Managing Carbon Risk:
A Look at Environmentally Conscious Indices

Authors
Alex LaPlante, Global Risk Institute
Charlotte Watson, Global Risk Institute

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The paper contains graphs in color, use color printer for best results.

Abstract:
Increasingly, governments around the globe are implementing more stringent climate policies to help stimulate the transition to lower-carbon economies. This transition brings with it both risks and opportunities for the financial sector. Consequently, financial institutions should be assessing the climate risk exposure of their investment portfolios as well as considering alternative investment strategies that take advantage of the new opportunities that climate change brings. In this study, we compare the carbon intensity and performance of 'green' equities portfolios (environmentally conscious indices) and traditional market portfolios (market indices). Although there are still limitations to the available emissions data that is currently available, the findings indicate that green investing can produce competitive returns while offering lower carbon exposure and conceivably, carbon risk mitigation. This is not to say that one should divest from all carbon intensive companies; our findings simply indicate that it is possible to address the carbon risk of equity portfolios in a profitable way.

Climate change has become an increasingly prevalent topic of conversation within financial institutions (FIs). As laid out in our previous report entitled "Climate Change: Why Financial Institutions should take note", there are ample reasons why FIs should consider the environmental risk exposure of their portfolios. [1] Given the wide range of possible future climate scenarios, the variation in impact severity of climate-related risks across different asset classes and geographies, and the general uncertainty of how climate-related events will impact financial markets and the broader economy, quantifying this exposure is far from simple.

Though many FIs view these risks as long-term, governments around the globe have demonstrated a clear shift towards cultivating more environmentally conscious economies in the near-term. In November 2016, the Paris Agreement came into force and has now been ratified by 125 of the 197 parties to the convention. [2] More recently, Canada implemented its first federal carbon pricing plan that all provinces must adhere to by 2018. [3] China, the world's largest carbon emitter, is emerging as a global climate change leader with increasingly stringent emissions targets and plans for substantial clean energy investments in the coming years. Overall, there has been a steady increase in the number of laws and policies aimed at climate change mitigation and adaptation, with 54 laws and policies in 1997 and 426 in 2009. By the end of 2014, 98 countries, responsible for 93% of the global greenhouse gas emissions, had enacted just over 800 climate change laws and policies. [4]

Governmental climate policies and carbon pricing plans have clear consequences for FIs, impacting the valuation of many of the assets they hold. In worst case scenarios, these regulations can lead to extreme devaluation and the stranding of assets. It is for this reason (perhaps paired with the desire to participate in socially responsible investing) that many FIs are putting great effort into understanding the impact that environmental policies may have on their portfolios and are exploring low carbon and 'green' investment opportunities.

In this report, we will provide an in depth look at the state of carbon risk management, highlighting some of the difficulties that FIs are faced with when assessing their own investments. As a benchmark, we introduce five environmentally conscious indices that offer a range of environmental investment strategies. We assess their carbon intensities and performances in comparison to the market and find that:

- Four of the indices offer both lower carbon intensities and better performance than the market
- One index offers lower returns and a substantially higher carbon intensity than the market

Transitioning to Low Carbon Economies: Policy and Regulation

The scientific community has provided strong evidence that a significant portion of the observed changes in climate over the last century can be attributed to anthropogenic greenhouse gases (GHG). [5] Going forward, it has been shown that if GHG production does not abate, extreme increases in atmospheric and oceanic temperatures will result, bringing with them intensified droughts, floods, wildfires, and severe storms. [6] Understanding the threat that climate change poses to human welfare and economic stability, governments around the globe have been working to motivate the reduction of GHG production through climate policies and regulations. The Paris Climate Change Agreement, for

one, marked a historic global step towards combating climate change, with world leaders agreeing to keep the global average temperature increase below 2°C.

Carbon pricing, the favoured method of governments to restrict GHG emissions, sets a price for the right to emit one tonne of CO2 equivalent into the atmosphere. Accordingly, those who emit GHGs must pay for their emissions. [7] Carbon pricing usually takes the form of either a carbon tax or an exchange trading system (ETS), commonly referred to as "cap-and-trade". A carbon tax, as the name implies, is a tax levied on a company's GHG pollution which results predominantly from processes that require the burning of fossil fuels. In a cap-and-trade system, a limited number of emissions permits for a specified quantity of pollutants are allocated by the government to GHG emitting organizations. Polluters must hold permits in the amount equal to their emissions. This more flexible environmental regulation allows organizations who want to increase their emissions to buy permits from organizations who are willing to sell them.

Despite general agreement to impede climate change, determining an appropriate carbon price is challenging and requires one to infer societal preferences about the substitution of consumption across time and across uncertain states of nature. [8] It follows that governmental carbon pricing plans vary drastically around the world. In their "Carbon Pricing Watch 2016" report, the World Bank Group provides a detailed look at the current state of global carbon pricing initiatives (Figure 1) and illustrates how these initiatives have evolved since the 1990's (Figure 2). [9]

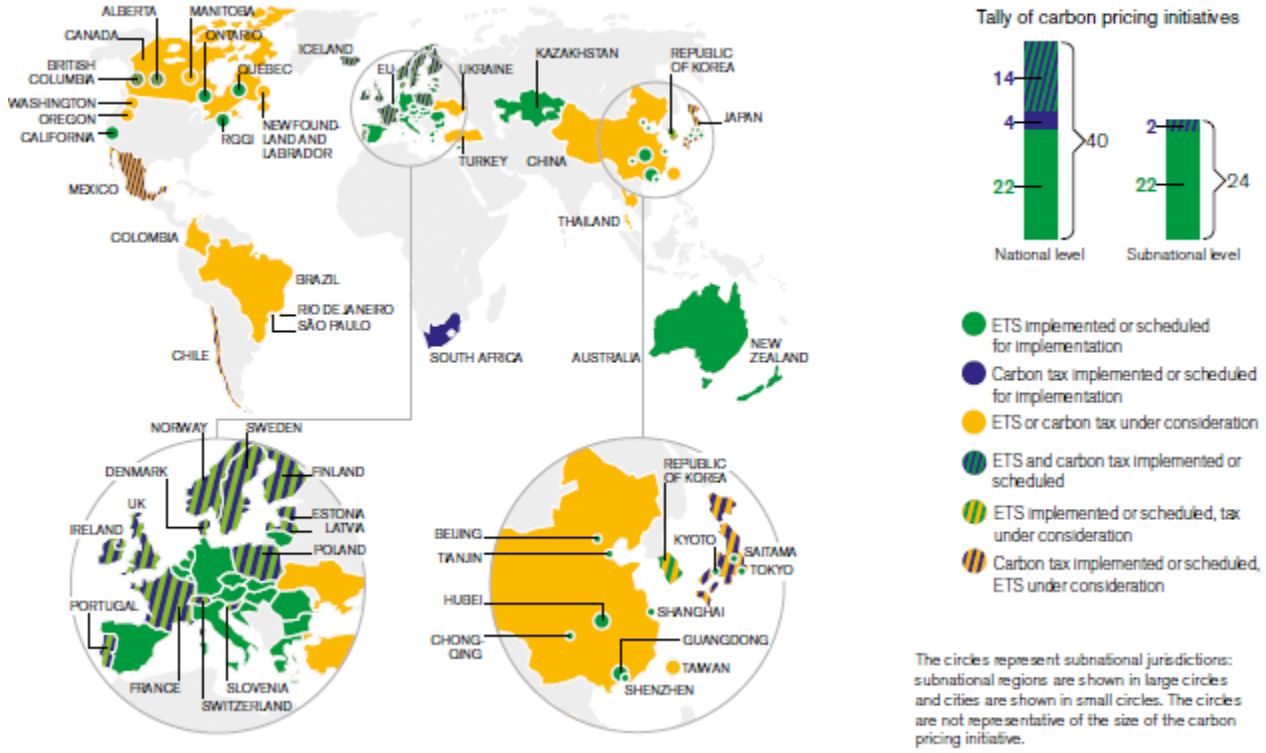

Figure 1: World Bank Group's Summary map of existing, emerging and potential regional, national and subnational carbon pricing initiative [9]

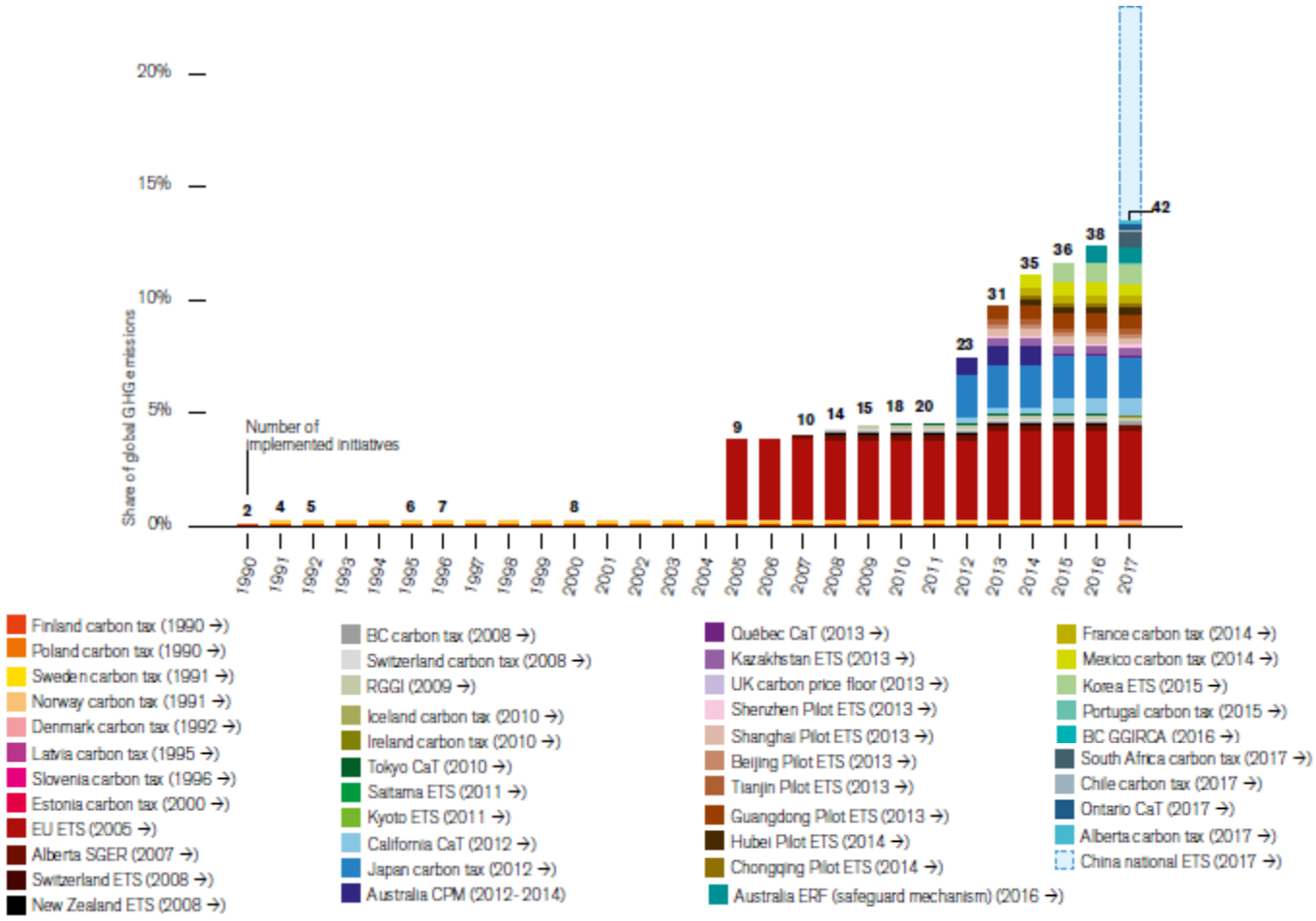

Figure 2: Regional, national and sub-national carbon pricing initiatives: share of global emissions covered [9]

In addition to carbon pricing, many countries have provided tax incentives to low-carbon alternative energy companies and have invested in the development of sustainable, environmentally friendly technologies. These varying forms of support have helped accelerate the move towards lower-carbon economies and have introduced many new investment opportunities for FIs.

Carbon Risk

Governmental climate policies and pricing frameworks have direct risk implications for FIs. Already, studies have shown that climate change and environmental risks are not properly accounted for in financial and corporate decision-making leading to the possible mispricing of assets. [10, 11] The implementation of new, more severe carbon pricing plans threaten to exacerbate these mispricing risks. For example, the asset valuations of fossil fuel companies are generally based on all known reserves and more than 50% of their market value is derived from long-term cash flows based on the extraction of these reserves over a broad time frame. [12] However, according to the International Energy Agency no more than one-third of the established fossil fuel reserves can be consumed prior to 2050 if we are to meet the climate change mitigation goals and GHG emissions reductions set out by

the IPCC. [13] Not only does this put oil companies at risk of asset stranding and devaluation, it also puts the FIs who have exposure to these companies in danger of losses as well as increased credit and default risk. HSBC and Standard and Poor's have both shown that stricter emissions targets and climate policies will have adverse impacts on the creditworthiness and market capitalisation of high carbon energy companies. [14, 15] The University of Cambridge has reported that climate and energy regulations will have significant impacts on company profitability at the national level. Furthermore, they have shown that there exists significant differences between individual companies in the same sectors and geographies, highlighting the need for granular bottom-up methods in order to understand firm-level risk. [16]

FIs have a number of options for managing the carbon risk of their portfolios. For example, an investor could adjust the risk premiums they seek for particular assets or companies; they could modify financing structures to limit carbon risk exposures; or they could avoid holding financial assets with a particularly high carbon risk profile. In general, the available pathways for managing carbon risk will differ depending on the nature of the FI's current investments and risk exposure. Moreover, which options the FI ultimately chooses will depend on their risk appetite, the yields they seek and how they choose to respond to the uncertainties associated with climate change. The United Nations Environment Programme – Finance Initiative (UNEP-FI) and the World Resources Institute (WRI)'s report on carbon asset risk provides further detail on the available carbon risk management options for institutional investors. [17]

As a complement to these risk management methods, environmentally conscious indices are becoming increasingly popular tools for carbon risk benchmarking and hedging. There are now a wide range of indices representing a diverse set of alternative investment strategies including those that pick sector specific best performers and those who eliminate fossil fuel securities altogether. In this report, we will introduce five environmentally conscious indices that take differing approaches to selecting their constituents. The 2010 to 2015 carbon intensities of these indices will be determined along with those of the TSX60 and the Dow Jones. Additionally, the performance of these indices will be considered and the carbon risk-return trade off will be assessed. A similar benchmarking analysis can be performed by a FI with their own public equity portfolios.

<u>An Analysis of Carbon Conscious Indices:</u>

In order to assess, manage, and mitigate carbon risk, FIs must first have an adequate understanding of the carbon exposure of the individual companies with which they have financial relationships. This exposure is generally quantified using the carbon footprint: the company's total GHG emissions expressed in carbon dioxide equivalent (CO_2e). Determining the total GHG emissions of a company can be exceedingly complex and generally requires in depth knowledge of the industry, the GHG emitting processes used, and the company's inputs and outputs, amongst other things. Consequently, obtaining sensible emissions data for an entire portfolio is no mean feat!

To help address these difficulties, FIs can, in many cases, access emissions data from company sustainability reports or from external data providers. The CDP, formerly the Climate Disclosure

Project, now has the largest collection of self-reported environmental data in the world with over 5,500 companies responding to their 2015 climate survey. [18] This data, which was used extensively in our analysis, will be introduced in more detail later in this report. Several governmental agencies including Environment Canada [19] and the Environmental Protection Agency [20] also provide emissions data that can be used to supplement GHG analyses. Although it does not affect our analysis, it is worth mentioning that despite drastic improvements in data availability over the last decade most corporate disclosure frameworks and initiatives focus on large cap listed equities and fail to address several climate-relevant asset classes. These assets, including private equities, sovereigns, municipalities and real-assets, can represent a significant portion of an institutional investor's portfolio. [21]

Once sensible emissions data is obtained, a FI or institutional investor can get a sense of the level of an equity's carbon risk by calculating its carbon intensity or the GHG emissions per dollar invested. In this analysis, we evaluate the carbon intensity of the index as the sum of the GHG emissions of all its constituents divided by the market capitalisation of the index.

Emissions Data:

Although it is becoming progressively more common for organizations to publish yearly sustainability reports, few organizations provide comprehensive emissions reporting. The CDP offers a solution to this data scarcity through their yearly climate change information requests which has allowed them to amass the world's most comprehensive set of self-reported climate change data. [22] In addition to GHG emission quantities and emissions performance, these surveys report on the organization's climate change-related risk, governance and strategy, their sustainability initiatives and targets, and their carbon trading activities. The CDP's climate change information request reports were the primary source of emissions data used in this study. When neither CDP data nor sustainability reports were available, informed emissions estimates were used.

To provide more transparent and effective GHG accounting, emissions data is broken down into three scopes (Figure 1). As laid out in the GHG Protocol's corporate accounting and reporting standards, scope 1 emissions are direct GHG emissions that occur from sources owned or controlled by the company while scope 2 emissions are those produced from the generation of purchased electricity that is consumed by the company. Scope 3 emissions are a product of the activities of the company, but that occur from sources not owned or controlled by the company. [23] Examples of scope 3 emissions include emissions produced as a result of the extraction of raw materials purchased by the company, or the emissions associated with the use of the final products sold by the company.

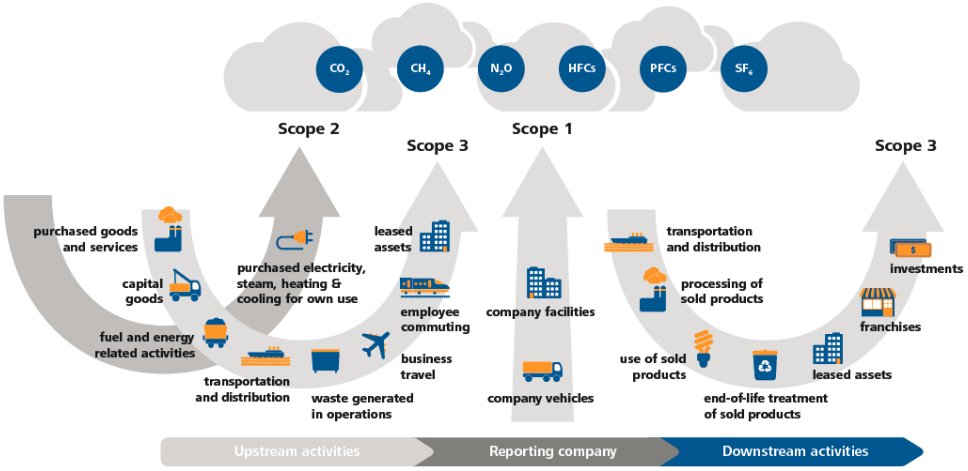

Figure 3: Scope Diagram: Overview of GHG Protocol Emission Scopes [24]

GHG accounting best practices state that at a minimum scope 1 and 2 emissions should be reported. [23] Fortunately, the vast majority of reporting companies included in this study provided both scopes. It should be noted, that missing scope 1 or 2 data can have a material impact on the carbon exposure assessment of a portfolio and thus should be mindfully addressed. Scope 3 data was not considered for the purpose of this report as data was largely unavailable.

Although organizations like the GHG Protocol and the Task Force on Climate-related Financial Disclosure (TFCD) are working to improve emissions disclosure quality, consistency and comparability, one should be cognizant of the current state of emissions data when using it as the basis for carbon risk analysis. [23, 25] For one, the methodologies employed to estimate emissions vary widely both across and within industries. Furthermore, emissions ownership is often dependant on one's interpretation of "control" which can refer to having either operational or financial control over the emitting asset. In some cases, this allows an organization to choose the definition which is best suited to reducing their reported emissions numbers. Moreover, it allows companies who have non-controlling stakes in GHG emitting assets to effectively walk away from any ownership of those emissions. Discretion was used when evaluating the soundness of the emissions data collected for this study.

Beyond erroneous or suspect data, data availability is still a major obstacle to performing a comprehensive carbon risk analysis. In 2015, the CDP reported that despite improvements only 42% of listed companies in high impact sectors submitted disclosures. [26] Depending on the level of completeness, various methods were used in our analysis to fill in the existing data gaps with suitable emissions estimates. For companies with partial data over the span of 2010 to 2015, interpolation, averaging and limited extrapolation were used where appropriate. When no emissions data was available, emissions-based comparable company analysis was performed. Please note that large mergers, acquisitions and sales were also taken into consideration when necessary.

Environmentally Conscious Indices:

Environmentally conscious indices aid investors in managing the risks associated with transitioning to a low carbon economy while satisfying growing interests in social and 'green' investing. These indices cover a range of investment strategies and can vary widely in their sectoral composition, weighting methodologies and carbon footprints. In this study, we analyze five environmentally conscious indices from a range of geographical regions; each taking a different approach to addressing carbon risk. The chosen indices are as follows:

STOXX Global Climate Change Leaders

The STOXX Global Climate Change Leaders Index tracks the CDP's "A-list", which includes leading organizations who publicly promote and are heavily active in carbon reduction and who proactively manage their climate risk. The list is intended to give recognition to companies who provide especially detailed carbon disclosures to the CDP. To make the list, companies must pass CDP determined criteria which include maximum performance points for GHG reductions. (Please refer to the CDP's scoring methodology for more detail. [27]) In 2015, 113 of the nearly 5,500 responding companies made the A-List. The STOXX Global Climate Change Leaders Index is comprised of the publicly traded CDP A-List members. [28]

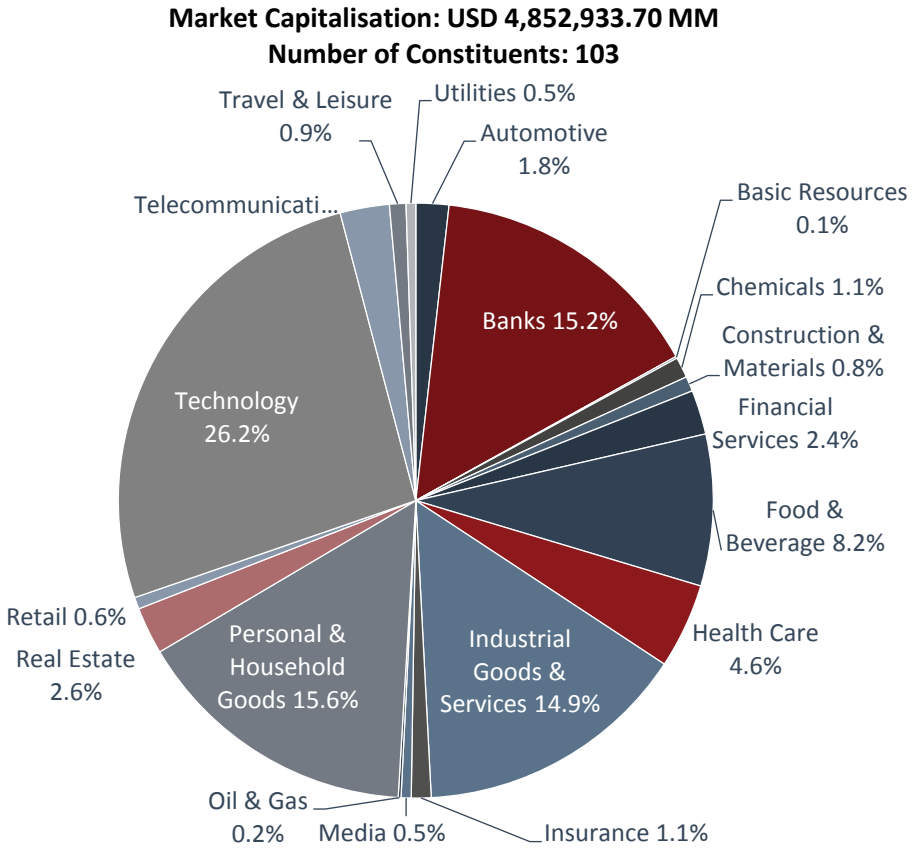

Figure 4: STOXX Global Climate Change Leaders Index Industry Breakdown

S&P/TSX 60 Fossil Fuel Free Carbon Efficient Index

The S&P/TSX 60 Fossil Fuel Free Carbon Efficient Index includes all of the constituents of the S&P/TSX 60 except those that own fossil fuel reserves. In addition, the index over weights low-carbon emitting companies while underweighting high-carbon emitting companies. [29]

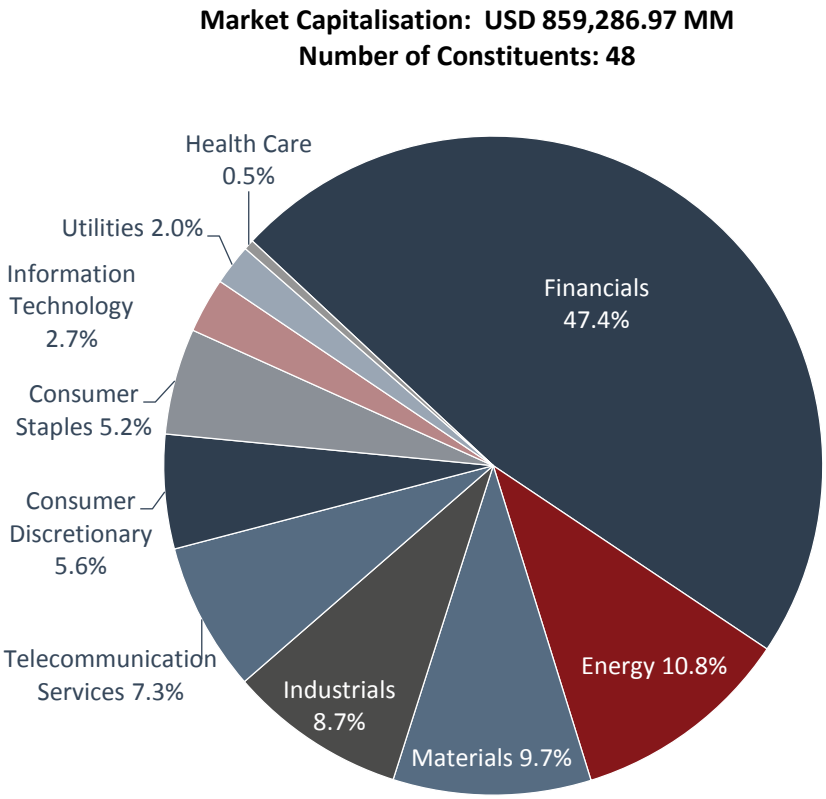

Figure 5: S&P/TSX 60 Fossil Fuel Free Carbon Efficient Index Industry Breakdown

S&P/TSX 60 Carbon Efficient Select

The S&P/TSX 60 Carbon Efficient Select Index ranks the constituents of the S&P/TSX 60 by highest to lowest carbon footprint and removes companies with the highest relative carbon footprints. The index is then weighted to closely track the parent index, while taking into consideration each constituents exposure to carbon risk. [30]

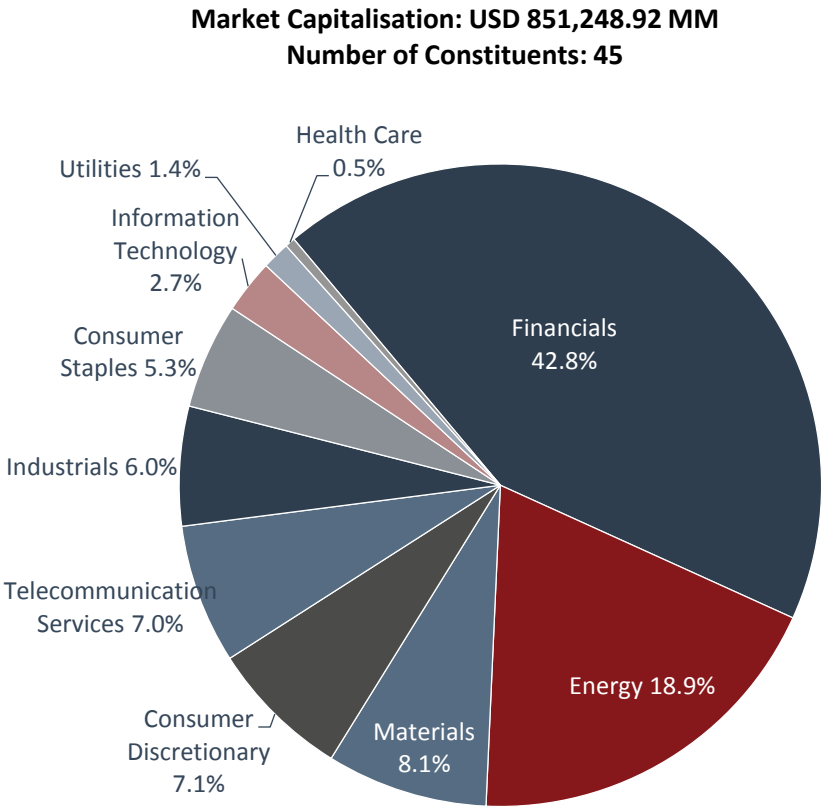

Figure 6: S&P/TSX 60 Carbon Efficient Select Index Industry Breakdown

S&P Global Clean Energy

The S&P Global Clean Energy Index is comprised of the 30 largest publicly traded clean energy companies from around the globe. The index is comprised of a diversified mix of clean energy production and clean energy equipment & technology companies. An exhaustive list of the company types that fall under S&P's definition of clean energy can be found in Table 1. [31]

Table 1: S&P Clean Energy

Clean Energy Producers	Clean Energy Technology & Equipment Providers
Biofuel & Biomass Energy Production	Biofuel & Biomass Technology & Equipment
Ethanol & Fuel Alcohol Production	Fuel Cells Technology & Equipment
Geothermal Energy Production	Hydro-Electric Turbines & Other Equipment
Hydro Electricity Production	Hydro-Electric Turbines & Other Equipment
Solar Energy Production	Photovoltaic Cells & Equipment
Wind Energy Production	

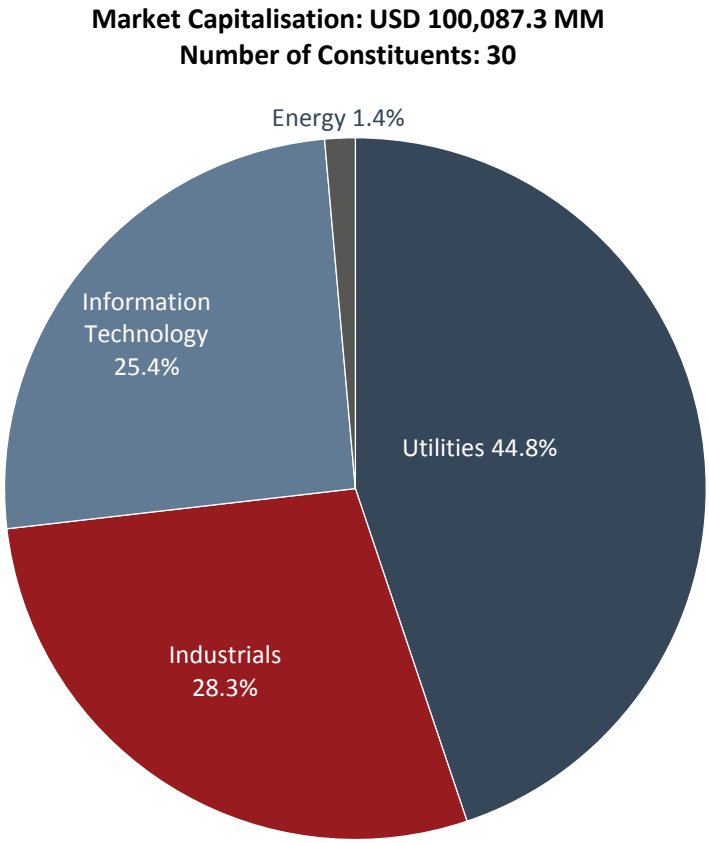

Figure 7: S&P Global Clean Energy Industry Breakdown

FTSE Environmental Opportunity 100

The FTSE Environmental Opportunity 100 Index is comprised of the 100 largest companies in the FTSE Environmental Opportunity All-Share Index. The FTSE EO Series measures the performance of global companies that have significant involvement in environmental activities such as, renewable & alternative energy, energy efficiency, water infrastructure and technology, and waste management. The index only includes securities that derive at least 20% of their business from environmental markets and technologies. [32]

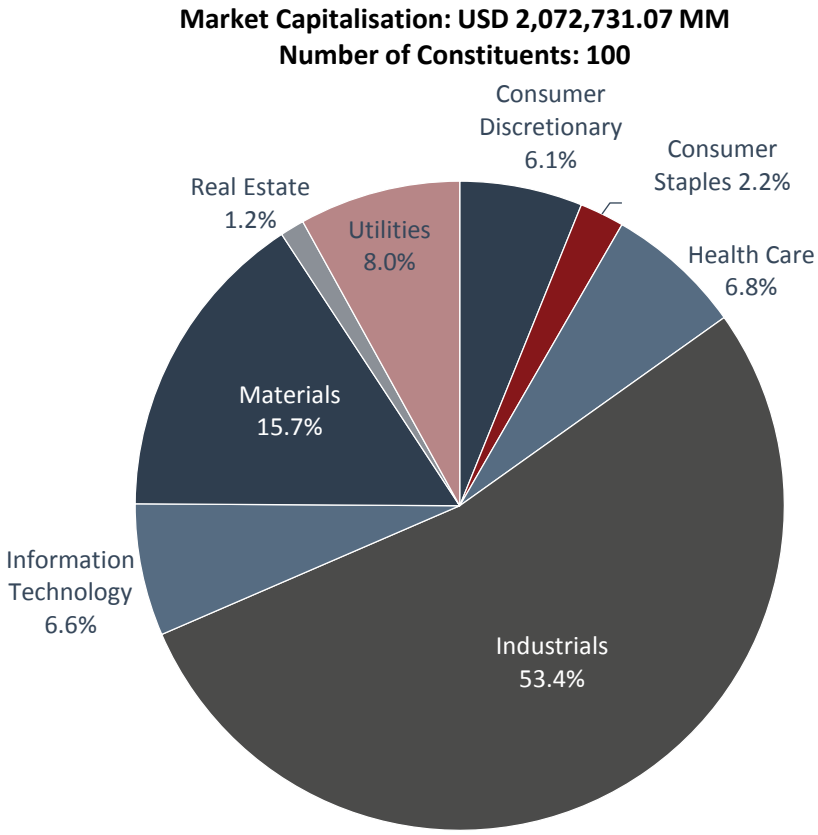

Figure 8: FTSE EO 100 Index Industry Breakdown

Carbon Intensities:

The carbon intensity, or GHG emissions per dollar invested, was calculated for each of the aforementioned environmentally conscious indices as well as for the Dow Jones and the TSX 60. The 2010 to 2015 scope 1 and 2 carbon intensities for each index are depicted in Figure 9. As shown, there is little fluctuation in the fraction of scope 1 to scope 2 emissions over time and the carbon intensities of each index vary only slightly over this period. The S&P Global Clean energy and the FTSE EO 100, who observed the largest variations in carbon intensity, can attribute these fluctuations predominately to changes in their market capitalisation and less so to variation in their total emissions.

The carbon intensities of the S&P Global Clean Energy are significantly higher than those of the other indices in this group. These large carbon intensity values are driven by the index's relatively small market capitalisation paired with sizable carbon emissions from a few of the index's constituents. In particular, 3 of the 30 constituents account for 78% of the carbon emissions on average. EDP Renováveis and Longyuan Power, large wind power producers who design, develop and operate numerous wind farms, account for 18% and 15% of the carbon emissions, respectively. Electric Power Development Co., on the other hand, is an electric utility company in Japan who mainly produces electricity from coal and hydroelectric power stations but who also participates in wind and nuclear

power generation. They are responsible for 45% of the S&P Global Clean Energy's emissions. This highlights the reality that some of the companies that are included in 'clean' and environmentally focused indices derive a large portion of their earnings from 'brown' or carbon intensive activities. In fact, several of the included indices contain carbon intensive companies, however, these carbon intensive constituents are offset by the indices' diversification and large market capitalisations. It should be noted that the S&P Global Clean Energy index is energy-centric and less diversified than the other indices that it is being compared to. Nevertheless, it offers greater carbon exposure per dollar than the other indices introduced in this study.

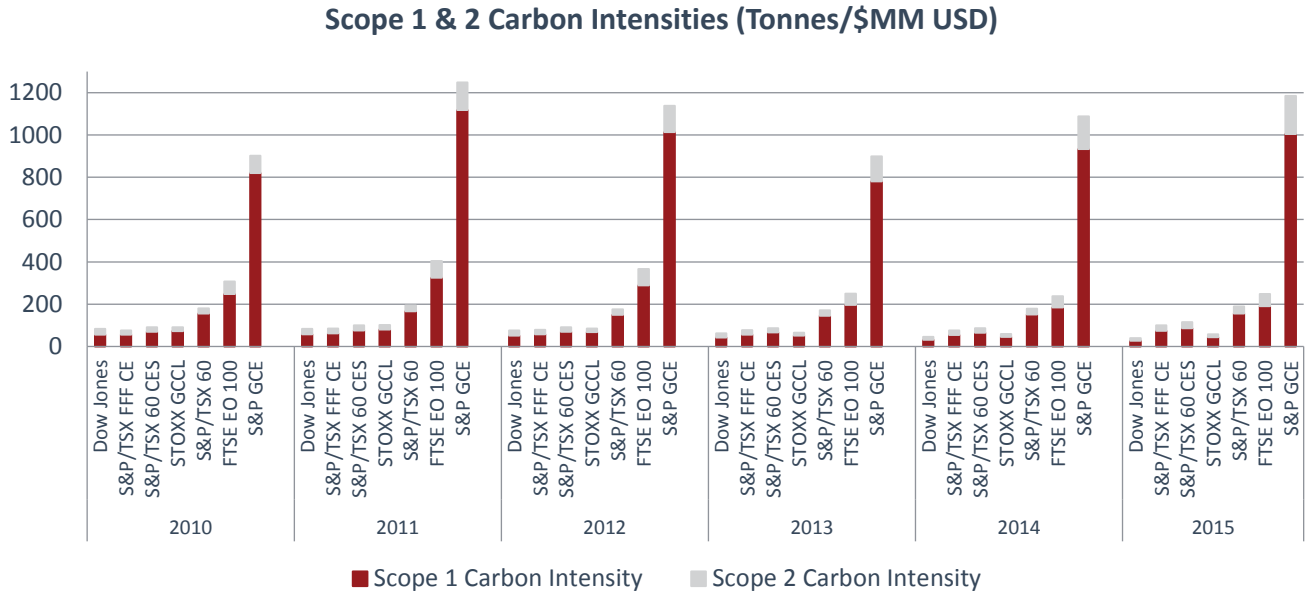

Figure 9: Scope 1 and 2 Carbon Intensities

Performance:

It is generally accepted that when one participates in socially responsible investing they receive non-financial compensation which is often thought to come at the expense of some financial returns. [33] Based on this statement one would assume that environmentally conscious indices may underperform the market. In this section we address this theory by comparing the returns of each index with a suitable market equivalent. Table 2, which reports the 3 and 5-year returns for each index, illustrates that the environmentally conscious indices perform, in most cases, on par or better than the market indices.[1] To provide a more comprehensive view, the performance of each index will be discussed separately. Note that the inclusion of both base currency and USD returns highlights the importance of exchange rate risk.

[1]It should be noted that the weak global oil markets may have played a role in augmenting the relative performance of fossil fuel free investments in recent years.

Table 2: 3-yr and 5-yr Index Returns

Index	Base Currency	3-YR Return (Base)	3-YR Return (USD)	5-YR Return (Base)	5-YR Return (USD)
Dow Jones[2]	USD	12.66%	12.66%	11.30%	11.30%
S&P 500	USD	15.12%	15.12%	12.56%	12.56%
S&P Global Clean Energy	USD	12.90%	12.90%	-7.70%	-7.70%
S&P/TSX 60	CAD	5.46%	-5.50%	2.88%	-3.69%
S&P/TSX 60 FFF Carbon Efficient[3]	CAD	6.57%	-4.61%	-[4]	-[4]
S&P/TSX 60 Carbon Efficient Select[3]	CAD	7.05%	-4.18%	4.82%	-1.81%
FTSE 100	GBP	5.63%	2.26%	4.88%	3.70%
FTSE EO 100	GBP	12.61%	8.58%	6.76%	5.56%
STOXX Global 1800	EUR	14.84%	7.64%	9.87%	5.41%
STOXX Global Climate Change Leaders[3]	EUR	13.58%	6.45%	-[5]	-[5]

S&P/TSX 60 Carbon Efficient Select & S&P/TSX 60 Fossil Fuel Free Carbon Efficient

The performance of the S&P/TSX 60 Carbon Efficient Select and S&P/TSX 60 Fossil Fuel Free Carbon Efficient are compared with their base index, the S&P/TSX 60, in Figure 10. It is apparent from both the calculated returns and the performance time series that the environmentally conscious indices outperformed the market. In addition to higher returns, the environmentally conscious indices offered a sizable carbon intensity reduction with the Carbon Efficient Select at 48% lower and the Fossil Fuel Free at 55% lower than the TSX 60.

[2]The Dow Jones was included in the performance comparison to remain consistent with the carbon intensity portion of this study and to provide insights into index performance vs. carbon intensity. The performance of the S&P 500 and the Dow Jones are fairly analogous over the highlighted time period.
[3]The S&P/TSX 60 Fossil Fuel Free Carbon Efficient, S&P/TSX 60 Carbon Efficient Select and STOXX Global Climate Change Leaders indices were launched in January 2016, October 2015, and December 2011, respectively. Reported returns that required data prior to the inception date were derived using back casted return values.
[4]Data was not available to calculate the 2015 year-end 5-yr returns. The 2015 year-end 4-yr returns are: CAD: 8.05% and USD: 0.16%. The 2016 year-end 5-yr returns are: CAD: 10.45% and USD: 4.55%.
[5]Data was not available to calculate the 2015 year-end 5-yr returns. The 2015 year-end 4-yr returns are: EUR: 14.97% and USD: 10.01%. The 2016 year-end 5-yr returns are: EUR: 14.01% and USD: 9.41%.

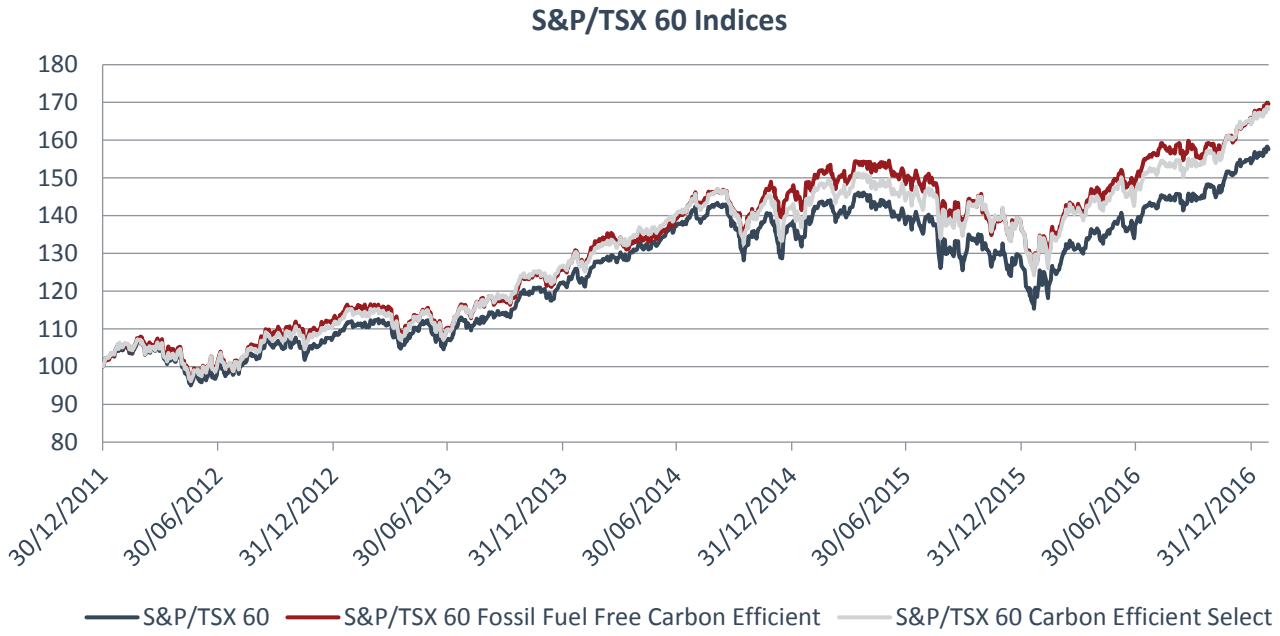

Figure 10: Performance of S&P/TSX 60 Indices

S&P Global Clean Energy

The performance of the S&P Global Clean Energy is compared to that of the S&P 500 and the Dow Jones in Figure 11. As shown, the S&P Global Clean Energy severely underperformed both market indices. Based on the performance of the Global Clean Energy Index's individual constituents, it appears that there is no one industry or geography that is solely responsible for its low returns. The majority of the constituents performed similarly with only four constituents reporting positive returns for the 2009 year-end to 2016 year-end time period. More generally, the clean energy market has been known to be quite volatile and has seen its share of sizable failures including: Solyndra, a solar panel manufacturer, had a market value of approximately $2 billion USD in 2009 but filed for bankruptcy two years later; SunEdison, the world's largest renewable energy developer, filed for bankruptcy protection in April, 2016 after failing to sustain their debt-fueled expansion; and Solar City, a residential solar installer, saw its stock price drop by more than 50% in 2016. Moreover, hydraulic fracking technologies, the volatile oil market and the recent global push for climate-related policy have all contributed to the uncertainties about the direction of the clean energy market.

Beyond its poor performance, it is also interesting to note that the carbon intensity of the S&P Global Clean Energy is nearly 17 times higher than that of the Dow Jones. As previously mentioned, participation in "clean" technologies does not necessarily mean low emissions — a truth that those looking to manage their carbon risk should be aware of.

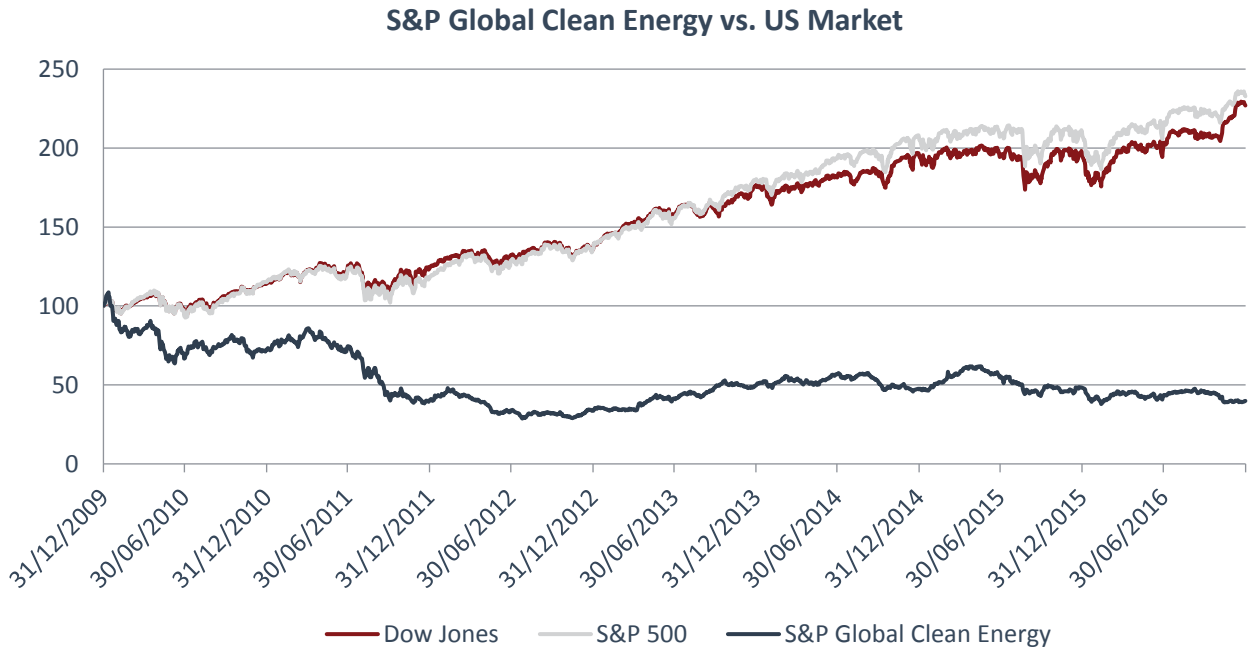

Figure 11: Performance of S&P Global Clean Energy vs. US Market

FTSE EO 100

Much like the TSX 60 based environmentally conscious indices, the FTSE EO 100 outperformed its market counterpart, the FTSE 100. (Figure 12)

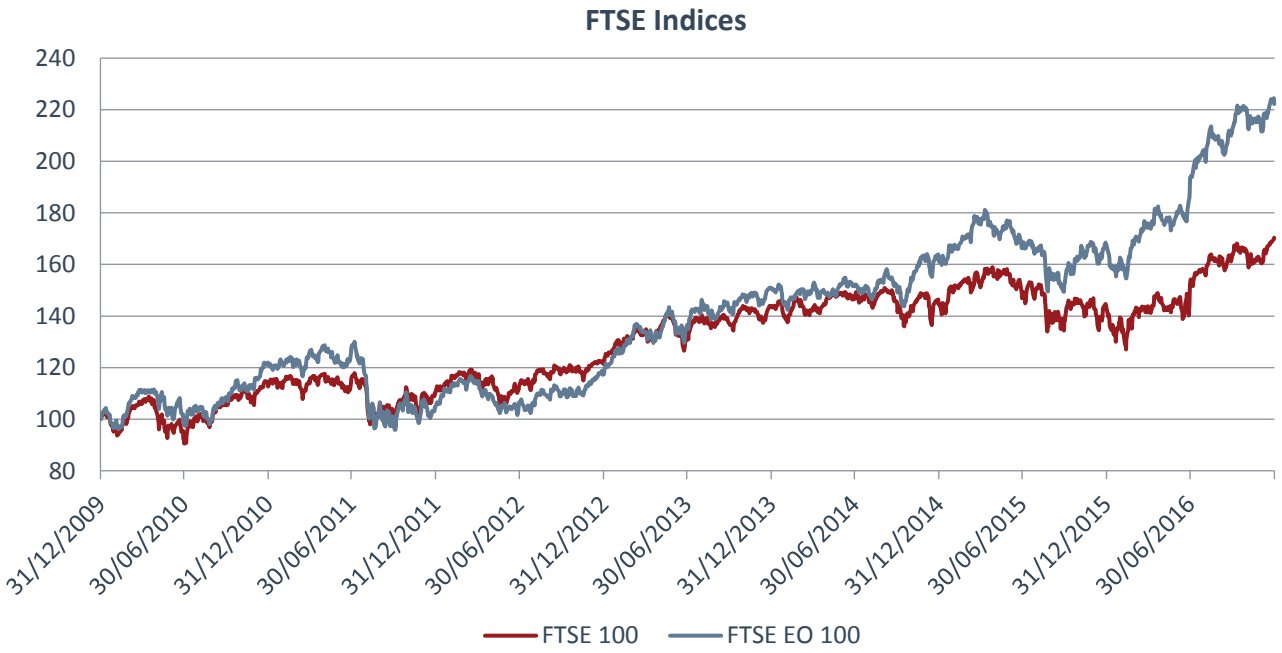

Figure 12: Performance of FTSE Indices

STOXX Global Climate Change Leaders

The STOXX Global Climate Change Leaders Index, which has a global view similar to that of the STOXX Global 1800. The performance of both indices is provided in Figure 13. The Global Climate Change Leaders marginally outperformed the Global 1800 while providing a carbon reduction of more than 70%. [34] Given the constituents of the Global Climate Change Leaders consists of best performers in terms of climate disclosure and governance, these results suggest that strong climate strategy and leadership can be beneficial for returns.

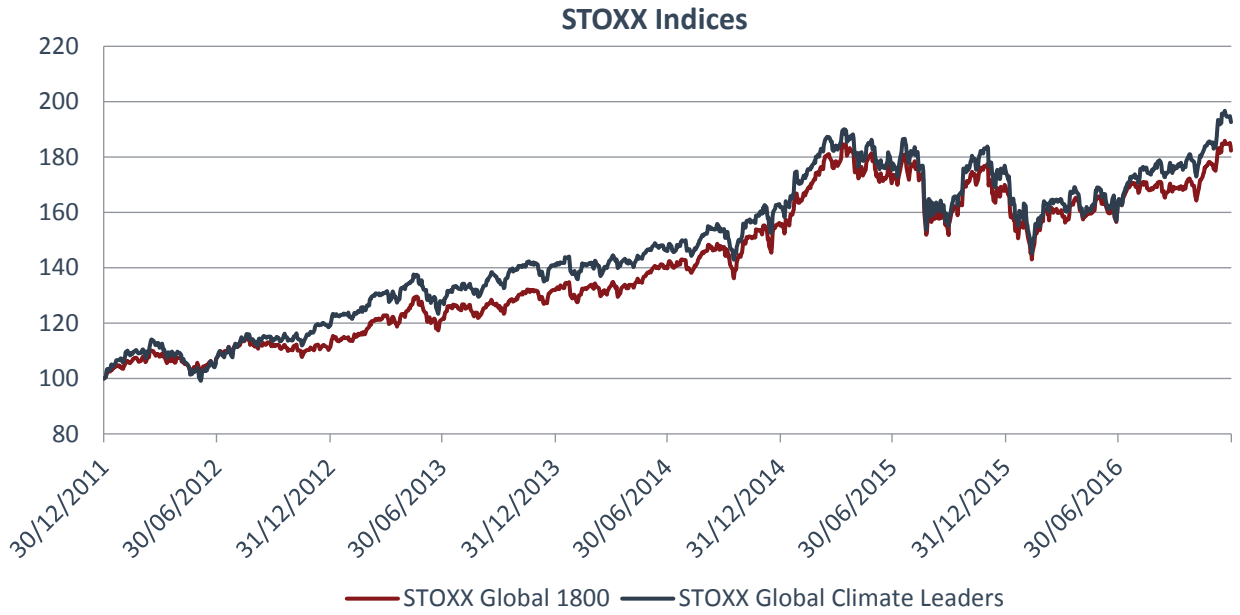

Figure 13: Performance of STOXX Indices

Given the complexity of financial markets and the large number of factors that can drive or impede returns, it is difficult to determine the relationship between the carbon intensity and performance of an index. Nevertheless, the results of this study strongly support the notion that environmental indices can provide returns that are often better than their market counterparts. This suggests that one can help to manage and mitigate their carbon risk without losing out on returns through thoughtful environmentally conscious investing.

Several sources provide further support of our findings. Based on a set of over 1400 funds, Ibikunle and Steffen found that over the period of 1991-2014 green mutual funds, who originally underperformed relative to conventional funds, made significant performance improvements over time and eventually surpassed and strongly outperformed conventional funds. [35] In their recent Eco-Fund Ratings report, the Corporate Knights reported that a decrease of one tonne of CO_2e/$mm sales increased the 3-year compound return of a fund by 0.1%. [36] The CDP stated that constituents of the S&P 500 who reported their emissions had 67% higher ROEs than non-reporting companies, suggesting that companies with strong internal climate strategies and governance provide higher returns. [18] Not only

do these results imply that environmentally conscious investing can be achieved without the loss of returns, but rather that it can be profitable. They also suggest that investing in companies who are mindful about climate change and sustainability can provide performance advantages. It should be noted that the weak global oil markets may have played a role in augmenting the relative performance of fossil fuel free investments in recent years. However, there has also been a considerable increase in funding for green/clean technologies. (Bloomberg reported that nearly 300 billion USD was invested in clean energy in 2016. [37]) Not to mention that many notable figures, including Mark Carney and Michael Bloomberg have been actively advocating for climate change mitigation and environmentally-informed investing.

As governments around the globe continue to transition to low-carbon economies, FIs will have to assess the impact of new, more severe climate policies on their investment portfolios. In this study, we introduced five environmentally conscious indices and compared their carbon intensities and performance with equivalent market indices. Although we must acknowledge the limitations of the current state of emissions data, the findings tend to support the notion that green investing can produce competitive returns while offering lower carbon exposure and conceivably, carbon risk mitigation. This is not to say that one should divest from all carbon intensive companies; our findings simply indicate that it is possible to address carbon risk in a profitable way.[6]

Of course, there are still questions surrounding the relationship between carbon emissions and returns, and there is significant uncertainty about the size and nature of the impact that climate policy and carbon pricing will have on financial markets. In addition, the recent shift in the U.S. government's stance on climate change has introduced further uncertainty pertaining to the future of U.S. climate policy. U.S. policy may diverge sharply from that of Canada and other major economies in the years to come, and if such a divergence materializes environmentally-conscious and fossil fuel-intensive companies in the U.S. may perform disparately from their global counterparts. Finally, comprehensively assessing a FI's carbon risk must go beyond assessing the carbon exposure of their equity portfolios alone. FIs hold a diverse and complex set of investments whose carbon risk assessment has gone largely unaddressed.

Despite these uncertainties and challenges, it is in the best interest of financial institutions to be mindful in the management and mitigation of climate risks and to take full advantage of the opportunities that transitioning to a low-carbon economy presents. Our results indicate that thoughtful carbon risk management can, in fact, present one such opportunity, providing increased returns and reduced carbon exposure at the same time.

[6] It may also be worth noting that it is possible to further reduce portfolio carbon exposure by investing in companies who participate minimally in emissions producing activities and whose emissions come predominantly from purchased electricity (e.g. large FIs, large tech companies, etc.). However, this will limit one's ability to have a truly diversified portfolio.

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