Climate Change Risk for Pension Funds & Financial Institutions
A Stress-Testing of The Global Capital Markets

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OSFI – Government of Canada

Response for Climate Change Risks and Net Zero Transformation

July 2021

July 19th, 2021
VIA EMAIL

Mr. Peter Routledge
Superintendent
Office of the Superintendent of Financial Institutions (OSFI)
Government of Canada
255 Albert St, Ottawa, Ontario, Canada, K1A 0H2

Re: Consultation - Climate-Related Risks in the Financial Sector

Dear Mr. Routledge

First let us congratulate you on your new appointment as Superintendent of OSFI. It is an exciting and critical time requiring transformational leadership in the Financial Services sector due to the challenges of transforming the North American and Global economy to Net Zero.

We are pleased to respond to the OSFI request for Consultation related to Climate Change Risk for Federally Regulated Pension Funds and Financial Institutions. The attached brings insights from over 50 years of combined experience in organization design, strategic leadership and incentive design practice and research as well as investment, risk and ESG (Environmental, Social, Governance) integration across both risk and value frameworks for institutional investors, corporations, and financial institutions.

We understand the complexity of the topics in relation to climate change and the financial sector and believe our recommendations and the findings of our Net Zero strategic analytics and previous hands-on capital markets and banking experience can help both highlight the urgent need for action from financial sector regulators as well as provide direction as to how OSFI and others in the Canadian financial services sector can provide strategic guidance to financial institutions such as Canadian pension funds and Canadian Banks, at this transformational time.

For the global economy to have a chance at transitioning to a Net Zero economy will take the will, might and coordinated efforts of the global capital markets. Never in history have we seen the need nor the urgency of that which is required today. Literally life on earth depends on it. We are now at a critical juncture. Regulators are key players in the global financial markets and can play a pivotal role in this needed transformation both by fulfilling their roles as supervisors and as early interveners. OSFI, today, has the opportunity to

play a crucial role as a forward-looking regulator, by supporting and guiding Canadian pensions as continued global innovators in the investment industry and the needed version 2.0 of the Canada Pension Model.

In collaboration with Credit Suisse HOLT®, and in response to public consultations from regulators in both Canada (OSFI), and the United States (the SEC), and for the UN Net Zero Asset Owners Alliance, we undertook custom analytical research and applied a carbon-shock stress test to over 11,100 global securities.

We found that firms with over $20 trillion of Enterprise Value are at material risk of a significant loss of value in the global capital markets and over 50% of that risk is in Canada and the United States. Additional details on this Business Model carbon stress-testing and Net Zero Transition "strategic analytics" by industry sector follows in the attached white paper.

The results from our Net Zero Transition Risk analytics are a critical wake-up call for U.S. and Canadian companies, company boards, pension funds as long horizon investors, banks, pension fund and bank regulators and securities regulators desiring to mitigate the real risks of another 2007/08 financial markets crisis that the attached analysis has identified.

The strategic framework outlined by net-negative.tech[1] identifies three stages and types of systems required for creating the net zero economy and the required critical key technologies that will enable: low carbon systems, zero emissions systems and carbon negative systems. "Different parts of the economy are likely to be at different points in their journey between these stages. The overall climate requires a balance: any activity that is still producing carbon must be offset by carbon absorbing activity elsewhere in order for net zero to be achieved."

New Performance Metrics for a Net Zero World

For companies, asset owners and asset managers, the lack of clear strategy and organizational alignment increases the possible risk of a carbon shock and material disruptions in both the real economy (as recently experienced by the COVID 2020 year) and in the capital markets. Firms need to understand their exposure to climate change impacts and risks, and their impact on climate change, to be able to make the needed strategic business model design change decisions and aligned strategic capital allocations decisions. It is not enough to simply report and disclose metrics and targets to an industry framework[2], firms need to have detailed transition plans in place including investment plans, transitional pathways, as well as guiding key metrics and incentive designs to get to Net Zero.

[1] Developed by Diana Fox Carney and Beatrice Lee, https://net-negative.tech/
[2] Such as the Task Force for Climate Financial Disclosures (TCFD) or Value Reporting Foundation (SASB)

A new set of metrics and incentive designs including new net zero enterprise performance metrics such as Tons of Carbon Produced per $Million in Revenues, Carbon-Adjusted Return on Capital (CAROC), Carbon-Adjusted Performance Spread (CAPS), and Net Zero Transition Cash Risk Ratios (TCRR)[3] are essential for both companies to help them identify risk exposures and gaps in their business model design but also for active and engaged investors for fundamental value analysis, assessments of business model value drivers, risk management, and investee company engagement which impacts long-term sustained company value creation and capital markets valuation.

Building on the above key strategic metrics, we propose ***a set of foundational questions***[4] that long horizon institutional asset owners, Board directors, fiduciaries, regulators and stakeholders should be asking of all companies/investments as we enter into a net zero global transformation together.

Capital Markets Stress Test Findings and Insights for Net Zero

Two foundational findings from our carbon stress testing of a sample of 1500 of the largest listed companies in North America, underscore the fact that (1) the "Race to Net Zero" needs ***better disclosures for investors and society at large*** - between 40 and 60% of key listed North American companies in each sector have not disclosed completely their GHG emissions,[5] and (2) ***better regulatory guidance and rules are clearly needed.*** Our research identifies that 38% of North American companies had higher emissions on average over the last 4 years than the previous 4 years, and of those companies that reduced emissions over the last 5 years, 25 % had reduced GHG emission by less than 7% per annum; thus together **63 % of North American listed companies and their recent performance results are not aligned to Net Zero goals or the interim milestones to 2030 that must be achieved for a Net Zero world.**

Following these findings, we analyzed global data from ISS and found that ***GHG metrics and targets are used less than 10% of the time in executive incentive design for listed companies, with the longest performance period for LTIP design at 3 yrs. or less for 90% of listed companies.*** Our previous research for CFA Chicago on metrics, incentive design and sustainability for North America's largest listed companies identified the same metrics and incentive design disconnect, and that they had been overwhelmingly voted "FOR" and approve by most of the major asset owners (including the largest Canadian pension funds) and the world's largest asset managers in their proxy and say on pay voting. To transition globally in the required time to a net zero economy, we cannot keep **voting for and approving metrics and executive incentive designs that lock in higher carbon business models in the real economy of the largest listed companies.**

[3] These metrics and methodologies are detailed in the the accompanying white paper.
[4] These are detailed in the accompanying white paper.
[5] Asset owners and asset managers need to pressure on regulators for new rules that require 100 % compliance on valid, reliable, and audited GHG emissions (scope 1/2/3) and their disclosures to all stakeholders.

The below ***five key findings and insights from our analysis*** which follows in detail, highlight the significant impacts from a carbon shock[6] and the fact that a large portion of Canadian and U.S. companies owned by Canadian Pension funds and or funded by Canadian Banks will need to undergo a business model transition, with some requiring a drastic transformation to achieve Net Zero business model outcomes and ideally positive returns on capital by no later than 2040 - 2050.

1) With the exception of the Energy sector, the global and North American capital markets appear to be mis-pricing a future rise in the price on carbon, possible carbon shock and COP26. Details on this by industry sector are included in the attached.

2) BEFORE a carbon shock, a significant portion of Energy (57%), Utilities (30%) and Materials (23%) companies had "failing business models" with a 3-yr. negative Economic Profit, a Return on Capital less than the Cost of Capital, and a very low / negative Future Value of the company, even though the majority of these Utility and Materials companies have had a positive 5-year Total Shareholder Return (TSR).

3) Within the same sector there can be a broad range of Business Model carbon intensity. For example, in North American Investor Owner Utilities Hydro One produces 69 Tons of CO2e / $ 1 million revenues, whereas NRG produces over 5,000 tons CO2e / $ 1 million revenues

4) After adjusting and stress-testing for a rising cost of carbon, a large portion of Energy (67%), Utilities (50%), and Materials (39%) companies have "failing business model" as measured by their Carbon-Adjusted Return on Capital (CAROC), Carbon-Adjusted Performance Spread (CAPS) and Future Value (FV). Details about key strategic insights from these findings are attached.

5) For all North American companies in our sample, 28% have a Net Zero Transition Cash Risk Ratio (TCRR) of less than 1, which means they do not generate enough internal cashflows to fund the net zero business model transition internally. Of these, 92% of Utilities, 67% of Energy, 11% of Materials companies will have to raise external financing.

As a significant number of companies (across many sectors) will require not just a business model transition, but a complete business model transformation to achieve Net Zero, one of the major overarching conclusions of our analysis was that ***the biggest risks to getting to a Net Zero economy are the gaps in organizational design, incentive design and strategic and transformational leadership capacity risk[7] at investee companies, asset owners and asset managers.***

[6]If the results show these significant and alarming impacts on a firm's business model using only one factor of climate risk (in this case, scope 1 & 2 carbon emissions), one can only imagine the exponential impacts when also including other climate change impacts. These include scope 3 emissions, the physical risks of climate change (acute and chronic) to a company's operations and supply chain, other transition risks such as policy changes and new technologies, as well as further material ESG issues such water use, biodiversity, and social issues such as impacts on workers and communities.

[7] Organizational structure and leadership capacity is a systemic risk for all companies facing a business model transformation. Senior leaders capable of transforming business models, are less than 5 % of the world's adult population.

Where OSFI must lead today

To live up to the mission and purpose of OSFI, we believe OSFI and other key stakeholders in the Canadian financial system and economy should be aware of our recommendations, stemming from both the results of Net Zero Business Model (NZBM) carbon stress tests and the new metrics that are available for effective business model transition risk management. These will help to:

1) Mitigate the risks of greenwashing and net zero washing within investment portfolios of pension funds.

2) Support an orderly evolution of the capital markets to a Net Zero real economy and protect pension plan beneficiaries, thus ensuring that pension plans remain in sound financial condition while enabling long horizon retirement capital as a Net Zero Business Model and economy driving force.

3) Ensure that OSFI is effectively auditing Pension Funds and Banks for the Net Zero alignment disconnects at Canadian financial institutions. This includes a review of the proxy voting, say on pay and say on climate policies and guidelines to ensure they are fit for purpose in their current design to accelerate the Net Zero transition of their investee companies.[8]

4) Ensure that OSFI has clear policies related to Pension Fund and Bank corporate governance, including the required "should be" new standard that at least 3 to 4 Board Directors / Trustees must have business model transformation experience or potential in their career paths, and the same with Pension Fund C-Suite leaders, along with valid and reliable "strategic leadership" assessment processes, and tools for leadership potential / risk evaluation and performance management.

By understanding these key risks and taking concrete actions now, OSFI can require pension funds and financial institutions to identify, assess, report on, and manage the risks within their portfolios, thus supplementing their current risk management practices with carbon-adjusted performance metrics and "strategic and transformational leadership" assessments more thoroughly.

Where OSFI must lead tomorrow

We believe the time is opportune to transition to a **Version 2.0 of the Canada Pension Model.**

OSFI can play a critical role in the design of the 2.0 Canadian Pension Model and support and guide the pension funds as larger asset owners, legal fiduciaries, global leaders and innovators in creating a new model for sustainable capitalism.

[8] Our recent review of the current proxy and say on pay voting policies and guidelines of the 10 largest pension funds in Canada, found that, while effective for a different time, are not aligned today with a Net Zero future and as currently disclosed will hold back the transition to a net zero economy

To do so requires **3 crucial elements**[9]**:**

(1) New Pension Fund Governance Model

(2) New Accountability Design, Incentive Design and Enterprise Risk Model

(3) New Active Ownership, Forceful Stewardship Model and Organization Design

Details on all the above are included in the attached consultation paper.

We believe the results from our Net Zero Transition Risk analysis as well as the recommendations we put forth in this data-driven evidence-based white paper are of utmost importance to long-horizon asset owners such as pension funds, Board directors, as well as to OSFI as the federal regulator of Canadian pension funds, banks and the Canadian financial system.

The evidence on climate change is clear, but the risk management and investment management practices to succeed are not. It takes brave and bold first movers to be able to create the transformational path forward to a net zero global economy.

Just as climate change is not carbon-centric the Net Zero transformation cannot be relegated to any one nation and performed in isolation. Together the United States and Canada, bound by more than just geography can form a powerhouse duo to catapult the North American economy to a leading global position in real economy innovation, capital markets innovation, and global competitiveness that in turn leads the world in the transformation required to a Net Zero economy for future generations.

OSFI is ideally placed to provide the level of strategic guidance and direction to Canadian pension funds and Canadian banks as continued global leaders and innovators in capital allocation and as founders of a new model for “sustainable capitalism”.

We look forward to answering any questions you, the OSFI leadership team, and other key stakeholder in the Canadian financial system may have regarding the implications for regulators and capital markets risk and risk for Canadian Pension Funds and Financial Institutional as we address the questions in the OSFI request for Consultation related to Climate Change risk. Our contact information is in the biography section of this report.

With Best Regards,

Mark Van Clieaf, Managing Director, FutureZero, and Tamara Close, Managing Director, CGC

[9] Details can be found in the accompanying whitepaper

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PART 1: Context

Before providing our responses to the questions from OFSI, we wanted to provide some context and background to our analysis and responses. This includes an overview of the findings of analytical research and stress tests that we performed to identify and quantify certain climate change transition risks of global and more specifically North American companies and capital markets.

Climate change, and in particular the needed transition to a carbon neutral or Net Zero economy with a view to limiting global warming to 1.5°C, is a thematic force that will reshape and completely transform the global and Canadian economies and their critical high GHG emitting sectors including Mining, Materials, Energy, Utilities, Agriculture and Transportation sectors.

Doing so requires nothing short of a total transformation of the world's energy systems that underpin our fossil fuel-based economies and the last 150 years of economic development. We are in a critical year at the start of a critical decade for these efforts. The 26th Conference of the Parties (COP26) of the United Nations Framework Convention on Climate Change in Glasgow in November is the focal point for strengthening global ambitions and action on climate by building on the foundations of the 2015 Paris Agreement.

While much literature has been published on the need to get to a low or net-zero global economy, there has been little evidence on the actual value at risk for companies in terms of the impact of a cost of carbon (GHG emissions) on the return on invested capital as well as for the total risk adjusted returns on investment portfolios.

The Need for a New Measurement Model in a Net Zero World

It became abundantly clear to us as we searched for metrics and methodologies to be able to evaluate the exposure of a company's business model to carbon and related regulatory risk and to evaluate a company's ability to transition to net zero, that the investment industry is undergoing a paradigm shift. Metrics such as Total Shareholder Return (TSR) are no longer sufficient or suitable in a transitioning economy. To be able to effectively identify risks and opportunities within companies, industries, and sectors, requires a whole new set of performance metrics, methodologies, and a shift in mindset in performance measurement and pay for performance based on value creation for shareholders and value creation for society as a whole.

As Board directors evolve their understanding of their companies' strategic risks including exposures to carbon risk and the transition to a low carbon global economy, and as companies pivot, transition and in some cases completely transform their business models, the investment industry needs to be able to thoroughly understand the operating drivers of investee companies and how they are truly creating value. **These new "carbon-adjusted" performance metrics are needed to manage risks, strategically allocate capital, and leverage opportunities but also to engage and create value within investment portfolios, effectively building a bridge between the operating companies and institutional investors. A new multi-dimensional value creation paradigm is evolving for climate savvy boards, companies, and investors, which goes beyond just a shareholder value paradigm.**

In this paper we identify new metrics and methodologies as well as present the results of our analytical research to identify the enterprise value at risk for a transition to a net-zero economy. We also discuss the critical role that both Board directors and institutional investors must play to urgently support the transition of the global economy to net-zero GHG emissions.

Methodology for new carbon-adjusted metrics

The world of Net Zero Business Models (NZBM) will require the use of new performance metrics that have rarely or never been used by companies to measure Enterprise performance, top officer performance and the alignment with long term incentive plans (LTIP). In searching for new metrics that could be used by investee companies, we reviewed the published guidelines, methodologies and metrics advocated by a number of organizations. These included: TCFD, VRF/SASB, S&P Global, MSCI, UN Net Zero Asset Owners Alliance-2025 Target Setting Protocol, UN PRI Climate Accounting Reporting Project, GHG Accounting and Reporting Standards for the Finance industry, Climate Action-100, GHG Reporting Protocol, Carbon Tracker, CDP, Sustainalytics / Morningstar, and the Network for the Greening of the Financial System (NFGFS). This review also included over 50 SEC comment letters related to ESG and climate related disclosures that advocated for mandatory disclosures. These comment letters included responses from Blackrock, State Street, Calvert, ICGN, CII, Ceres, LGIM, World Economic Forum, Climate Disclosures Standard Board, Hermes, Schroders, CALPERS, CALSTRS, CPPIB, Norges, FCLT, to name a few.

The overall industry consensus is that to determine how much GHG[1] has been generated and released into the atmosphere, companies need to disclose their GHG emissions completely and 100% across their entire business model / business system: from the upstream sourcing of materials to the downstream delivery, end-users and even the recycling of a product. This covers what is universally recognized as scope 1, 2 and scope 3 GHG emissions. Also required is the disclosure of the absolute GHG reduction targets (short, mid, and long-term) and dates for these targets.

Some market participants have advocated for more investment-oriented metrics such as the Enterprise Value or Market Capitalization adjusted for the carbon emissions of the issuer. This then extends to a metric such as the Weighted Average Carbon Intensity (WACI) of an investment portfolio. Others have suggested relative carbon intensity metrics for the business model as measured by CO2e Tons / Enterprise Value or CO2e Tons / $ 1 million of revenues. There is also the disclosure of Zero Emission Revenues vs GHG Emission revenues. Some organizations have gone deeper into the income statement to calculate a carbon adjusted earnings at risk performance metric[2]. While compelling from an investor's point of view, we felt that many of these metrics would not be relevant for Board directors at investee companies who need to evolve their understanding of their companies' strategic risks and opportunities including exposures to carbon risk and their risks due to the global transition to a net zero emission global economy.

Building on the foundations of finance and business strategy, we started to conceptualize the need for new generic carbon adjusted performance metrics, such as a Carbon Adjusted Return on Capital (CAROC) that could be created, measured, and disclosed by issuers. The Carbon fee cost on the income statement could result in a Carbon Adjusted Net Operating Profit After Tax or CA-NOPAT. This CA-NOPAT could then be transformed into a Carbon Adjusted Return on Capital (CAROC) measured as:

Carbon Adjusted NOPAT / Invested Capital = Carbon Adjusted Return on Invested Capital (CAROC)

[1] GHG emissions are usually disclosed as CO2e Tons of Carbon

[2] This starts with the current operating performance of the business model as measured to the EBITDA or EBIT performance level, and then based on carbon pricing (current or future risk) and the current carbon disclosures by issuers, the adjusted and stress-tested earnings at risk due to a carbon price increase is calculated.

This CAROC metric as an integrated performance measure could then be extended further to also include a fully loaded performance metric (the full Monty) of the Returns on Capital after cost of capital and after cost of carbon and could be called a Carbon Adjusted Performance Spread (CAPS).

This new generic carbon adjusted performance metric could be measured as:

Carbon Adjusted Return on Capital – Weighted Average Cost of Capital = Carbon Adjusted Performance Spread (CAPS)

In the new world of Net Zero, these new carbon adjusted metrics could be the new true north of a multi-capital value creation model[3]. Companies, their executive officers, and total workforce would then not be seen as having created true value for customers, shareholders and society UNLESS ***their performance clears the double thresholds of a return on capital greater than the cost of capital and also including the full cost of carbon imputed into the income statement and returns on capital, including net zero emission new R&D and new CAPEX***.

In our search for a partner who might have similar carbon adjusted performance data and analytics already imputed, we reached out to our many contacts globally in both the investment banking community and at financial data providers. We discovered that Credit Suisse HOLT® had, over the last 5 years, undertaken some leading-edge financial analysis and model building to identify how to measure long-term investee company performance and carbon adjusted performance. The Credit Suisse HOLT® model is a unique and proprietary model for assessing company performance, returns on capital, and warranted value of the company using a life-cycle approach to innovation, returns on capital, fade of returns on capital all underpinned by a discounted cashflow and inflation adjusted company valuation model.

Thus, our conceptualized and generic performance metric which we named Carbon Adjusted Return on Capital (CAROC) had a derivative version that was already being deployed by Credit Suisse HOLT® called the “Carbon Adjusted – Cash Flow Return on Investment” or CA-CFROI.

Our generic Carbon Adjusted Performance Spread (CAPS) also had a very similar derivative metric being deployed by Credit Suisse HOLT® called “Carbon Adjusted – CFROI – Discount Rate spread”.

While our generic Carbon Adjusted performance metrics of CAROC and CAPS are not exactly the same as the proprietary Credit Suisse HOLT® carbon adjusted performance metrics, they were close enough in measurement outcome and followed the same business strategy, finance and capital allocation principles like the company life cycle and returns on capital life cycle, that we believed were imperative to use. We therefore decided to collaborate with Credit Suisse HOLT® for this empirical research study and the carbon shock stress testing of the global and North American capital markets. We have yet to find any other investment bank or financial data provider that is as far advanced in their thinking about the new world of carbon adjusted performance and pay for performance than the global team at Credit Suisse HOLT®.

In the balance of this white paper, we use the generic new term Carbon Adjusted Return on Capital (CAROC) and Carbon Adjusted Performance Spread (CAPS), which in this case refers to the proprietary versions of these generic metrics and transformed data as provided to us from Credit Suisse HOLT®. We used the Credit Suisse HOLT® version because they had far better coverage of

[3] See the MultiCapital Scorecard, a new performance accounting method which makes it possible to measure, manage and report Triple Bottom Line performance relative to organization specific norms for impacts on multiple capitals. https://www.multicapitalscorecard.com

global securities than most and because we felt their approach to inflation adjusted assets and fade adjusted returns on capital is probably one of the best models in the industry for such performance modeling and carbon adjusted cashflow stress-testing.

Working in close collaboration with Credit Suisse HOLT® we present results from a bottom-up quantification of the scale and risk of a net zero transformation in the global capital markets with a specific emphasis on the North American markets, to determine which firms are most at risk from the transition to a net zero global economy. We did this by stress-testing a rise in carbon prices, a possible carbon shock scenario, and the impact on returns on capital for a sample of over 11,100 listed global companies.

The cost of carbon, in its ability to be quantifiable (we can actually observe a market price for carbon) is one metric that has been used extensively when attempting to model the impacts of climate change on an investment or investment portfolio.

The intent of this consultation comment paper for OSFI is not to provide evidence that a carbon shock will happen but rather to stress-test what would be the consequences on global and North American listed companies and their performance if a "Carbon shock" were to happen.

Whether there is a carbon shock or not, it is generally accepted that the price of carbon will most probably rise throughout the world given the various scenarios and legal commitments that are being observed in the capital markets. Canada for instance is set for a carbon fee of $170 / ton CO2e by 2030[4]. The passing of the Net Zero Accountability Act by the Government of Canada at the end of June 2021, furthers the "ALL IN" position and related targets and commitments being made by Canada, and it's related federal ministries and regulatory bodies such as OSFI. This includes the Minister of Finance who has legal authority to appoint Trustees to the Board of the Canada Pension Plan Investment Board (CPPIB).

Climate change is not just a carbon centric issue but is a business model design, business strategy and risk management issue. Board directors at investee companies and Board Trustees at pension funds, in their roles as fiduciaries, need to provide strategic oversight to evaluate and help guide / transform these investee companies to net zero business models (NZBM), and as such, help create NZBM eco-systems and industry structures. Institutional investors, and in particular, large global investors with long-term capital can drastically and permanently transform the transition to Net Zero with a new type of investment model – one that is founded on long-term investment horizons, systems level investing, beta activism and strategic engagement.

We believe the Canadian Pension funds can play a critical role in this historical transition. As sophisticated investors and stewards of long-term patient capital, they could implement this new type of investment model as well as develop and effectively deploy "strategic engagement" capabilities with companies to enable this total systems transformation and help shape this journey.

Main Findings[5]

Two foundational findings from our carbon stress testing of a sample of 1,500 of the largest listed companies in North America, underscore the fact that (1) the race to Net Zero needs ***better disclosures for investors and society at large*** - between 40% and

[4] The Net-Zero Asset Owners Alliance (NZAOA) (with over $6 trillion in AUM) recently advocated for a carbon price floor of $147 by the early 2030s. Carbon is currently trading around $60 in the EU/UK.

[5] This section provides an overview of some of the main findings of our research. For more detailed methodology and findings please see Appendix 2- Summary of Our Analytical Research.

60% of key listed North American companies in each sector have not completely disclosed their GHG emissions,[6] and (2) ***better regulatory guidance and rules are clearly needed.*** Our research identifies that 38% of North American companies had higher emissions on average over the last 4 years than the previous 4 years, and of those companies that reduced emissions over the last 5 years, 25% had reduced GHG emission by less than 7% per annum; thus together 63 % of North American listed companies are not aligned to Net Zero goals or the interim milestones to 2030 that must be achieved for a Net Zero world[7].

Following these findings, we analyzed global data from ISS[8] and found that ***GHG metrics and targets are used less than 10% of the time in named officer incentive designs, with the longest performance period for LTIP design at 3 yrs. or less for 90% of listed companies.*** These incentives have been overwhelmingly approved by most of the major asset owners (including the Canadian pension funds) and asset managers in their proxy and say on pay voting. To transition globally to a net zero economy in the required timelines, ***Boards and institutional investors cannot keep voting for, and approving, higher carbon business models in the real economy, for the largest listed companies.***

Our cross-sector analysis[9] in collaboration with Credit Suisse HOLT®, showed that 27% of firms (equivalent to more than 3,400 listed companies) in our global sample (of over 11,100 listed companies) saw a 5% or greater decrease in their return on capital when their business models are stress-tested at a $75 / ton price for carbon (CO2e), based on current business performance and current disclosed GHG emissions (using only scope 1 & 2 data). Not surprisingly, sectors such as Energy, Utilities and Materials had between 64% and 75% of companies impacted negatively by a carbon price shock of $75 / ton CO2e (scope 1 & 2). Overall companies with over US$20 trillion in Enterprise Value (EV) had significant negative impacts on their return on capital.

A 5% or greater decline meets the test of "materiality" under securities law in many jurisdictions, and thus Directors and Officers are therefore required to disclose the risks to shareholders[10].

For the companies that were most impacted worldwide from a $75 / ton price shock for carbon, over 50% were in North America. We therefore undertook a second analysis of over 1,500 of the largest companies in Enterprise Value in North America. This time we stress-tested at $100 / ton CO2e, using scope 1 + 2 emissions data. This was a logical price shock in our view given that Canada is scheduled to go to $170 / ton carbon fees by 2030.

Within our North American sample, 46% of the Utilities sector were companies that had business models that were highly sensitive to carbon[11] yet also had positive Future Value (FV) which suggests that the capital markets may not be integrating future carbon and regulatory risk in the Utilities sector into company valuations, future returns on capital, and discounted cashflows.

[6] Asset owners and asset managers need to pressure on regulators for new rules that require 100 % compliance on valid, reliable, and audited GHG emissions (scope 1/2/3) and their disclosures to all stakeholders.

[7] According to a recent study by MSCI (https://www.institutionalassetmanager.co.uk/2021/07/12/303243/listed-companies-have-less-six-years-align-15degc-warming-target-inaugural-msci), the world's publicly listed companies must dramatically accelerate climate action if the 1.5C warming target set out in the 2015 Paris Agreement is to be met. Emissions levels are still where they were in 2013.

[8] Institutional Shareholder Services

[9] For details on the analysis, including methodologies and data sources, please contact Mark Van Clieaf at MarkVC@FutureZero.com

[10] See SEC definition of materiality.

[11] Defined as companies over 50 tons of carbon emissions (CO2e) per million dollars of revenue

Within the North American Energy sector, 73% of the companies had negative FV and had high carbon business models, suggesting that the capital markets are effectively pricing in carbon risk and these companies may be recognized by the capital markets as companies with high transition risk / transformation risk.

After adjusting for a cost of carbon and stress test at $100 / ton CO2e, we found that 93% of Utilities end up with a negative Carbon Adjusted Return on Capital (CAROC)[12]; and a Carbon Adjusted Performance Spread (CAPS)[13];. However, most had positive Future Value (FV) and positive 5-year Total Shareholder Return (TSR). The majority (87%) of Energy companies had a negative CAROC, and 86% also had a negative CAPS. More than half the Energy companies by contrast had a negative 5-year TSR.

Upon further investigation, we found that 93% of the Utilities companies do not currently generate positive internal cash flows to fund any transition to a low or a net zero business model design, hence external financing will be required. This was measured using the Net Zero Transition Cash Risk Ratio (TCRR)[14]. 72% of the Energy companies do not currently generate positive internal cash flows to fund any transition to a low or a net zero business model design, hence external financing will be required.

Therefore, from our findings, even though the majority of the Utilities companies in our sample seem to be at significant risk from a net-zero transition and do not currently generate positive internal cash flows, they have created positive shareholder value and the capital markets seem to still be expecting positive future value (FV) and future positive returns on capital for these companies and this sector. This may be indicative that the capital markets have not been pricing in a rising price of carbon for Utilities companies and are not pricing in a future carbon risk for the Utilities sector, all else being equal. In contrast, the capital markets seem to be expecting and pricing in a negative future value (FV) for the majority (75%) of North American Energy companies. These have also generally had negative shareholder returns, implying that the markets may be pricing in current and future carbon risk for the Energy sector, all else being equal.

Climate Change and Business Model Risk is Not Only About Disclosures

For companies, asset owners and asset managers, the lack of clear strategy and organizational alignment increases the possible risk of a carbon shock and material disruptions in the real economy (as recently experienced by the COVID 2020 year) and in the capital markets. Firms need to understand their exposure to climate change impacts, and their impact on climate change, then make the needed strategic business model decisions and strategic capital allocations decisions. It is not enough to simply report to an industry framework[15], firms need to have transition plans in place[16],

[12] FutureZero has many treatments for cost of carbon impact on financial statements and company valuation; this study uses Credit Suisse HOLT's proprietary CA-CFROI, where CA-CFROI = Credit Suisse HOLT Carbon Adjusted – Cash Flow Return on Investment.
[13] FutureZero has many treatments for cost of carbon impact on financial statements and company valuation; this study uses Credit Suisse HOLT's proprietary calculations for Carbon Adjusted CFROI – Discount Rate Spread, where CA-CFROI-DR Spread = HOLT Carbon Adjusted CFROI – Discount Rate = a return on invested capital after cost of carbon and cost of capital.
[14] Calculated as the ratio of key cash expenses for R&D, CAPEX, SGA and cash financing (interest and dividend payments) relative to gross cash flow using data from Morningstar / Sustainalytics and S&P Global (Compustat and CAPIQ). We also analyzed the 3-year cumulative new CAPEX investments with many investments being made with failing business models with negative returns on capital.
[15] Such as the TCFD.
[16] As noted in Mark Carney's new book "*Value(s): Building a Better World for All*" Random House Canada Limited, 2021, and in Larry Fink's latest letter to CEOs.

While the disclosure of climate-related financial risks can certainly help investors assess companies' climate change risks, what is of crucial importance, is how the company is managing these risks not solely what they are reporting. Voluntary disclosures such as those based on the recommendations of the Task Force for Climate-related Financial Disclosures (TCFD) are being "hailed as an effective measure for better climate risk management". A recent academic study[17] uses a deep neural language model to determine whether this expectation is justified[18]. The authors conclude that the firms' TCFD reporting is "mostly cheap talk and that firms cherry-pick to report primarily non-material climate risk information". The authors conclude that "the only way out of this dilemma is to turn voluntary reporting into regulatory disclosures." [19]

The Goal of Net Zero

Beyond the multitude of global agreements that have taken place since COP25 and the Paris Accord, the number of countries announcing commitments to achieve net-zero GHG emissions over the next 20 and 30 years continues to rapidly accelerate. Today, nine out of the ten largest economies of the world have now set ambitious targets to reach their Net Zero pledges in the coming decades (see Figure 1). This translates into trillions of dollars of investment, and this will result in numerous industries that will inevitably be restructured. While this will undoubtedly create opportunities (for instance with the advent of new technologies and solutions), it will also massively disrupt certain sectors of the economy.

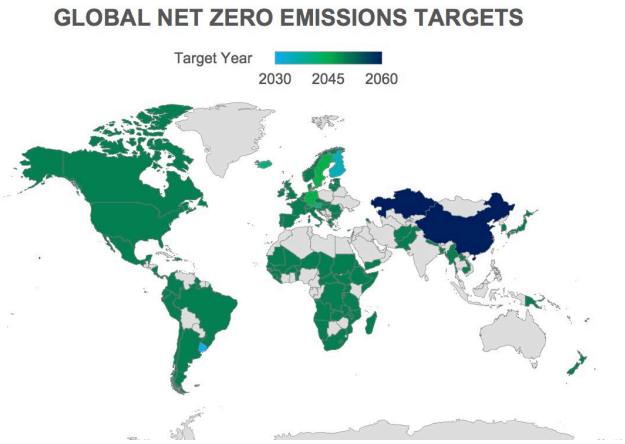
The goal of Net Zero is more challenging for Canada and its citizens than any other OECD developed country, because Canada has the highest per capita carbon emissions among the G20[20] countries and because the number one global export is Oil & Gas (23% of Canadian exports). While Canada may hold the third largest reserves of oil in the world, these are mainly low-quality oil (tar) sands which are inherently energy and emissions intensive to extract, and high cost to refine.

Canada hence finds itself on the wrong end of the quality and cost curve for hydrocarbon energy reserves for the world.

[17] Bingler, Julia Anna and Kraus, Mathias and Leippold, Markus, Cheap Talk and Cherry-Picking: What ClimateBert has to say on Corporate Climate Risk Disclosures (March 2, 2021). Available at SSRN: https://ssrn.com/abstract=379612
[18] They call their model "ClimateBert" and analyzed the disclosures of TCFD-supporting firms.
[19] Ibid.
[20] William Carroll, Fossil Capitalism, Climate Capitalism, Energy Democracy; The Journal of the Society of Social Studies, 14(1) 2020

Figure 1: *Net-Zero targets per country*[21]

	Target Year
Canada	2050
China	2060
European Union	2050
France	2050
Germany	2045
Italy	2050
Japan	2050
South Korea	2050
United Kingdom	2050
US	2050



While all sectors will be impacted either directly or indirectly, to truly achieve a net-zero global economy, the heavy GHG emitting industry sectors and companies such as those in the Energy, Utilities sector, as well as Mining and Materials will need to pivot, adapt, and for some, significantly re-design their business models. For others, the companies should plan for winddown.

Some higher emitting companies currently have assets on their balance sheet that are at risk of becoming stranded and may be subject to complete write downs in value. Stranded assets associated with a carbon neutral, or net-zero transition are unique in that they are not strictly driven by technological innovation, but rather by a need to limit carbon emissions to mitigate the worst effects of climate change[22]. This underlines the need for global pathways that explore what would need to happen to the fossil fuel energy sector (both from a global and North American perspective) to achieve net-zero emissions by 2050.

In line with an official request by the COP26 Presidency, the International Energy Agency (IEA) recently released a report[23] "Net Zero by 2050 – A Roadmap for the Global Energy Sector" providing the first comprehensive Energy sector pathway towards global net-zero emissions by 2050. The IEA landmark report assesses the policy requirements, the deployment and innovation needs, the necessary investments, the economic benefits, and the wider implications for the world of getting to Net Zero for the energy sector and beyond.[24]

The global energy system is currently dominated by fossil fuels. As demonstrated within the IEA report, in 2050 the global energy system needs to be dominated by clean energy. To get to Net Zero by 2050, in line with a 1.5°C economy, more than 400 milestones were identified to help monitor whether countries are on or off track. As of this year (2021), these critical milestones include:

[21] Source: KKS Advisors (www.kksadvisors.com), adapted from: Energy & Climate Intelligence Unit., (2021), Net Zero Emissions Race, https://eciu.net/netzerotracker
[22] Olaf Weber, Truzaar Dordi, and Adeboye Oyegunle, Stranded Assets and the Transition to Low-Carbon Economy, Sustainability and Financial Risks, Palgrave Studies in Impact Finance, https://doi.org/10.1007/978-3-030-54530-7_3
[23] https://iea.blob.core.windows.net/assets/ad0d4830-bd7e-47b6-838c-40d115733c13/NetZeroby2050-ARoadmapfortheGlobalEnergySector.pdf
[24] https://www.youtube.com/watch?v=WQ5HsTyU_5Q

- No more fossil fuel supply capital expenditure (CAPEX) investments (oil, gas, and coal)
- No more construction of unabated coal fired power plants

As of 2035, milestones include:

- No new sales of internal combustion engine (ICE) vehicles

In addition, by 2040:

- The electric power systems of the world must be 100% clean and carbon neutral electric power

The sobering and exhaustive report and related energy systems modeling from the IEA highlights what needs to happen, and by when, to get the global energy system to Net Zero. This challenge is further compounded by the fact that that many of the largest electric public power utilities owned by cities and sovereign nations around the world do not disclose their GHG emissions to the CDP[25]. This includes the largest public power producers in China and most of the members of the American Public Power Association (comprising 1400 public power utility members)[26].

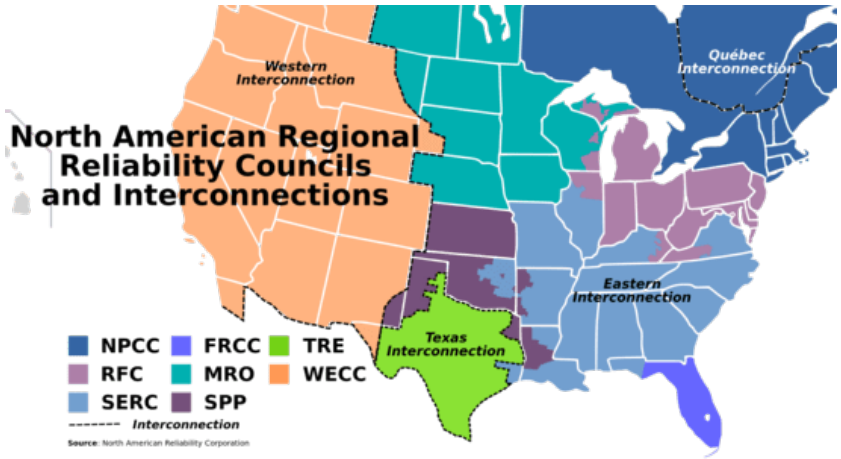
Specific challenges for North America

An additional challenge in North America is the interconnectedness and interdependence of the electric power grid. For instance, if Ontario and Quebec, which together are 96.5 % clean power, as members of the Northeast Power Coordinating Council (NPCC), flipped the off switch, the lights would go out in Washington, D.C and New York City. The electrical power grid is a North American integrated power system and the electrons do not stop at either U.S. or Canadian Customs for entry (see Figure 2).

The American power generating capacity as of March 2021, is still 66.9% fossil fuels (natural gas, coal, and fuel oil), and permitted new capacity to be built is still 35% natural gas power generation. The risk of stranded assets in many of these utilities is high in light of the IEA's new 2050 Net Zero scenario and their milestone of 100% clean power for the world by 2040. More importantly is President Biden's new goals to create a carbon pollution-free power sector by 2035 and net zero emissions economy by no later than 2050[27].

[25] Previously known as the Carbon Disclosure Project (www.cdp.net). CDP is a not-for-profit charity that runs the global disclosure system for investors, companies, cities, states and regions to manage their environmental impacts.
[26] One of the authors of this OSFI report has been an advisor over the last 30 years to the Boards and C-Suites of some of the largest electrical utilities in the world, including those with Nuclear power; https://www.publicpower.org/our-members; https://www.publicpower.org/resource/americas-electricity-generating-capacity
[27] https://www.whitehouse.gov/briefing-room/statements-releases/2021/04/22/fact-sheet-president-biden-sets-2030-greenhouse-gas-pollution-reduction-target-aimed-at-creating-good-paying-union-jobs-and-securing-u-s-leadership-on-clean-energy-technologies/

Figure 2: *Interconnectedness of the North American power grid*[28]



Climate Change: A Business Model Design and Strategic Transformation Issue

Climate change is not just a carbon centric issue. It is a business model design and strategy issue, and Boards need to take notice.

A recent PwC analysis[29] shows that as of February 2021, "only about 8% of the world's largest companies represented by the Global Fortune 500 have pledged to become net zero". Another concerning statistic was that "27% of CEOs report being 'not concerned at all' or 'not very concerned' about climate change". In addition, "60% of CEOs have not yet factored climate change into their strategic risk management activities." Even more surprising is that these companies tend to be in countries with the most exposure to, and the largest contributors of, CO2 emissions.[30]

These sobering statistics mean that a majority of companies will be left out of the required climate action and required business model transformation planning, imperiling the ability to transition globally to a Net Zero economy.

Climate change is not something that can be simply delegated to a Chief Sustainability Officer or other C-Suite staff member. All companies and their business models will be impacted by climate change either directly or indirectly and this means that for certain companies, climate change is a business model risk and strategic issue that needs to come under the purview of the entire Board and their fiduciary and strategic duty.

Boards need to provide strategic oversight to business model transformation.

[28] Source: North American Reliability Councils
[29] https://www.pwc.com/gx/en/issues/reinventing-the-future/take-on-tomorrow/business-achieving-net-zero.html?icid=feature-lnk-tot
[30] ibid

Measuring the impact from sustainability risk is inherently difficult. Data and reporting processes are critical to evaluate the ability of a company to transition to Net Zero. To be equipped to tackle the previously never before seen issues related to a global transition to a 1.5°C economy, and as part of the Net Zero transition, it is critical for Boards of directors of investee companies to be armed with sufficient relevant data, analytics, and business strategy insights from which to make strategic oversight and Board approval decisions. This includes deciding if the board has selected the right CEO to lead business model transformation. Directors therefore must ensure that their companies put in place the appropriate and relevant processes, data, information, and reporting systems to evaluate the ability to transition to Net Zero (see Table 1). While Directors will require a certain level of knowledge about climate change (and ESG issues in general)[31], of critical importance is their ability to be able to translate these issues into risks and opportunities for their companies' business models.

Three essential steps for Boards to take

The climate crisis and the transformation to net zero business models and industry sectors will require the majority of companies to fundamentally revisit their business strategy and business model design.

A first step is to ensure the Directors have complete visibility into the GHG emissions of the firm and its current business model including scope 1, 2 and 3 emissions. A second critical step is to then identify the risk to the business model if there was a carbon price shock. The third step is then to undertake a life-cycle review of the Business Model to determine where it is currently positioned on the lifecycle of competitiveness, innovation and returns on capital. This analysis requires a process to analyze and plot a firm's Future Value relative to its operating competitive advantage by using such metrics as economic profit.

Based on the results of

1) the carbon analysis (including foot printing, carbon intensities, etc.)

2) the stress testing of the current business model at, say a $100 per ton CO2e carbon pricing, and

3) the Life-Cycle review

Directors should then be able to determine the scope and scale of business model transformation required to achieve Net Zero. Directors should also ask to benchmark all these key performance metrics relative to the median of their GICS industry sector and peer group for a relative performance comparison.

[31] While there are several preparation courses available to increase the knowledge level of Board directors on ESG issues and climate change. However, on their own, these are not sufficient for a Board member to be able to understand the business model specific risks of their companies. To do so, Board directors need to become experts in the underlying business models of their companies, their related value drivers and value destroyers and be equipped with the right metrics and data to be able to do so.

Table 1: *Decision critical Board analytics and reporting to assess a company's ability to transition to Net Zero*

Decision critical data to assess ability to transition to Net Zero	Time frame
Return on Invested Capital or similar such as HOLT CFROI	1,3,5,10 yr.
Carbon Adjusted Return on Capital (CAROC) or similar such as HOLT CA-CFROI	1,3,5,10 yr.
Weighted Average Cost of Capital or HOLT Discount Rate	1,3,5 yr.
Tons of Carbon Emissions / Million Dollars of Revenue	1,3, 5 and 10 yr.
Absolute GHG emissions	1,3,5,10 yr.
GHG reduction targets	e.g.: 50% reduction targets to 2030
Future Value % of EV	Current and past 3 to 5 yrs.
Net Zero Transition Cash Risk Ratio (TCRR)	1,3,5,10 yr.

To achieve this critical data and net zero business intelligence (NZBI), and to evaluate a company's ability to transition to Net Zero, the following core processes need to be put in place (see Table 2).

Table 2: *Critical Board approved processes to evaluate the ability to transition to Net Zero*

Critical Board approved process to evaluate the ability to transition to Net Zero	Outcome
Review of the life cycle of innovation, capital allocation and returns on capital	Current and Future value of the business
C-Suite succession planning processes and tools for assessing the current and future potential to Innovation Zones 5/6/7 for CEO / C-Suite roles – transformational leadership capacity	Insight into the ability of the current and future CEO / C-suite to transform the business model to Net Zero
Business strategy: 5,10,15+ yr. Net Zero business model design, key performance metrics aligned to strategy, R&D and CAPEX plans to transform the business model to Net Zero	Business plan and capital allocation that is needed to transform the business to a Net Zero business model
Enterprise performance metrics / targets and MTIP and LTIP incentive designs over 5-7 years – aligned with the business strategy and business model design to Net Zero	Aligned incentives to transition the business to Net Zero

The above data and processes comprise some of the critical information and structure needed for Directors to exercise their business judgement, to evaluate and to guide / transform a business to a low or net zero business model (their "strategic duty").

Members of the Judiciary have suggested that **if three or more of the above core board processes are missing, this represents a "systemic breach of strategic duty"**[32] and Directors may be found in breach of their Fiduciary Duty, including Duty of Care and Duty of Loyalty to the enterprise and long horizon shareholders.

[32] Mark Van Clieaf, "New Liabilities for Compensation Committees", The Corporate Board, Jan/Feb 2005

Organizational structure and leadership Capacity is a Systemic risk for all companies facing a business model transformation.

Organizational risk to these firms includes:

- A lack of alignment of organizational structure, allocation of capital that aligns to the Organizational Lifecycle, and key performance metrics / targets with a Net Zero Business Model transformation.
- A gap in the talent pool for the number of required strategic leaders with business model transformational experience or potential for C-Suite roles or Board of Directors.

If the analytical results show these significant and alarming impacts on a firm's business model using only one factor of climate risk (in this case, scope 1 & 2 carbon emissions), one can only imagine the exponential impacts when also including other climate change impacts. These include scope 3 emissions, the physical risks of climate change (acute and chronic) to a company's operations and supply chain, other transition risks such as policy changes and new technologies, as well as further material ESG issues such water use, biodiversity, and social issues including impacts on workers and communities.

Within this paper we present a methodology to identify where a company is positioned within the lifecycle of innovation and returns on capital when adjusting for an increase in the cost of carbon and a carbon shock for many. This will be critical for Boards and investors to understand so that they can both identify how exposed a company is to net-zero business model (NZBM) transition risks, as well as the level of probability and Carbon Adjusted Returns on Capital (CAROC) that the company can actually transition to given the current business model and organizational leadership (For further details, see Appendix 1).

We believe the results from our Net Zero Transition Risk analysis as well as the recommendations we put forth in this paper are of utmost importance to long-horizon asset owners such as pension funds, Board directors at investee companies, as well as to OSFI as the federal regulator of Canadian pension funds, banks, and the Canadian financial system.

***One of the major, overarching conclusions of our research was that the biggest risk to getting to a Net Zero economy is organizational design and leadership risk. A significant number of companies (across many sectors) will require not just a business model transition but a* complete Business Model Transformation!**

Prior research conducted by one of the authors, tells us that the level of Strategic Leadership capacity (Board and C-Suite) and the level of systems thinking in their senior leaders capable of transforming business models, is less than 5 % of the worlds adult population (For further details, see Appendix 3).

Therefore, the greatest risk to achieving a net zero global economy is therefore actually organizational and leadership risk.

For a summary of our analytical research across a number of key industry sectors see Appendix 2. Full details of the methodology and findings are available by contacting Mark Van Clieaf at Mark.VanClieaf@FutureZero.com

PART 2: Response to Select OSFI Questions

Climate Related risks and their Impact on FRPPs

Q1 - What are your views on the characterization of climate-related risks as drivers of other risks? Do you have other views on the characterization of climate related risks set out in this paper?

In the response to this question, we believe that it is important for OSFI and federally regulated pension plans (FRPPs) - both their Boards of Trustees and Executive Management teams - to stand back and reflect on the larger global picture related to climate disruption, the risks and opportunities that today we all face, as well as the current state of the world in actioning COP25.

It has been 6 years since 195 national governments came together in Paris to adopt the first-ever binding global climate agreement. Cities, regions, states, and the private sector played a crucial role galvanizing support and building momentum for the Paris Agreement and have continued to scale efforts to support a stable and thriving planet. Action to implement the Agreement – and to align policies, R&D, business plans and investments with its goal of achieving "net zero emissions" by mid-21st century – has spread across the globe.

In the last 4 months, there has been a material acceleration and further alignment of the courts, asset owners, assets managers, banks and even government policies to COP25. This includes:

- The Supreme Court of Canada (SCC) ruling related to the legal jurisdiction of the federal government of Canada in its implementation of carbon pricing[33].
- The rise in ESG factors as strong drivers of private foreign direct and institutional investment, as stakeholders lend their support to more sustainable, less carbon-intensive opportunities.[34]
- The impact of a steadily increasing fuel charge on Canadian business. The fuel charge is currently at $40 per ton and will rise to $50 on April 1, 2022. From this point onward, the federal Minister of Environment and Climate Change has announced that the government plans to accelerate these increases to reach $170 per ton by 2030.[35]

[33] On March 25, 2021, the Supreme Court of Canada (the SCC) released its much-anticipated decision, upholding the constitutionality of the Greenhouse Gas Pollution Pricing Act (the Act), the centerpiece of the federal government's climate change plan, which imposes minimum carbon-pricing standards on the provinces. The majority of judges in the 6-3 split decision emphasized the importance of a national approach to addressing climate change. At the SCC, Canada and British Columbia argued that the Act is within federal jurisdiction under the national concern branch of the Peace Order and Good Government (POGG) clause of the Constitution Act, 1867.The SCC's majority decision emphasized that the Act imposes a standardized national pricing floor, while preserving provinces' flexibility to design their own GHG emissions policies, including on carbon pricing. The SCC also held that the fuel and excess emission charges imposed by the Act are sufficiently connected to the regulatory scheme to be considered constitutionally valid regulatory charges that alter behaviour, rather than being characterized as a tax. The SCC's decision upholding the Act may remove, or detract from, some climate-motivated opposition to investment in Canadian oil sands or pipeline development.

[34] Robert G. Eccles and Svetlana Klimenko, The Investor Revolution" (May-June 2019), *Harvard Business Review*, online: hbr.org/2019/05/the-investor-revolution

[35] *Fraser Institute* fraserinstitute.org/sites/default/files/estimated-impacts-of-a-170-dollar-carbon-tax-in-canada.pdf at pgs 4 and 14 (2021).

- Net Zero Finance initiatives covering more than 160 investors and banks with more than **$70trn in assets** brought together in April 2021 under the umbrella initiative Glasgow Financial Alliance for Net-Zero (GFANZ). Launched by Mark Carney, the UN Special Envoy on Climate Action and Finance and former Governor of the Bank of England and Canada, GFANZ includes the existing Net-Zero Asset Managers Initiative and Net-Zero Asset Owner Alliance, as well as a new UN-convened Net-Zero Banking Alliance. Created in partnership with the UNFCCC Climate Action Champions, the UN Race to Zero campaign and the COP26 Presidency, GFANZ - which will be chaired by Carney - aims to accelerate the transition of the global economy to net-zero emissions by 2050 at the latest.

  Signatories are required to set science-based long-term goals, supplemented by interim targets and action plans. Firms must also advocate for public policy that supports the Net Zero transition and transformation of capitalism in supporting this global transformation of society to Net Zero.

The Net Zero Asset Owner Alliance (NZAOA) in January 2021, issued their transparent, rigorous, and realistic interim targets, and have committed to report against them in the next 4 years. This is an extraordinary, and essential, demonstration of ambition by private sector leaders who exist at the pinnacle of our financial systems. The 33 institutional investors of the Asset Owner Alliance are leading the way and igniting a tidal wave of action across the globe[36]. **Please note that the NZAOA does not include membership from CPPIB, OTPPB, PSP, HOOP, OMERS, AIMCO or BCI. The only Canadian member of the NZAOA is CDPQ.[37]**

The new Net Zero Banking Alliance (NZBA) officially launched in April 2021 with 43 banks, includes Bank of America, Barclays, UBS and Morgan Stanley, and combined assets managed of $28.5 trillion. Alongside committing to reaching Net Zero by 2050 or earlier, signatories must set interim targets, engage their clients on the transition, annually report progress and take a “robust approach to the role of offsets in transition plans”. The announcement comes just days after the Institutional Investors Group on Climate Change (IIGCC) led a campaign with 35 investors including Amundi, DWS, KBI, Legal & General, Northern Trust, M&G and Nordea, calling on major banks to adopt Net Zero targets ahead of the creation of “a bespoke Paris alignment assessment benchmark” to assess progress.

- The Bank of Montreal (BMO), with a purpose-driven commitment to a sustainable future, launched the BMO Climate Institute. Using sophisticated capabilities to analyze climate-related risks and opportunities facing the financial sector and key client industries, the BMO Climate Institute will convene stakeholders, information and best practices at the intersection of climate adaptation and finance.[38] BMO acted as joint lead manager for the World Bank on a landmark US$8 billion sustainable development bond for pandemic relief, developed Canada’s first sustainability-linked commercial loan, and became joint bookrunner on only the third ever high-yield green bond for a wind and solar power utility in the U.S..
- Earlier this year, over the course of two days and eight sessions, President Biden convened heads of state and government, as well as leaders and representatives from international organizations, businesses, subnational governments, and indigenous

[36] https://www.unepfi.org/net-zero-alliance/resources/alliance-2025-target-setting-protocol/
[37] https://www.unepfi.org/net-zero-alliance/alliance-members/
[38] https://our-impact.bmo.com/our-practices/climate-change/bmo-climate-institute/

communities to rally the world in tackling the climate crisis, demonstrate the economic opportunities of the future, and affirm the need for unprecedented global cooperation and ambition to meet the moment[39].

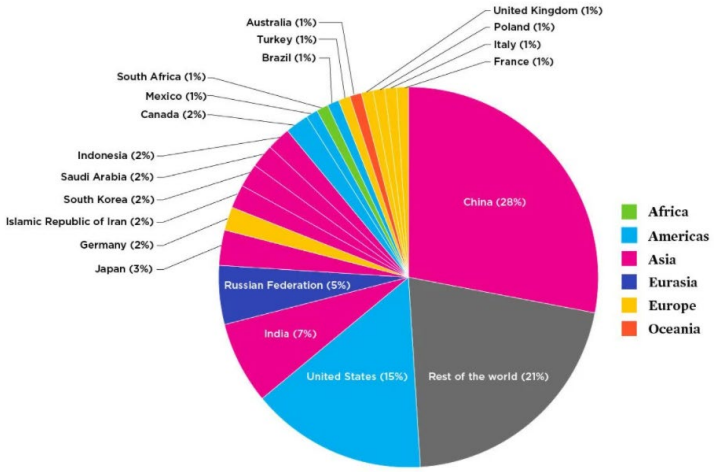
On the first day of the summit, President Biden announced the United States will target reducing emissions by 50-52% by 2030 compared to 2005 levels. He underscored America's commitment to leading a clean energy revolution and creating good-paying, union jobs, noting that the countries that take decisive action now will reap the economic benefits of the future.

- China and U.S. are now both committed to Net Zero goals for the planet and their respective countries and together represent 43% of total CO2 emissions (see Figure 3)
- Canada committed to cut emissions by 40-45% by 2030

In Canada, the Energy Sector represents over 23% of Canadian Exports. Thus, the transformation of the energy system in Canada to a clean energy system by 2050 is a "systems level" challenge. A "systems level" challenge that already today crosses the U.S. / Canada border with energy pipeline lines, electric power lines and the North American electric power grid.

- Thus, there are a broad range of regulatory risks related to alignment with COP25, for FRPF's, FRFI and their investment in all asset classes across the North American and global economy in which pension funds and banks are invested.

Figure 3: *Share of CO2 emissions per country*



Source: https://www.ucsusa.org/resources/each-countrys-share-co2-emissions

[39] https://www.whitehouse.gov/briefing-room/statements-releases/2021/04/23/fact-sheet-president-bidens-leaders-summit-on-climate/

Figure 4: *9 out of the 10 top economies have committed to Net Zero*

Climate Risks as Systemic Level Investment Risks

In the newly released "21st Century Investing: Redirecting Financial Strategies to Drive Systems Change" seasoned institutional investors Steve Lydenburg and William Burckart, outline a new approach for asset owners and asset managers in light of pension fund capital that has a higher-level purpose beyond just investment returns, as a force to drive positive societal change[40].

Jon Lukomnik and James Hawley describe, in their new book "Moving Beyond Modern Portfolio Theory: Investing That Matters[41]", the core problems with Modern Portfolio Theory (MPT), the three stages of corporate governance and the principles behind the third stage of corporate governance, which they coin as "Beta Activism":

- The authors' "Five problems with MPT's alpha/beta paradigm"[42] are:
    1. Systematic risk, not alpha, drives the vast majority of portfolio investment returns.
    2. Beta, though a mathematical constant, is anything but constant in the real world.
    3. Focusing on alpha results in a misalignment between the asset management industry and the people who entrust their money to it.
    4. Alpha and beta are not mutually exclusive. They are a continuum, with many factors which explain risk shifting on that continuum over time to be more "alpha" or more "beta".
    5. The "MPT Paradox,"

[40] Both authors advanced chapters of their new books to the authors of this OSFI comment letter for review and consideration; Burckart, William and Lydenberg, Steve, "21st Century Investing: Redirecting Financial Strategies to Drive Systems Change", 2021, Berrett-Koehler, USA
[41] Lukomnik and Hawley, "Moving Beyond Modern Portfolio Theory: Investing That Matters",2021, Routledge, New York
[42] Ibid.

- It is the fifth problem that comprises the "MPT Paradox," and it gives rise to a fundamental "rethink of whether MPT is sufficient to invest wisely going forward". Indeed, it "challenges the very idea of what activities constitute investing".
- A number of studies have shown, "more than 75% of the variability in the return to an investor is caused by systematic risk", that is, "some combination of beta and of how much exposure an investor has to that beta."[43]
- If it is systematic, or systemic risk and not alpha that drives investment performance, this would mean that investors should move beyond trading securities for relative return. The Investment Integration Project (TIIP)[44] terms the "tools of intentionality" as those that affect capital markets and total market return by "affecting the systems on which capital markets rely". The TIIP notes that the key differentiating points of investors who consider systems level thinking is that they act with intentionality. TIIP identifies ten such activities" [45]

From Lukomnik's and Hawley's "Beyond Modern Portfolio Theory: Investing That Matters":

"On January 11, 2020, Larry Fink, the Chief Executive Officer of Blackrock, told the world that "Climate Risk Is Investment Risk".[46] This was not news. Mark Carney, the Governor of the Bank of England, had been warning for years about a "Minsky Moment" when the values of carbon-related assets could collapse.[47] The Bank for International Settlement, the central bankers' central bank, had been saying for some time that that central bankers cannot save the world's capital markets from climate risk, culminating a week after Fink's proclamation with its "Green Swan" report.[48] An investor coalition, partially organized by CERES, was instrumental in pushing through the Paris Climate Accords. There are billions and billions invested in low-carbon index funds and in clean-tech portfolios.

Until Fink's request, reporting of ESG factors has been a ball of confusion, as governments and traditional accounting standard-setters have refused to regulate disclosure standards. The result is an alphabet soup of disclosure frameworks. SASB and TCFD to be sure, but also – in alphabetical order -- CDP, EEI, GRESB, GRI, IIRC, IPIECA. And scores of others. A 2018 report noted that 78% of the S&P 500 companies issue sustainability reports, but that they had virtually zero standardization. 97% of them customized

[43] James P. Hawley and Jon Lukomnik, "The third, systems stage of corporate governance: Why institutional investors need to move beyond modern portfolio theory," available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3127767.
[44] Steve Lydenberg is one of the co-founders of the TIIP project
[45] https://www.tiiproject.com/effective-investing-long-term/
[46] Fink letter. https://www.blackrock.com/corporate/investor-relations/larry-fink-ceo-letter. Accessed January 29, 2020.
[47] https://www.bankofengland.co.uk/news/2019/april/open-letter-on-climate-related-financial-risks. Accessed February 28, 2020.
[48] Mark Jones and John Revill, "Central banks can't save the World from Climate Change, BIS Says". Reuters January 20, 2020. At: https://uk.reuters.com/article/uk-climatechange-cenbank-bis/central-banks-cant-save-the-world-from-climate-change-bis-says-idUKKBN1ZJ1CL. Accessed January 29, 2020.

their reports by picking and choosing from the various frameworks as they liked – one referenced six of those alphabet soup frameworks -- or used no framework at all.[49,50]

Fink's attempt at private-sector standard setting for ESG disclosures is definitely a "stage three corporate governance tool". It promises to be game-changing.[51] *Within days of Mr. Fink's letter going public, SASB saw an increase in inbound inquiries from corporations".*[52]

However, climate change is not only an investment risk. Climate change, in that it will impact all sectors of the economy, whether directly or indirectly, can be considered a systematic and systemic risk.

As Lydenberg, one of the co-founders of the TIIP project in his new book, "21st Century Investing: Redirecting Financial Strategies to Drive Systems Change" and his coauthor William Burckart write:

"Investment today has evolved historically from a basic, conventional approach (concern about the risks of security selection and portfolio risk management) to embrace as well sustainable investment (intentionally achieving social and environmental benefits along with financial returns). Building on this integration of sustainability factors, it can now transition to a third stage that recognizes both the power of investments to impact social, financial, and environmental systems and the complexity of the times we live in. We call this system-level investing."

"When we say systems, we are talking about those large social, financial, and environmental foundations of society necessary for any successful investment. At the broadest levels, social systems include healthcare, food and water security, fair employment, freedom of expression, consumer safety, economic and environmental justice, and education and training. Financial systems include air and honest markets, access to basic services, and transparency of data. Global environmental systems include climate stability, natural resources, oceans and fresh water, forests, and arable land." [53]

Implications for Pension Funds

The implications of the research and thought leadership by Jon Lukomnik and Steve Lydenberg and their respective co-authors for these groundbreaking new books, is that **Pension Funds need to "level shift" their purpose and mandate beyond just an "investment only" legal mandate**. A transformation is required for the design, role, and a higher order purpose for long horizon pension retirement capital to be invested for impact and for the benefit of global society.

Thus, in the context of creating a Net Zero global economy by 2050, driven by the real climate risks and disruptions here at home in North America (see Figure 5), Canadian and U.S. pension funds, acting collaboratively, have a critical new role to play. This role is to be accountable and forceful stewards of capital, leading "strategic engagement" with investee companies for the use of their long

[49] "State of Integrated and Sustainability Reporting 2018," Sustainable Investments Institute and IRRC Institute (2018). With the approval of the E.U. Taxonomy on Climate (part of the E.U. Action Plan on Sustainable Finance) there will be an E.U. wide standardization, with global implications. The taxonomy is highly detailed, technical, and transparent.
[50] Note that there has been progress in standardization of disclosures with the Sustainability Accounting Standards Board (SASB) and International Integrated Reporting Council (IIRC) announced plan to merge into one organization — the Value Reporting Foundation (2021)
[51] Attracta Mooney and Billy Nauman, "Larry Fink rules on the best global standards for climate risk reporting," *Financial Times*, January 20, 2020.
[52] Jon Lukomnik and James Hawley, Beyond Modern Portfolio Theory,
[53] https://www.amazon.ca/21st-Century-Investing-Redirecting-Strategies/dp/152309107X/ref=sr_1_1?dchild=1&keywords=lydenberg+investing&qid=1620061037&s=books&sr=1-1

horizon pension capital. This includes supporting the transformation of the business models in their investment portfolios as well as the transformation of complete industry eco-systems to Net Zero.

How can this be done?

Pensions, in allocating and deploying their pension and investment risk capital for innovation and R&D can fund and enable the transformation of the most disrupted sectors of society to Net Zero. This includes the Fossil Fuel industry, the Transportation sector, Mining and Materials, Renewable Energy, the complete Power Utility industry and smart grids, as well as Agricultural and Food systems.

Thus, long horizon Canadian and US pension capital can be the foundation and provide the financing oxygen for societal transformational to create a Smart Planet (see details in Appendix 1) for humanity and generations to come, as well as provide national and economic security for the North American continent.

The Net Zero and "Smart Planet and Smart Continent" will be enabled by new investments in innovation, R&D, new processes, and new CAPEX for energy efficiency and for smart vehicles, smart homes, smart office buildings, smart transportation systems (trucks, planes, ships, logistics and warehousing) and smart agriculture and global food systems[54].

Underpinning this transformation to Net Zero and a "Smart Planet" is the need for advanced computing, AI and next generation semiconductor materials. All with long horizon investment for a foundation in Canada and the USA as part of national and economic security for the continent.

To deliver on their mandate for both ***"supervision and early intervention"***, OSFI will need to ensure that the Canadian pension system remains in sound financial condition. To do so going forward, and to cement Canadian pensions as global innovators in the investment industry, we believe the time is opportune to transition to a **Version 2.0 of the Canada Pension Model.**

OSFI, in their role as regulator can play a critical role in the design of the 2.0 Canadian Pension Model and support and guide the pension funds as larger asset owners, legal fiduciaries and in their role as continued leaders and innovators globally in creating a new model for sustainable capitalism[55]. To do so requires **3 crucial elements:**

(1) **New Pension Fund Governance Model**

Pension funds need to have the right governance structure in place. This includes the right investment mandate, investment beliefs & philosophy, organization structure, metrics, incentives, and strategic leadership capacity aligned for a Net Zero world.

(2) **New Accountability Design, Incentive Design and Enterprise Risk Model**

Canadian pension funds are risk aware entities. The risk to a net zero economy needs to be accurately reflected in portfolio risk limits, thresholds and exposures. Board Risk Appetite Statements also need to reflect this reality. To help advance the

[54] A strategic role for Canadian pension funds can also be to provide long horizon risk capital for R&D and to launch the blue hydrogen economy and the next generation of nuclear power and small modular nuclear, both of which are critical foundations for a Net Zero Smart Planet that is GHG net zero neutral if not negative.

[55] For more details see Appendix 3

risk model, new performance metrics, targets and risk budgets need to be developed and monitored at the most granular holdings level, such as:

- Scope 1, 2 & 3 CO2e / $ million revenues, CAROC, CAPS, TCRR's, etc.
- Impacts on the business model design (current and gap to net zero business model design) and the ability of firms to transition to net zero

(3) **New Active Ownership, Forceful Stewardship Model and Organization Design**

Canadian pension funds have always been exemplary active owners and stewards of capital. As the global economy transitions to a Net Zero world, so too must the active ownership models of Pension Fund Investment organizations. This includes an evolution of Proxy voting guidelines and policies, Say on Pay and Say on Climate aligned for a Net Zero World.

Engagement with investee companies must transition to a "Strategic Engagement" model and in some cases, this will require engagement for complete industry structure / eco-system re-designs to help drive sector level transformation and risk management. This means focusing on the Beta returns of the industry as opposed to the alpha returns of any one corporate.

A new pension fund organization structure and a higher order of "strategic leadership" skills and operating company experience for credible Board and C-Suite engagement at investee companies on fundamental business strategy and business model design options, including transition pathways to Net Zero.

This would be like a private equity model where the pension funds would retain "operating partners" with deep industry knowledge and operating experience to "strategically "engage with the Board and C-Suite at investee companies from a position of operating credibility and experience.

Figure 5: *Impacts of climate risks on North America*

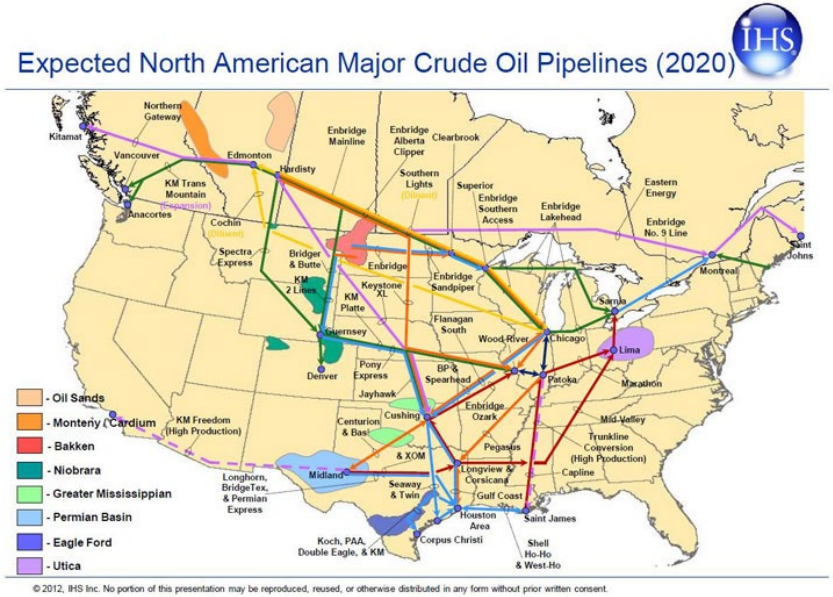
San Antonio Texas, in March 2021, looks like Waterdown, Ontario, Canada due to the same winter weather system. However, Texas almost loses complete power, along with the almost complete failure of critical water and natural gas systems for the state. Over $130 billion in insured loses was incurred in the state of Texas due to this single weather event. The San Antonio crisis sends a shockwave to climate crisis deniers in the U.S.

As part of the transformation of the North American economy to a carbon neutral and Net Zero GHG emission economy, new investments in transformative technologies and clean energy systems will be required. North American pension funds have the ability to, and must start to engage at, a new "strategic engagement" level in initiating sector level and long-term strategy discussions with key lead steer Boards, CEOs and CFOs in critical sectors/industries such as Utilities, Mining & Metals, Energy, Pipelines, Automotive, Transportation, Food and Agricultural. For example, in the strategic transformation of the Utilities sector to 100% clean energy, *the lights must stay on*. In the Mining & Metals sector, much collaboration will be required working with the steel, aluminum, and rare minerals industries to ensure the viability and sustainability of the complete sector as it is *critical to national security for North America*.

Such engagement must focus on the longer-term 10, 20 and 50 yr. industry sector strategies for R&D and the complete transformation of key industry sectors so that the base load energy is no longer anchored in hydrocarbons but rather in clean energy systems. This means a transition from carbon molecules to clean gases, biofuels and clean electrons enabled through distributed clean / carbon neutral electric power systems for the continent.

The new vision for clean energy base load at scale for North America will need to be anchored in energy efficiency, hydro, distributed small modular nuclear, solar, wind, and battery storage. This will represent a new, fully integrated and distributed 100% clean Smart North American electric power grid. These new energy systems will also see the complete transition and transformation of the North American oil and gas pipeline systems and infrastructure to hydrogen, enabling a new hydrogen economy (see Figure 6).

Figure 6: *Expected North American Major Crude Oil Pipelines*



Source: IHS Markit

The Hydrogen economy

The hydrogen economy's tipping point will be when Moore's law surfaces and green and blue hydrogen energy is delivered at less than $2 / kilo by 2025, then at parity with oil & gas by 2040, and finally at less than $1 / kilo by 2050. To enable this, new pipeline and storage systems for hydrogen, CO2 and blended hydrogen / methane will replace and transform today's North American fossil fuel pipeline and infrastructure systems over the next 20-30 years to zero GHG emissions and almost zero fossil fuels[56].

[56] https://marcoalvera.com/en/

Canada could be a possible future member/supporter of the Green Hydrogen Catapult[57] to help transform sectors such as the power generation, chemicals, steelmaking, and shipping. In establishing the new Initiative, the founding partners of the Catapult are collaborating to accelerate the necessary technology, component manufacturing, construction advancements, market developments and flow of long-term investment capital. The Catapult target will require R&D and capital investment of roughly US$110 billion and deliver more than 120,000 jobs, thus in parallel facilitating recovery from COVID-19. [58,59]

[57] 'Green hydrogen catapult' is a global coalition comprised of seven world-leading companies to accelerate the scale and production of green hydrogen 50-fold in the next six years, thus helping to transform the world's most carbon intensive industries, including power generation, chemicals, steelmaking, and shipping. Green hydrogen industry leaders, including ACWA Power, CWP Renewables, Envision, Iberdrola, Ørsted, Snam, and Yara. They target the deployment of 25 gigawatts through 2026 of renewables-based hydrogen production, with a view to halve the current cost of hydrogen to below US$2 per kilogram. Source: https://racetozero.unfccc.int/green-hydrogen-catapult/

[58] https://racetozero.unfccc.int/green-hydrogen-catapult/

[59] https://hydrogencouncil.com/wp-content/uploads/2020/01/Path-to-Hydrogen-Competitiveness_Full-Study-1.pdf

Q2 - What steps can FRPPs take to improve their definition, identification and measurement of climate related risks and the impact of these risks?

In the response to this question, we would first like to highlight the differences between implicit and explicit risk management for climate change impacts and the steps that pensions can take to implement an explicit risk framework. We then introduce a classification system which can help Boards and Regulators identify if and how a pension fund has assessed climate change for their underlying investment holdings. Finally, we present an innovative way for Canadian pension funds to work as a collective investor force to define, identify and assess the climate risk ratings of certain companies.

1. Implicit vs. explicit risk management for climate change risks

While there are some industry frameworks to help identify and report on material climate issues, the inherent multi-dimensionality of many ESG issues makes it difficult to assess the severity of the risk level. Traditional quantitative models to assess risk exposures such as standard deviation, value at risk (Var), conditional value at risk (CVar), etc. do not easily apply to climate issues, in great part because we do not have historical data nor is it straightforward to calculate the average or mean of the impact of these issues. Without the key assessment step, it is difficult to then effectively manage and monitor these systemic risks in a structured manner[60].

Given the lack of a consistent, universally accepted ESG risk measurement and disclosure frameworks in the investment and risk management industry, firms are integrating ESG issues into their risk management processes in a variety of ways.[61] Many are implementing an "implicit" risk management framework.

Implicit risk management is similar to a "checklist" approach, where certain risk criteria are required to be ticked-off before proceeding[62]. Implicit risk management can also be "outsourced" risk management in that the risk identification and assessment is delegated to a third-party provider (e.g., external rating provider) or an external manager. This type of implicit risk management approach tends to be reactive in nature and can lack an in-depth analytical methodology. There is also generally no explicit measurement of risk nor any comparison against a defined benchmark[63] in an implicit risk management approach. For instance, while the distinction between material and non-material metrics may be understood, the metrics themselves may not be properly understood.

Pension funds that delegate climate risk management to third parties (such as external rating providers and/or external asset managers) without a thorough understanding of the underlying details of methodologies (in the case of data providers) and/or the activities being undertaken on their behalf (in the case of external managers) can be thought of as engaging in implicit risk management.

60 Actual theoretical research in finance coupled with science-based expertise and knowledge will need to increase in this area.
61 Sometimes culminating in greenwashing as risk processes are simply relabeled. This can result in not only inferior risk management (failure to account for climate risks) but also the creation of potential reputational risks for the fund.
62 Generally, these criteria can be answered by yes or no. For instance, questions can include: Does the issuer/investment report GHG emissions and/or report to TCFD? Does the issuer have a net-zero commitment? etc.
63 "Measuring and Managing Information Risk", 2015, Freund, J. and Jones, J.

Some drawbacks with an implicit approach for ESG risk management include:

- High dependence on external or third-party data for risk identification which may not include the wider universe of material stakeholder climate issues
- High dependence on external or third-party data for risk assessments which may translate into a lack of internal analysis, investment insight and knowledge, which can also lead to the exclusion of certain asset classes or holdings in the risk assessment[64]
- Difficulty determining the impact on the overall firm (all portfolios including internally and externally managed portfolios) and therefore determining the prioritization of issues so as to take meaningful capital allocation actions and focus resources on managing the highest risks/opportunities for the firm
- Possible lack of comprehension of how climate issues directly or indirectly impact an investment's operations and/or value-creating and cash generating potential in both the short and long term
- A tendency to focus on linear assessments (i.e., time horizons are not identified), creating less meaningful[65] results that may also fail to account for the rapidly evolving nature of climate and business model transformation risk issues)

While implicit risk management can be a very useful first step, it often does not provide enough relevant insights to enable effective climate risk management. As opposed to implicit risk management, "explicit" risk management is a more proactive and analytical approach that includes event likelihoods and impacts, the ability to set risk objectives and budgets, and the ability to manage those objectives over time[66].

The main advantage of an explicit risk management approach for net zero business model design and climate risk management is the ability to prioritize risks. This allows for the optimization of investment and risk management strategies to mitigate these risks (or leverage opportunities).

Steps that pension funds can take to implement an explicit Net Zero Risk Management Framework:

1. **Identification**:
   - Climate risk identification can be done at 2 levels: at a macro level (sector or industry) and at a micro level (issuers and holdings)[67]

     The macro level can be performed using scenario analysis tools and techniques. Different scenarios should be used to identify the most risks possible per sector/industry and the risks most material to each sector/industry.

[64] Since external data providers may not cover all assets in the firm's holdings.
[65] For any risk assessment to be meaningful, it requires a time horizon.
[66] "Measuring and Managing Information Risk", 2015, Freund, J. and Jones, J.
[67] ESG and climate issues that are material to the financial performance of a company vary depending on the industry of the firm as well as the specific business model (see the seminal article: Khan, Mozaffar and Serafeim, George and Yoon, Aaron, Corporate Sustainability: First Evidence on Materiality (November 9, 2016). The Accounting Review, Vol. 91, No. 6, pp. 1697-1724., Available at SSRN: https://ssrn.com/abstract=2575912)

Whereas a macro analysis is worthwhile, a micro level analysis of individual securities and industry sectors within which the securities are part of should also be performed for all securities within a portfolio that have material climate risk exposures (for instance, a high turnover, low conviction portfolio may not need to be assessed at the holdings or micro level for climate risks)

- Given the complex nature of climate change risks, a multi-departmental team comprising of the investment teams (PMs, analysts), risk teams (risk managers and analysts as well as total fund groups), the responsible investing or ESG teams could be involved in the climate change assessments.

  External experts can be leveraged for specific climate risks. Climate change risks are by nature complex and science-based experts may be needed for pensions to fully understand the nature of their top risks.

  Assessments should be led by the investment managers initially and eventually be independently validated / monitored by Risk teams.

- A micro analysis includes an extensive investigation into any net zero, TCFD and/or carbon reduction commitments of investee companies

  A micro analysis should be more than just a carbon foot printing exercise. It should include all climate change impacts (both from the company on the climate and from the climate on the company). This includes the physical location of the company as well as any upstream or downstream supply chains and overall business model risks with a particular focus on scope 1& 2 and scope 3 emissions.

  This requires a net zero business model architecture and clear Net Zero Business Model (NZBM) design review / audit process from which to understand all the risk and opportunities levers required in an investee company re-designing of its business model including the current state of products, services, supply chains, manufacturing, and distribution and their end-to-end GHG emissions.

  This includes the detailed analysis of analytics as presented in this paper (Carbon Adjusted Return on Capital (CAROC), Carbon-Adjusted Performance Spread (CAPS), and Net Zero Transition Cash Risk Ratio (TCRR). Using the Credit Suisse HOLT model this includes CA-CFROI and CA-CFROI-Discount Rate Spread.

  This micro level analysis will also require an analysis of the Organizational design, disclosed key performance metrics, incentive plan design (STIP, MTIP, LTIP), and a high-level assessment of the “Strategic Leadership” capacity and “Complexity Orientation” of the executive team and board of directors including their potential and past track record to lead business model transformations. Note that less than 5% of the world’s adult population has the level of conceptual

capacity, systems thinking and capacity for complexity to conceptualize and implement Net Zero Business Models[68]. (For further details see Appendix 3).

Thus, one of the biggest risks of Net Zero Global Economy (NZGO) success is the lack of "strategic and transformational leadership" capacity in the C-Suite and on the Board of Directors.

This lack of potential leaders with the level of "Strategic Leadership" and Capacity for Complexity (CFC) and Level of Systems Thinking related to the transformation of business models and industry eco-systems creates risks for the asset owners in the selection of Pension Fund Officers (such as CEO, CIO, CFO, CRO, CTO, COHRO, etc.) and in the selection of the Board of Trustees capable of providing the right level of strategic oversight and risk management for the asset owner.

2. **Measurement framework and methodologies**:

- Frameworks such as the COSO framework[69] can be used to create a framework for measuring ESG risks. Other industry frameworks such as the TCFD and SASB include guidance and recommendations, but most fail to fully audit the complete current business model design, portfolio review of current products and services, and the complete global supply chain and downstream business to the end user or client such as transportation and logistics.

  Pensions can also use measurement methodologies similar to those used to measure other hard to quantify yet significantly material investment risks (such as geopolitical risk, operational risk, etc.). The Risk and Control Self-Assessment (RCSA) methodology is an example. This includes the ability to:
  - Assess the magnitude of risks, which can be identified as high / med / low until more quantitative data is available.
  - Include the probability of risks arising over multiple time horizons, plus the speed of onset of these risks.
  - Aggregate these risks up to the overall fund level. Management and monitoring of the risks at the fund level can be then delegated to a transversal or total fund risk group.

3. **Assessment of business model design transition and climate risks**:

- Key to an explicit risk management framework is the ability to assess the particular risk. As mentioned above this can be done using a framework similar to the RCSA framework. However, the assessment needs to go deeper than an industry level assessment and needs to filter down to the individual issuers and holdings, including an assessment of the business model, exposure to business model transition / climate risks, commitment to transition if required, ability to transition both financially and through business model re-design, and management and Board capacity to enable and oversee the transition.

[68] See International Corporate Governance Network (ICGN) article by Mark Van Clieaf, "Over the Horizon", ICGN Yearbook 2013
[69] https://www.coso.org/Pages/default.aspx

A Portfolio Level Assessment of Business Model Risk and climate change

As climate risks are becoming systemic in nature, most firms are either directly or indirectly impacted by and/or impacting climate change. Many industry frameworks will focus on certain aspects of climate change such as a firm's carbon emissions. However, investment / risk managers need to assess the Net Zero business model and climate change management strategy of the firm to determine if, based on the firm's current underlying business model, the firm can actually execute the business model transformation required to get to Net Zero.

As the global economy transitions to a Net Zero GHG emissions economy, some firms will:

- Easily transition to a net zero model because their current business model design and GHG emission profile is low.
  - For example, Hydro One currently produces 69 Tons of CO2e / $1 million in revenues[70] vs Emera which produces 4,383 tons / $ 1 million in revenue.
- Be able to transform to a net zero business model even though their GHG emission profile may be higher (e.g., integrated, financially strong companies).
- Struggle to transform to a net zero business model given their current business model complexity and a high GHG emission profile.
- Need to enter into a managed decline and steady payout, similar to an income trust.

Elements that will help to bring clarity to the path for investee firms include an assessment of:

1. **The firm's strategy for Net Zero business model design within the context of climate change**.
   - Does the firm have a clear business strategy, 10 to 15 year R&D and CAPEX investment and change management plans to manage the Net Zero business model transformation resulting from impacts of climate and related regulatory change?
   - Has the firm done an assessment of the material climate change issues impacting the firm's business model and stress tested the possible financial impacts of a carbon fee and or carbon shock on the current business model and emission profile footprint?
   - Is the strategy a high-level aspirational commitment to Net Zero or is it detailed with a complete Net Zero Business Model value driver and business system analysis, Scope 1, 2 and 3 GHG emissions, and clear absolute reductional science-based targets including timelines, metrics, milestones, etc.?
2. **The governance structure for the Net Zero business model and climate change strategy**.
   - Is there sufficient backing from executives/Board to execute the strategy and Net Zero business model transformation?
   - Does the Board view climate risk as a business strategy and/or business model risk? i.e. Do they see this as part of the purview of the Board or rather something that can be delegated to management?
   - Does the C-Suite and Board have at least 4 to 6 strategic leaders with actual business model transformational experience and or potential to lead such transformation and change management?

[70] Data source: CS HOLT global database

3. **The competitive position of the firm**.
   - What is the firm's competitive positioning in the industry and what is the industry's climate change and carbon shock profile based on the sector/industry analysis above?
   - Does the Board have clear monitoring / tracking of the competitive life cycle of return on capital, Carbon-Adjusted Return on Capital, cost of capital, the levels of innovation required for Net Zero Transition or Transformation?
   - How will the firm be positioned competitively in their industry over the next decade?
4. **The financial position of the firm with stress tests to the current and future business model value drivers**[71].
   - What is the relative financial health of the firm, including its production of tons of CO2 / $ 1 million dollars of revenue, percentage of R&D to revenues, Return on Capital, Carbon-Adjusted Return on Capital, Future Value, and Net Zero Transition Cash Risk Ratio (TCRR)?
   - What impact does a $75 or $ 100 / ton CO2e carbon shock have on Carbon-Adjusted Return on Capital (CAROC)?
   - Where is the firm in its corporate life cycle of innovation and returns on capital?
   - Does the firm have, and can the firm access the financial capital required to execute their business model transformation to net zero and overall climate strategy?
   - What are the forecasted cash flows for the firm 5 years or 10 years in the future?
5. **The financial and value creation position of the complete industry sector on the above same metrics and stress-tested against the current investment portfolio?**
6. **The impact on a "Just Transition"**
   - Does the firm's transition plan include the ability to transition to a low carbon economy in a just fashion by re-skilling workers and ensuring employment and support for workers and communities within highly disrupted sectors and industries?
   - Each firm will have a different risk profile based on their specific business model and carbon intensity profile. It is important to model the Net Zero business model risk of the firm in such a way that it captures the most risks possible. This brings another level of complexity to the risk modeling business model change to Net Zero and for climate impacts. For instance, two firms considered competitors may have significantly different Net Zero business model risk profiles when one assesses their supply chain and scope 3 emission risks and/or physical locations for operations.

External ESG data providers and the Net Zero Transition

Environment, Social and Governance (ESG) data plays a very strong and foundational role in investment and risk management for more ESG-minded investors. Third-party ESG and sustainability data vendors provide a service to investors by gathering, analyzing and aggregating corporate data that is often available only in text form and graphs from sources such as sustainability reports and disclosures such as CDP (formerly the Carbon Disclosure Project) and/or TCFD aligned disclosures.

[71] See the "Four questions to determine a firm's net zero transition" (in Appendix 2)

However, while external data providers can provide important climate data on investee companies, it is important to understand in detail the methodologies underlying any external scores and/or rating that is produced. While data providers can help solve the "accessibility issues", they have also created intrinsic data quality issues mainly due to inherent differences in methodologies and inputs.

Due to these key methodological inconsistencies and lack of transparency between ESG data and service providers, this may cause portfolios to be exposed to elevated risks of ex-ante and ex-post assessment and rating inconsistencies. There have been numerous documented research studies that have looked at the differences in the rating providers and the low correlations between these providers.

Therefore, while these sources are important sources of information, pension fund asset owners should increase their internal knowledge and capacity to be able to fully understand the underlying ratings methodologies and to challenge, when necessary, these investee company ESG ratings and the degree of their validity and reliability. Sophisticated investors are starting to use the underlying source data from a range of providers and internal insights to produce internal ratings which feeds into their investment decisions and risk modeling.

2. Climate change and a Net Zero Business Model Assessment Categorization Methodology

Climate change is increasingly being viewed as a systemic risk[72] and the valuation of climate change risks (both business model transition risks and physical risks) represents a complex and multi-dimensional process for which there is no agreed upon industry standard. Due to the inherent complexities of business model design and climate change risk valuation, many investors are not factoring these risks into their investment decisions, or they are doing so at a high, broad macro-level, effectively leaving business model and climate change risk as a largely unknown, unpriced, and yet material risk in their investment portfolios.

During the 2008-2009 financial crisis, the valuation of complex OTC derivatives, became increasingly unclear due to their dependence on certain key industry and model assumptions and relationships that no longer held their validity as markets became dislocated. The FAS 157 classification methodology was developed to give investors and regulators a clearer view into the amount of assets that had uncertain valuations (classified as Level 3) in an investment portfolio.[73]

The same concept could be applied to the assessment of Net Zero Business Model (NZBM) transformation and climate change risks performed on the individual securities in an investment portfolio. For instance, one could classify securities based on whether a climate change and/or business model transformation risk assessment analysis was performed or not, and if so, what was the underlying methodology.

For example:

- Securities that have not been assessed for their business model risk and climate change risk exposures (no matter what the industry), or securities for which a qualitative or subjective climate change assessment has been performed could be classified as **Level 3 securities (*therefore considered most at risk because they would have unassessed climate change risks*)**

[72] https://www.theregreview.org/2020/11/04/ramani-climate-change-systemic-financial-risk/
[73] This includes investment funds, pension funds, etc.

- Securities for which a business model risk and climate change assessment had been completed but that employed a more subjective methodology[74], that used the ESG ratings from an external data provider (with an unknown ratings methodology), or that used a top-down approach could be classified as **Level 2 securities.**
- Securities and their current business model design, emission profile and carbon footprint that had been assessed using a quantitative, science-based methodology, and that used a micro-level holdings-based approach could be classified as **Level 1 securities (*therefore considered least at risk because they would have been assessed for climate change risks*)**

Classifying a security based on whether its current business model design has been assessed and stress-tested for its exposure to climate change and business model transformation risks does not require the manager to necessarily change a security's official valuation in external investment reports. However, the classification of the security provides insight into how the asset manager or firm views the future impact of climate change on that security, enabling greater transparency and insight into the potential risks of their investments and holdings. It also identifies whether an asset manager has actually performed a climate change analysis of the securities in their portfolio.

This implies a **reverse burden of proof on investment managers**. If they have not performed a business model transformation and climate change risk assessment, then the security is automatically categorized as Level 3. The manager needs to prove/show that they have performed a science-based and security level Business Model design, GHG risk profile and NZBM risk assessment to be able to categorize it in Level 1. Boards of asset managers may decide to limit the number or percentage of assets under management (AUM) that are considered Level 3 assets for climate change risks. By not performing a level 1 type climate change assessment, investment managers may thus be subjected to additional constraints on their portfolios.

[74] For instance, similar to a high/med/low analysis

Table 3: Overview of a proposed classification methodology for climate change assessments for a portfolio of securities

	Level 1	Level 2	Level 3
Definition	Securities and their business model design that have been assessed using a quantitative, science-based, and bottom-up or granular methodology including ESG and complete Carbon Cost stress testing at $75, $100 and $150 / ton CO2e	Securities and their business model design that have been assessed using a subjective or qualitative approach / or securities that have been assessed using a top-down methodology	Securities that have not been assessed for their climate change risk exposures
Examples	Extensive business model design, carbon adjusted stress-testing of financial performance and climate risk assessment (including the firm's strategy for climate change, the financial and competitive position of the firm; carbon-adjusted return on capital and carbon-adjusted performance spread; as well how the firm is positioning themselves for the just transition)	Scenario analysis using a top-down or sector analysis Use of qualitative data from ESG ratings providers (with little understanding of the methodology, value drivers, and ESG correlations to sustainable business performance) Subjective or qualitative methodologies such as using High/Med/Low assessments	No climate change assessment has been performed

Benefits and Challenges

There are numerous benefits that can be derived for capital markets stakeholders such as investors, boards, and regulatory authorities from a classification of climate change risks in an investment portfolio.

Benefits include, but are not limited to:

- Increased transparency into the current and future expected key material risks of an investment portfolio.
- Help in fostering the essential conversation around Net Zero business model climate change transformation risks and impacts on company valuations and discounted cashflows and a determination of Future Value in the capital markets. This may encourage asset owners with portfolios exposed to physical and/or transition risks to assess the Net Zero business model climate change impacts in their portfolios so as to mitigate risks and/or leverage opportunities.
- Enabling a smooth transition to integrating business model transformation and climate change assessments into company valuations and discounted cashflow modeling;[75]

[75] The methodology does not impact current NAVs, so valuations do not necessarily require adjustments.

- Universal application as the methodology is investment strategy and asset class agnostic.[76]

Challenges to the methodology include the fact that since this is a classification methodology, it does not identify the specific climate change risks inherent in the underlying securities, only whether the securities have been assessed for business model design and climate change risks. In addition, as there is no single industry-wide accepted valuation or risk methodology for business model and climate change risk, firms will need to be continuously adjusting their climate change risk measures as the industry evolves. This may create an uneven playing field for those managers that have larger risk management teams and access to more resources, including data, staff and budget.

We have found in our global Net Zero Business Model (NZBM) stress-testing, that at a minimum, all securities need to be analyzed on the following metrics: Economic Profit, Future Value, Tons of CO2e / Million Dollars of Revenue, Return on Capital, Carbon-Adjusted Return on Capital (CAROC), EV/EBITDA, P/E, Price/Book Value and Net Zero Transition Cash Risk Ratio (TCRR) and where they stand on all of these same metrics compared to the median, average and quintiles of performance relative to their GICS sector peer group. The above strategic Net Zero business model analytics needs to be undertaken over at least a 10 yr. historical lookback and then use of management disclosures and equity analysts' reports for a forward business strategy and business model risk review.

3. Leveraging the collective investment business intelligence of the Canadian pension fund industry to determine the business model and climate risks of companies and industry sectors

Using the above methodologies, the Canadian pension funds could leverage their collective investing intelligence and come together to create a **Net Zero Business Model (NZBM) global database:**

- Pensions would submit their respective business model risk assessments, carbon stress testing and climate assessments of certain companies.
- The database could also include an assessment of the corporate life-cycle position, level of innovation and returns on capital relative to cost of capital of each security. This might also include an assessment of the C-Suite and Board and any indicators of their accomplishment track record in leading business model transformational change.
- The process could be comprised of a closed loop where the pensions submit their climate change assessments, with a feedback loop and on-going recalibration.
- The data would be anonymized, and comparable. It could be a starting point for internal risk budgets and risk measures and could help determine which companies to start strategic engagements with (collective or individual engagements).

This would represent a never-before-seen level of collaboration between the pension funds, bring clarity to the intrinsically difficult role of assessing business model transformation risk factors and climate change for companies and help cement the Canadian pensions' position as continued innovators in the global investment industry.

[76] It can be applied to both active and passive mandates as well as across all asset classes.

Ways FRPP Could Prepare For, and Build Resilience to Climate Related Risks

Q8 - What are the key considerations for incorporating climate related risks into the FRPP's statement of Investment Policies and Procedures (SIP&P)?

A SIP&P should, by definition, reflect a pension plan's investment objectives and risk appetite. In the EU this has been part of the regulatory agenda for a while.

"Since October 2019, pension schemes in the EU have been subject to enhanced statutory requirements around ESG and stewardship considerations. Even though climate change was called out specifically in the ESG guidance for SIPs, the focus on climate change has significantly increased (….) Pensions Minister Guy Opperman has expressed a commitment to ensuring that pension scheme trustees act on climate change and as well as consulting on requirements on all large asset owners (including pension schemes) to make disclosures in-line with recommendations of the Taskforce on Climate related Financial Disclosures (TCFD) by 2022, the Pension Schemes Bill currently progressing through parliament had an amendment tabled which, if included in the final legislation would give the Government broad reserved powers to introduce enhanced climate change governance responsibilities and reporting requirements for trustees as well as giving related enforcement powers to the Pensions Regulator."[77]

It is therefore clear that in the EU the regulatory direction of travel for ESG, climate change and Net Zero business model risk issues is moving towards increased governance. This is forcing pension funds to adopt an Economic and ESG-integrated mindset (EESG). The former Chief Justice of the Delaware Supreme Court, Leo Strine, also uses EESG as a way to consider business models and business model risk for shareholders. Our applied Carbon Adjusted Return on Capital (CAROC) using the Credit Suisse HOLT® data and other data sources allows us to model an entire carbon stress tested portfolio of companies as an **Integrated ESG model.**

In addition, in 2021, EU pensions will also need to produce an "implementation statement". The Pensions Regulator intends that this statement will be a way of ensuring that action follows intent by requiring pension fund trustees to set out how they have followed and acted upon the investment principles and policies contained in their SIP during the fiscal year.

The implementation statements will be publicly available meaning that pensions will need to show compliance with the principles and rely on their asset managers and consultants to equip them with the relevant information to demonstrate compliance. The Pensions and Lifetime Savings Association (PLSA) also released its implementation statement guidance[78].

[77] source reference (https://www.nortonrosefulbright.com/en/knowledge/publications/7a09ceab/uk-pensions-briefing-trustee-investment-decisions-and-the-role-of-esg)

[78] https://www.plsa.co.uk/Portals/0/Documents/Policy-Documents/2020/PLSA-Implementation-Statement-guidance-for-trustees-July2020.pdf

In line with requirements in the EU, some specific elements that could be included in Canadian pension SIP&Ps include:

- How the pension is integrating ESG (including climate change) across their portfolios and over the "appropriate time horizon"
- Stewardship obligations – including how voting rights are exercised including reporting and metrics to ensure adherence to a proxy voting policy
- Further details on arrangements with external asset managers, including:
    - How they incentivize the manager to align the manager's investment strategy and decisions with the pension's investment policies
    - How they incentivize managers to assess and make decisions based on the medium to long-term financial and extra-financial performance of an issuer of debt and equity
    - How they incentivize managers to engage issuers to improve their medium and long-term operating performance, including Carbon Adjusted Return on Capital (CAROC)
    - How the methodology and time horizon of the evaluation of the asset manager's performance as well as the manager's remuneration is aligned with the pension's investment policies
    - An updated stewardship policy which details how managers engage with and monitor investee companies in terms of their capital structure and how actual or potential conflicts of interest are managed
    - How managers monitor the portfolio turnover costs incurred by the asset manager
    - The duration of the arrangement with the asset manager

Some elements specific to climate change that could also be included in Canadian pension SIP&Ps include:

- Further detail on their arrangements with external asset managers, including:

How managers are performing macro and microclimate assessments of their funds, investee companies and investments (see Q#2 above)

- How the pension manages the systemic ESG / Climate Change issues and Net Zero Business Model (NZBM) risk in the diversification section of SIP&Ps. Given the systemic nature of some ESG risks (including climate change risks), one cannot easily diversify away total or active risk through traditional diversification methods (such as the diversification of asset classes, geographies, sectors, industries, currencies and/or investment styles)
- How climate change risks and returns are included in the pension's long-term capital market assumptions (LTCMAs) and/or optimization methodologies when determining sector allocations for a Policy Portfolio

Climate Risk should be a core part of the Risk Appetite Statement of a pension and should be included in the pension's Enterprise Risk Management (ERM) Framework.

Additional items for reference:

- The choice of Benchmark: Pensions will need to start evaluating how to start transitioning away from market cap benchmarks. Tilted funds and alternative index investing are potential alternatives.
- The governance structure for climate change risk management. This could include:
    - A high-level climate change committee (this could be a subset of a management level ESG committee) – to provide governance and oversight
    - An underlying Tactical ESG committee (comprised of investment, risk and ESG teams) to analyze and review climate issues for investments
    - A governance framework designed for climate risks in line with other material risks. This may include creating policies and procedures and ensuring controls are in place, such as:
    - Active risk budgets
    - The 3 lines of defense:
    - Lines of business
    - Risk management / compliance
    - Internal Audit
    - A 4th line could be added for regulators (providing guidelines and oversight)

Q10 - For FRPPs where individual investment decisions are delegated to an investment manager, should consideration be given to climate-related risk management when plan administrators select investment managers? If so, what are the key climate related criteria for selecting investment managers?

Pension Funds as Asset Owners need to take an active role in considering Business Model design and climate change as a factor in investment decisions and should carefully consider the responsibilities which they are delegating to asset managers. As climate impacts can be considered as a subset of business model design and ESG "mission critical" risks, this assessment methodology applies equally to EESG issues for asset managers.

The key consideration in selecting a manager is to have transparency into their process for identifying Net Zero Business Model (NZBM) and climate risks within their fund(s). While allocating to a fund that claims to integrate/mitigate ESG or climate risks may be tempting for pension funds, it is imperative to understand the core underlying methodology as this can differ substantially from manager to manager.

First, ensure an internal understanding of ESG, climate and Net Zero business model value drivers and risks

- Pension Funds should ensure they understand which ESG, climate risks and Net Zero business model transition and transformation are most material to their portfolio (see Q#2 for a discussion on methodology) and how these risks are already incorporated within their pension's investment portfolio
- External experts can be engaged to:

Assess the pension's portfolio to identify the business model and climate risks that are most material to the fund, at both an individual security and an industry or sector level

Provide tailored training and skill building for ESG / climate change risks, corporate life-cycle analysis and business model design / re-design value drivers and levers to net zero and positive return on capital for investment teams, management, and Board members[79]

Second, ensure a thorough understanding of the manager's process for assessing business model and climate risks

- This requires a due diligence of the manager's ESG/climate and business model risk assessment and integration processes/methodologies and financial modeling to determine if they are employing an implicit or explicit risk methodology (see Q#2 for more details)
- This due diligence should be tailored to the specific strategy of the asset manager.

For instance, a low conviction / high turnover will entail a different level of diligence than a long only high conviction, concentrated strategy.

- Managers should be able to provide a direct causal link between their climate risk methodology and their fund's holdings

[79] This should be general as well as for the most material EESG issues and climate risks

Sample RFP/manager review questions[80]:

ESG / climate change and Net Zero Business Model Risks should be an integral part of the evaluation and management process for long and short-listed managers. Questions should include:

- Which ESG/climate and investee company Business Model risks they consider financially material to their portfolio and why
- Details on their approach to ESG integration and the data, tools and methods which they use to integrate ESG factors as well as climate risk
- The time horizons the managers use to calculate ESG/climate and Net Zero business model risks
- The frequency of their ESG/climate risk assessments[81]
- Questions on the managers' governance processes, active ownership and reporting frameworks. These can include:

  Governance:

  - What governance processes are in place / how do these compare to governance processes for other investment risks?
  - What are the controls, metrics, KPIs that are tracked?
  - Will they be disclosing in line with the upcoming CFA disclosure standards for ESG features of investment products?[82]
  - Do they undergo any 3rd party review of EESG / Climate change assessment methodologies?
  - Are proxy voting, corporate governance policy guidelines, Pay for Performance, Say on Pay and possible Say on Climate voting policies and processes in alignment with managing business model risks to net zero across the entire investment portfolio?

  Active Ownership:

  - What is the manager's engagement and voting approach (on ESG/climate and Net Zero business model issues) and specifically what is their ability to influence the long-term strategies and business model design of investee companies?
  - Does the asset owner engagement team have a level of deep operating experience and in-depth industry knowledge and insight that positions them as a credible strategic partner and long horizon investor for key investee company Boards and C-Suite executives? (Similar to Private Equity with Operating Partners.)
  - What is the manager's voting record on ESG and climate issues?
  - What are the manager's securities lending practices?

  Reporting:

  - What are the reports / data that can be received?

[80] For an extensive manager ESG assessment methodology see CGCs' ESG integration maturity assessment tool
[81] As the issues are dynamic in nature, an assessment should be performed on a regular basis.
[82] https://www.cfainstitute.org/en/ethics-standards/codes/esg-standards

These should include detailed reporting for ESG / Climate / Net Zero Business Model change impacts (e.g., the fund's top ESG / climate risks, a review of their assessment methodologies, etc.)

For global managers that market funds in the EU, ask about receiving their SFDR reporting and the classification of their funds (article 8 vs 9)

- Pensions should also check the Investment Management Agreements to see if ESG / climate change requirements should be added to the mandate.
- Pensions should engage with their asset managers to periodically review their SIP&Ps to ensure alignment.

Third, ensure alignment with fees:

- Ultimately pensions should ensure alignment of their requirements and time horizons with their asset managers. The fee structure should ensure managers are incentivized for doing what they say they will do.[83]
- Pensions should also compare managers / strategies net of fees.

Fourth, when using investment advisors for asset manager searches:

- Pension funds should challenge advisers on their knowledge of ESG and climate change and on how the consultants assess managers on ESG integration.
- Pensions should ask for details on ESG/climate assessments the investment consultants perform on the managers. These should include all the points mentioned above.

Fifth, keep up to date with best practices for Net Zero Business Model Transition Risk Assessment

- Pension Funds as long horizon fiduciaries need to ensure that they keep up to date with industry best practice guidance. Gather information and insights from the more sophisticated asset managers on ESG and climate change, and use external experts, to increase internal knowledge and capabilities.

[83] "GPIF's manager contracts show its long-term promise" https://www.pionline.com/ja/node/235886

PART 3 – ADDITIONAL INSIGHTS AND ANALYSIS

APPENDIX 1

The "Smart Continent"

To achieve a Net Zero North American power grid, what some describe as "the largest machine in the world", by 2040 and replace the last 150 years of infrastructure built with 85% fossil fuel electric power will require an almost wartime-like orientation and cross-border planning. This includes massive investment in new R&D and innovation[84] and investment in infrastructure, to build back better a new clean energy North American power grid which will be essential in enabling the idea of a "Smart Continent".

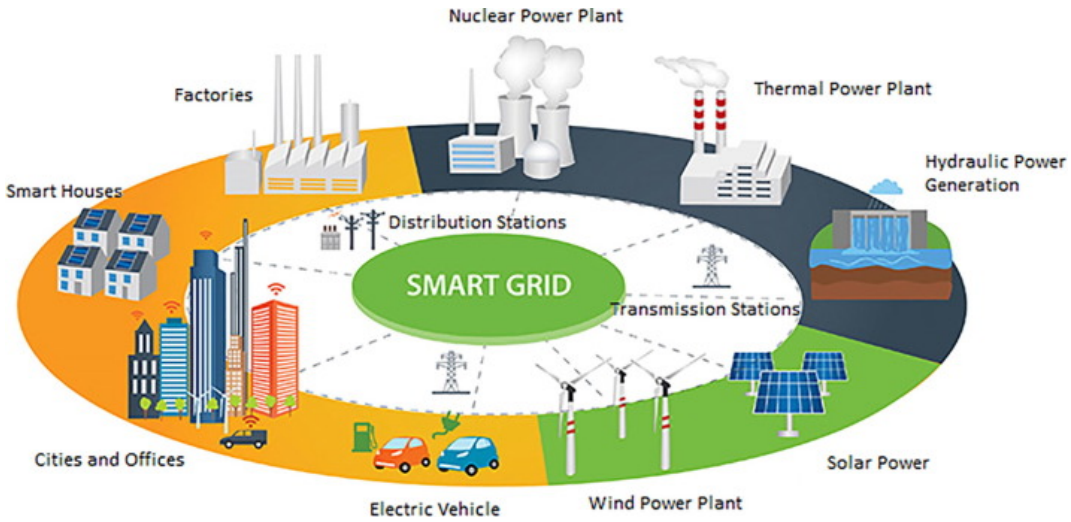
The Smart Net Zero Continent and transformation will be composed of:

- **A smart, clean, cyber-secure North American electric power grid (100% clean energy, including small modular nuclear)**
- **A smart, clean local distributed energy generation power systems**
- **Smart, clean energy efficient commercial buildings and factories**
- **Smart ground transportation (cars, trucks, trains)**
- **Smart logistics and warehousing**
- **Smart air travel, air transport, marine and biofuels**
- **Smart mining, smelting, and zero emissions steel and cement**
- **Smart agriculture and food systems**
- **Smart leisure and travel**
- **Smart cities**
- **Smart homes**

The foundation for this new infrastructure will be smart computing, artificial intelligence, and next two generations of 3D semi-conductors and new materials

[84] Such as hydrogen energy, biofuels, carbon capture & storage (CCS), bioenergy with carbon capture and storage (BECCS) technologies, distributed generation, battery energy intensity and storage, direct air capture (DAC), negative emission technologies (NETS) and small modular nuclear.

Figure 7: *Clean and smart power grid will be the core of the smart continent*[85]



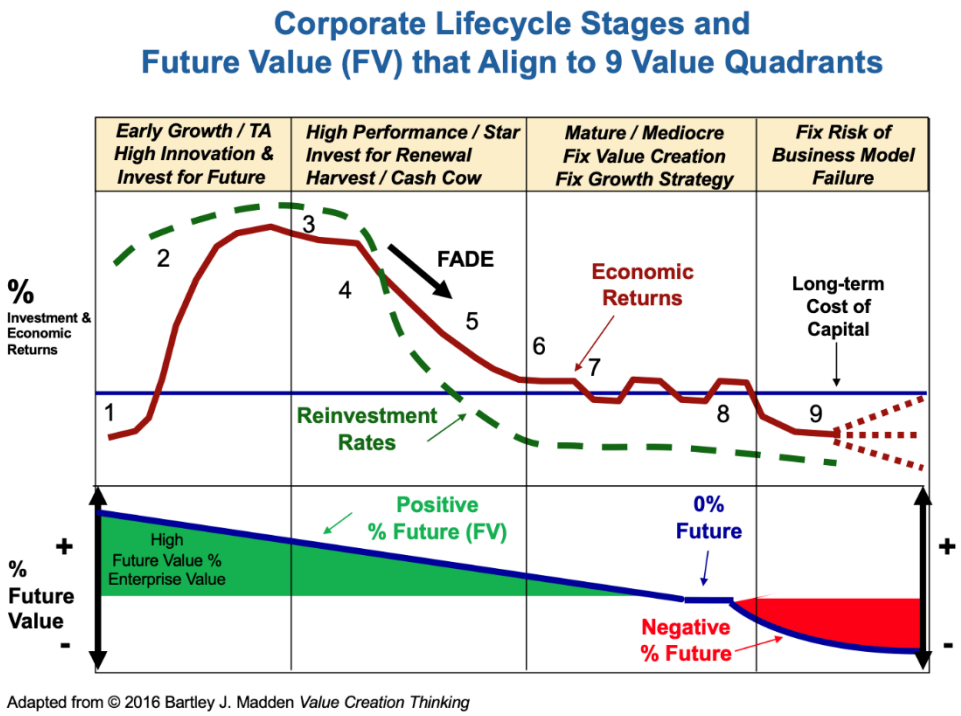
The transformation of sectors required to attain a net-zero global economy and smart continent will inevitably see some companies within these sectors transition and transform their business models, some companies that will struggle to transition, and some companies that will need to enter into a managed decline state or, depending on the forces of the capital markets, may simply see their total enterprise value completely erode. The ability of a company to transition and become part of the new eco-system of the smart continent, will depend largely on where they reside in the corporate life cycle for innovation and return on capital and whether they have a positive or negative future value.

[85] Source: www.sciencedirect.com

The Corporate Lifecycle, Innovation and Future Value[86]

The company life cycle for growth, innovation, competitiveness and returns on capital, provides boards, institutional investors, and regulators with insights related to where in the life cycle a company is (and even where the entire industry is) using either the median or average of the industry for Economic Returns on Capital and Future Value (see Figure 8).

Figure 8: The Corporate Life-Cycle Stages, Innovation and Future Value



Adapted from © 2016 Bartley J. Madden *Value Creation Thinking*

As the global economy is committing to a net-zero environment, companies in higher emission industry sectors, in order to survive, will face the required challenge of re-designing their business models and in some cases their entire industry eco-systems to achieve:

[86] See the Book "Value Creation Principles and Sustainable Capitalism" by Bart Madden, 2020 Wiley & Sons and also "Beyond Earnings: Applying the HOLT CFROI and Economic Profit Framework" by David Holland and Bryant Mathews, Credit Suisse, Wiley 2018

- A positive Carbon Adjusted Return on Capital (CAROC) above their cost of capital (also measured as the HOLT CFROI > Discount Rate using the Credit Suisse HOLT ® model)
- Net-zero GHG emissions and zero waste by no later than 2050

At times of major disruption of industries and business models, the transformation to positive Carbon Adjusted Return on Capital (CAROC) and Zero/Net Zero GHG emissions will become a major strategic challenge for many companies.

The below points describe part of the company life cycle of innovation and returns on capital that must be recognized by Officers and Directors of public companies for effective strategic capital allocation in operating companies.

Global capital markets research by Credit Suisse HOLT® identifies that, based on over 25 years of global analytics[87]:

- Companies starting as “Failing Business Models” with a 5-yr. Return on Capital (HOLT CFROI) less than their Cost of Capital (HOLT Discount Rate) and a “Future Value” that is low or negative, have a 59% probability of ending up as a “Failing / Failed Business Model”, destroying shareholder value, in the next 5 years
- Companies starting as “Value Myth” with a 5-yr. Return on Capital less than their Cost of Capital but with a Future Value that is positive, have a 40% probability of being wound down or acquired in the next 5 years
- Companies starting as “Hidden Value” with a 5-yr. Return on Capital greater than their Cost of Capital but with a Future Value that is low to negative, have a 38 % probability of being wound down or acquired in the next 5 years

Within this paper we present a methodology to identify where a company is positioned within the lifecycle of innovation and returns on capital when adjusting for an increase in the cost of carbon and a carbon shock for many. This will be critical for Boards and investors to understand so that they can both identify how exposed a company is to net-zero business model (NZBM) transition risks as well as the level of probability and Carbon Adjusted Returns on Capital (CAROC) that the company can actually transition to, given the current business model and organizational leadership.

[87] Holland, David and Matthews, Bryant, “Beyond Earnings”, 2018, Credit Suisse Securities, Wiley & Sons p. 278

APPENDIX 2 - Summary of Our Analytical Research

Full details of the methodology and findings are available by contacting Mark Van Clieaf at Mark.VanClieaf@FutureZero.com

Enterprise Value at Risk from a Carbon Shock

Working in close collaboration with Credit Suisse HOLT® in both London and Chicago, we requested a special custom data run, based on our specifications, from the Credit Suisse HOLT® global securities database. Using this custom data, we completed a pioneering global analysis to create greater strategic insight for the Government of Canada and the Office the Superintendent of Financial Institutions and the U.S. Securities Exchange Commission.

The results provide a unique and bottom-up quantification of the scale and risk of a Net Zero transformation in the global capital markets[88] by stress-testing a rise in carbon prices on the cost of capital of a sample of global firms, based on their disclosed scope 1 & 2 emissions, and assuming no cost pass through to consumers.

Of the 12,883 companies in our global sample, 11,163 companies (87%) had disclosed or estimated (by ISS) carbon emissions data (scope 1 & 2) in the Credit Suisse HOLT® global database. The data source for carbon emissions was ISS[89]. When we applied an estimated cost of $75 / ton CO2e to the 11,163 securities, 3,470 securities (27%) had a greater than 5% decline in their Carbon Adjusted Return on Capital (CAROC)[90].

From Table 4 below, we can see that this varies considerably from sector to sector. Not surprisingly, sectors such as Energy, Utilities and Materials have 64%-75% of companies impacted negatively by a carbon price of $75 / ton.

At the 80th percentile, some sectors like Utilities, Energy, and Materials had a negative 300 to 700 basis point (bps) decline in CAROC as measured in this research study using the HOLT Carbon Adjusted-CFROI.

The total Enterprise Value at risk[91] of these 3,470 global securities is over $20.3 trillion in the global capital markets[92]. This figure is not immaterial for the risk-adjusted and more specifically, the carbon-adjusted portfolio returns, of global, long horizon investors such as pension funds.

[88] With their significant exposure to global markets, Canadian and US pension funds are at particular risk.
[89] Institutional Shareholder Services
[90] Where return on capital is measured by the > 5 % negative change in CFROI calculated by Credit Suisse HOLT®.
[91] As measured by the total combined Enterprise Value of the of the 3,470 global securities that had a greater than 5% decline in Return on Capital.
[92] We also found that Asia/China only had 12% of their listed companies with a material negative impact when stress tested at $ 75 / ton CO2e, which raised questions about the accuracy of their GHG disclosures.

Table 4[93]: *Impacts on the return on capital on a global sample of over 11,100 companies after applying a $75 / ton price of carbon to scope 1&2 data. This table identifies those companies that had great than a 5 % negative change in their return on capital (HOLT CFROI) and their total combined Enterprise Value at risk.*

	GLOBAL					
	Companies	Carbon Data		>5% Impact		Enterprise Value ($m)
Materials	962	854	89%	179	75%	$ 4,041,014
Utilities	259	234	96%	70	64%	$ 3,698,549
Energy	480	451	97%	187	73%	$ 3,416,406
Industrials	2,475	2,236	95%	190	35%	$ 3,504,753
Consumer Staples	741	693	90%	87	63%	$ 2,228,310
Consumer Discretionary	1,997	1,693	85%	135	24%	$ 1,516,140
Financials	1,417	1,264	91%	4	1%	$ 722,296
Information Technology	1,703	1,397	87%	62	15%	$ 722,423
Health Care	1,308	1,052	82%	28	6%	$ 197,264
Real Estate	796	725	98%	13	5%	$ 194,073
Communication Services	740	564	89%	12	5%	$ 133,197
	12,883	**11,163**	**87%**	**3,470**	**27%**	**$ 20,374,424**

Source: Credit Suisse HOLT®

North American Securities at Risk

In the above sample of securities that were at risk from a $75 / ton CO2e price shock and stress test, over 50% of the securities were in North America (see table 5). We therefore undertook a second analysis of over 1,500 of the largest securities in Enterprise Value in North America. This time we stress-tested at $100 / ton CO2e, using scope 1 & 2 emissions data and assuming no carbon cost pass through to consumers. We believe this was a conservative price shock given that Canada is scheduled to go to $170 / ton carbon fees by 2030. The results can be found in Table 4. As can be seen, 23% of the sample of the North American sample of securities had greater than a 5% negative change in their return on capital and their total combined Enterprise Value. This is equivalent to $10.9 trillion in EV.

[93] Source: Credit Suisse HOLT ®

Table 5[94]: *Impacts on the Return of Capital (HOLT CFROI) on the North American securities in our sample after applying a $75 / ton price of carbon to scope 1&2 data. This table identifies those companies that had greater than a 5 % negative change in their return on capital (HOLT CFROI) and their total combined Enterprise Value at risk.*

	CAN/USA						
	Companies	Carbon Data		>5% Impact		Enterprise Value ($m)	
Materials	252	225	89%	179	71%	$	1,621,617
Utilities	93	89	96%	70	75%	$	1,935,249
Energy	233	225	97%	187	80%	$	2,243,173
Industrials	578	547	95%	190	33%	$	1,855,363
Consumer Staples	170	153	90%	87	51%	$	1,235,936
Consumer Discretionary	500	426	85%	135	27%	$	822,827
Financials	754	684	91%	4	1%	$	688,634
Information Technology	586	507	87%	62	11%	$	317,157
Health Care	720	590	82%	28	4%	$	64,411
Real Estate	222	218	98%	13	6%	$	135,252
Communication Services	183	162	89%	12	7%	$	52,863
Unknown	2	0	0%	0	0%	$	-
	4,293	**3,826**	**89%**	**967**	**23%**	**$**	**10,972,481**

Source: Credit Suisse HOLT®

[94] Source: Credit Suisse HOLT - with Strategic Analytics by the Credit Suisse HOLT global team

Four questions to determine a firm's net zero transition

While the exposure and carbon risk of companies will differ from firm to firm, there are a set of foundational questions that long horizon institutional Asset Owners, Board directors at investee companies, fiduciaries, regulators, and stakeholders should be asking of all companies as we enter into a net zero global transformation together. Below are four questions to help us determine which firms were most at risk from the transition to a net zero global and North American economy:

1. **Does the company currently have an economically strong business model** and therefore would be able to transition to a net zero business model (NZBM) as measured by its current positive Return on Capital (ROC) and Economic Profit (EP) business model profile?
2. **What is the level of exposure and carbon emissions intensity within the current business model design and total business system** and therefore what is the expected distance of travel and level of complexity of transition required for the business model to achieve net zero?

Measured as **Tons of CO2e produced per Million Dollars of Revenues**

3. **What will be the impact if there is a positive carbon price shock of $100 / ton CO2e**. Specifically, what is the impact on the company's:

Return on Capital (therefore a **Carbon Adjusted Return on Capital or CAROC**)

Carbon Adjusted Performance Spread (therefore a **Carbon Adjusted Performance Spread or CAPS**) – an ultimate new performance metric which measures the Return on Capital after the cost of capital and after the cost of carbon

4. **Is the company able to fund their required transition** given their current business model and cash flows?

Measured by the ratio of key operating cash expenses and cash financing (interest and dividend payments) relative to gross cashflows (therefore a **Net Zero Transition Cash Risk Ratio or NZTCRRS**) since most companies will require some level of R&D and new CAPEX to transform to a GHG neutral, low, or negative business model

After answering the above questions and solving for the expected net zero or carbon risk of a company. Two follow-on core questions naturally arise, that all investors, Board directors, fiduciaries, regulators, and stakeholders need to ask:

- Are the capital **markets accurately pricing in the Carbon Risk** of the company and its current Business Model design? Is this risk accurately reflected in investment portfolios or is there excess uncompensated risk (like in the 2008/2009 financial crisis) that the capital markets are not pricing in? Is this a product of short-termism?

- Are capital market participants being evaluated on the right set of metrics (i.e., total shareholder return, quarterly/annual alpha, etc.) or are **new performance metrics and incentive designs required to accelerate the transition to a Net Zero Business Models (NZBM) and a Net Zero economy?**

- Does the company or the Board have the right level of "**Strategic Leadership" and Systems Level Thinking** required to effectively and successfully transition a business model to a Net Zero Business Model and its contribution to a net zero economy? Do the asset owners?

We then sought to align our findings for the 1500 largest listed companies to identify where they sit in the corporate lifecycle of the business model, the lifecycle of innovation and returns on capital, and the current position of their business model performance into the requisite value creation quadrants[95] using Economic Returns on Capital (Economic Profit) and Future Value to determine the position. (Please see Appendix 3 for the detailed Quadrant diagrams).

This paper outlines a methodology and introduces a new set of research-based performance metrics and Net Zero Transition "strategic analytical insights" to help Boards at investee companies, capital market participants and key financial system regulators answer the above questions. It also outlines a framework to determine the strategic leadership positioning of a firm. To illustrate the impact from a carbon shock, we present results from a global and North American analysis that includes over 11,100 securities with carbon emissions disclosed or defensibly estimated.

The point of our Net Zero Transition stress-test research study was to:

- Identify the percentage of firms exposed to carbon risk within the core fundamentals of their current business model design as well as the percentage of companies that today have failing business models with consistent returns on capital below their cost of capital
- From the above companies, we then wanted to identify which higher carbon business models also had a high 5 yr. Total Shareholder Return (TSR) and Future Value (FV), therefore indicating a possible capital markets mispricing.

[95] For full details of the quadrant analysis and findings, please contact Mark Van Clieaf at Mark.VanClieaf@FutureZero.com

Five key findings and insights from our analysis

1) With the exception of the Energy sector, the global and North American capital markets appear to be mis-pricing a future rise in the price on carbon and possible carbon shock.

2) BEFORE a carbon shock, a significant portion of Energy (57%), Utilities (30%) and Materials (23%) companies had failing business models with a 3 yr. negative Economic Profit, a Return on Capital less than the Cost of Capital, and a very low / negative Future Value of the company, even though the majority of these Utilities and Materials companies had a positive 5-year Total Shareholder Return (TSR).

3) Within the same sector there can be a broad range of Business Model carbon intensity. For example, in North American Investor Owner Utilities:

   - Hydro One produces 69 Tons of CO2e / $ 1 million revenues
   - Emera, Southern Co, and Duke all produce > 4,000 tons of CO2e / $ 1 million
   - NRG is the highest with over 5,000 tons CO2e / $ 1 million revenues

   These last 4 investor-owned utilities are examples of companies that need a significant business model transformation. The entire North American electric power system will also require significant industry sector / eco-system transformation as well to get to a Clean Power Grid for North America by 2040.

4) After adjusting and stress-testing for a rising cost of carbon, a large portion of Energy (67%), Utilities (50%), and Materials (39%) companies have failing business models as measured by their Carbon Adjusted Return on Capital (CAROC), CAPS and Future Value (FV).

5) For all North American companies in our sample, 28% have a Net Zero Transition Cash Risk Ratio less than 1 which means they do not generate enough internal cashflows to fund the net zero business model transition internally. Of these, 92% of Utilities, 67% of Energy, 11% of Materials companies will have to raise external financing to drive the Business Model transformation to Net Zero.

For these companies it is NOT a Business Model Transition but a complete Business Model Transformation!

Summary of Sector Findings[96]

Full details of the methodology and findings are available by contacting Mark Van Clieaf at Mark.VanClieaf@FutureZero.com

North America - Overall:

- The majority of companies are in Value Quadrant 2[97] in our value creation analyses, demonstrating that most North American companies (across all the various industries in the sample) have strong business models, positive FV and will still manage to create a positive Return on Capital and Performance Spread above cost of capital when we adjust for a carbon stress-test at $100 / ton CO2e (scope 1 & 2). Note, we have not adjusted our findings for the market value of the underlying companies, nor applied any industry or sector weightings to the sample of 1500 companies.

North America - Utilities:

- 57 % of North American utilities had a return on capital less than their cost of capital and a 3-year cumulative negative economic profit. 30% of the Utilities companies analyzed had a “failing business model” (as defined by a 3-year negative Economic Profit and negative Future Value (FV))
- 98% of companies in the Utilities sample were considered “higher carbon” business models and nearly half of these high / higher carbon companies also had a positive FV and thus expectations for positive returns on capital in the future
- When we adjust and stress-test for a $100 / ton price of carbon:

The majority (92%) of companies had a negative Carbon Adjusted Return on Capital (CAROC - which in this research study used the HOLT Carbon Adjusted CFROI), yet 44% of these companies also had a positive Future Value (FV).

91% of companies had a negative Carbon-Adjusted Performance Spread (CAPS – which in this research study used the HOLT Carbon Adjusted CFROI – Discount Rate spread), and thus the business model is destroying shareholder value after cost of capital and after a cost of carbon stress test at $100 / ton CO2e (scope 1 & 2). However, 86% of these had a positive 5 yr. Total Shareholder Return (TSR). The capital markets therefore seem to be mis-pricing potential future carbon price risk, new clean energy technologies, and regulatory risk.

- 93% of Utilities companies had a Net Zero Transition Cash Risk Ratio (TCRR) of less than 1, and therefore these companies do not generate enough free cash flows in their current business models to internally finance / invest in a Net Zero Business Model transition, all else being equal.

These findings may be indicative that the capital markets are not pricing in a rising price of carbon, or transition risk, for Utilities companies, all else being equal.

[96] Our data from multiple data sources is as of April 30, 2021
[97] For full details of the quadrant analysis and findings, please contact Mark Van Clieaf at Mark.VanClieaf@FutureZero.com

North America - Energy:

- 57% of the Energy companies analysed had a "failing business model" (as defined by a 3-yr. negative Economic Profit (EP) and negative Future value (FV)) before taking into account any carbon shock risk
- Not surprisingly, the Energy sub-sector had 92% of companies that were considered high carbon, and 73% of these had a negative Future Value (FV).
- When we adjust and stress test for a $100 / ton CO2e (scope 1&2) price of carbon:

The majority (87%) of companies had a negative Carbon-Adjusted Return on Capital (CAROC), and 79% of these companies also had a negative FV.

86% of companies also had a negative Carbon-Adjusted Performance Spread (CAPS) thus the business model is destroying shareholder value after cost of capital and after a cost of carbon stress test at $100 / ton CO2e (scope 1 & 2). 75% of these also had a negative 5 yr. Total Shareholder Return (TSR).

- 66% of Energy companies had a Net Zero Transition Cash Risk Ratio (TCRR) less than 1 and 34% had an TCRR greater than 1, indicating that, as opposed to Utilities, over a third of Energy companies do have sufficient free cash flows in their current business models to internally finance / invest in a Net Zero Business Model transition, all else being equal.

These findings may be indicative that capital markets have been pricing in a rising price of carbon, reduced demand for fossil fuels, and increased technologies for clean energy, and hence are pricing in a rising price of carbon, or transition risk for the Energy sector, all else being equal

North America - Materials:

- 23% of the Materials companies analysed had a "failing business model" (as defined by a negative EP and negative FV) and 46% were "High Performers" with a 3-yr. positive EP and Positive FV.
- Not surprisingly the Materials sector of our sample had 85% of companies that were considered higher carbon, and 54% of these had a negative FV.
- When we adjust and stress test for a $100 / ton price of carbon:

47.7 % of companies end up with a negative return on capital (CAROC), and 31% of these companies also had a positive FV

57% of companies end up with a negative carbon-adjusted performance spread (CAPS) thus the business model is destroying shareholder value after cost of capital and after a cost of carbon stress test at $100 / ton CO2e (scope 1 & 2), but 76% of these companies had a positive 5 yr. TSR.

- 89% of the Materials companies had a Net Zero Transition Cash Risk Ratio (TCRR) greater than 1, and more than three quarters (76%) of these companies had a positive FV, indicating that most Materials companies have sufficient free cash flows in their current business models to internally finance / invest in a Net Zero Business Model transition, all else being equal.

This may suggest that either over the past five years, the capital markets have not been pricing in the impact of a future increase in the price of carbon, or this may be indicative that the markets believe that the companies have created, or will create, viable strategies to reduce the carbon sensitivity of their business models.

North America - Financials:

- Only 14% of the Financials companies analysed had a “failing business model” (as defined by a negative EP and negative FV) and 77% were “High Performers”.
- 82% of companies were low carbon companies (83%), which is not surprising as we are only looking at scope 1 & 2 emissions. If scope 3 emissions, such as those resulting from financing and lending activities were included, then the Carbon-Adjusted returns would be much lower.
- When we adjust and stress-test for a $100 / ton price of carbon:

83% of companies had a positive return on capital (CAROC), and 82% of these companies also had a positive FV.

73% of companies had a positive Carbon-Adjusted Performance Spread (CAPS). However, 89% of these had a positive 5-yr TSR.

- 67% had a Net Zero Transition Cash Risk Ratio (TCRR) less than 1, meaning these companies may not have sufficient free cash flows in their current business models to internally finance / invest in a Net Zero Business Model transition, all else being equal.

These results suggest that a rise in the price of carbon does not have as much impact on Financials companies than the other sectors. However, this does not reflect any carbon risk in the investment or loan portfolio of Financial Institutions (Banks and Insurance companies) since we are only using scope1&2 disclosed data.

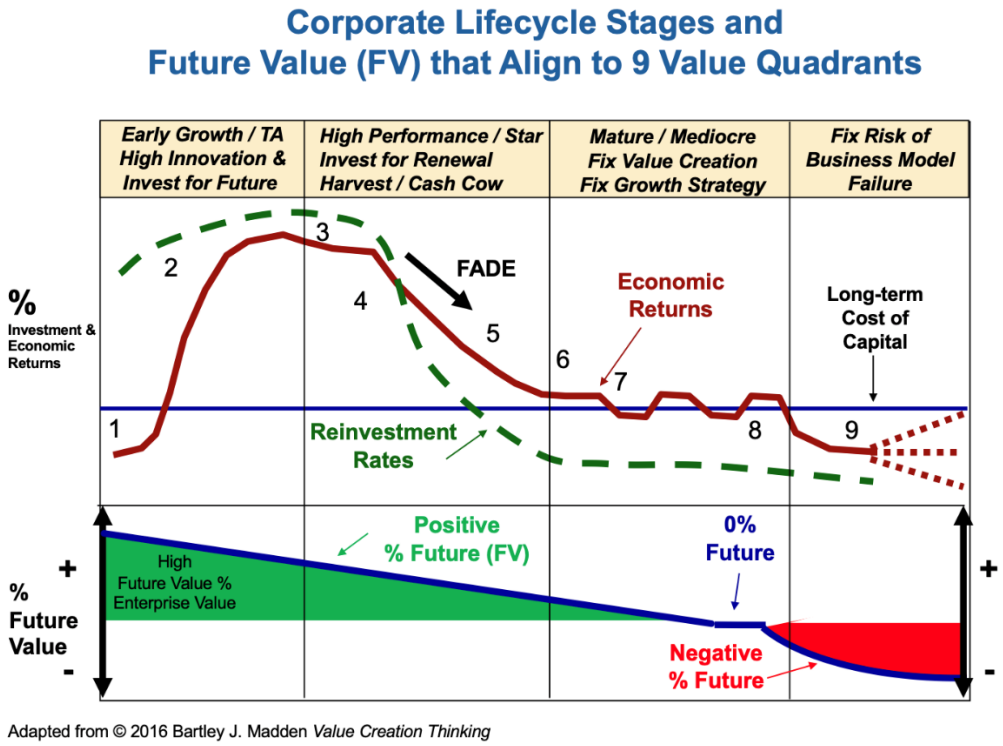
APPENDIX 3 – The Critical Role of Boards

Business Strategy and Business Model Design

The climate crisis and the transformation to net zero business models and industry sectors will require the majority of companies to fundamentally revisit their business strategy and business model design.

A first step is to ensure the Directors have complete visibility into the GHG emissions of the firm and its current business model including scope 1, 2 and 3 emissions. A second critical step is to then identify the risk to the business model if there was a carbon price shock. The third step is then to undertake a life-cycle review of the Business Model and where it is positioned today on the lifecycle of competitiveness, innovation and returns on capital. This analysis requires a process to analyze and plot a firm's Future Value relative to its operating competitive advantage by using such metrics as economic profit.

Figure 9: *Corporate Lifecycle Stages and Future Value*

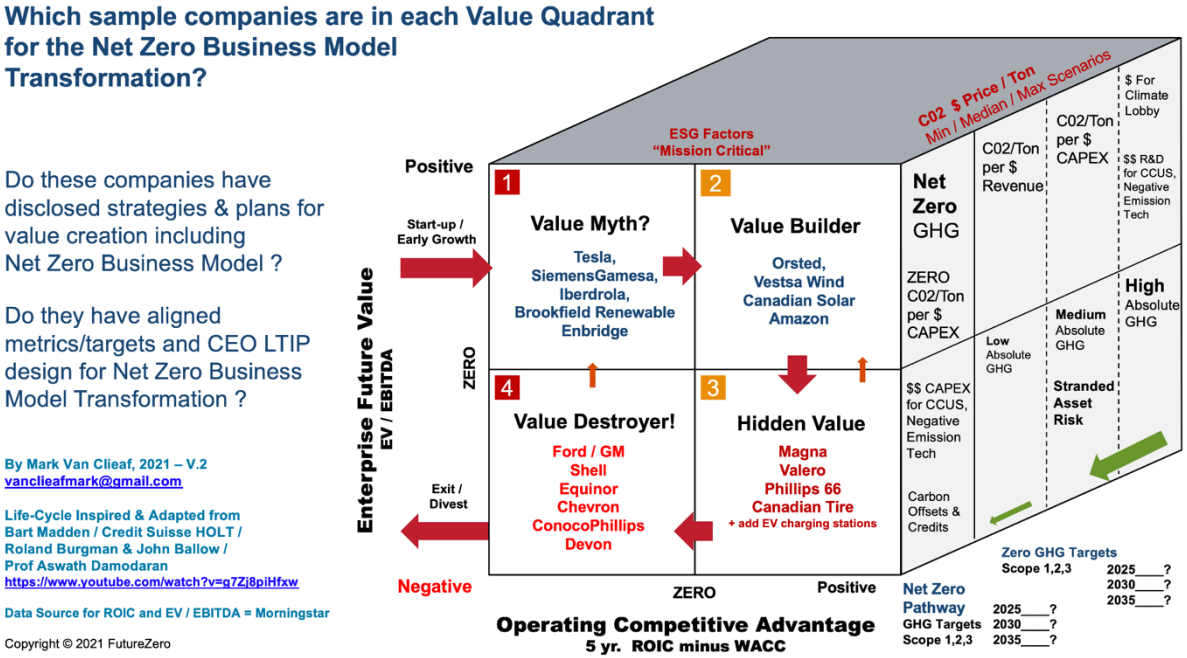


Adapted from © 2016 Bartley J. Madden *Value Creation Thinking*

Based on the results of 1) the carbon analysis (including foot printing, carbon intensities, etc.), 2) stress testing of the current business model at a $100 per ton CO2e carbon pricing, and 3) the Life-Cycle review, Directors should be able to determine the

scope and scale of business model transformation required to achieve Net Zero. Directors should also ask to benchmark all these key performance metrics relative to the median of their GICS sector and peer group for a relative performance comparison.

Figure 10: *Net Zero New Business Model Performance Assessment*



The biggest risk to the level of business model transformations that will be required in critical industries such as Electric Utilities, Airlines, Smart Buildings & Homes, Mining, Steel, Cement, Oil & Gas, Chemicals, Road and Rail Transportation, and Food Products is the potential lack of "strategic and transformational leadership" capacity in executive teams with the potential to lead business model and industry sector transformations.

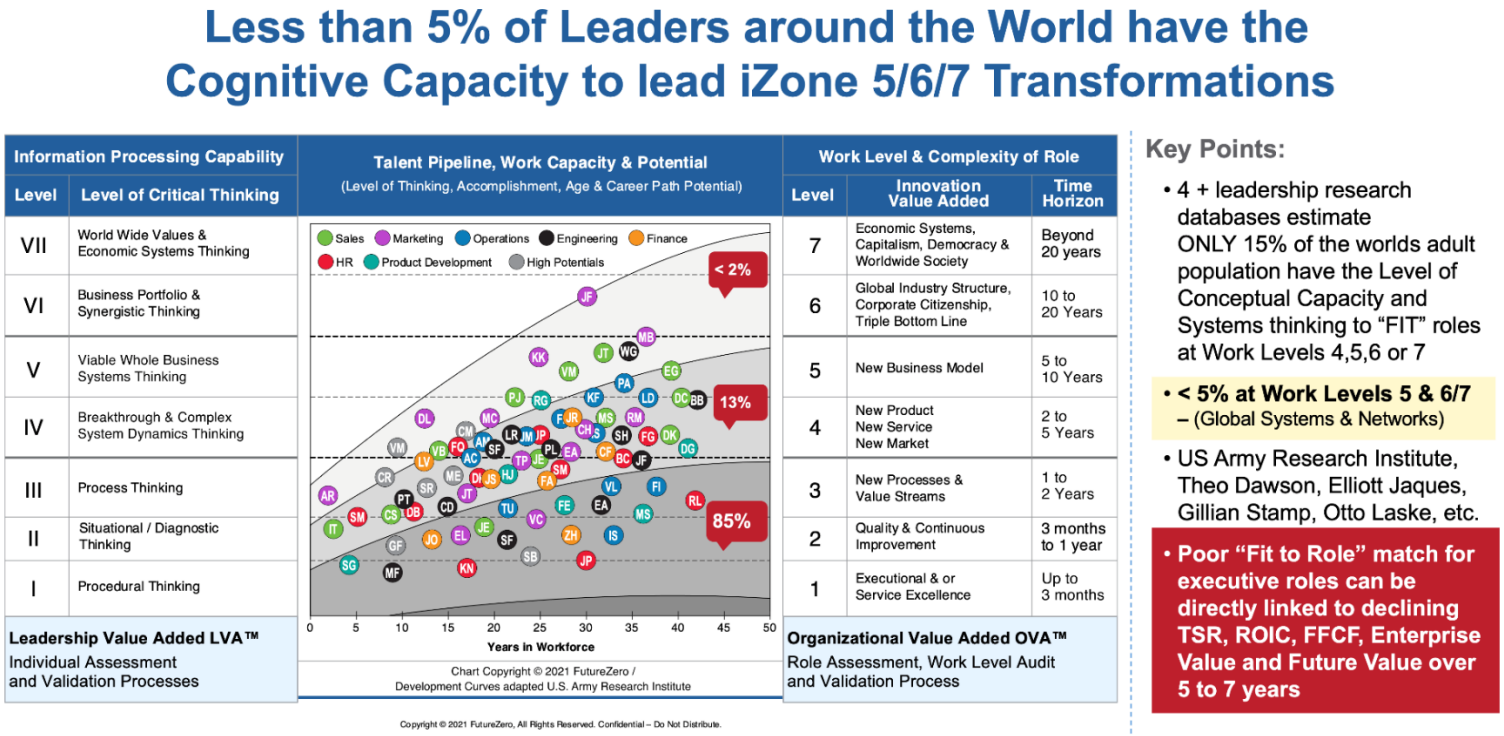
Research on levels of cognitive development, critical thinking and problem solving identifies that less than 5% of the world's adult population have the level of conceptual capacity and systems thinking to conceptualize and implement business model and industry eco-system transformations. This research includes over 40 years of "strategic leadership" research at the US Armed Forces in the selection and development of 1, 2, 3 and 4 Star Generals.[98]

[98] One of the authors of this comment letter has ties to the "Strategic Leadership" research at the Army Research Institute (ARI), Industrial College of the Armed Forces and the National Defense University of the USA, including both classified and unclassified leadership assessment and research findings conducted over the last 50 years.

Thus identifying, selecting, and developing CEO's, C-Suite team members and even Board Directors with the minimum Level of Capacity for Complexity (CFC), Systems Thinking and Conceptual Capacity required for business model transformation to Net Zero will be a material challenge and risk for most companies.

Companies who lack a deep C-Suite talent pipeline and appropriate Capacity for Complexity, Systems Thinking and Conceptual Capacity and leadership development tools for "Strategic and Transformational Leadership" assessment of potential and performance, will be challenged to implement Net Zero Business Model transformation.

Figure 11:



APPENDIX 4 - The Critical Role of Institutional Investors and Financial Institutions

Given the exposure that large, diversified institutional investors have to the global economy, and the results of our findings, a large portion of institutional investors (asset managers and asset owners) are directly and/or indirectly exposed to the risks of a rise in the price of carbon. Pension funds, with their inherent long-term liabilities face an even greater exposure and risk.

The long-term Beta return is at risk if the global economy cannot transition to a net-zero environment. Pension Funds as asset owners (AO's) need to ensure sufficient operating returns on capital, free cashflows and investment portfolio liquidity are being generated to pay their pension beneficiaries. Passive asset managers that are universal owners are significantly exposed to systemic risks from climate change.

As fiduciaries and stewards of their investors' capital, asset managers need to navigate the complexities of a global transition to net zero. Investment managers will need to identify those companies that will need to completely redesign their business models, those industry eco-systems that will need to be completely re-shaped and transformed, as well as those companies that are financially strong enough to be able to transition and do so from their current cash flows and those who will need external financing to fund the transition.

Current investment and risk management practices will need to materially change to encompass the increased complexities of climate change risk. Scenario analysis and "Carbon Shock" stress-testing will need to ensure a realistic increase in the price of carbon, the development and use of new technologies, and a pragmatic power generation energy mix for Utilities.

Investors such as pension funds, have long term investment time horizons. Within these investment time frames the global economy and investment portfolios will need to transition to net zero. By proactively managing these risks and supporting investee companies in their journeys to Net Zero Business Model (NZBM) design, pension funds can become future makers as opposed to future takers.[99]

From a global perspective, we cannot get to Net Zero without looking at the real economy. That means investment portfolios cannot be managed in isolation or evaluated solely on relative investment portfolio returns. Portfolios will need to look to the real cash flows and the carbon adjusted real value drivers and returns on capital (CAROC – such as the HOLT CA-CFROI) of their investee companies in the investment portfolio.

In order to identify the investment risks and the investment opportunities of a global transition to a low carbon or Net Zero economy, investors must ensure that they perform an in-depth value driver analysis and valuation of the securities held in their portfolios as well as a holistic explicit risk analysis. This includes all material EESG issues from a stakeholder perspective as well as both physical and Business Model transition and climate change impacts.

However, since climate change is a systems problem and not an individual company's problem, we therefore need a "systems level" approach to the whole sector / industry and a new way of thinking about investment for institutional investors, banks, and credit

[99] https://www.bain.com/insights/future-makers-vs-future-takers-long-term-thinking-fm-blog/

analysis / lending. Most of the key points raised in the balance of this position paper on Risks and Opportunities for Pension Funds have similar application for major Banks and their lending, investment banking and trading portfolios. One of the authors of this white paper has extensive global banking experience[100].

Industry initiatives

There are a significant number of industry initiatives which major investors (both asset owners and asset managers) have signed on to, and they have succeeded in increasing awareness of various sustainability issues including the need for rapid and extensive climate action. However, while successful from a diplomatic standpoint, concrete actions are less evident. Although these initiatives may have high participation rates, they need to be followed by concrete, meaningful actions to truly have an impact on the real economy.

In addition, the emphasis of some of these initiatives is the carbon emissions of companies, both from a reporting and disclosures perspective. However, the significant impact on the real economy that needs to happen will only happen with transformational change to business models and industry eco-systems in some of the most impacted sectors like Power Utilities, Materials, Transportation and Energy.

The emphasis needs to be on business model transformation and how a company is managing risks, not only reporting and disclosures.

New investment model

Systems level investment model

Steve Lydenberg one of the co-founders of the TIIP project[101] in his new book co-authored with William Burckart[102] "21st Century Investing: Redirecting Financial Strategies to Drive Systems Change"[103] describes how investments have the power to impact social, financial, and environmental systems and the complexity of the times we live in. They call it system-level investing[104].

Systems refer to "large social, financial, and environmental foundations of society necessary for any successful investment". This includes social systems such as healthcare, food and water security, and consumer safety; financial systems such as honest markets

[100] This includes advisory work in setting up the Corporate Banking, Merchant Banking, Leverage Finance, M&A Advisory, Corporate Credit, Workout, CRM and Datamining functions for Retail and Small Medium Enterprise Banking for such financial institutions at the CitiCorp, Royal Bank of Canada, Scotiabank, Bank of Montreal, Chase Manhattan Bank, First USA Credit Card, Barclays Bank, Standard Bank of South America
[101] The Investment Integration Project; https://www.tiiproject.com/
[102] Authors Jon Lukomnik and Steve Lydenburg advanced chapters of their new books to the authors of this OSFI comment letter for review and consideration.
[103] Burckart, William and Lydenberg, Steve, "21st Century Investing: Redirecting Financial Strategies to Drive Systems Change", 2021, Berrett-Koehler, USA
[104] "Investment today has evolved from a basic, conventional approach (concern about the risks of security selection and portfolio risk management) to also embrace sustainable investment (intentionally achieving social and environmental benefits along with financial returns). Building on this integration of sustainability factors, investment can now transition to a third stage that recognizes both the power of investments to impact social, financial, and environmental systems and the complexity of the times we live in. We call this system-level investing." Source:

and transparency of data; and global environmental systems include climate stability, natural resources, oceans and fresh water, forests, and arable land." [105]

"System-level investors believe that it is time to support and enhance the health and stability of the social, financial, and environmental systems on which they depend for long-term returns. They preserve and strengthen these fundamental systems while still generating competitive or otherwise acceptable performance."

Climate change is a systems problem and as such requires a systems level approach and solution.

Systemic Risks and Beta Activism

Lydenberg and Burckhart posit that the primary source of long-term returns is from beta exposures (market benchmarks) rather than from alpha (outperformance of market benchmarks). Long term investors need to "understand the relationship between their actions and the health of the social, financial, and environmental systems that they depend on for financial success. These are system-level risks and rewards and require system-level solutions."

Jon Lukomnik and James Hawley[106] continue this thread and have coined the phrase "beta activism". Their view is that society needs more investor activism to create a sustainable economy.

"The activism we need is of a different type though: it focuses on the long-term performance of the market as a whole, rather than just the short-term performance of individual companies."[107]

They believe that a paradigm shift is required to get investors beyond modern portfolio theory (MPT), as this contains within it what they call a "fateful error of omission": it assumes that investors cannot affect the risk-return profile of the market as a whole" since today most companies' shares are owned not by individuals, as they were back in the 1950s when Markowitz published his MPT, but by large institutional investors like pension funds and sovereign wealth funds.

These institutional investors have become universal owners in that while they do have active management strategies, focusing on alpha, they are also, given the depth and breadth and hence diversity of their investments, significantly exposed to systemic, beta risks, which cannot easily be diversified away.

Richard Roberts and John Elkington call for a "**Modern Portfolio Theory 2.0**" [108] which incorporates "systemic impact as a third dimension to be optimized in the portfolio construction approach, alongside risk and return".

Lukomnik and Hawley's "beta activism" goes beyond traditional MPT which assumes that investors need to focus solely on trading and portfolio construction to improve the risk-return of investments. **Beta activists will target improvements in the real economy and key industry sectors to improve the risk-return profile of the market as a whole**.

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[105] Burckart, William and Lydenberg, Steve, "21st Century Investing: Redirecting Financial Strategies to Drive Systems Change", 2021, Berrett-Koehler, USA

[106] "Moving Beyond Modern Portfolio Theory: Investing That Matters"; https://www.routledge.com/Moving-Beyond-Modern-Portfolio-Theory-Investing-That-Matters/Lukomnik-Hawley/p/book/9780367760823

[107] https://medium.com/volans/the-investor-activism-we-need-e32efd661605

[108] https://volans.com/wp-content/uploads/2021/02/Aligning-Finance-to-a-Net-Zero-Economy-2-fig1.pdf

In a recent paper, Ellen Quigley also points out that "universal owners have been ill-served by the ESG industry's focus on risks to funds' performance as opposed to the real-world mitigation of systemic risks such as unabated climate change and income inequality."[109]

A New Strategic Active Ownership Model

"Strategic engagement" with investee companies

As part of the transformation of the North American economy to a carbon neutral and Net Zero GHG emission economy, new capital will be required (both debt and equity) for R&D and commercialization of transformative technologies and clean energy systems. North American pension funds and Corporate / Investment Banks can, and must, start to engage at a new "strategic engagement" level in initiating sector level and long-term strategy discussions with Boards, CEOs, and CFOs in key sectors / industries[110] on their transformation to Net Zero Business Model design and aligned structure, skills and short and longer-term (5 yr. plus) incentive designs.

Such engagements must focus on longer-term (ie.7, 10, 20 and 50 yr.) strategies for R&D and the complete transformation of key industries and sectors so that the base load energy systems and transportation systems are no longer anchored in hydrocarbons but rather in clean energy systems. This means a complete and massive transformation from carbon molecules to clean gases, biofuels and clean electrons enabled through distributed clean / carbon neutral electric power systems for the North American continent.

Proxy voting evolution

The proxy voting processes for asset owners need to evolve with the new Net Zero world. This means that policies and guidelines will need to be updated, or risk being not 'fit for purpose' in the new Net Zero investment management world. Proxy voting, corporate Pay for Performance, Say on Pay and possible Say on Climate voting policies and processes will need to align with managing business model risks to net zero.

The new governance model and organization design

To be able to support successful strategic engagement, a new and different Organization Design is required. To initiate the sector level and long-term strategy discussions with Boards and senior executives, on among other things, their transformation to Net Zero requires a higher level of strategic leadership capacity from investment management leaders and teams to be accountable for these newly defined "strategic engagement" processes. This includes collaboration with other key market participants (asset owners, asset managers, regulators, NGOs, and a number of key lead investee companies) to transform a complete industry sector to Net Zero - in essence moving the Beta of the market.

Climate change impacts are not only about Net Zero

While we have focused on climate change and in particular the transition to Net Zero, there are other climate issues that can and will have a significant impact on the financial performance of companies. One recent example is the car industry's reliance on water for computer chips as part of their manufacturing processes. The on-going drought in Taiwan has severely cut back production for

[109] Quigley, Ellen, Universal Ownership in Practice: A Practical Investment Framework for Asset Owners (May 28, 2020). Available at SSRN: https://ssrn.com/abstract=3638217 or http://dx.doi.org/10.2139/ssrn.3638217

[110] Such as Energy, Mining & Metals, Pipelines, Utilities, Automotive, Transportation, and Food and Agriculture

computer chip manufacturers causing significant losses further along the value chain. Car manufacturers have had to cut vehicle production due to a limited supply of chips, and the financial implications of this are significant. Ford recently announced a "projected chip-related downtime costs of $2.5 billion (at the high end of prior estimates) and as much as 50 percent of second-quarter output could be affected"[111]. AlixPartners projects the global auto industry could see a $60.6 billion decline in revenue this year attributable to chip shortages."[112]

Other material impacts from climate change that need to be considered. Some of these include bio-diversity risks, water use, biodiversity, and social issues such as impacts on workers and communities.

Morgan Stanley outlined in their 2018 research note "Data Era Investment and The Machine Age" many of the elements of a SMART Planet required to get to Net Zero including, advanced computing, artificial intelligence, augmented reality, IoT sensors, machine vision and robotics. **All of these technologies will contribute to a SMART and Net Zero emissions planet and some $3 trillion in productivity and energy efficiency gains.**

Investor support for issuer disclosures to help foster long-termism

Companies have been advocating for semi-annual reporting to both reduce the burden of quarterly reporting and reduce short-termism from investors, for many years now. A letter from Canadian Tire Corp. to the CSA in August 2017, for example, stated that "the company would support a semi-annual reporting model especially in industries where quarterly results "inadvertently encourage investors to focus too heavily on short-term results."

Accordingly, research by FCLT Global in collaboration with KKS Advisors, concluded that long term investors do not need quarterly earnings guidance from companies, citing investor surveys that have shown that "just 9% of investors found that earnings guidance for periods of less than one year was an important factor"[113]. Contrary to these findings the CFA Institute conducted a survey of its global membership in 2019 on the topic as well as conducted a roundtable discussion, and concluded that "unequivocally, respondents say earnings releases provide minimal and slanted information, while quarterly reports provide standardized and detailed financial information that is extremely valuable to investors."[114]

Regulators have also debated this issue for many years. The CSA[115] in Canada and the SEC in the U.S. have both asked for public consultation letters on the topic to identify areas to reduce regulatory burden in issuers' disclosure obligations without compromising investor protection or capital markets integrity. Our experience is if Quarter 1 and Quarter 3 were dropped from the external reporting cycle for the investment community, there would be no material information lost impacting longer-term company valuation, and this would provide 50% more time for the Directors and Officers to focus on longer-term (10 yr. plus) business strategy and business model transformation to ensure positive return on capital and net zero if not net negative business model emissions profile.

[111] https://www.sasb.org/blog/water-risk-flows-across-industries-and-through-value-chains/
[112] Ibid.
[113] FCLT Global, "Moving Beyond Quarterly Earnings Guidance: A Relic of the Past", 2017, https://static1.squarespace.com/static/5143211de4b038607dd318cb/t/59f2226c2774d1b6f78ab0f5/1509040812294/moving-beyond-quarterly-guidance-whitepaper.pdf
[114] https://www.cfainstitute.org/en/research/survey-reports/financial-reporting-quarterly-and-esg-2019
[115] https://www.theglobeandmail.com/business/article-securities-regulators-propose-allowing-small-companies-to-report/

What does this mean for Canadian Pension Funds as Asset Owners and Fiduciaries?

The Canadian pension model, while innovative and industry leading, is also significantly exposed to global systemic risks and the returns from markets indices[116] given their notable assets under management and the breadth of their investment exposures and strategies. They are perfectly placed to be key players in strategic global engagement and beta activism.

Exposure to systemic risks

As global multi-asset investors, Canadian pension funds are significantly exposed to systemic risks resulting from climate inaction. Canadian pensions, by acting in the best interests of their stakeholders can ensure actions today will create a strong and resilient economy for the future benefit of their pensioners. While these actions may seem costly today, inaction will inevitably end up costing more.

From a global perspective, we cannot get to Net Zero without looking at the real economy. That means investment portfolios cannot be managed in isolation or solely in excel spreadsheets. It requires a detailed understanding of the real operating value drivers, cashflows and forces underpinning the returns on capital and free cashflows of the underlying business models of investee companies and investments.

In order to identify the investment risks and the investment opportunities of a global transition to a low carbon or Net Zero economy, investors must ensure that they perform an in-depth valuation of the securities held in their portfolios, as well as a holistic explicit risk analysis. This includes all material “mission critical” ESG issues from a stakeholder perspective as well as both physical and Net Zero business model transition risks from climate change.

Returns tethered to passive market indices

The Canadian pension model differs from international peers in their Board and governance structures and due to the significant internalization of investment management. Whereas peers pension funds outside of Canada generally outsource a large percentage of assets under management (AUM), Canadian pensions manage most assets in-house and attract top investment talent with top quartile incentive compensation packages. This has allowed them to be leaders in the Pension Fund industry globally based on key benchmarks and has enabled a significant amount of innovation and first mover initiatives[117]. Within the public markets’ investment classes of these firms, there is a large percentage of AUM managed passively and hence tied to market indices.[118] This further highlights the need for strategic engagement and beta activism as mentioned above.

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[116] This includes synthetic replication strategies that are exposed to market indices such as Total Return Swaps (TRS).

[117] For instance, Canadian pensions entered the OTC derivatives markets and securities lending markets much sooner than their international peers. Canadian pensions are also amongst the largest global direct investors in private equity, infrastructure and real estate.

[118] This is due both to the size of the AUM but also to ensure sufficient liquidity ratios (as passive exposures can be obtained through the use of synthetic instruments such as total return swaps). To note, a recent study by Richard Ennis on US pensions showed that all AUM, even the active management portion, was significantly correlated to passive market indices. https://blogs.cfainstitute.org/investor/2021/06/07/institutional-portfolio-benchmarks-slow-rabbits/

Well placed for the complexities of ESG investing

As large, sophisticated investors, Canadian pensions are perfectly placed to be able to navigate the complexities of ESG investing including the specific challenges related to climate risks. ESG and Responsible investing requires not only advanced investment skills and acumen but also integrated ESG analysis skills, so as to identify the financial impacts from material, company and business model specific ESG issues. The investment analysis and ESG analysis cannot be done in silos but must be combined to accurately understand the underlying value drivers of the business model design in both the short and long term.

Support transitioning companies through Strategic Governance and Strategic Active Ownership

Canadian pensions have long term, patient capital, that can be used to help companies transition to a Net Zero economy. Given the breadth and depth of their investment strategies, Canadian pensions and their investment portfolios cannot transition to Net Zero without the successful transition of those companies that are committed and that are able to transition. Canadian pension funds and Canadian Banks are uniquely placed to help support these companies and help shape their journeys to achieve better outcomes and create value. As mentioned above, in order to succeed at strategic engagement, Canadian pension funds will need a new and different Organization Design. This higher level of strategic leadership capacity will be required from investment management leaders and teams to be accountable for the newly defined “strategic engagement” processes including collaboration with other key market participants (asset owners, asset managers, regulators, NGOs, and a number of key lead investee companies) to transform a complete industry sector to Net Zero - in essence moving the Beta of the market enabled by long-horizon pension capital.

A review of Canadian Pensions’ Proxy Voting Policies and Guidelines

As part of our research for OSFI related to Climate change and pension funds we did a review of the proxy voting policies and guidelines of the 10 largest pension funds in Canada and the Canadian Coalition of Good Governance (CCGG).

What we discovered reflects a world in transition and we believe these policies and guidelines will need to be updated, or risk being not ‘fit for purpose’ in the new Net Zero investment management world. In the research that we undertook, we found that Canadian Pension funds’ disclosed proxy policies did not outline any guidelines related to performance measurement nor their fiduciary duty related to investee companies. This includes using core financial metrics like Return on Capital (ROC) as a measure of capital efficiency and as fiduciaries over the retirement capital of their pension beneficiaries.

The policies and guidelines also did not address the need to focus executive management and boards at investee companies on the longer term through effective performance measurement and long-term incentive program (LTIP) design for executive compensation. This is indeed an issue in the markets today, as based on one of the author’s research projects performed for CFA Institute 3 years ago:

- 85% of listed companies (in North America) had no capital efficiency metrics in their LTIP design
- the longest performance period for named officers in their LTIP design was 3 yrs. or less

Not focusing on these core capital efficiency and performance metrics will no longer hold sway in a world focused on Net Zero by sector by 2035 (clean vehicles) by 2040 (clean energy) and the world by 2050.

Lastly, there was nothing in any of the governance and proxy voting policies and guidelines related to use of GHG metrics and specific targets that align to GHG reduction in the next 5 years nor by 2030, which is needed to create line of sight alignment with a Net Zero World by 2050.

In our view, a proxy voting policy that is Fit for Purpose in a Net Zero Business Model world would include a Say on Pay voting is a clear “No” when:

- **there are no capital efficiency or balance sheet metrics in the performance metrics and LTIP design for named officers at investee companies**
- **the longest performance periods in LTIP design are less than 5 yrs. at investee companies**
- **there are no GHG reduction targets in the LTIP design aligned to at least a 30 % absolute GHG reduction by 2025 and 50% reduction by 2030**
- **there are no metrics for other “ESG" mission critical KPI'S included in the LTIP design for named officers at investee companies**

Given the risks and potential for material loss in asset values and stranded assets in the new net zero world, it is clear that OSFI will need to play a strong leadership and regulatory role in setting clear standards for good governance of pension capital in the Net Zero world.

This would include an ongoing reporting of each Pension Fund back to OSFI related to how they have aligned their fiduciary duties and proxy voting, say on pay voting and say on climate voting with a Net Zero World and skating to where the puck will be!

The importance of a “just” transition for the Canadian economy

It is a matter of debate whether a just transition can truly happen. Capital markets have rarely let companies just gradually enter into states of managed decline and steady payouts. However, the success of a low carbon or Net Zero economy cannot be judged “solely on emissions reduction”. The public and private sectors will also need to ensure a “just transition” for those industries, communities and their workforces that are the most at risk.

As companies are re-designing their business models and, in some cases, helping to re-design their entire industry, they will need to target not only a positive Carbon-Adjusted Return on Capital (CAROC) above their cost of capital, net-zero GHG emissions and zero waste by no later than 2050, but they will also need to target high scores for a just transition, including:

- Re-training and development of employees
- True equality, diversity and inclusion of their workforce
- Workforce wellbeing and retention
- Cash value-add for society (including taxes paid, jobs created, total compensation paid to suppliers, etc.)

Achieving Net Zero is still a transformational journey. It is intrinsically linked to the real economy, and investors cannot look at their portfolios in isolation. Canadian pensions, by using their long-term capital, their ability to strategically engage with companies and their sophistication in ESG investing, can play a key role in enabling this transition and shaping this journey.

Biographies for FutureZero & CGC

Mark Van Clieaf

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FutureZero

Mark Van Clieaf is Managing Director at FutureZero, a leading consultancy advising Global Institutional Investors, Boards, CEO's, CFO's on Organization Design, Enterprise Performance Measurement, CEO succession planning and selection, and Named Executive Officer Long-Term Incentive Plan design all aligned to shareholder and societal value. A core focus includes Organization Design, Executive Succession planning & selection, and LTIP design for the Net Zero Transformation to 2050..

He brings over 30 years consulting experience in Boardrooms and C-Suites on 3 continents across a broad range of industries. This includes Consumer Marketing, Marketing Services, Retail, Financial Services, Pension Funds, Technology, Healthcare, Energy, Utilities, Mining and Telecoms sectors. Over the last 30 years he has assisted in negotiating over 400 executive employment agreements for named officers at some of the largest companies in the world. This experience also includes over 20 yrs. advisory capacity to Omnicom Inc. the worlds' leading group in Marketing Communication, Advertising and Branding.

His research on company valuation, Carbon - Adjusted Return on Capital (CAROC), Future Value and the direct link to the Five Zones of CEO Innovation & Sustainability, management structure design, and executive talent assessment and the alignment to Net Zero transformational leadership, has been applied by number of leading companies and Institutional Investors around the world.

Management structure design, executive talent management, and LTIP design as "Organizational Capital" and the new drivers of long-term (10 year +) shareholder and societal value.

For the last 20 years he was based in Tampa, Florida, working worldwide and has recently return to Toronto, Canada full-time.

While at Price Waterhouse in his earlier career in the Executive Search and Business Strategy consulting practices, he developed the first CEO role profile for the newly formed Board of the Ontario Teacher's Pension Plan and was part of the PWC team to recruit its first Chief Executive Officer. He has been an advisor on Organization Design, CEO Succession and Executive Incentive Design for Ontario Teacher's and or their investee companies, and other major global Asset Owners and Asset Managers for over 30 yrs.

He was on a two-year retainer with CitiCorp Inc providing organization design and executive search in setting up their corporate banking, merchant banking, leverage finance, M&A advisory, Corporate Workout and Corporate Credit teams and P&L centers.

His began his career in account management in the advertising, graphic design, direct marketing, and marketing services industries. He has continued in an advisory capacity to Boards and Executives on Madison Ave, Wall Street, Bay Street, Canary Wharf and Silicon Valley for over 30 yrs.

His consulting experience, research and thought leadership has been published in a number of leading publications including:

- Handbook of Board Governance – 1st and 2nd Editions
- Directorship
- Corporate Governance Advisor
- The Corporate Board
- The Ivey Business Journal
- Business Horizons
- American Journal of Management Development

And he is frequently quoted by:

- New York Times
- Wall Street Journal
- USA Today
- Financial Times
- And on TV for CNBC

His appointments & memberships have included:

- International Corporate Governance Network – London, UK – 2021 - Panel Chair - Metrics & Incentive Design for Investee Companies and integration with Sustainability and the Net Zero Transformation to 2050
- CFA Chicago – PDDARI – Lead on Corporate Governance and Proxy Voting Research
- Investor Responsibility Research Center Institute, Report on Value Creation, Metrics + Long Term Incentive Design
- Guest Lecturer and Researcher for over 8 yrs., Corporate Governance, Ivey School of Business, University of Western Ontario
- Commissioner for the National Association of Corporate Directors, Blue Ribbon Commission on CEO Succession Planning, Washington, D.C.
- Founding Member, Executive Selection Research Advisory Board, Center for Creative Leadership, Greensboro, North Carolina
- Guest Lecturer – Ph.D. Level I/O psychology University of Guelph, Ontario, Canada
- Guest Lecturer, The Center for Strategy, Execution and Company Valuation, Driehaus College of Business – School of Accountancy, DePaul University, Chicago, USA
- Sustainability Accounting Standards Board, Advisory Group Member
- Past President of the Strategic Leadership Forum, Toronto – Largest Chapter in North America for Strategic Leadership Education

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Tamara is the founder of Close Group Consulting, an independent ESG advisory firm, which focusing on ESG integration across investment and risk management frameworks for asset managers, general partners, and asset owners.

She brings over 20 years of experience in the global capital markets in both risk management and Investment management roles.

She has served as Managing Director and Head of ESG Integration for KKS Advisors and recently developed an industry-leading ESG integration maturity assessment model (Sustainable Risk Assessment Framework) and tool for investment managers, providing standardized industry best practices benchmarking in a scalable technology-driven solution.

Prior to founding CGC, she was at PSP Investments in Montreal, for over 10 years, in senior management roles within the Risk Management and Public Markets Investment groups.

PSP Investments is one of Canada's largest pension funds with over $160 billion in AUM. It invests retirement funds for the pension plans of the Canadian Public Service, the Canadian Armed Forces, the Royal Canadian Mounted Police and the Reserve Force.

https://www.investpsp.com/en/

PSP has more than 800 professionals that manage a diversified global investment portfolio composed of assets in the public financial markets, private equity, real estate, infrastructure, natural resources and private debt.

Prior to PSP, Tamara was head of research and risk management for a fixed income asset management firm in Montreal

In her early career, she held various front office investment management positions for the Bank of Montreal and Credit Lyonnais in the global derivatives and foreign exchange markets.

Tamara holds a:

Chartered Financial Analyst (CFA) designation

Bachelor of Arts in Economics from McGill University

Master of Science in Finance from Concordia University's John Molson School of Business.

She has also completed Ph.D. level studies in Finance at Concordia University.

She is also a Certified Sustainable Investment Professional (SIPC); Concordia University, John Molson School on Business

Her appointments & memberships include:

- Board Director of CFA Montreal
- Chair of the ESG Committee for CFA Montreal
- Council member of the Canadian Advocacy Council for CFA Societies Canada
- Advisory Board member of PracticalESG
- Member CFA Global Industry Standards ESG Expert Network
- Women in Capital Markets; Co-chair Montreal Steering Committee

Lori Mattes

Chief Data Scientist

FutureZero

Lori is Chief Data Scientist for FutureZero and brings over 20 years' experience in **Analytics / Modeling / Reporting / Metrics** design across disciplines of **Market Research, Finance, Statistics/Actuarial, Marketing, Legal, Strategy, Pricing & Profitability and Operational excellence.**

Her 20 yrs. of experience in Strategic and Operational Analytics, Data mining, Business Intelligence and Reporting cuts across the Finance, Healthcare, Insurance sectors and Strategic Analytics and consulting across the Industrial, Consumer Goods, High Tech, Banking, Asset Owner and Asset Manager industry sectors.

EMD Serono Inc., *2016 – Present*
Rockland, MA
Manager, Sales Analytics

FutureZero Inc and prior Organizational Capital Partners, *2012 – Present*
Tampa, Florida
Chief Data Scientist

DELL, *2013 – 2016*
Quincy, MA,
Harvard Pilgrim Health Care
Management of account reporting for contractor of leading health insurer in the New England region
Metrics and Reporting Senior Advisor

ARBELLA INSURANCE, 1993 – 2012
Quincy, MA
Property/casualty insurance company with personal and commercial revenues of $650M in New England.
Manager Research Analytics
Manager Research & Development
Program Manager Profit & Product Development
Research Analyst

SOFTWARE SKILLS

- Statistical Applications: Base SAS, JMP, R
- Spreadsheet/Database Applications: Excel, Access, PL/SQL, Teradata
- Reporting: Business Objects, Brio, Microstrategy
- Presentation: Word, PowerPoint
- Programming: Java Script, SQL, Visual Basic

EDUCATION

Graduate Level Applied Statistics
Texas A&M University, College Station, TX

M.B.A.
Babson College, Wellesley, MA

B.A., Foreign Languages
Bowdoin College, Brunswick, ME

Women's Leadership Program
Babson College, Wellesley, MA

Denise Bonte

Chief Graphic Design, Visualization & Presentation Artist

FutureZero

Denise specializes in creative, marketing, and document solutions to empower businesses communications and collaboration.

A broad portfolio of graphic design, logo design and the development of brand assets using Adobe to design and implement type, photography and brand styles into professional presentations, white papers, proposals and for Instructional Design / Training & Development.

With 30+ years working with Financial Analysts, Asset Owners, Advertising Agencies, Marketing Groups, and Business Consultants, she creates MS Office documents that function in a collaborative work environment.

Portfolio:

https://www.behance.net/denise_bonte

Denise Bonte Design, 1990 – Present

Presentation Designer Ontario, Canada

Genigraphics Canada, 1985 - 1990

Senior designer / 35mm slide production

Maclean Hunter Cable TV, 1981-1984

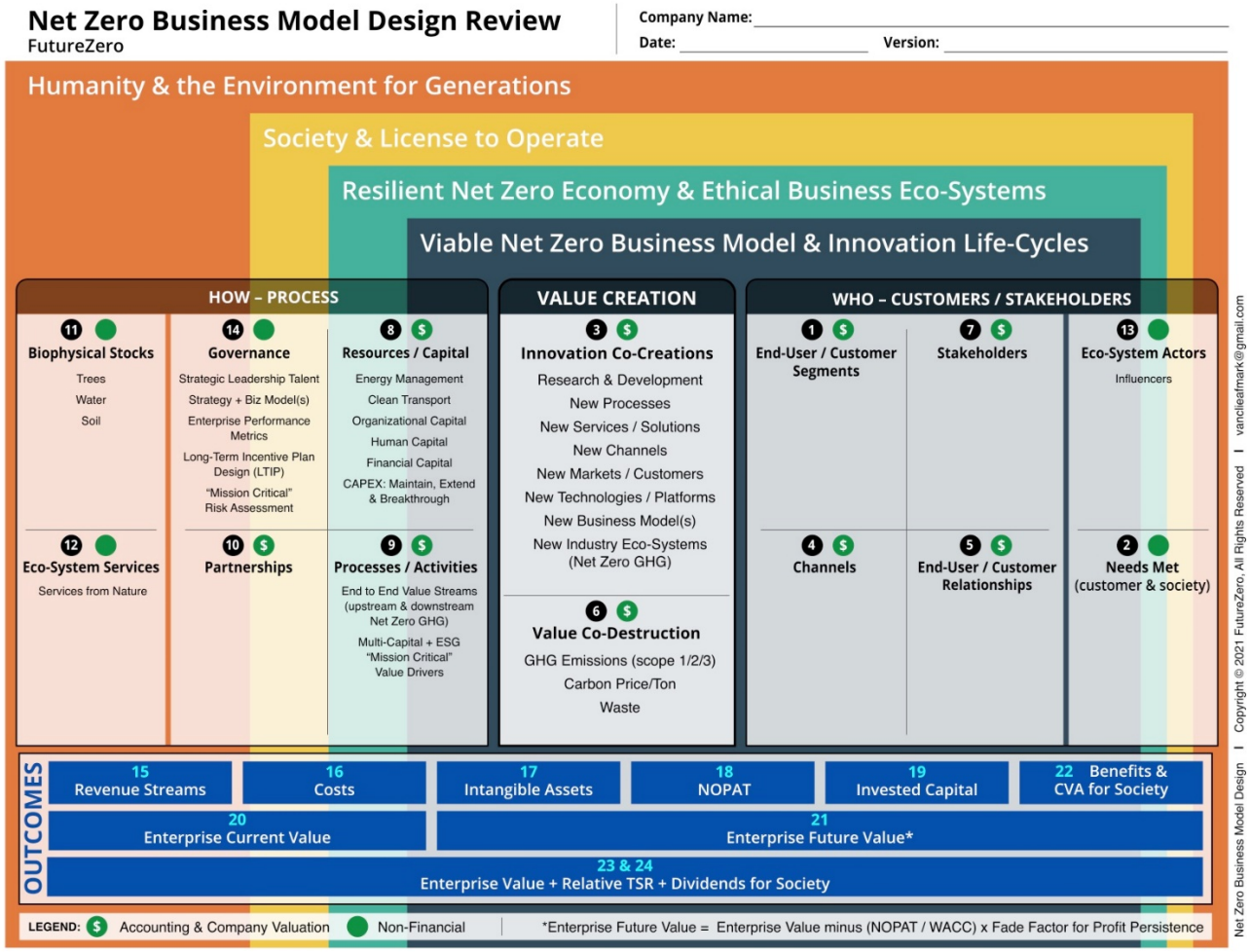
Community TV Producer / Program Director

Georgian College, 1978 - 1980

3 yr Graduate Diploma in Design Arts, Applied Arts & Technology

FutureZero

VALUE • TRANSFORM • SUSTAIN



DISCLAIMERS

Note to readers:

The preceding white paper presents our analysis, observations, and findings. ***We have not undertaken an extensive literature review into the existing empirical research on this subject, nor have we applied the same level of rigor to our analysis that one would find in a peer reviewed academic paper***.

However, we believe that the findings are significant enough to serve as a catalyst to start the conversation for capital markets participants in the board rooms of corporates, asset owners and asset managers. While certain assumptions have been made in our analysis (as detailed in the specific tables), we believe the findings can serve as a foundation for further empirical research into this topic.

Information contained in this integrated analysis is generated using the Credit Suisse HOLT Lens® model for company Life-Cycle competitive performance and company valuation and the Morningstar Model for company Moat analysis. The information and data in the report are current as of the publication date and subject to change without notice.

The information provided is not intended to provide a sufficient basis on which to make an investment decision.

This analysis is provided by Future Zero for the purposes of Corporate Governance and insight related to business strategy, relative and absolute enterprise performance assessment and possible risks related to Net Zero Business Model Transition. The raw data sources for these “strategic analytics” includes S&P Global Compustat, S&P Capital IQ, and Sustainalytics / Morningstar and like all data sources is subject to error. All Errors & Omissions Excepted, and should be interpreted and used accordingly.