beyond carbon, active investing in solutions
CO_2 Target	None	None	None	Reduce carbon footprint of long-term investments by ≥40% by 2030	None
Signatory or Participant	CDP	None	UNPRI, CA, CDP	UNPRI, MCP, CA, CDP, RIA	UNPRI, INCR, CDP
Endowment	US$10.9B	$1.6B	US$39.2B	$2.5B	US$13.4B

*ESG Integration: Integrating ESG factors into analysis of listed equity investments
Source: Official websites of institutions mentioned

Peer Institutions' Philosophy on RI Driven Divestment

Institutions' philosophies sit on a continuum of having maximum impact in the short term, and building ESG into the fabric for long term; financial prudency is consistent across approaches

	Columbia University	McGill University	Harvard University	University of Toronto	University of California
Carbon Emitter Divestment	**Yes** – Companies deriving more than 35% revenue from thermal coal	**Not Yet** – Commitment to divest carbon intensive companies (undefined)	**No** – Views endowment as an economic vs. political or social tool	**No** – Engagement rather than divestment approach	**Yes** - CU200, Extended Custom List

	DESCRIPTION	RATIONALE	FINANCIAL ANALYSIS REQUIRED
ESG Mission & Values (University of California; University of Toronto; Harvard University)	Focus portfolio on organizations with **well-rounded ESG factors in longer-term** mission, values, and objectives	Belief that companies with **long-term ESG focus** yield **higher return over time**, and **systematically integrating all ESG factors** into investment approach provides most **accurate risk-reward calculation**	Analyze **risk-adjusted performance** (i.e. adjusted for ESG compliance) of companies over the **medium and long term**
Top Carbon Emitters (University of California)	Exclude/divest **top carbon emitters**; **standard lists (e.g. CU200)** serve as a starting point, then may be adjusted based on organizational targets	Immediately **maximizes carbon reduction** in portfolio; single criterion (i.e. carbon emission) is **easily understandable by public**; accounts for carbon emitters **beyond oil & gas industry** (e.g. airlines, agriculture)	Identify **top carbon emitters** in portfolio, then perform **scenario analysis** to compare returns over specific period (e.g. 10 years) with/without emitters
% Revenue from Fossil Fuel(s) (Columbia University)	Exclude/divest organizations that derive **% of revenue from any or specific fossil fuels** (e.g. thermal coal)	Targets **fossil fuel producers**, which make up majority of top carbon emitters; allows for **varying levels of screening selectivity** depending of % revenue specified	Identify **fossil fuel(s) comprising greatest portion** of portfolio, then perform **scenario analysis** on returns with/without corresponding companies

Canadian Pension Plans' General Approach to ESG Investing

There is also broad alignment among major Canadian pension plans to integrate ESG factors into investing approaches and policies

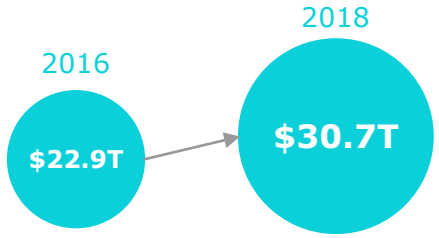
	CPP Investment Board	Ontario Teachers' Pension Plan	BCI	AIMCo	OMERS
Carbon Emitter Divestment	**No** – consider and integrate ESG risk and opportunities, rather than eliminating based on ESG factors	**No**	**No** – climate action plan	**No**	**No**
ESG Policies	**Yes** – ESG integration*, direct & industry, engagement, collaboration, proxy voting, reporting	**Yes** – ESG integration, corporate engagement, collaboration	**Yes** – ESG integration, active ownership, collaboration, reporting & disclosures, acceptance & implementation	**Yes** – ESG integration, active ownership, collaboration, reporting & disclosures, acceptance & implementation	**Yes** – ESG integration, active ownership, collaboration, reporting & disclosures
Investing Approach	Monitor ESG factors and engage with companies to promote improved management of ESG	Apply an ESG lens to investment decision-making process and the management of assets	In-depth ESG considerations integrated into investment decision-making process	Exercises a policy of engagement over exclusions and divestures	Integrating ESG factors into decision-making, along with evaluation of other risk factors
CO_2 Target	None	None – but closely monitors co2 emissions	None – but closely monitors co2 emissions	None	None
Signatory or Participant	UNPRI	UNPRI	UNPRI, TCFD, Climate Action 100+	UNPRI, CDP, RIA	UNPRI
Funds Under Management	US$400.6B	$191.1B	US$153.4B	$108.2B	US$109B

*ESG Integration: Integrating ESG factors into analysis of listed equity investments

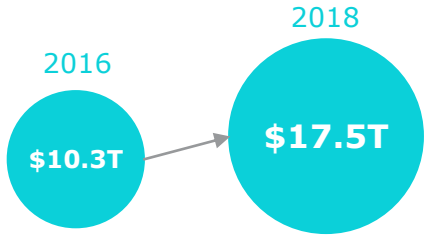
Shift Towards ESG Investing & Key Drivers

A global shift towards ESG investing is evident in investment managers' increasing allocation of funds towards socially responsible funds and signatories with RI initiatives

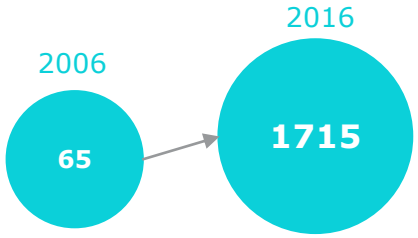
Sustainable investing globally has grown by 34% since 2016[1]



Integration of ESG factors into investment analysis globally has grown by 69% since 2016[1]



The number of **PRI signatories globally has grown** by 2500% from 2006 to 2016[1]



Several key factors drive the shift towards ESG:

Global Exposure

Large investment firms holding **significant, globally diverse assets** can no longer hedge against the global economy; their **success is closely tied to the planet's well-being**.

Financial Returns

Studies have found that firms with a **better ESG record** than their peers have produced **higher returns in the long term**.

Long-Term Liabilities

Large asset owners such as pension funds are forced to take a long-term view due to **long-term liabilities** — they must plan to pay out retirements for the next 100 years.

Evolving Fiduciary Duty & Client Demand

Clients demonstrate **increasing awareness of and desire to help address social issues**, thus investment firms also focus on **ensuring clients are responsibly invested**.

Leadership Awareness & Alignment

Senior leaders are ensuring that ESG analysis is being integrated into the fundamental financial activities carried out by analysts and portfolio managers.

Shareholder Activism

Active managers who intend to **hold a stock for a long time have an incentive** to see that companies address the **material ESG issues** that will improve their financial performance.

[1]Source: Global Sustainable Investment Review (2018). The Global Sustainable Investment Review 2018, the fourth edition of this biennial report by the Global Sustainable Investment Alliance (GSIA), continues to be the only report collating results from the market studies of regional sustainable investment forums from Europe, the United States, Japan, Canada, and Australia and New Zealand. It provides a snapshot of sustainable investing in these markets by drawing on the in-depth regional and national reports from GSIA members— Eurosif, Japan Sustainable Investment Forum. Responsible Investment Association Australasia, RIA Canada and US SIF.

ESG Investing Returns Over Time

Industry and academic research studies broadly conclude that ESG investment strategies, compared to traditional investment strategies, do not result in lower investment returns

In 2019, **RBC Global Asset Management** published a report reviewing **dozens of independent, 3rd party academic and industry research studies on SRI**. The research **defines SRI more broadly than climate change or carbon risk and generally supports several key findings**[1]:

SRI does not necessarily result in lower investment returns compared to broad market investing

Considerations around **corporate social responsibility** in stock market portfolios **do not result in financial weakness**

Incorporating **ESG criteria** in security selection **does not lead to a loss of diversification**

Companies with **high ESG ratings tend to outperform the market** in the medium term (3-5 years), as well as in the long term (5-10 years)

The question of **whether socially responsible investment strategies outperform** traditional investment strategies **remains inconclusive**

The SRI studies **compare SRI strategy and traditional investment strategy** using index comparison, mutual fund comparison, hypothetical portfolios, and company performance to broadly conclude that **SRI does not result in lower investment returns**. For example, for Canada and the United States as well as globally, the **SRI index has offered similar performance to its comparable traditional index over time**[1]:

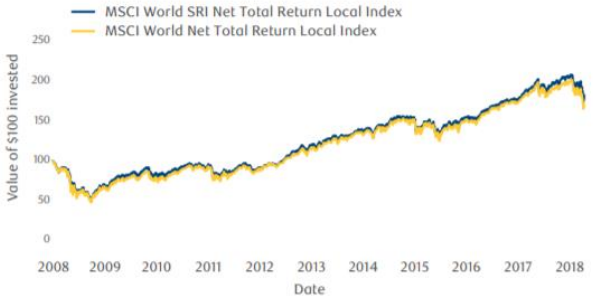
Figure 1: U.S. index comparisons
MSCI KLD 400 Social vs S&P 500

Source: Bloomberg (2019)

Figure 2: Canadian index comparisons
Jantzi Social vs S&P/TSX 60

Source: Bloomberg (2019)

Figure 3: Global index comparisons
MSCI World SRI vs MSCI World



Source: Bloomberg (2019)

Note: The **MSCI KLD 400 Social Index** was created in May 1990. It was the first index to **measure the performance of a broad universe of socially responsible stocks** in the United States.

[1]Source: RBC Global Asset Management (2019). This report looks at dozens of independent, third-party academic and industry studies, many of which themselves review hundreds of other studies.

Responsible Investing Update
Divestment Financial Justification

April 2020

Peter Smailes, Vice-President Finance & Operations

Dawn Jia, CEO, UBC IMANT

Introduction and Summary

Review of legal analysis received at February 2020 Board meeting:

- Legal opinion confirms path to divestment
- Divestment needs to be financially prudent
- Climate risk is material financial risk that can and should be considered by the Board
  - Need to obtain third party financial advice
  - Need to obtain financial advice on how best to reinvest divested funds
- Legal advice covers entire endowment

Financial Analysis

- UBC has requested and received 3 different reports:
  1. “Financial Risk of Climate Change in a Transition to a Low-Carbon World” by Mantle314
  2. “Risk and Portfolio Analysis on Divestment” by UBC IMANT
  3. “ESG Investing Landscape – Macro Analysis” by Deloitte

Financial Analysis – Mantle314 Report

- The link between climate change and financial viability of investment assets is clear
- Carbon intensive companies will be exposed to climate-related financial risks as society shifts away from fossil fuels
- Transition towards low-carbon economy may be faster and more abrupt and disorderly than previously thought
- There is a discrepancy between the amount of carbon emissions in current fossil fuel reserves and what would be allowed under the Paris Agreement. This is the “carbon bubble” and leads to the potential for stranded assets
- Viability of fossil fuel reserves and therefore value of companies that hold them are in question if Paris Agreement is to be met
- Climate change risk is not only confined to fossil fuel extraction companies

Financial Analysis – UBC IMANT Report

- Consistent with leading practice and UBC IMANT's expertise, adopted a four-pronged approach to financial analysis on divestment:
  1. Literature review and academic research on divestment
  2. Evaluating practical implementation considerations
  3. Conducting an investment return analysis of excluding certain sectors
  4. Performing quantitative analysis of broad-based global equity portfolio versus divested portfolios
- Results of analysis are consistent with practical observations that limited-scale constraints on public equity portfolios do not materially alter risk-return profile of the portfolio over the long run
- UBC IMANT Board endorses the risk and portfolio analysis and will incorporate the research into future asset mix studies

Financial Analysis – Deloitte Report

- Broad alignment between UBC's responsible investing framework and other peer universities
- Other universities have taken varying approaches and actions to execute on their ESG investing principles such as:
  - Integrating ESG into investment policies
  - Becoming signatories with SRI initiatives
  - Commitment to divestment
- Financial prudency is a consistent cornerstone across approaches
- Broad alignment among pension funds to integrate ESG factors into investment decision-making and policies
- Global shift towards ESG investing by investment managers

Next Steps – Divestment Plus

- UBC IMANT will manage the portfolio to move towards divestment goals while applying best practice responsible investing principles:
  - Develop “divestment plus” implementation plan
  - Review investment process and governance structure to facilitate plan
  - Become signatory to advocacy group such as United Nations Principles of Responsible Investing
  - Establish methodology for carbon emission measurements

- Update will be provided at June 2020 Finance Committee Meeting

Next Steps – Summary Project Progress

Summary of project progress to date:

Project Categories	Percentage Completion
1. Define the Scope of Divestment Plus	
2. Provide Financial Justification of Divestment	
3. Determine the Optimal Operating Model	
4. Review Governance Structure of On-going Divesting Decision Making	
5. Assess Limitations in Various Asset Classes	
6. Enhance Climate Risk Measurement and Reporting	
7. Investigate Cost Structure of Divesting Strategies	
8. Establish New Due Diligence Procedures and Criteria for Divestment	
9. Review Divestment Timeline and Sequence	
10. Assess Market Capacity and Manager Capacity for Divesting Strategies	