

The Climate has Changed:

Exploring the Investment Potential
of Fossil Fuel Free Portfolios

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Responsible Investment Association

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1. Executive Summary

The likelihood of carbon pricing has led many financial analysts, environmental campaigners, and others to warn about the risk of 'stranded assets' in the energy sector. Stranded assets refers to a scenario in which the value of fossil fuel reserves falls due to rising operational costs associated with carbon prices. Fossil fuel assets could become 'stranded' as production becomes unprofitable. In Canada, the possibility of increased regulation and public pressure, both domestic and international, poses additional risks.

The risk of stranded assets is a growing concern for investors. An increasing number of investors are interested in learning about fossil fuel free (FFF) investment alternatives. Yet the Canadian market presents a challenge for investors wishing to avoid fossil fuels because fossil fuel companies account for roughly one quarter of the value of the S&P/TSX composite index.

This report provides an overview of FFF investment options, while focusing specifically on the Canadian market. The report categorizes investment options according to their level of involvement with the fossil fuels industry. It provides a brief summary of portfolio investment options available to Canadians. The report also uses qualitative and quantitative data to assess the viability of implementing a FFF investment strategy. In addition, the report observes future opportunities for developing such a strategy and outlines potential paths to follow. Furthermore, it identifies areas for further research, and provides a chart that lays out the investment options that are available to Canadians.

Since there are very few existing FFF funds, we examined simulations from numerous sources to assess the market. The simulations suggest that such funds could yield financial returns that slightly outperform their benchmarks. They also show that these funds could achieve those returns with risk profiles that are comparable to the benchmarks, thereby achieving similar return/risk ratios while simultaneously reducing the carbon intensity of their investment portfolios. Additionally, funds that exclude fossil fuel companies could also eliminate the direct risks associated with stranded assets.

Although there are few existing FFF funds, we performed an empirical analysis of the available data. Our analysis of existing funds' risk and financial performance is consistent with the simulated findings. The existing FFF funds have outperformed the index over the last 12 to 15 months, but slightly underperformed their benchmark on a 3, 5 and 10-year basis. Contrary to assumptions about FFF strategies, these comparable returns were also achieved with comparable risk, relative to the benchmark.

Our findings suggest that, although FFF funds may not offer a radically more profitable opportunity than traditional funds, they do offer comparable alternatives for investors. This conclusion holds true regardless of whether they are designed to mitigate the risk of stranded assets or to satisfy environmental and social concerns.

Notwithstanding, there are significant challenges for Canadian fund companies. Two in particular stand out as barriers to FFF fund development.

1. Home country bias. Although Canadian equities represent only 4 percent of the global market, the majority of Canadians are overweight Canadian investments in their RRSPs and other investment portfolios. There are a number of reasons for this. Company familiarity, dividend treatment and currency risk are among them.
2. Lack of patient capital. Due to the lack of historical data, the funds studied do not reflect the many failed attempts to launch environmental or sustainable investment funds. A number of funds have been launched to acclaim but rolled into other funds with very different mandates when they failed to attract sufficient assets to make them viable in the short term. Patient capital is not observable in the Canadian mutual fund marketplace.

Responsible investment managers have also identified the lack of emissions targets in Canada as a significant factor in the potential development of FFF products. In a regulated environment, investment managers would be better able to assess the risks vis-à-vis stranded assets and better able to communicate those risks to investors.

Canadians wishing to avoid fossil fuels may be best served by investment managers who can offer them discretionary FFF portfolios that are globally diversified. As these are usually only available to high net worth investors, the alternative is to invest in FFF exchange traded funds (ETFs). A number of Canadian Responsible Investment (RI) mutual funds have adopted low carbon, though not FFF strategies combined with engagement with fossil fuel companies.

2. Introduction

Climate change and its impacts are challenging our planet, our livelihoods, and our economy. As the planet warms and extreme weather events become the norm, Canadians and people across the globe are increasingly concerned about their environmental impacts. In addition, there is an increasing probability of government intervention to reduce carbon emissions. This intervention is likely to take the form of carbon pricing. The likelihood of government-sanctioned carbon pricing has led many financial analysts, environmental campaigners, and others to warn about the risk of 'stranded assets' in the energy sector. Stranded assets refers to a scenario in which the value of fossil fuel reserves falls due to rising operational costs associated with carbon prices. Fossil fuel assets could become 'stranded' as production becomes unprofitable.

The risk of stranded assets is a concern for investors. Within the growing field of responsible investment (RI), many are taking a proactive approach by engaging with oil and gas companies, banks, and others to reduce their exposure to the risk of stranded assets. For many responsible investors, however, this is not enough. They seek fossil fuel free (FFF) alternatives that will deliver a market return. The World Economic Forum and the International Energy Agency estimate that climate change mitigation and adaptation requires USD \$700 billion to \$1 trillion in additional investment in clean energy and low-carbon infrastructure.^{i,ii} For some responsible investors, this is a wakeup call that cannot go unanswered.

The Canadian market, however, presents a serious challenge for investors seeking FFF investment alternatives. Fossil fuel companies account for approximately 24% of the value of the S&P/TSX composite index, holding a market capitalization of between \$400 and \$500 billion.ⁱⁱⁱ This makes it difficult to find portfolios that are free of companies engaged in the production, refining, and distribution of fossil fuels. Yet due to growing climate change awareness and the media attention surrounding 350.org's divestment campaign, Canadian investors are increasingly interested in learning about FFF investment alternatives.

The purpose of this report is sevenfold. First, it categorizes investment options according to their level of involvement with the fossil fuels industry. This step is required to understand precisely what it means for an investment to be FFF. It then provides a brief summary of FFF portfolio investment options available in Canada. Third, it provides an overview of available data on the financial performance, risk, and environmental performance of FFF investment products outside Canada. This section highlights successes and failures. Fourth, it discusses some of the barriers, risks, and limitations to implementing a FFF investment strategy. Fifth, it observes future opportunities for developing a FFF investment strategy. It outlines potential

paths to follow and partnerships to learn from. Sixth, it identifies areas for further research. Seventh, it provides a graphical overview of FFF investment options for those who might invest in such funds. This overview is featured in the appendix.

3. Categories of investment options for responsible investors

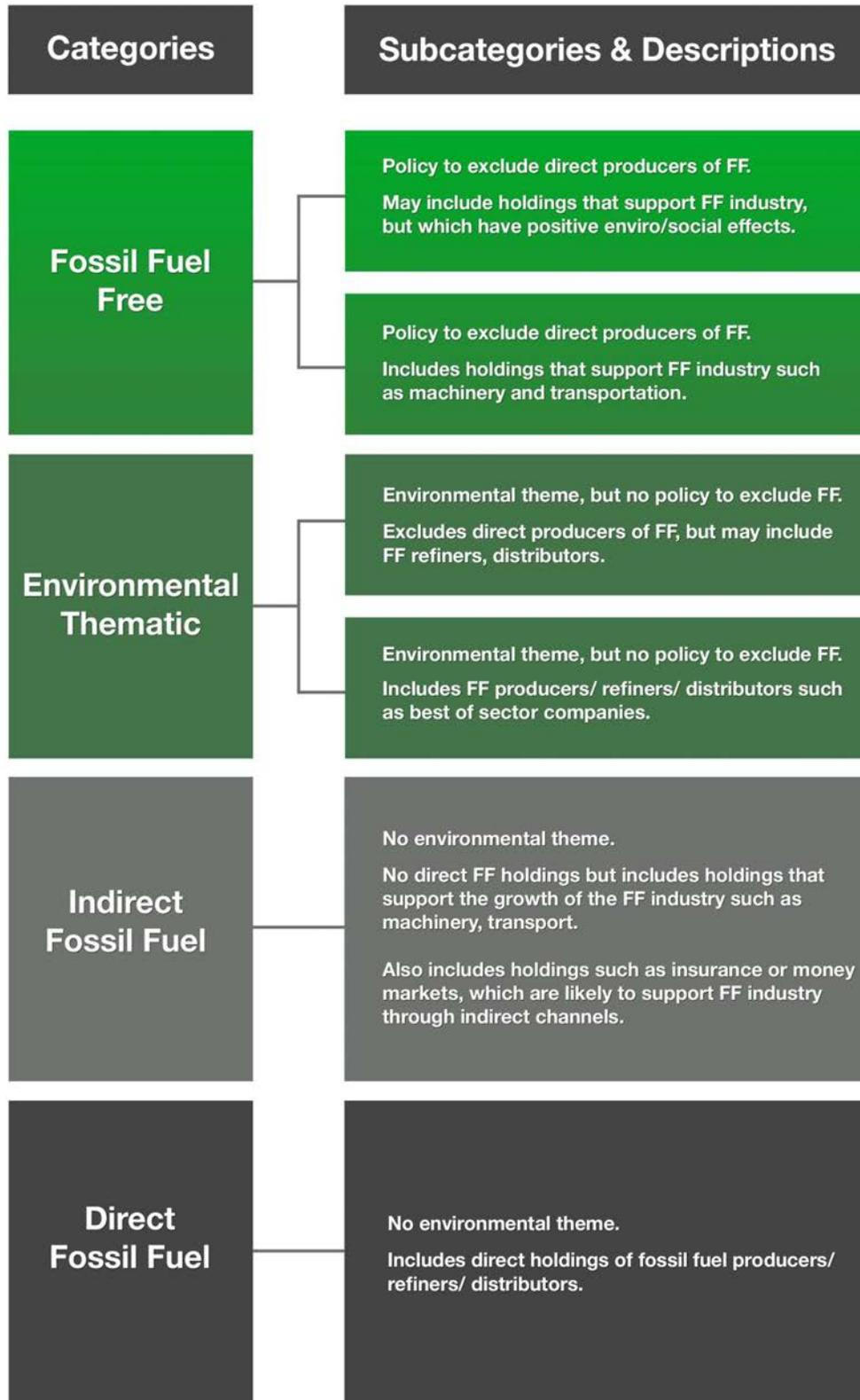
Approaching the topic of fossil fuel free investments requires a clear understanding of what it means for a portfolio to be fossil fuel free. To establish a definition, we developed a taxonomy of investment options to provide an overview of the different categories that various investment products fall into. The categories are based on an investment product's level of involvement with the fossil fuel industry. This taxonomy is shown in Figure 1.

Starting at the top of Figure 1, we divided the Fossil Fuel Free category into two subcategories. We did this for several of the categories to reflect the variation that exists within them. The top subcategory within the Fossil Fuel Free category describes the most robust of all currently-existing fossil fuel free portfolios. It is characterized by an explicit policy to exclude fossil fuel industries. It excludes both fossil fuel producers *and* companies that support the distribution of fossil fuels and growth of the fossil fuel industry, such as companies that transport fossil fuels. Yet this subcategory may include holdings that support the fossil fuel industry in a way that improves environmental or social outcomes. The bottom subcategory within Fossil Fuel Free is characterized by an explicit policy to exclude fossil fuel industries. Yet it may hold companies that support the distribution of fossil fuels and growth of the industry, such as companies that transport fossil fuels.

The second category from the top is Environmental Thematic. This category describes portfolios that are established using environmental criteria, but that do not have an explicit policy to exclude fossil fuels. Although the top subcategory excludes fossil fuel producers, it includes companies that are involved with refining and distribution. The bottom subcategory includes fossil fuel producers that are considered to perform well on the environment.

The third and fourth categories describe conventional investment products that do not use environmental criteria. Although portfolios in the Indirect Fossil Fuel category may not contain fossil fuel holdings, they likely support the growth of the fossil fuel industry indirectly through machinery and transport, or through indirect channels like insurance and money markets. As its name indicates, the Direct Fossil Fuel category describes conventional portfolios that hold fossil fuel companies.

Figure 1: Categories of investment options
 (Fossil fuels abbreviated to FF)



4. Summary of available fossil fuel free products in Canada

Currently, there are very few FFF portfolio investment products based in Canada. Our researchers found only two Canadian-based companies that offer FFF portfolio investment products. Vancouver-based Genus Capital offers five funds that meet the criteria to place in the most robust subcategory of Fossil Fuel Free products, which is shown at the very top of Figure 1. These five funds – Biosphere CanGlobe Equity Can\$, Biosphere CanGlobe Equity US\$, Biosphere Dividend Equity, and Biosphere Corporate Bonds Biosphere Government Bond – are based on a policy to exclude both fossil fuel producers *and* companies that directly support the distribution of fossil fuels and growth of the fossil fuel industry. Genus established these funds in 2013.

Toronto-based Greenchip Financial is the only other Canadian firm to offer a fund that falls within the Fossil Fuel Free category in Figure 1. Greenchip established its Greenchip Global Equity Fund on a clear policy to exclude fossil fuel producers. Although the fund excludes fossil fuel companies, it does hold companies that service the fossil fuel industry; but these companies must have an environmental angle such as clean-tech, energy efficiency, or pollution reduction. Like the Genus funds noted above, this fund falls within the top subcategory of Fossil Fuel Free.

Although there are only two Canadian companies offering FFF funds, there are non-Canadian companies whose FFF funds are available to Canadians. These are exchange-traded funds (ETFs). Yet FFF ETFs are typically not as diversified as mutual funds. Rather, they tend to focus on a specific sector. As a result, these ETFs tend to be more volatile. These funds include, but are not limited to, the Guggenheim Solar ETF, Van Eck's Market Vector Solar Energy ETF and Market Vectors Environmental Services ETF, Invesco's PowerShares Cleantech ETF, First Trust NASDAQ Clean Edge Green Energy Index ETF and First Trust NASDAQ Clean Edge Smart Grid Infrastructure ETF. All of these funds are based in the United States, and are available to Canadians through a discount brokerage account.

5. Successes and failures of fossil fuel free investment products

Recent studies suggest that a fossil fuel free investment strategy could prove to be successful in three ways: financially, environmentally, and in terms of risk management. MSCI, Impax Asset Management, and Aperio Group are three organizations that have recently evaluated the viability and impact of FFF investment strategies. Their research uses a back-testing methodology to simulate a variety of large FFF and low carbon portfolios to evaluate their probable historical

performance against the index they were derived from. These back-tests have supported the viability of FFF funds, generally showing comparable financial returns and risks.

5.1. Macro analysis of financial potential of FFF

The recent MSCI report, *Options for Reducing Fossil Fuel Exposure*, evaluated four investment approaches using back-tests to show simulated performance between January 1st, 2007 and December 31st, 2013.^{iv} They constructed three simulated portfolios: (1) a FFF portfolio that excluded all companies with fossil fuel reserves from the MSCI All Country World Index (ACWI); (2) a low carbon portfolio that excluded the largest 50% of companies according to their fossil fuel reserves from the MSCI ACWI; (3) a so-called carbon-tilted approach, in which the investment weightings were skewed in favour of companies with strong governance strategies on carbon emissions, without applying an exclusionary screen to any companies. Finally, they also evaluated the MSCI Global Environmental Index as a proxy for a climate-themed investment fund.

MSCI's back-tests of its diversified FFF fund showed that, from January 1st 2007 to December 31st, 2013, annualized returns would have outperformed its parent index by ten basis points (4.4% versus 4.3%). The simulated low carbon fund showed the strongest annualized returns, outperforming its parent index by thirteen basis points (4.43% versus 4.3%). The carbon-tilted fund underperformed its parent index by eight basis points (4.22% versus 4.3%). Additionally, the thematic fund outperformed the MSCI ACWI investable market index by 50 basis points, with annualized returns of 17.33% versus 16.83% between November 28, 2008 and December 31st, 2013.^v From these performance numbers, MSCI concluded that a FFF investment strategy could have slightly outperformed a similar yet non-divested fund.

An earlier edition of MSCI's report showed significantly different, although still positive results.^{vi} This study had a shortened time frame by one month, evaluating past performance between January 1st, 2007 to November 30th, 2013. The report also used a different methodology for establishing their carbon-tilted strategy. Otherwise the methodology was consistent between the two papers. The time-frame difference of one month generated very different findings. For example, the earlier model found the comparable benchmark to have yielded annualized returns of 2.99% as opposed to the 4.3%. As a result the simulated funds showed stronger relative performance in outperforming the index. For example, the FFF fund and the low carbon fund outperformed the index by 120 and 123 basis points, with annual returns of 4.19% and 4.22% respectively.^{vii} These significant performance differences, primarily resulting from an increase in time horizon by one month,

illustrate the challenges of a back-testing analysis.

Similar to MSCI's reports noted above, Impax Asset Management's 2013 report, *Beyond Fossil Fuels: The Investment Case for Fossil Fuel Divestment*, back-tested several compositions of FFF portfolios.^{viii} A noticeable methodological difference between the two reports is Impax's integration of actively and passively managed environment-themed funds into the test portfolios. Impax back-tested four simulated portfolios: (1) they evaluated the financial return and affiliated risks associated with an MSCI World Index-based FFF fund; (2) a more elaborate fund that re-invested a passive allocation of renewable energy securities to their basic FFF fund; (3) an active allocation of renewable energy funds; and (4) another FFF fund that added back a "wider range of resource optimization and environmental investment opportunities".^{ix}

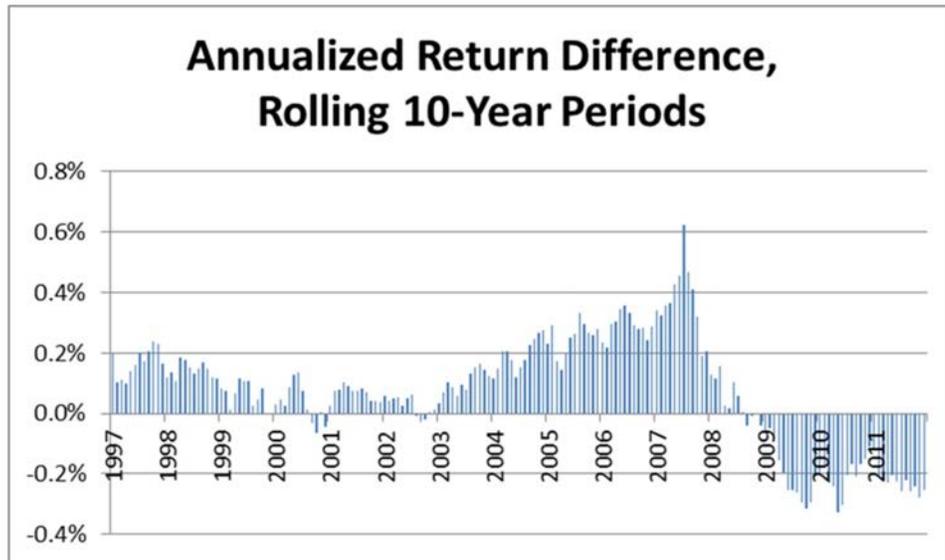
Impax's inclusion of passive and active environmentally-beneficial funds added dynamism to its back-tests. Traditionally, back-testing is a general overview of how an unmanaged portfolio could have performed. By including a selection of actively managed funds during the relevant time period, Impax created a more tangible example of how an actual fund may have performed.

From these back-tests, Impax found that all of their simulated FFF portfolios would have marginally outperformed the MSCI World Index between January 2008 and March 2013. Their FFF, FFF plus passive, FFF plus active, and FFF plus environmental opportunities funds had annualized returns of 2.3%, 1.9%, 2.2% and 2.3% respectively relative to the MSCI World Index's 1.8% annualized return.^x

In its 2013 study, "Do the Investment Math: Building a Carbon-Free Portfolio," Aperio Group back-tested a fossil fuel free version of the Russell 3000 Index, which is composed of the 3000 largest publicly-held American companies.^{xi} Aperio's researchers constructed their simulated fund by excluding all securities from the oil, gas, and consumable fuels industries. Aperio then compared this simulated fund to the actual Russell 3000 index over rolling 10 year periods from the end of 1987 through the end of 2012. They called this simulated portfolio Full Carbon Divestment.

In their back-test, Aperio Group's researchers found that the Full Carbon Divestment portfolio performed well against the Russell 3000 benchmark. The results are shown in Figure 2. The researchers found that the Full Carbon Divestment portfolio actually outperformed the benchmark 73% of the time, and earned a slightly higher average annualized 10-year return, by 0.08%.^{xii}

Figure 2 ^{xiii}



Return numbers show annualized return difference between Full Carbon Divestment portfolio and Russell 3000 for periods from Jan 1988 to Dec 2012.

Average Annualized 10-year Return Difference	+0.08%
Percentage of Periods Higher than R3000	73%
Percentage of Periods Lower than R3000	27%
Tracking error, current forecast	0.60%
Tracking error, historical simulation	0.78%

Despite the challenges associated with using back-tests to examine individually-managed funds, the research conducted by MSCI, Impax, and Aperio presents an interesting and positive outlook on the financial viability of fossil fuel free investments.

5.2. Macro analysis of risk of FFF

One of the major reservations investors have about FFF is the assumption that a smaller investment universe increases risk. MSCI's report addresses this concern by evaluating the risk that their simulated portfolios carried. They found that the simulated funds experienced marginally higher risk measured evaluated in terms of volatility (standard deviation %), tracking error, and return/risk ratios.

MSCI's simulated FFF fund experienced marginally higher volatility at 19.08% versus the MSCI ACWI volatility of 18.95%, but also experienced the highest of the simulated fund's tracking error at 1.23%. Yet the FFF fund matched the index's return/risk ratio at 0.23. The low carbon portfolio similarly experienced marginally higher volatility at 19.08% relative to the MSCI ACWI's volatility of 18.95% and yielded a moderate tracking error of 0.60%. Similar to the FFF fund, the low carbon

fund also matched the index's return/risk ratio of 0.23. Despite not eliminating any companies, the carbon-tilted strategy also had higher volatility than the index at 19.00%. It did however, have a lower return/risk ratio at 0.22 and the lowest of the funds tracking error at 0.47%. The less diversified, environment-themed fund experienced higher volatility at 21.63 relative to MSCI ACWI investable market index's volatility of 17.70 between November 2008 and November 2013. It also had a lower return/risk ratio of 0.80 versus the index's 0.95.^{xiv}

Once again, Impax's results mirrored MSCI's. Impax's back-tests revealed a moderate increase in volatility and tracking errors for the divestment of fossil fuel companies even when replaced with passively or actively managed renewable energy securities, or other actively managed environmental opportunities securities. Impax's FFF portfolio matched its parent index's annualized volatility at 20.5%. Its Passive Plus fund, Active Plus Fund and Active Environmental Opportunities Fund all had slightly higher annualized volatility at 21.1%, 21.3% and 20.8% respectively. The FFF fund, Passive Plus fund, Active Plus fund and Active Environmental Opportunities fund all had low tracking errors to their parent index MSCI World Index at 1.6%, 1.8%, 2.0% and 1.6% respectively.^{xv}

In their back-test noted above, Aperio Group's researchers measured the tracking error between the simulated Full Carbon Divestment portfolio and the Russell 3000 benchmark. In examining the difference between Full Carbon Divestment and the Russell 3000 benchmark, Aperio researchers found a tracking error of just 0.78%. Figure 2 demonstrates Aperio Group's findings. Although this number is slightly higher than the forecasted tracking error of .60%, it nonetheless suggests that investors assume a negligible degree of risk in choosing to exclude fossil fuels from a diverse portfolio.^{xvi}

These results show that while FFF options exhibit slightly elevated risk, FFF funds' risk metric remain reasonably comparable to relevant benchmark indices. In addition to the individual funds' risk assessments, it is also important to consider the risks stemming from the macro investment climate. The most daunting risk to fossil fuel companies and their respective owners/shareholders is the potential for crippling levels of their assets becoming stranded, which would reduce or eliminate their financial viability. This is particularly true for Canadian companies where existing climate regulation is currently minimal in its impact on the production and profitability of the companies but has the potential to increase significantly.

In MSCI's back-test, their FFF fund eliminated both oil and oil and gas exploration as well as non-nuclear, coal and consumable fuels companies. In doing so, the portfolio effectively eliminated its collective holdings of fossil fuel reserves. As a consequence, the direct risk of stranded assets is negated. However, it is important

to note that the majority of fossil fuel reserves are held by governments or state-owned companies.^{xvii,xviii,xix} As a result, investment portfolios that contain investments in governments with state-owned oil and gas companies will have some degree of indirect risk associated with stranded assets. Such investments may include bonds, treasury notes/bills. By comparison, MSCI's simulated low carbon and best-in-class funds in their back-tests continue to experience, albeit diminished, direct risk from stranded assets.

To help investors understand the risk and return implications of the projected rising costs and falling prices associated with fossil fuels, Bloomberg developed a Carbon Risk Valuation Tool.^{xx} This tool, available on Bloomberg profession terminals at XLTP XCO2, provides an interesting, preliminary insight into the risks associated with five potential scenarios that can be applied to individual companies. The tool allows investors to simulate five varying price and earning scenarios as well as underlying assumptions to understand the outcomes based on varying companies lifting costs, from different ways stranded assets could manifest themselves.^{xxi} By allowing users to simulate potential impacts on individual companies' average lifting costs, the valuation tool could facilitate a shift to a best-in-class approach whereby investment companies reduce their risk of stranded assets by identifying and eliminating the highest risk companies.

5.3. Macro analysis of environmental implications of FFF

In addition to showing relatively strong performance results and comparable risk, it is important to consider the extent to which fossil fuel divestment achieves a carbon conscious investor's goal of reducing their portfolio's carbon exposure. The updated MSCI report *Options for Reducing Fossil Fuel Exposure* evaluated simulated funds carbon exposure using carbon intensity, the emissions as a percentage of revenues, as their metric. This is a useful metric because it provides some indication of the ability to decouple emissions from economic performance. In this regard, the FFF index has the second lowest carbon intensity at 77% of the index, while the low-carbon fund has a carbon intensity of 71% and the carbon-tilted fund is 84% of the index's carbon intensity.^{xxii}

In the first edition of the MSCI report, the researchers assessed the total carbon footprint (scope 1 and scope 2 emissions) and carbon intensity of each simulated fund. They found that in eliminating oil and oil & gas exploration companies non-nuclear, coal, and consumable fuels, the FFF fund reduce its carbon footprint to 61% of the MSCI ACWI. Similarly the low carbon fund was able to reduce its carbon footprint to 63% of the MSCI ACWI, whereas the carbon-tilted strategy only succeeded in reducing the carbon footprint to 91% of the MSCI ACWI.^{xxiii}

Of particular note is that the environment-themed investment fund had a significantly lower carbon footprint and carbon intensity performance at only 10% and 31% respectively, compared to the MSCI ACWI investable market index.^{xxiv}

MSCI’s findings indicate that, although fully and partially divesting from fossil fuel companies will not result in a carbon neutral portfolio, it could significantly reduce your investment’s carbon footprint. Additionally, a significant reduction in carbon intensity indicates that fully and partially divested funds can achieve strong financial performance with higher emissions efficiency.

5.4. Micro analysis of select existing FFF products

As indicated above, most research on potential risk and return of FFF investments uses back-tests. The challenge with relying on back-tests is that, although it provides an overview of general market performance, it overlooks how individual portfolio managers would have performed with unique selections of securities. While the existing investment universe for FFF funds remains quite small, a look at existing North American funds provides useful insights that back-tests do not.

Table 1: Select Canadian and American Fossil Fuel Free Funds

Management Company	Fund	Established*
Genus Capital Management	Biosphere Global Equity Canada	2013
Genus Capital Management	Biosphere Global Equity USA	2013
Genus Capital Management	Biosphere Dividend Equity	2013
Genus Capital Management	Biosphere Corporate Bonds	2013
Genus Capital Management	Biosphere Government Bond	2013
Greenchip Financial	Global Equity Fund	2008
Portfolio 21	Global Equity Fund - Retail	1999
Portfolio 21	Global Equity Fund - Institutional	2007
Green Century	Green Century Balanced Fund	2005
Trillium Asset	Fossil Fuel Free Core	2007
Trillium Asset	Sustainable Opportunities Fund	2008
PAX World Investments	Global Environmental Markets Fund - Individual	2008
PAX World Investments	Global Environmental Markets Fund - Institutional	2008
Shelton Capital Management	Green Alpha	2013

* Established date listed is when the fund became fossil fuel free

An evaluation of the predominant Canadian and American fossil fuel free funds reveals that the financial performance of FFF funds has been reasonably comparable to global benchmarks. The funds evaluated are shown below in **Table 1**. While the current availability of these types of funds in North America is relatively small, current players are demonstrating optimism in the market with two new funds under development. The Canadian firm Genus Capital and American firm Green Century are both developing additional funds for a mid-2014 release, which will apply fossil fuel screens.^{xxv}

5.4.1 Real World FFF Fund Evaluations- Financial

Although some of these funds, such as Portfolio 21's Global Equity Funds, have existed as FFF for over 10 years, the majority are less than 5 years old with a few only being introduced over the last year. Most of these funds are classified as global equity funds, although there are also balanced, income, and fixed income funds.

Over the periods for which there is sufficient data, the average annualized performance of the FFF global equity funds slightly outperformed the MSCI World Index on annualized three-month and one-year bases, but were outperformed by the index on three, five and ten year bases. The fund's annualized returns are presented below in Table 2, where outperformance of the index is indicated in green and underperformance is indicated in red.

Table 2: Global Equity, FFF Funds Annualized Performance against MSCI World Index

Fund Owner	Fund	Location	Est.*	3 mo	1 year	3 year	5 year	10 year
Greenchip Financial	Greenchip Global Equity Fund	Canada	2008	9.6	35.8	10.9	11.5	NA
Genus Capital Management	Biosphere CanGlobe Equity Can\$	Canada	2013	11.87	NA	NA	NA	NA
Genus Capital Management	Biosphere CanGlobe Equity US\$	Canada	2013	8.23	NA	NA	NA	NA
Trillium Asset Management	Fossil Fuel Free Core	USA	2007	No Data	23.42	14.33	9.48	NA
Trillium Asset Management	Sustainable Opportunities	USA	2008	No Data	23.85	15.23	9.54	NA
Portfolio 21	Global equity Fund - Retail	USA	1999	No Data	22.16	8.97	13.15	7.27
Portfolio 21	Global equity Fund -	USA	2007	No	22.52	9.28	13.48	7.58

	Institutional			Data				
Pax World Investments	World Global Environmental Markets Fund - Individual Investor Class	USA	2008	8.09	32.01	12.15	16.62	NA
Pax World Investments	World Global Environmental Markets Fund - Class A	USA	2013	8.07	32.01	12.15	16.62	NA
Pax World Investments	World Global Environmental Markets Fund - Institutional Class	USA	2008	8.09	32.37	12.44	16.92	NA
Pax World Investments	World Global Environmental Markets Fund - Class R	USA	2008	8.02	31.72	11.86	16.34	NA
Shelton Capital Management	Green Alpha	USA	2013	14.42	NA	NA	NA	NA
Average FFF Global Equity				9.55	28.43	11.92	13.74	7.43
MSCI World Index				8.11	27.37	12.13	15.68	7.56

As illustrated above, it is also important to note that the long term performance is bolstered by Pax World Investments fossil fuel free fund's classes.

A fund by fund comparison of these global equity funds, which is shown in Appendix 2, demonstrate the similarity in financial performance to the MSCI World Index.

Green Century Balanced Fund, global balanced equity fund, has also performed strongly prior to and since becoming FFF in 2005. Its performance is shown below in Table 3.

There are also three additional funds available to Canadians, all available from Genus Capital Management. The funds are relatively new and consequentially can only offer performance data (un-annualized) over the last six months as illustrated below in Table 4. This short term perspective limits the extent to which the data can be used to comment on the funds long term sustainability.

Table 3: Green Century Balanced Fund Annualized Performance

Fund Owner	Fund	Location	Est.*	3 mo	1 year	3 year	5 year	10 year
Green Century Capital	Green Century Balanced Fund	USA	2005	No Data	23.67	11.86	13.26	Not FFF

Table 4: Genus Biosphere Income and Fixed Income Funds Un-annualized Performance

Fixed Income	Fund	Location	Est.	1 mo	3 mo	6 mo
Genus Capital Management	Biosphere Dividend Equity	Canada	2013	1.24	9.7	12.87
Genus Capital Management	Biosphere Corporate Bonds	Canada	2013	-0.64	0.92	NA
Genus Capital Management	Biosphere Government Bonds	Canada	2013	9.7	NA	NA

ETFs

An additional option for investors who are interested in avoiding investment in fossil fuel companies, is to invest in sector specific or themed investment funds. While many themed investments will be fossil fuel free, those that relate to alternative energy or sustainability services may offer the most distinct alternative from fossil fuel containing funds. For a Canadian investor who does not have access to these predominantly American, fossil fuel free mutual funds, Exchange Traded Funds (ETFs) offer an available investment option that tracks an alternative energy or sustainability index. However, tracking an environmental index does not preclude investment in fossil fuel companies. Individual funds need to be evaluated for their screening procedures to ensure that there are no companies directly involved in the extraction, refining or distribution of fossil fuels an investor must evaluate the entire holdings on the fund's most recent annual report.

A selection of these types of ETFs as articulated in section 4 of this paper performed very well during 2013, albeit with high degree of variance. It is important to note, however, that 2013 appears to be an anomaly, with annualized numbers over three and five year time frames exhibiting modest or poor performance. Their

performance numbers as of December 31st, 2013 are described below.

Table 5: Select American FFF ETFs Average Annual Total Returns

Fund Manager	Fund	Est.	Loc.	3 mo	1yr	3yr	5yr	10yr
Guggenheim Funds	Guggenheim Solar ETF	2008	USA	4.33	129.86	-16.83	-12.89	NA
Van Eck Global	Market Vector Solar Energy ETF	2008	USA	13.11	101.66	-21.29	-17.45	NA
Van Eck Global	Market Vector Environmental Services	2008	USA	5.79	28.71	9.65	14.43	NA
Invesco	PowerShares Cleantech Portfolio	2006	USA	No data	37.73	7.14	12.99	NA
First Trust	First Trust NASDAQ® Clean Edge® Green Energy Index Fund (QCLN)	2007	USA	10.22	89.79	3.53	10.25	NA
First Trust	First Trust NASDAQ® Clean Edge® Smart Grid Infrastructure Index Fund (GRID)	2009	USA	7.24	24.41	5.61	NA	NA

5.4.2 Real World FFF Fund Evaluations- Risk

A common concern regarding FFF investment portfolios is that the funds will be subject to increased volatility as a result of a reduced investment universe. This makes it worth investigating the historical risks associated with each of these funds where the data is available. The following standard deviation (%) calculations are provided by Morningstar and the index standard deviation is provided by MSCI, all as of December 31, 2013.

The limited number of observations in this overarching volatility assessment, which are shown in Table 6, limits the generalizability of the findings to the existing and future FFF funds. Despite the shortcomings in generalizability, the FFF funds

examined show volatility comparable to that of the MSCI World Index.

Table 6: FFF Funds Volatility; 3, 5 and 10 year Trailing Standard Deviation (%)

Fund	3 Year Standard Deviation (%)	5 Year Standard Deviation (%)	10 Year Standard Deviation (%)
Portfolio 21 Global Equity Fund	12.71	16.29	15.69
Pax World Environmental Markets Fund - Individual	15.51	18.46	NA
Pax World Environmental Markets Fund - Institutional	15.54	18.49	NA
Green Century Balanced Fund	8.89	10.46	11.45*
Shelton Green Alpha Fund	No data	No data	No data
Genus Capital Funds	No data	No data	No data
Greenchip Financial Funds	No data	No data	No data
MSCI World Index	13.71	17.22	15.98

* The Green Century Balanced fund has only excluded companies since 2005.

The previously described ETFs offer a niche approach to investing. As pure play funds, with significantly reduced investment universes, they are expected to have significantly higher volatility than broadly diversified funds – either fossil fuel free or traditional. Looking at the volatility numbers for the selection of ETFs evaluated, it is clear that they are significantly more volatile, although this varies by sector. This higher average volatility contributes to making these funds higher risk investment options.

Table 7: FFF ETFs Volatility; 3, 5 and 10 year Trailing Standard Deviation (%)

Fund	3 Year Trailing Standard Deviation (%)	5 Year Trailing Standard Deviation (%)	10 Year Trailing Standard Deviation (%)
Guggenheim Solar ETF	51.37	51.06	NA
Market Vector Solar Energy ETF	49.24	49.28	NA
Market Vector Environmental Services	14.21	17.62	NA
PowerShares Cleantech	18.8	22.74	NA

Portfolio			
First Trust NASDAQ® Clean Edge® Green Energy Index Fund (QCLN)	27.57	29.89	NA
First Trust NASDAQ® Clean Edge® Smart Grid Infrastructure Index Fund (GRID)	18.11	NA	NA

5.5: Failures:

Since there is scant empirical evidence available on discontinued FFF funds, we searched for simulated fund performance to assess criticisms of a FFF investment strategy. Specifically, we searched for published analyses that demonstrate costs and increased risks associated with fossil fuel divestment. Mark Kritzman and Tim Adler’s 2008 study, “The Cost of Socially Responsible Investing,” seems to be the only often-cited, empirical work that contradicts the finding shown above.

Kritzman and Adler used a Monte Carlo methodology to run 10,000 simulations of investment portfolios intended to proxy responsible investments. Depending on the scenarios parameters around percentage of correct choices and percentage of randomly ‘divested’ securities, the costs of responsible investing as a percentage of portfolio values ranged between -0.07% and 4.13%.^{xxvi} This forward-looking simulation indicates that there could be a tangible cost to responsible investing which implicitly includes fossil fuel divestment strategies.

When extrapolating these findings to understand the viability of fossil fuel divestment, as the author Mark Kritzman suggests doing in a personal online statement, it is important to understand the underlying assumptions.^{xxvii} Unlike the aforementioned back-testing evaluations that actively identified fossil fuel companies and associated sectors, this simulation takes a randomized selection of securities. This approach is meant to reflect any strategy that uses selection criteria other than financial performance. This allows the data to be generalizable to any type of responsible investment strategy regardless of the criteria applied. This strategy assumes that there are zero risk or return benefits to eliminating companies that use social or environmental screens. Yet the plausibility of stranded assets and subsequent reduced profitability challenges the assumption that responsible investment strategies are not also simultaneously a financial performance consideration.

In addition to the previously described report, MSCI has also released a research

report that suggests FFF funds would have underperformed their non-FFF benchmark. This MSCI research paper, *Responding to the Call for Fossil Fuel Free Portfolios*, which was released prior to MSCI's *Options for Reducing Fossil Fuel Exposure*, also performed a back-testing analysis on MSCI's ACWI excluding 7% to 8% of the index by removing the 247 reserve owning fossil fuel companies.^{xxviii} This five year simulation found that the ex-fossil fuel simulated fund outperformed its parents index by 0.7 to 0.8%. However, that same report also considered a longer, 10 year time frame from 2003 to 2013. To do so, MSCI created a more dynamic version of Carbon Tracker's list of 200 top fossil fuel companies and removed those companies from the MSCI ACWI. This FFF fund underperformed its parent index by 0.16% on an annualized 10 year basis. This was as a result of underperformance over the first 5 years that was not offset by slight over-performance in the later 5 years. Yet from that ten year analysis, MSCI concluded that the FFF fund would have had lower risk as a result of the relatively high volatility in the energy sector during that time.^{xxix}

The above analysis shows that, although empirical work is sparse, there is some reason to believe that applying a FFF screen to an investment portfolio could have a negative impact on performance.

6. Barriers/risks/limitations to implementing a FFF investment strategy: Interviews with RI managers

As illustrated above, there may be some risks and limitations associated with a FFF investment strategy. This section, which discusses those potential risks and limitations, draws from thirteen interviews we conducted with mid to executive-level professionals working in the RI industry.¹ Three of the interviewees work in the United States, and the remainder work in Canada. Since the sample size is small, our data does not necessarily reflect the entire industry's perspective. Yet, since there is scant empirical evidence on the topic, the interviewees' perspectives shed some light on the potential barriers, risks, and limitations to implementing a FFF investment strategy. The interviewees asked to remain anonymous.

One portfolio manager in Canada, who does not manage any FFF portfolios, stated that there are several potential barriers to implementing a FFF investment strategy. He said that there is little proof of significant commercial demand. Although there is volume and interest in the RI space, this is not necessarily true for a more

¹ Confidential interviews with representatives from several Canadian and American Asset Management companies who have asked to remain anonymous, January 2014.

specialized niche like FFF. He added that such niche products may have unconventional risk-reward profiles and could be more volatile. He also said that Europe is more active in the FFF space due to emissions caps. Conversely, the absence of emissions caps in North America sends the message to investors that there is no limit, and there are no problems. According to this portfolio manager, when investors see things as limitless, there is a tendency to stick to the status quo because there is no reason to seek alternatives.

Concerns about the volatility of FFF strategies were echoed by another Canadian manager. He felt that minimizing fossil fuel exposure through the integration of environmental, social and governance (ESG) factors while engaging in dialogue with fossil fuel companies was a superior strategy and one that many Canadians support. He mentioned the many failed attempts by thematic funds that were initially FFF but added back fossil fuel companies to address volatility and performance issues. Others failed to gather assets and were rolled into non-FFF funds, including utility funds with high GHG emissions profiles. Another issue raised was home country bias. The majority of Canadians are significantly overweight Canadian securities in their portfolios. The lack of a regulatory environment was again mentioned as a barrier to FFF creation.

Another interviewee, a former mutual fund Portfolio Manager, described the frustration that small/mid-cap Portfolio Managers have experienced with FFF portfolios holding alternative energy and other clean-tech holdings. He described a number of situations in which small-cap companies were purchased by large energy companies, effectively limiting the potential portfolio return. As a result, he has seen a number of FFF funds increase their focus on larger cap companies to achieve stability. He hypothesized that oil and gas subsidies and the lack of regulatory guidance in Canada are barriers to success in FFF funds. He also mentioned home country bias as a barrier.

One interviewee, who works for a FFF fund company, suggested two reasons that others hesitate to implement a FFF strategy. The first is that different people have different ways of perceiving and interpreting risk. In his view, his perception of risk diverges from the ways the traditional investment theories typically perceive risk. In contrast to conventional, mainstream approaches to investment, he prioritizes ESG risks. His company prioritizes ESG risks because he and his colleagues share a genuine concern about the risk of being heavily exposed to hydrocarbons within the context of potentially stranded assets. For his company, policy and supply-side risks associated with fossil fuels are simply too high to ignore.

The second reason he thinks others hesitate to implement a FFF strategy concerns benchmarking. Traditionally, companies market themselves as being able to

perform a certain way against a specific benchmark. Yet his fund's portfolio has unique sectoral weightings, so it will undoubtedly deviate from traditional benchmarks.

Another interviewee, who works with a FFF fund company, suggested that a major challenge to creating a FFF portfolio is the way in which a fossil fuel company is defined. Her company is interested in excluding all companies involved with the extraction, refining, and distribution of fossil fuels. This strategy leads to the exclusion of large portions of secondary industries such as rail companies. But for others, this could be viewed as a very aggressive FFF strategy. In designing a FFF strategy, then, the questions arise: Where do you draw the line between conventional and FFF investments? Do you include holdings involved in the distribution of natural gas to households, or do you focus more sharply on just excluding direct producers of oil and gas? In this interviewee's view, these questions present challenges for those who might wish to implement a FFF strategy.

Another interviewee, who works for an RI investment company, takes a more theoretical approach. For her, modern portfolio theory is a limitation to scaling up FFF investment alternatives. Modern portfolio theory suggests that investors should invest across all, or many, sectors and geographic regions as a matter of risk management and diversification. This philosophy implies that negating an entire, large industry is a suboptimal strategy because it unduly increases portfolios risk without increasing financial performance. But in her view, that is not necessarily the case. In her view, a FFF strategy actually aims to increase, or at least to maintain financial performance by excluding fossil fuels. For her, any risks assumed by excluding an industry can be mitigated using other diversification strategies. Another interviewee, who works for a FFF fund company, echoed this position. For him, taking a global equity approach enables sufficient diversification.

Lastly, one interviewee, who works for a FFF fund company, said that implementing a FFF strategy is not a great challenge at all. In his view, others' hesitation about adopting a FFF strategy is actually the reason that his FFF funds are enjoying success. In other words, his company has engaged a niche market that others are not operating in.

7. Future opportunities – potential paths to follow and partnerships/collaborations to learn from

Fossil fuel divestment is not a new concept, as Portfolio 21's nearly 15 year-old FFF fund demonstrates. Yet the mainstreaming of the concept is relatively new. As a result, existing research on the topic remains sparse.

As one portfolio manager suggested in an interview for this project, some mainstream investors may only begin to consider FFF alternatives once legislation appears to cap emissions.

Despite the lack of widespread emission regulation in North America, many professionals working for FFF fund companies said that they are currently experiencing a significant growth in demand. Many of them attribute this growth to the fossil fuel divestment movement led by [350.org](https://www.350.org) as well as their funds' performance as proof points for divestment.

Most asset management companies that offer FFF funds have not relied exclusively on FFF funds – or at least, they did not rely on FFF funds when they started out. Yet for many of these companies, their FFF funds have grown to represent a significant portion of their assets under management. While most of the FFF funds are managed in-house, several of the evaluated funds, at least initially, were sub-managed by a company with more experience managing FFF portfolios. There has also been a few cases in which investors have tested demand by creating portfolios consisting of previously-existing FFF funds. These approaches represent different routes for asset management firms to address the described rising demand. It also seems that these companies can also play a role in provoking the demand.

In the United States, the fossil fuel divestment movement is making its way into the mainstream through collaborations between environmental organizations and private investment firms. While [350.org](https://www.350.org) and its founder Bill McKibben have been the primary force in this movement, the resources that are available to American investors are a result of collaborations between not-for-profit and for-profit organizations.

For example, in guiding investors through the divestment process [350.org](https://www.350.org) has partnered with another not-for-profit Green America to generate a list that showcases current FFF investment opportunities.^{xxx} While the divestment campaign in Canada does not offer such resources, the coordinators in Canada are attempting to assemble such an investment guide for the demand that they are

uncovering/creating. The organization Community Foundations of Canada has an interest in mission-related investing and have independently created a list of responsible funds wherein some mutual funds and ETFs are classified as 'Fossil Fuel Free' or 'Low Carbon'.^{xxx} Such a collaboration could expand, update, and distribute this resource for would-be divestors unclear of how to proceed in Canadian markets.

Additionally, collaborations between companies and not-for-profit organizations are beginning to materialize such as the joint publication between [350.org](https://www.350.org/), Trillium Asset Management and Green Century Funds. They wrote a white paper that explains why and how to divest from fossil fuel companies and facilitates an understanding of what it means to reinvest your money without fossil fuels.^{xxxii}

The examples of past collaborations demonstrate some ways in which the divestment movement has been growing through the provision of practical resources for those who want to divest from fossil fuel companies. Those investment management companies currently operating in this sphere are in turn experiencing benefits from the increased demand for their products.

Growing interest in responsible investment in Canada may also translate to an increase in demand for FFF products. For example, in countries where ESG consideration is required to be addressed, such as Australia in their 'Know Your Client' form, there was a marked increase in demand for RI products that took into account ESG criteria.^{xxxiii} Similarly, if regulatory bodies in Canada required investors to ask about ESG criteria, which would include carbon emissions and fossil fuel exposure, then it could well spark an increase in demand.

8. Areas for further research

One debate that is currently happening in RI circles concerns divestment versus engagement. Whereas some responsible investors say that engaging with fossil fuel companies is the more effective approach, others favour outright divestment.

Seventeen private foundations in the US representing over \$2 billion in assets recently pledged to divest of their assets in oil, gas and coal and to invest in the clean-energy economy.^{xxxiv} This announcement has given strength to 350.org's 'Go Fossil Free' divestment campaign. Their goal is to raise awareness about the urgent risk of climate change and to bolster support for a carbon tax.

On the other side, large pension funds such as CALPERS and NYCERS, the California and New York City pension plans, are firmly in the corporate engagement camp. These organizations and others believe that, as shareholders, they can have an

impact on the fossil fuel companies in their portfolios and pressure them to reduce carbon emissions and transition from fossil fuels to low carbon energy sources.

Future research could examine the effectiveness of each strategy and explore how each, or a combination of both, could drive the transition from fossil fuels to low carbon energy sources. With 350.org and the fossil fuel companies both hardening their stances, the only path to success may be to determine how to chart the middle ground.

9. Conclusion

This evaluation of the current market for FFF funds highlights the spectrum of approaches that a carbon conscious investor could encounter. The report provides some guidance on the way in which FFF funds can be classified and the criteria that can be used to classify them. To be defined as FFF, funds should have an explicit policy to screen fossil fuel companies as well as secondary/supply chain companies.

Following this articulation of what constitutes a FFF fund, a survey of the existing Canadian fund market shows that there are just two asset management companies that offer a total of 6 FFF funds that are available to Canadian investors. While the market is somewhat larger in the United States, these funds are not available for purchase in Canada, although some of the ETFs that are offered on American Exchanges offer sector specific options that implicitly exclude the oil and gas sector.

Despite the limited existing market, recent research by MSCI, Impax and Aperio Group suggest that FFF funds could have yielded financial returns that slightly outperformed their benchmarks over the last 5-10 years. The research also states that these funds may have been able to achieve these returns with comparable risks to the benchmarks, thereby achieving very similar return/risk ratios while simultaneously reducing the carbon intensity of their investment portfolios. Additionally, funds that eliminated fossil fuel reserve-owning companies also eliminated the direct risk of stranded assets arising from holding these reserves.

While there are few existing FFF funds, an empirical analysis of their financial performance and risks supports MSCI, Impax, and Aperio's research – yet with slightly diminished financial performance. The existing FFF funds have outperformed the index over the last 12 to 15 months, but slightly underperformed their benchmark on 3, 5 and 10-year basis. Contrary to assumptions about FFF strategies, these relatively comparable returns were also achieved with comparable risk, relative to the benchmark.

These findings suggest that while FFF funds may not offer a radically more

profitable opportunity than traditional funds, they do offer a comparable investment option for investors. This conclusion holds true regardless of whether they are designed to mitigate the risk of stranded assets or to satisfy environmental and social concerns.

For asset management companies seeking to capitalize on the apparent increase in demand for FFF funds, the older FFF funds in the United States can offer some guidance as to how to successfully create such a portfolio while also identifying some of the challenges. Furthermore the work being done by non-profits such as 350.org and their collaboration with FFF fund management firms demonstrates ways to continue to grow the demand for these products.

There are significant challenges for Canadian fund companies. Two in particular stand out as barriers to FFF fund development.

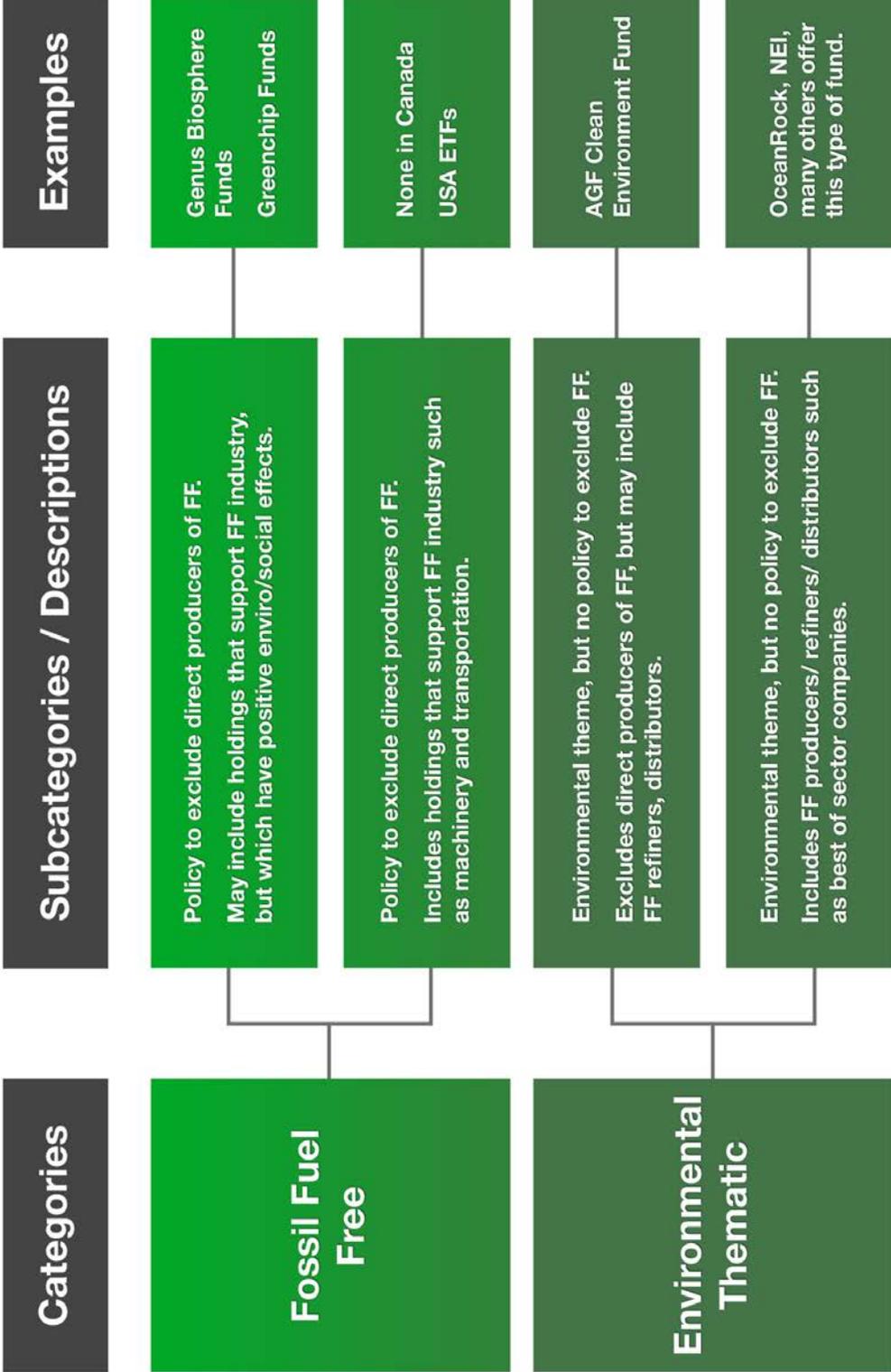
1. Home country bias. Although Canadian equities represent only 4% of the global market, the majority of Canadians are overweight Canadian investments in their RRSPs and other investment portfolios. There are a number of reasons for this. Company familiarity, dividend treatment and currency risk among them.
2. Lack of patient capital. Because of the lack of historical data, the funds studied do not reflect the many failed attempts to launch environmental or sustainable investment funds. A number of funds have been launched to acclaim but rolled into other funds with very different mandates when they failed to attract sufficient assets to make them viable in the short term. Patient capital is not observable in the Canadian mutual fund marketplace.

Responsible investment managers have also identified the lack of emissions targets in Canada as a significant factor in the potential development of FFF products. In a regulated environment, investment managers would be better able to assess the risks vis-à-vis stranded assets and better able to communicate those risks to investors.

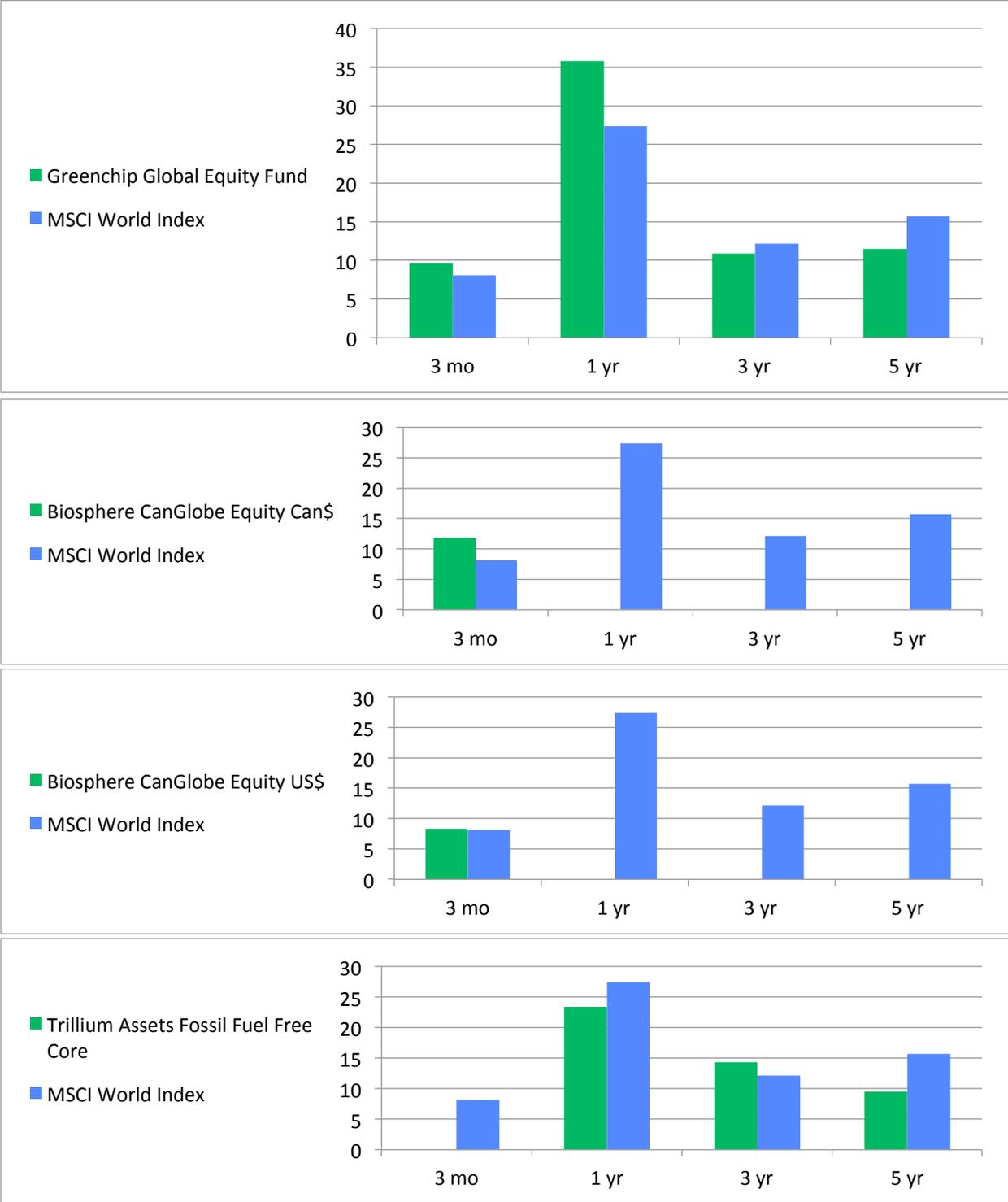
Canadians wishing to be FFF in their investments may be best served by investment managers who can offer them discretionary FFF portfolios that are globally diversified. As these are usually only available to high net worth investors, the alternative is to invest in FFF exchange traded funds (ETFs). A number of Canadian Responsible Investment (RI) mutual funds have adopted a low carbon, though not FFF strategy combined with corporate engagement.

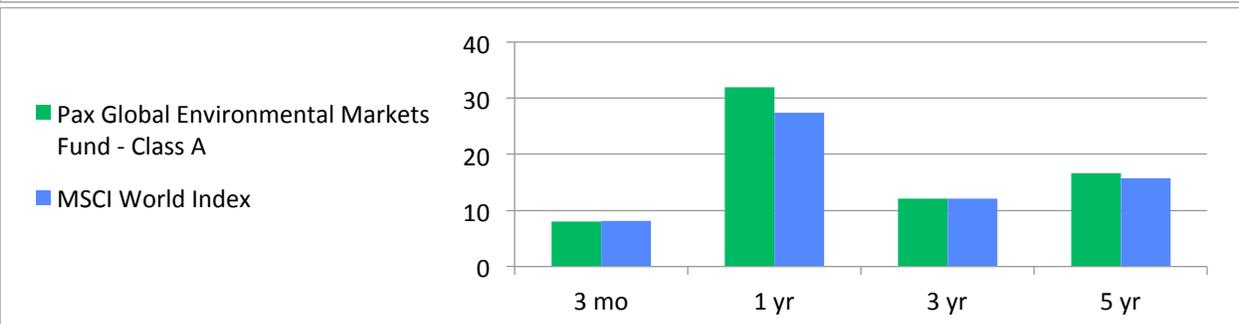
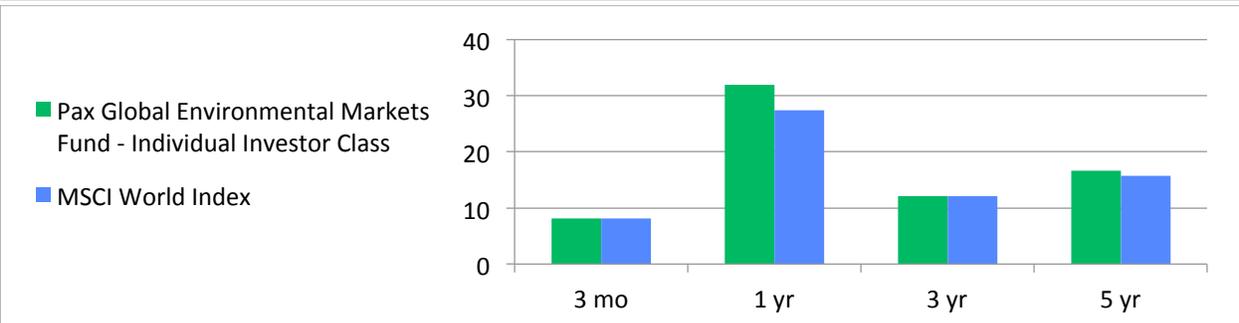
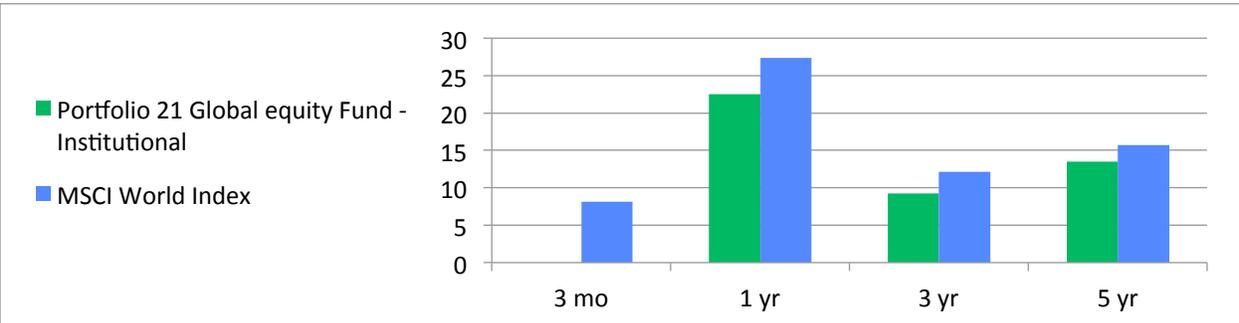
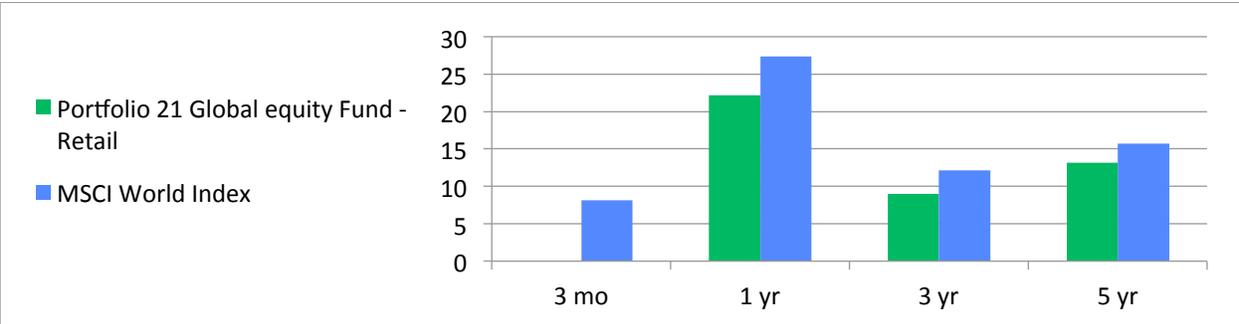
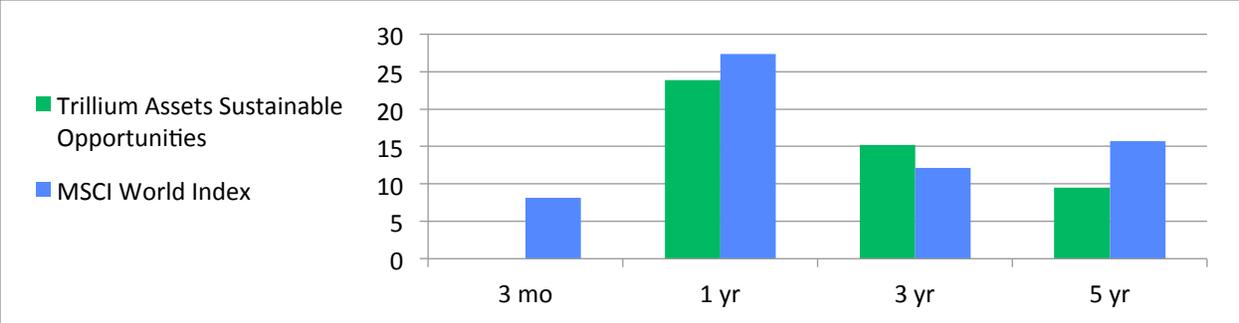
10. Appendices

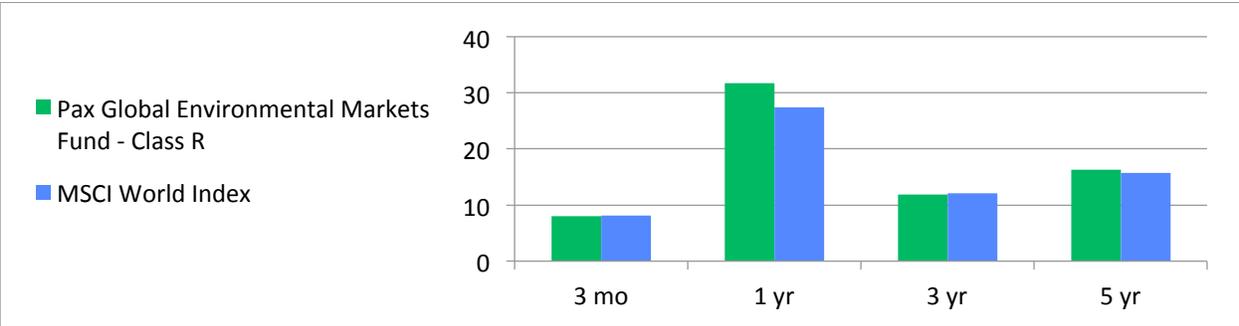
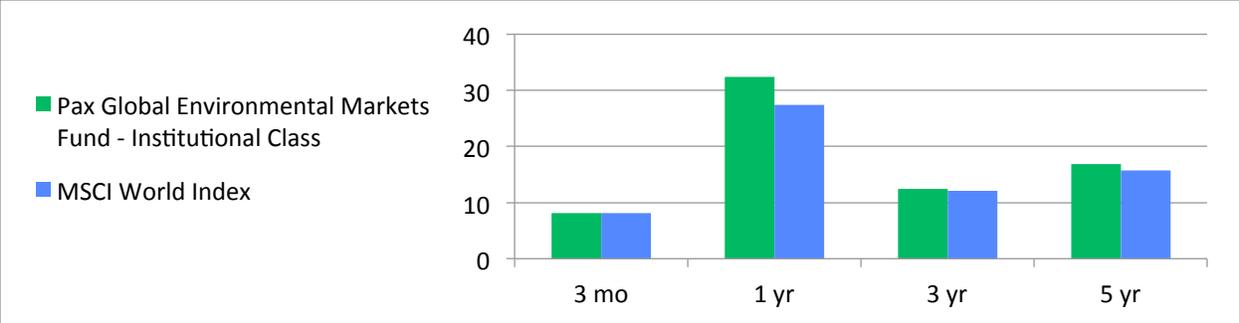
Appendix 1: Climate-themed and FFF investment options for Canadians



Appendix 2: Financial Performance of Select Global Equity, Fossil Fuel Free Funds Relative to the MSCI World Index







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