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Editorial: The Divestment Conundrum

Cary Krosinsky
Editor

Divestment from fossil fuels is a topical and divisive issue on university campuses in the United States as well as throughout the world. Questions remain about the utility of divestment as an investment strategy for solving climate change; as a result, we thought it would be helpful to provide a neutral space for both sides of the debate in this, the *JEI*'s tenth issue, and our first of 2015.

This issue presents everything from points of view written by experienced financial professionals and former financial regulators to in-depth academic analyses to student perspectives. The articles range from those fully supporting divestment to those fully against—and everything in between. We chose not to categorize these perspectives, rather to provide them as a series of stories and analyses from many angles.

The issue starts with former SEC Commissioner Bevis Longstreth and his financial and moral case for divestment, followed by Ian Simm of Impax Asset Management, Gerrit Heyns of Osmosis Investment Management (both based in London). Our sponsor for this issue, Sustainable Impact Capital Management, provides three different professional investor perspectives.

Bard College faculty member Kathy Hipple and Yale's Jordan Sabin organize and provide student considerations. In addition, academic perspectives, research papers, and analyses contribute to the discussion as well. The range of views reflects the unsettled nature of the question before us.

My own experiences are perhaps useful to share briefly. Two things are abundantly clear to me from my experience on the Board of the Carbon Tracker Initiative since its inception and from teaching Climate & International Energy at Yale:

1. **The Climate Change Problem Is Exceedingly Severe**—there is no greater issue of importance that we face as a global society. Social issues in the supply chain, such as factory conditions in Bangladesh or corporate governance concerns and other environmental aspects, are trumped by the looming effects of climate change,

including spill-over effects on water and issues that manifest from the core matter of the carbon emissions we continually send into the atmosphere. Make no mistake, climate change will affect, perhaps permanently, life as we know it, and very soon, so what we do or don't do about it now matters perhaps as much as anything. The key thing about climate change, aside from its truly global nature, is the temporal exigency: we need to act now if we are to avoid cataclysmic and irreversible consequences. Some question whether it is too late, but it is never too late to dramatically reduce carbon emissions in an effort to mitigate the worst possible effects.

2. **But the Question of What to Do Remains Unclear**—my own experience in the sustainable investing and corporate sustainability spaces tell me one thing very clearly. We don't have the answers to this critical question. For all the efforts and experiments and global negotiations and passion on the issue, we continue to emit 35–40 Gt of carbon dioxide into the atmosphere annually. Is there a lack of understanding of this? Socially responsible investing largely fails to address this at all, even to this date. Climate Bonds are interesting but a drop in the bucket of what seems to be needed. Why does so much money continue to flow in a business-as-usual manner?

So what to do? We should, at a minimum, learn from what has been tried before; hence, we value the perspectives in this issue.

I entered this field with the idea of creating environmental metrics, combining my previous life as a computer programmer and builder/interpreter of institutional ownership data, which led me to an invitation to join the Expert Group in the formation of the PRI in 2005. From there, I embarked on what became eight years of intermittent work with Trucost on the carbon intensity of mutual funds and through perspectives, such as the Newsweek Green Rankings, which looked at a combination of companies and their environmental footprints and what they were or were not doing about them. Yet neither approach generated any real change in market behavior, if we are being honest.

Regardless of looming climate change effects, investment dollars largely remain stuck where they are. A side effect of the global financial crisis (GFC) often not discussed is how calcified investment strategies have become. Over the past two generations or so, leading up to the GFC, the assumptions of mutual fund strategies and pension funds on universal ownership have become established and accepted, with any significant prospect of change causing fear of personal reputation risk, helping further lock in the status quo. With institutional ownership making up 65% to 70% of public companies, this all creates, perhaps, an unintended but very real and deeply entrenched state of inertia for business as usual at a time when we need to shift investment in a more environmental direction.

What appears to be needed is some form of a Manhattan Project on the need for a global transition to a low-carbon economy. Others have long suggested such an approach, for example, here: https://www.princeton.edu/step/people/faculty/michael-oppenheimer/recent-publications/Manhattan-Project-for-climate-change.pdf, and here: http://www.huffingtonpost.com/michael-d-intriligator/why-we-need-a-new-manhatt_b_544464.html; even if others have their concerns http://hengstrom.net/energyczar.html

Many efforts are occurring in isolation. One company at a time develops a sustainability plan. Investors create strategies with limited take-up. Policymakers chip away mostly in isolation and in many cases without mandate. It would seem that all of these stakeholders need to sit at the table together to come up with scenarios that can actually get us to where we need to be—or investment strategies themselves will fail.

Perhaps it would be useful for investment professionals of all stripes to outwardly recognize the looming financial failure that will likely come from climate change effects and drive a multi-stakeholder collaboration themselves. If the goal of investors is to maximize their financial performance, then this should be seen as table stakes.

Our publisher had similar thoughts in his post-Copenhagen 2009 piece for aiCIO, where he said:

> *Let me be clear: I do not think asset owners should have simply attended COP15; they should have participated in the UN negotiations themselves and actively shaped the discourse. Why? Solving the climate problem will require vast amounts of money and creating the optimal financing solutions is a primary goal of these negotiations.*

The latest COP 21 negotiations also seem to be insufficient for their intended purpose. The commitments expected by December from the countries attending the COP in Paris are not enough to get the needed low-carbon transition started. And, many major emitting countries—such as India—have not committed at all, or as in the case of Japan, are far from what should be required. If the UN cannot deliver a real transition, then what global effort will take its place? Does this state of affairs enhance the calls for divestment or, given that divestment won't stop climate change, is it a distraction from creating a global process that could actually work at solving the problems? (See http://www.reuters.com/article/2015/05/13/us-climatedeal-un-idUSKBN0NY2AD20150513.)

Given all this, what is the best possible role for students, as well as the average person, young or old, and for the average investment consumer? Consumer demand is required to ensure the necessary changes occur: the changes that can get us through the next 20–30 years without

climate change permanently altering both investment and living conditions into a state of permanent unsustainability.

Individual behavior, including investment choices, then could help mitigate the risks of climate change. Many of the needed technologies for climate change mitigation already exist in the marketplace.

What we need is more environmental investing and conditions that ensure the existence of a business case for such, or the delays preventing necessary action will likely continue and perpetuate.

Given this clear need, our next issue will look at the performance side of environmental investing on the five year anniversary of our publisher Angelo Calvello's *Environmental Alpha*—what went right and wrong, what have we learned about the alpha potential from the environmental trends that played out, and what is the outlook going forward. Watch for that over the next few months.

In the meantime, we need to dig in on what is truly needed to fix looming climate change. We start in this issue of the *JEI* with *Responses to Calls for Divestment.*

The Compelling Case for Divestment

Bevis Longstreth, JD

In Cancun, Mexico, at the 2010 United Nations Climate Change Conference, nations of the world set 3.6°F as the permissible increase in global average temperature over the preindustrial level. An increase beyond that would be a catastrophe. Since Cancun, the dangers of climate change have grown, become palpable in myriad ways, and become commonplace in the daily press. And, yet, nations have made little progress. In fact, having put the car in reverse, they are accelerating in the wrong direction. Thus, the International Energy Agency (IEA) reports that our current trend-line will take the planet by 2050 to 7°F higher than the preindustrial average, twice the level set in Cancun. Carbon emissions increased by 1.5% per year from 1980 to 2000. But then, that rate almost doubled to 2.5% per year through 2012. And in 2013, emissions jumped 2.3% to record levels. The IEA recently reported that the cost to decarbonize by 2050 was $44 trillion, up from $36 trillion just two years ago, and climbing. The cause? An increase in coal usage that exceeds the increase in renewables.

The planet has already warmed by 1.5°F since the preindustrial era. On our present trajectory, we will exceed the 3.6°F level, reaching as much as 10°F above the preindustrial era by 2100. By then, civilization and its current residence will have become unrecognizable.

So, the planet has a big problem. To help solve that problem, divestment from fossil fuel companies is an important strategy for fiduciaries of all types to pursue. Here's why.

Purpose of Divestment

The argument for divestment clusters around two ideas: financial and moral.

The Financial Reasons

Here the argument focuses on reducing the risk to your portfolio. Today the risks are many and they are growing. Consider a few:

- *The very serious yet hardly recognized risk from "stranded assets," in particular "unburnable carbon."* To hold to the global goal of only a 3.6°F increase in average temperature, there is a limit on how much carbon can be emitted by 2050. It's called the *carbon budget* and it's reckoned through science. The estimated level is 886 gigatons of CO_2 to be emitted between 2000 and 2050. Subtracting what has been emitted from 2000 to date (121 Gt) leaves 765 Gt left to emit up to 2050. But just the reserves currently on the books of public and private companies equal 2,795 Gt of potential emissions, meaning that proven reserves are well over three times what nations can allow to be emitted up to 2050 in order to remain within the safe standard set at Cancun and avoid the serious risk of planetary catastrophe. So the rest is at risk of being stranded—unburnable—if nations have a Darwinian moment and act, as they must. If this happens, of course, it will mean that current market prices for fossil fuel companies are hugely overvalued.

- *And consider the risk to the $21 trillion of CAPEX by Big Oil that is planned for expenditure in the near term to develop unconventional oil projects.* Last year the fossil fuel giants spent nearly $700 billion on developing new oil supplies, a record; yet, despite U.S. fracking, they were able to replace only 4.5 months' worth of current production.

- *And given the plummeting prices for solar and wind energy, the risk that oil prices will not remain high enough to profit from the sale of newly discovered reserves from unconventional projects, which generally need about $90 or more per barrel to break even.* Here, the big point—and a fearsome one for fossil fuel giants—is that a dramatic shift in the paradigm of "peak oil" is occurring. As competition from renewables grows more intense, "peak oil" supply may well become "peak oil" demand. And in looking back a decade from now, we may be forced to conclude that demand for oil had already peaked when this paper was being written.

In summary, risk to fossil fuel investments is growing in lock-step with the growth in the cluster of problems facing the fossil fuels complex: faltering productivity, falling profits, poor economics, environmental disasters, and increasing competition from power plants and automobiles running on free fuel.

Automobiles. Changes to autos deserve attention, for there is an incipient revolution emerging with advances in battery design and vehicles powered by electricity or hydrogen. Under its base case scenario, the IEA projects a 33% growth in world primary energy demand up to 2035. Of this increase, over 86% is projected to come from transport. And yet the IEA projects only minimal growth in clean automobiles by 2035. There is a substantial risk that growth in electric and hydrogen-powered vehicles could explode over the next two decades, stranding much of the oil developed to meet the projected needs of transport.

There are growing risks of stranding in the grid power sector. Barclays recently downgraded high-grade corporate bonds across the entire U.S. utility sector, citing the energy threat of solar power and storage. Baseload power sources like coal and nuclear are being replaced by renewables, and in time the grid will become obsolete. In Europe, growth in renewables was the primary reason the top 20 utilities lost $600 billion in market value over the past five years. And the same reason E.ON, Germany's largest utility, gave when it announced recently the end to its use of fossil fuels.

As is now well known, the losses in market value experienced by the coal industry over the past three years have been drastic, down 61% against the S&P 500, which was up 47%. And, among other things, coal is the canary in the oil well.

Conventional oil peaked in 2005. Oil and gas production by Chevron, ExxonMobil, and Shell has declined over the past five years, even as they were spending $500 billion in CAPEX on new projects—that's shareholder wealth likely to vanish down very expensive holes drilled in the earth.

Despite the recent surging flows of tight oil and shale gas in the United States, the country is waking up to the high decline rates experienced by the sources for these products.

Renewable energy supplies at least 23% of global electricity generation today. Its capacity doubled from 2000 to 2012. Solar is now growing at a 30% rate every year and rapidly becoming cost competitive with fossil fuels.

Finally, consider that government subsidies for fossil fuels are some $600 billion per year, compared to just $90 billion annually for clean energy—a public perfidy whose days are numbered—a global outrage that will soon end. As it must.

There's an old saw: "How did you go bankrupt? Two ways: slowly at first; then all at once." In financial markets today, too few people consider climate change an investment risk at all. Too many of those who do, consider it merely a tail risk, remote and barely worth noting. But change in energy is coming at a gallop. It has happened before. Consider, not long ago, when we used whales for light; horses for power; coal for steam to drive locomotion; coal again for electricity; and incandescent bulbs for light. We need to disenthrall ourselves from old business models and listen to the wise and well informed. Sheikh Zaki Yamani, Saudi Arabia's powerful minister of oil from 1962 to 1986, famously said, "The Stone Age didn't end because we ran out of stones, and the age of oil won't end because we run out of oil." Or as Johannes Mauritzen from the NHH Norwegian School of Economics wrote in the Financial Times on January 10, 2015, of the threat to electric cars from falling oil prices: "When automobiles first emerged at the beginning of the last century, their eventual success had little to do with the price of hay. The success of electric cars is unlikely to be dependent on the price of oil."

Or listen to Lord Browne, former head of BP and one of the energy world's most influential voices, who, speaking at a London seminar on November 19, 2014, said that "energy and mining groups are ignoring an 'existential threat' that climate change poses to their industry and need to make big changes to the way they operate." (*Financial Times*, November 20, 2014, 13.)

Or Amory B. Lovins, co-founder and chief scientist of the Rocky Mountain Institute, who, at the Oslo Energy Forum in February 2015, put slides on the screen showing the New York Easter Parade on Fifth Avenue in 1900 and again in 1913. In the first, the Avenue is filled with horse-drawn carriages. In the second, the Avenue is filled with cars, with not a horse in sight. One picture is worth a thousand words.

Sometimes a snapshot can capture something so obvious we can't see it—the old quip about not seeing the forest for the trees. Consider Transocean, one of the world's largest drilling contractors. Falling oil prices are hurting its deepwater drilling business because offshore oil has some of the highest production costs of all oil deposits. Transocean's shares have lost 46% over the past 12 months. Here's the snapshot: Transocean says its future lies in what's called "ultra-deep water." Its new rigs are equipped to operate in 10,000 feet of water, and drill wells 40,000 feet below sea level. That's close to eight miles down. Contrast finding and lifting carbon-laden oil from such a distance with capturing free and clean energy from sources like wind and sun. Aren't we insane? Which business would prudence and foresight lead a fiduciary to invest in?

The Moral Imperative

The moral argument is particularly pertinent to educational institutions and public pension funds, each so importantly affected with the public interest.

Given the gargantuan existential risk of climate change to the planet, those in positions of leadership who fail to take reasonable steps to stop carbon emissions from rising are the moral equivalent of those who deny the science and brush away the problem—as Galileo did by recanting to save his life. Divestment is a reasonable step for pension trustees to take.

What does divestment accomplish? It avoids the ugly scene of trustees seeking to profit from carbon emissions through the selling and burning of fossil fuel reserves and especially through the massive use of shareholder funds to search for more fossil fuels to sell and burn. Such behavior violates the most basic norms of a civilized society.

I've tried to imagine how Homer, the great story-teller, would have described Big Oil. You'll have your own answer. Here's mine: the lung-choking, ocean-poisoning, species-sickening pitiless scourge of humanity.

Divestment by any group, but particularly by those responsible for educational institutions and public pension funds, helps to stigmatize the oil, gas, and coal giants as repugnant social pariahs and rogue political forces bent on profit at whatever cost to the planet and its people. That is, the pitiless scourges of humanity.

Don't underestimate the power of being able to create pariahs. These companies fear stigmatization. It hurts in hiring, employee morale and motivation, customer attitudes, shareholder satisfaction, and equity valuations. And it hurts when leaders of these companies go home to face their children and grandchildren.

Most energy and mining group leaders remain in denial about the existential risk to their businesses from climate change. But increasingly, shining exceptions can be found. Consider the following statement from David Crane, CEO of NRG, a leading electricity business that uses coal and other fossil-fueled power plants. In announcing NRG's goal of reducing carbon emissions 50% by 2030 and 90% by 2050, he said, "If divestment from fossil fuel companies becomes the issue that preoccupies college campuses around America for the next decade, I don't relish the idea that year after year we're going to be graduating a couple million kids from college, who are going to be American consumers for the next 60 or 70 years, that come out of college with a distaste or disdain for companies like mine." (*New York Times*, November 21, 2014, B3.)

Does Big Oil deserve stigmatization? Consider, for example, the ExxonMobil and Shell reports to shareholders on stranding. Despite each company's acceptance of the science, they smack their gauntlets across the collective face of humanity by asserting that no government restrictions will restrain them. Here, for example, is ExonMobil's statement:

> *We are confident that none of our hydrocarbon reserves are now or will become stranded. . . . Further, the company does not believe current investments in new reserves [which it intends to discover and develop in quantities at least equal to current proven reserves] are exposed to the risk of stranded assets, given the rising global need for energy. . . .*

As the Carbon Tracker Initiative observes in its rebuttal to the ExxonMobil report, that company does not consider a low-carbon scenario in its investment planning, which is proceeding on a "business as usual" basis. Its projections are, without doubt, incompatible with meeting the goal of a 3.6°F maximum increase. Studies show that the company's projections correspond with the IPCC's RCP 8.5°F scenario, putting the planet on a pathway to about a 7°F increase from the preindustrial era by 2050.

In its annual *Energy Outlook* report, released in February 2015, BP models its "most likely" energy scenarios down to 2035. In predicting an increase in fossil fuel use of 33% over this 20-year period, BP generally follows the lead of reports by Exxon and Shell. These companies now acknowledge that climate change is occurring and is principally caused by the burning of fossil fuels. They further acknowledge, expressly or implicitly, that their "most likely" growth predictions for fossil fuel use put the planet on an IEA trajectory to multiples above the 3.6°F limit. Yet, they mention not a word about the multiple catastrophes that will, according to the science they now accept, afflict the planet if their predictions come to pass. In its report, Exxon said, "We don't model global average temperature impacts." Nor do they offer solutions. Here one finds a dramatic example of cognitive dissonance, one that, beyond culture, can perhaps best be explained as the blind and single-minded pursuit of profit. By literally averting their eyes and minds from the scientifically established estimates of global damage to be caused by their published plans to continue "business as usual" long into the future, they appear to think they can avoid responsibility. It is the public's job not to let that happen.

Divestment by our country's leading pools of capital will help awaken citizens to the peril of inaction. Collectively, we are like the frog resting comfortably in a pot of cold water being heated to boiling. (This metaphor probably abuses frogs, who are too smart to stick around that long, but it works, so I claim poetic license.) You can be among the first in the nation to shake this frog from the deadly comfort zone in which it rests.

Despite the success of the People's Climate March in New York City, even the most basic scientific arguments have not been settled. Consider, for example, the comment of

Freeman Dyson, distinguished and greatly admired theoretical physicist at the Institute for Advanced Study:

> *What worries me is that many people, including scientists and politicians, believe a whole lot of dogmatic nonsense about climate change. The nonsense says that climate change is a terrible danger and that it is something we can do something about if we wanted to. The whole point is to scare people, and this has been done very successfully."* (*New York Times*, September 23, 2014)

Dyson is wrong. Alas, not enough people have been scared. Too many are still complacent frogs. Governments won't act until enough people—call it a critical mass—have been scared by the foreseeability of the dire consequences that science tells us will follow inaction. Only then will people insist that their governments act, thereby driving down demand for fossil fuels and driving up demand for non-fossil fuel alternatives such as renewables, nuclear power, and higher energy efficiency. In fact, foreseeability is the key to action, and every one of us holds that key in our hands. By educating ourselves and others on this matter, each of us can help achieve the necessary level of certainty.

Consider the tragedy of the Titanic. It is a metaphor for the surpassing vanity of humankind and the indifferent brutality of nature. As such, it can speak to us about the looming threat of climate change. On that night in April 1912, hundreds of human beings consciously, and with deliberation, chose to die as a matter of honor in order to save women and children. Men of privilege, such as Isidor Straus and Benjamin Guggenheim, refused places on the lifeboats, choosing to wait in deckchairs for death to come. Of course, the immediacy of death, the certain foreseeability of the ship sinking, is what makes that case different from the perils of doing nothing about carbon.

Although the sinking of the Titanic is high drama, I don't believe it is any more fraught than the planetary threat we face today. It's just far more compressed: two and a half hours to sink instead of 35 or so years to reach 7°F and even more years to experience the full catastrophe. Humans are simply not well designed to contemplate, fear, and act in anticipation of events—however terrifying—that are way down the road.

Somehow, despite the timeline, the resting frog—our collective self—must be awakened.

Why Not Engagement?

Drew Faust, president of Harvard University, and other prominent leaders have been pushed, pulled, and prodded to make the endowments they oversee divest from fossil fuel companies directly engaged in extractive activities; instead, they have rejected this idea in

favor of "shareholder engagement." Engagement, say, with ExxonMobil is possible only if one is a shareholder of that enterprise. Therefore, engagement is a distinct alternative to divestment, because one cannot do both at the same time with regard to the same company.

With some social, environmental, and governance (SEG) issues, shareholder engagement has been tried and been successful. However, the closer one comes to trying to affect core business issues or issues involving the safety, security, and compensation of officers and directors, the less successful engagement becomes. In fact it's a bust. Thus, for example, trying to convince Phillip Morris to give up making cigarettes or Johnny Walker to abandon its distilleries will most certainly be a fool's errand. Likewise, trying to convince GM or Microsoft to abandon stock options or to institute a nominating system that allows shareholders to nominate and elect directors from a slate larger than the number to be elected will prove to be an equally useless effort. It is for these reasons that divestment became the tool of choice in addressing tobacco companies and companies heavily engaged in profitable businesses in South Africa under apartheid.

In regard to fossil fuel companies directly engaged in extractive activities, it is unrealistic to imagine them being swayed by shareholder arguments to get out of their core business of exploring for, extracting, and selling carbon-emitting fuel. The problem goes beyond just the high likelihood of accomplishing nothing in addressing the urgent need for global action. Indeed, engagement is likely to assist Big Oil and Big Coal in postponing the day when governments limit the burning of fossil fuels.

The IEA reckons that if governments compel adherence to the "carbon budget" in order to hold the planet to a 3.6°F rise in temperature from preindustrial levels, it will cause Big Oil and Big Coal to lose about $1 trillion a year. Engagement with institutional investors like Harvard gives the fossil fuel giants the protective cover they need to stretch out the transition to renewables for as long as they can. It legitimizes talk over action. In truth, if the engagement crowd didn't exist, the fossil fuel giants would have invented them. (And, in light of the parallels to tobacco and lead, who knows the extent to which they did.)

The Relevance of Norway

Early this year, Norway put its toe in the global movement to drop investments in fossil fuel companies. Its Sovereign Wealth Fund, at $850 billion the world's largest, divested 14 coal mining companies, 5 tar-sands oil producers, and a few other companies heavily involved with fossil fuel. Late last year, an Expert Group appointed by Norway's Finance Ministry released a 71-page report addressing whether the Fund, as a responsible investor sensitive to the global threat of climate change, should exclude fossil fuel companies from its portfolio or exercise its ownership and influence by engaging with those companies.

The Expert Group rejected an "either-or" approach, describing the many ways in which strategies of exclusion and active ownership can contribute to lessening the climate change danger. Indeed, it wisely emphasized the reinforcing value of using both exclusion and active ownership in combination, suggesting that together they "can be larger than the sum of their parts."

In exploring these strategies, the Expert Group ignored concerns of fiduciary duty. This is important. There is nothing exceptional about the Fund's objectives that distinguishes it, in regard to investments, from the vast majority of institutional funds managed by fiduciaries throughout the world, whether as pension funds, endowments of educational institutions, philanthropies, or others. This approach to fiduciary duty is remarkably and refreshingly different from the defensive one adopted by many fiduciaries in the United States, who have wrapped themselves in the "duty of care" to avoid confronting the fossil fuel industry by either exclusion or engagement through active ownership.

In acting upon the Expert Group's report, Norway has a problem. Not only is the Fund's immense wealth derived from North Sea oil, the Norwegian Parliament controls Statoil, one of the largest oil companies in the world. These facts pose a dilemma. They also offer Norway a unique opportunity.

Norway could provide exactly the dramatic step needed to make active ownership through engagement with fossil fuel companies a promising enterprise. The Fund could try engagement with the fossil fuel companies held in its portfolio, but only if first the government were to align the behavior of Statoil with the demands the Fund would then make on those portfolio companies. The Norwegian Parliament has the power, and Norway is recognized as a global leader in both thought and deed.

There are three fundamental requirements that a fossil fuel company should meet to avoid exclusion from portfolios managed by responsible fiduciaries seeking to acknowledge the global threat of climate change. They should

1. Publicly accept the science of climate change, including recognition of the scientifically rooted predictions of damage to the planet and its people if we fail to halt carbon emissions.

2. Within a reasonable period, cease capital expenditures (CAPEX) in search of more fossil fuel.

3. Publicly and constructively lobby for (a) elimination of all fossil fuel subsidies, which today globally total some $600 billion a year; (b) imposition of carbon taxes or other processes that would internalize the costs to the planet of burning fossil fuels, and (c) legislation to reduce carbon emissions to a level, globally, that will

not harm the planet. Lobbying for these three goals should be conducted by the company's own lobbying forces, wherever active in the world.

There may be other demands that investors want to make on fossil fuel companies, but these three are fundamental and fair and can be instituted immediately. Any company accepting them would no longer be viewed as a global pariah throughout the world, but instead would become a responsible corporate citizen whose securities need not be excluded from portfolios. Any company rejecting one or more of them would remain a pariah and be excluded.

By instituting these three policies, Statoil would establish itself (and vicariously the government of Norway and its people) as first among those global leaders addressing the most existential threat the world has ever faced. Statoil would become the measure against which all other fossil fuel companies would be tested for inclusion or exclusion from portfolios everywhere.

Universities and public pension funds would then have something serious to demand of the fossil fuel companies held in their portfolios. And, as is likely to be the case when demand is made on the likes of Exxon, Shell, or BP, they would have a clear basis for divesting.

Fiduciary Duty

Fiduciaries are charged with the duty of care. Here's how the American Law Institute's Restatement of Trusts describes that duty:

> *This standard requires the exercise of reasonable care, skill and caution, and is applied to investments not in isolation but in the context of the . . . portfolio and as a part of an overall investment strategy, which should incorporate risk and return objectives reasonably suitable to the [purposes for which the portfolio is held]*. (Section 227)

If you have an informed view of all climate change factors, including those I've just outlined, it is easy to conclude from financial considerations alone that divestment of fossil fuel company holdings is a permissible option. And the moral dimension makes this conclusion even more powerful.

Whether at this time divestment is compelled by the duty of care is a more difficult question to answer. Anticipatory divestment in recognition that, at some unknown and unknowable point down the road, markets will suddenly adjust equity prices downward to reflect swiftly changing prospects for fossil fuel companies, however wise as a prudent option today, is probably not yet compelled in the exercise of due care.

But here's the most important point: Whether your portfolio will under- or outperform after divestment is unknowable. Looking back in time, you can see that results vary depending on the measuring period and assumptions about how proceeds are reinvested. But past is not prologue here. And, in any case, fiduciaries need not worry about short-term results. Anticipatory investment should be viewed as having unknown short-term consequences. In the end, those results are unimportant. A decision to divest rests on the claim that fossil fuel companies will prove to be bad investments over the long term and, therefore, with foresight that anticipates this result, should be removed from the pension fund before the strengthening and foreseeable likelihood of this result becomes commonplace in the market—as it did with coal.

Biography

From 1981 to 1984 Bevis Longstreth served as a Commissioner of the U.S. Securities and Exchange Commission. In 1993, he retired from the practice of law as a senior partner in the New York City law firm of Debevoise & Plimpton to teach at Columbia Law School and pursue other interests, among which was writing. Over his professional career he has often spoken and written many articles and two books on finance, corporate behavior and the law. Mr. Longstreth has also written two novels: *Spindle and Bow* (2005) *and Return of the Shade*. Mr. Longstreth is a graduate of Princeton University and the Harvard Law School.

Climate Change: Now Risk, Not Uncertainty

Ian Simm
Chief Executive, Impax Asset Management

As we learned from the recent financial crisis, systemic issues can wreck portfolios and undermine investor confidence for years. For many, climate change is emerging as a major systemic issue facing investors: Economic damage from extreme weather and shifting climatic belts is likely to get worse, and governments are unlikely to sit on the sidelines. Investors need to act now, developing a coherent, flexible strategy to manage the risk of intervention from governments around the world.

The "unburnable carbon" issue has become polarized. Those who advocate full divestment are seen by many as extreme, particularly because divestment entails the willful avoidance of dividend streams and a risk of underperformance if energy prices rise. However, recent statements made by fossil fuel exploration and production companies to challenge the analysis behind stranded asset risk and/or to downplay its significance have been less than persuasive.

Asset owners are increasingly frustrated, particularly if they are faced with rising stakeholder pressure to reduce exposure to fossil fuels. Although there have been a few high-profile announcements of wholesale divestment, for the vast majority, the default response has been to do nothing and wait for further developments.

Polarized responses are irrational for two reasons. First, recent developments in science and policy have had a major impact on the climate change issue, recasting it as a risk

rather than an uncertainty, thereby facilitating the use of traditional investment management tools, particularly asset allocation. And second, developments in energy efficiency markets have created options for investors to mitigate some of the risks implied by divestment.

Assessing the Risk

Investors struggle to deal with uncertainty when the magnitude and timing of a potential impact cannot be readily estimated. In the recent financial crisis, many investors sat on their hands because they were unable to assess the likelihood of a shock to the system. In contrast, when magnitude and timing can be estimated, the potential impact is usually categorized as a risk. Investors are typically comfortable with incorporating risk information into their decisions, particularly regarding the level of allocation to different types of assets.

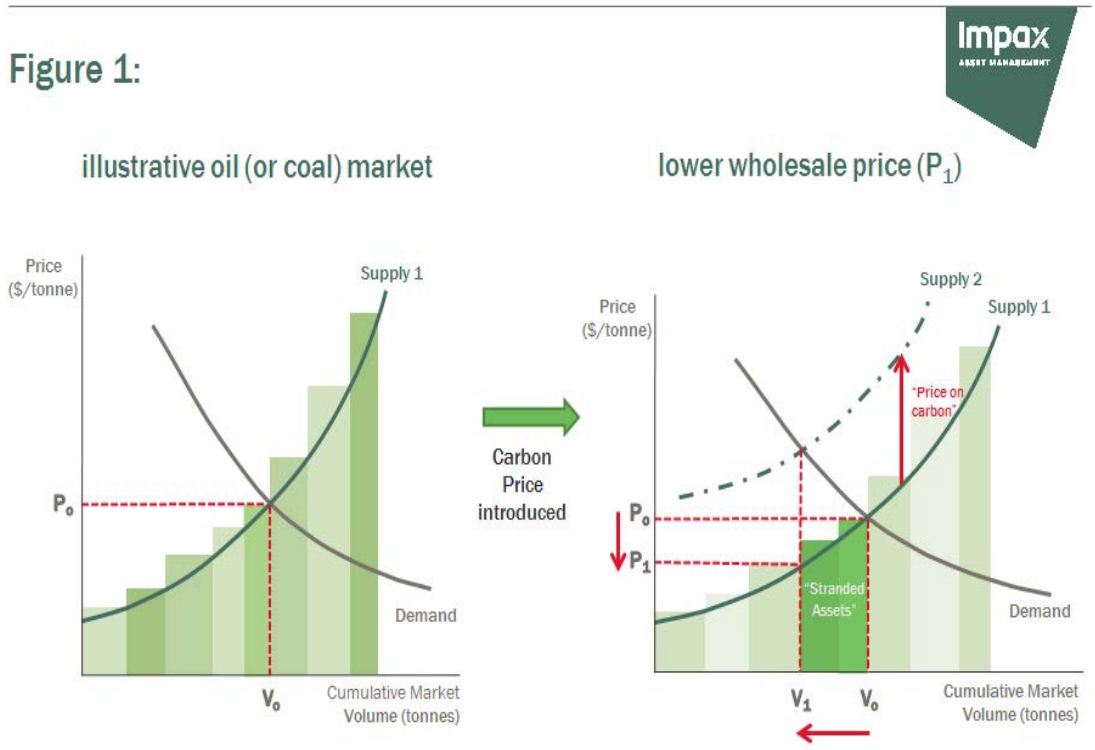
For many years, the mainstream investor reaction to climate change has been that the science and the likely policy response have been too uncertain to justify action. However, the UN Intergovernmental Panel on Climate Change report of September 2013 reported a strong scientific consensus on the causes of climate change and the likely consequences for the planet of the current rate of greenhouse gas emissions. Subsequent announcements from both the United States and China of specific plans to limit emissions of carbon dioxide have materially raised the chances of policy intervention, potentially on a pan-regional scale. Investors can now legitimately consider scenarios in which major economic blocs pass legislation to restrict CO_2 emissions within the next decade, for example through a significant "Carbon Price," which will affect the economics of both energy producers and consumers.

Toward an Investment Response

Investors generally have one of three responses to higher levels of risk (individually or in combination): Lower exposure to the assets concerned; reduce the risk; hedge the risk. Faced with a material probability of a carbon price within a decade, a timescale that matters for decisions taken today, it is rational for investors to lower their exposure to assets that could be affected. On the one hand, it is likely that the effect on today's valuations of these lower wholesale prices is "drowned out" by myriad other drivers of prices, including

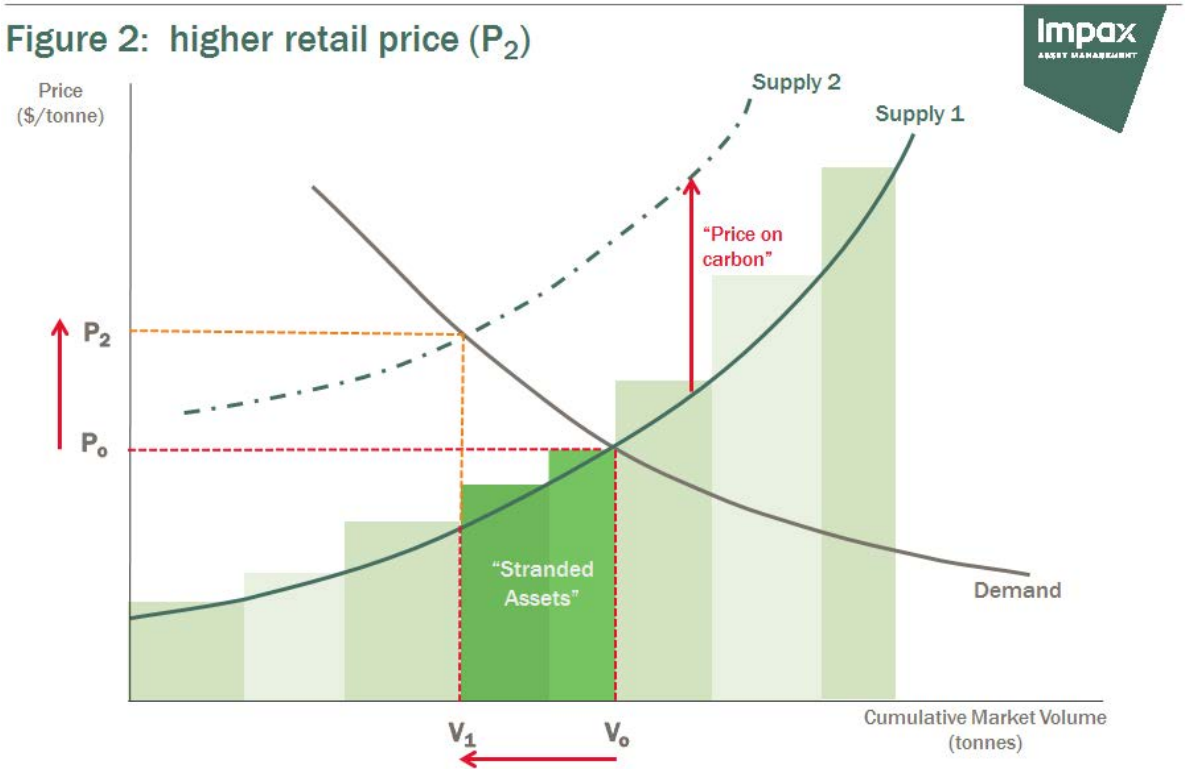
political risk. On the other hand (as shown in Figure 1), a carbon price may render those assets with a higher marginal cost of production "stranded," or potentially worthless. It is these assets that should be targeted for selective divestment.

Figure 1:



To mitigate risk, investors should challenge the management teams that oversee assets whose fortunes could be improved by a change of strategy. For example, oil majors could cut back on capital expenditure into high marginal cost assets, which could possibly lead to a commensurate increase in dividend levels.

Although the wholesale energy price is depressed by a carbon price, the retail energy price can be expected to rise (Figure 2). By reinvesting the proceeds from selective divestment of fossil fuel assets into energy-efficiency-related business opportunities, investors not only hedge the risk that they miss out on future energy-price rises, but also create exposure to energy prices that should increase in line with government intervention to limit greenhouse gas emissions.



Divestment in Practice

Taking a risk-analysis approach to the impact of future climate-change policy, investors may rationally decide to reduce their exposure to fossil fuel assets rather than to undertake full divestment. We recommend that a plan of action include four components. First, examine individual assets to determine their marginal cost of production (and thereby their potential exposure to carbon pricing); this is likely to be difficult except for discrete assets or for companies with high levels of disclosure. Second, develop scenarios for the level of carbon prices and the probability and timing of their introduction; we recommend a simple model to start with that can be developed further as circumstances change. Third, divest in line with the probability-weighted loss per asset, that is, multiply the loss per asset in the scenario by the probability of the scenario occurring; this will be far from an exact science, so it makes sense to start with conservative assumptions, that is, a relatively low level of divestment. Fourth, consider reinvesting the divestment proceeds into the energy efficiency sector; this may introduce additional risks, for example exposure to the industrial capital expenditure cycle.

At the heart of this issue is the scarcity of useful data, particularly around marginal production costs. Alongside their divestment plans, investors should request additional information from the companies they hold and consider supporting wider initiatives to persuade stock exchanges and financial market regulators to oblige companies to provide further disclosure, for example in prospectuses and annual reports.

Positioning for Outperformance

Policies to reduce greenhouse gas emissions aren't developed in a vacuum. We won't wake up one morning and discover that a material carbon price has been imposed overnight. Nevertheless, governments have a nasty habit of ratcheting up their intervention to solve important policy problems, so investors who can anticipate government action and take preemptive measures to protect themselves are likely to outperform.

Biography

Ian Simm is the founder and chief executive of Impax Asset Management Group plc. Ian has been responsible for building the company since its launch in 1998, and continues to head the listed equities and real assets investment committees.

Prior to founding Impax, Ian was an engagement manager at McKinsey & Company, where he advised clients on resource efficiency issues. In 2013, he was appointed by the Secretary of State (Senior Minister) for Business, Innovation and Skills as a member of the Natural Environment Research Council (NERC), the UK's leading funding agency for environmental science. He has a first class honours degree in physics from Cambridge University and a master's in public administration from Harvard University.

Optimal Diversification and the Energy Transition: Exploring Fossil Fuel Exposure Beyond Divestment

Jakob Thomä
2° Investing Initiative / Conservatoire National des Arts et Métiers

Stan Dupré
2° Investing Initiative

Alexandre Gorius
Paris Dauphine University

Manuel Coeslier
2° Investing Initiative / Mirova / Ecole Centrale de Nantes, Audencia School of Management

Danyelle Guyatt, PhD, Collaborare Advisory

Abstract

Capital allocation decisions in equity markets are significantly influenced by market capitalization-weighted indices. They are widely seen as "market proxies" —a selection of equities that represents the listed equity universe. Drawing on modern portfolio theory, which suggests that holding the market portfolio represents an optimal investment strategy, the majority of equity investors use these indices to manage their diversification. The results of this paper suggest that from the perspective of the transition to a low-carbon economy, these indices are not optimally diversified. The research shows that the FTSE100 and CAC 40, for example, overweight the oil and gas sector relative to the listed equity universe by 5.7% and 3%, respectively. These indices, in addition to the S&P 500, also overweighted these sectors relative to the real economy. Furthermore, cap-weighted equity indices also appear to underweight climate-friendly technologies in the automobile and utility sectors. The results suggest that investors seeking to be optimally diversified should explore alternatives to cap-weighted equity indices. This applies in particular to investors seeking to manage the transition to a low-carbon economy.

Optimal Diversification and the Energy Transition: Exploring Fossil Fuel Exposure Beyond Divestment

Equities constituted an estimated 26% of global financial assets in 2013 ($64 trillion).[1] This makes listed equities the second-largest type of investible financial asset after non-securitized loans outstanding. By extension, they are also likely to be a prominent asset class in the transition to a low-carbon economy. A significant share of investment for the equity asset class is determined by market capitalization-weighted equity indices. These indices are built to include the largest companies in the equity market, weighted based on their market capitalization. The size can range from 30 companies (DAX 30) to over 1,000 (MSCI World). These indices are used by "closet indexers" or by passive investors to mirror an index fund and can help to track performance, define the investment universe, and define sector allocation. A key driver behind the use of indices is their apparent role as "market proxies" —representing optimal diversification for investors.

Market capitalization-weighted indices have come into the spotlight in the context of climate change in part thanks to the now global divestment movement calling for investors to divest from fossil fuels. While this movement has received significant media attention and contributed to putting the issue on the agenda of institutional investors, active response has been relatively muted. One key barrier raised by investors against the concept of divestment is the issue that it would violate the fiduciary duty of investors to ensure broad diversification. The premise is that today's investing strategies are broad diversification strategies.

The study evaluates the extent to which this premise—that market capitalization-weighted indices provide broad diversification—applies in practice. In this regard, it reviews the diversification of the indices not only from a sector diversification perspective but also from an energy-technology perspective. The key assumption behind this analysis is that sector diversification, as an indicator, does not suffice to inform on optimal diversification.

Beyond a sector view, diversification needs to be managed from an energy-technology perspective. Energy-technology diversification refers to the portfolio's exposure to various energy technologies in high-carbon sectors and the extent to which this is aligned with the "market." Energy-technology diversification is a key metric in an economy on a low-carbon roadmap. However, a transition of this nature entails significant risk and significant uncertainty.

1. Private equities and real estate assets, probably representing by far the largest asset classes, are excluded.

Ensuring appropriate diversification to this transition is a key tool in managing risk. Understanding both the sector and the energy-technology allocation of benchmark equity indices ensures optimal diversification in the tradition of the modern portfolio theory (MPT). Portfolio diversification is one of the core mantras of MPT, which provides the theoretical framework for the construction of investment portfolios that achieve the highest return for a given level of risk. Diversification reduces the exposure to idiosyncratic risk by reducing the correlation of risk and assets. It follows the simple saying "don't put all your eggs in one basket." Thus, in the first instance, diversification is a risk issue.

Index investing is usually seen as a way to "bet" in line with the market. In practice however, from an energy-technology perspective, this study shows that indices can be significantly misaligned with the market. This misalignment appears both with the current market and with the economic roadmap for the transition to a low-carbon roadmap. The results suggest that investors need to look beyond cap-weighted indices to ensure a 'bet' in line with their expectations and/or the market/policy scenarios.

This study reviews the use of six large cap-weighted equity indices: the S&P 500 (United States), the FTSE 100 (United Kingdom), the DAX 30 (Germany), the CAC 40 (France), the STOXX 600 (Europe), and the MSCI World (developed economies). These are among the dominant equity indices used by funds today. The review suggests that cap-weighted equity indices are not optimally diversified from an energy-technology perspective. This has implications for investors who wish to construct well-diversified investment portfolios. It also signals a potential barrier in mobilizing private sector capital for climate finance. The study concludes by mapping the way forward for investors, examining the potential for current alternatives and looking at "new tools" that are broadly diversified from both an energy-technology and a sector perspective.

Literature Review

The point of departure for this paper is the classical literature on the modern portfolio theory. The modern portfolio theory arguably has its beginning in the work of Henry Markowitz and his seminal 1952 article "Portfolio Selection." This article marked a fundamental break from the traditional analysis of security prices, notably by Graham and Dodd (1934), Williams (1938), and Smith (1924). This analysis had limited the review to the returns of individual securities, with references to broader portfolio diversification remaining peripheral. Thus, Williams (1938) defines a security's investment value "as the present worth of future dividends, or of future coupons and principal (…) of practical importance to every investor because it is the critical value above which he cannot go in buying or holding without added risk." Modern portfolio theory breaks with this view by arguing that a security's mean-variance can only be measured in the context of its

contribution to the overall portfolio. This top-down approach puts diversification at the center of investment decision-making. Optimal, or "efficient," portfolios, then, are the portfolios that maximize returns while minimizing the correlation between risks. These portfolios then sit on the "efficient frontier."

While Markowitz may be the father of modern portfolio theory, it is really the work of Tobin (1958) and Sharpe (1964) that turned the conceptual framework into a dominant force in financial markets. Whereas Markowitz still argues that there are a range of efficient portfolios on the efficient frontier, whose adoption is driven by the risk preferences of the investor, the Tobin Separation Theorem proves that, in fact, assuming the existence of a risk-free asset (such as cash or Treasury bonds), there is only one super-efficient portfolio. Investors, then, based on their risk preferences, simply adjust the ratio between the super-efficient portfolio and the risk-free asset. Sharpe (1964) then proves mathematically that this super-efficient portfolio is actually the market portfolio—a portfolio holding all the world's assets. The model proving this is called the Capital Asset Pricing Model (CAPM) and it reduces the challenge set by Markowitz (that of defining the correlation of all assets with each other) to a simpler version, where what needs to be measured is not the correlation among assets, but the correlation with the market risk (beta). Diversification then ensures the elimination of idiosyncratic risk.

Despite early empirical evidence for the presence of beta (Black et al. 1972; Fama and Macbeth 1973), there have been a number of criticisms of the CAPM. Some of these criticisms are of the strong assumptions of the CAPM, notably that all investors have identical return expectations and investment horizons; that there are not transaction costs or taxes; that investors can trade all securities and have access to unlimited borrowing and lending at the same risk-free interest rate; that they seek to maximize risk and minimize return; and that asset returns are normally distributed. Indeed, these assumptions embed the CAPM in the larger theoretical framework of the efficient-market hypothesis (Fama 1965) and the associated idea that prices fluctuate randomly (Bachelier 1900; Osborne 1959; Samuelson 1965). In other words, the market portfolio only works if investors don't have a better strategy to consistently beat the market.

The criticism of this larger theoretical edifice, and the CAPM, has its origins in empirics. A range of academics since the 1960s have been able to demonstrate other factors beyond beta acting as predictors of return, notably low price-to-earnings ratio (Basu 1977), low book-to-market ratios (Chan, Jegadeesh, and Lakonishok 1995; Barber and Lyon 1997), leverage (Bhandari 1998), and short-term price momentum (Jegadeesh 1990). Partly as a function of this criticism, the CAPM had later developments, notably in the form of the intertemporal capital asset pricing model (Black et al. 1973) and arbitrage pricing theory (Ross 1976). Fama and French (1993) developed a three-factor model (FF3) and then a five-factor model (1996) when integrating bonds, that, the authors claim, ultimately

unifies these model advances based on the simple idea that CAPM works, albeit with more than just a market factor (2004). Naturally, there remain a range of fundamental criticisms, notably based on the idea of market inefficiency (Rosenberg 1976) from the champions of chaos theory who argue against the notion of normal distribution of returns (Mandelbrot 2004) and behavioral economics. Falkenstein (2012), for example, argues that a missing "risk premium," because of human irrationality, makes low-risk stocks a better investment.

As important as this literature has been for developing the field today known as *modern portfolio theory,* it has not truly challenged the fundamental premise that optimal diversification is the key to successful investing—and that optimal diversification by and large still means a "true" exposure to the market portfolio, albeit one perhaps mixed in with an additional stock-picking strategy. Given that in practice it is impossible to hold all financial assets, indices in general—and cap-weighted equity indices in particular—are seen as a tool for achieving diversification. They are seen as representing the "market portfolio." Indeed, this paper relies not on the validity of the capital asset pricing model for its argument, but rather on the fact that investors use the premise of the model, or the original modern portfolio theory, to construct portfolios based on the sector allocation and diversification of cap-weighted equity indices. The challenge is to understand if these indices do in fact represent the market portfolio and are in line with a broader understanding of optimal diversification, namely alignment with an economic trajectory that in turn is in line with the transition to a low-carbon economy.

The particular focus, then, is on equity portfolios. This approach reformulates the original academic question slightly. It asks not only whether equity portfolios are aligned with equity markets, but also whether the high-carbon sectors—notably oil and gas, automobile, and utilities—are aligned, from an energy-technology perspective, with markets, the real economy, and a forward-looking economic trajectory. It is the answer to this question that will be explored in the third section (Diversification of Cap-Weighted Equity Indices). First, however, the review must start by turning the brief theoretical discourse into a focus on practice: to what extent do indices (as a legacy of Markowitz, Sharpe, Tobin, and others) penetrate financial markets? The next section will address this question.

The Uses of Indices Today

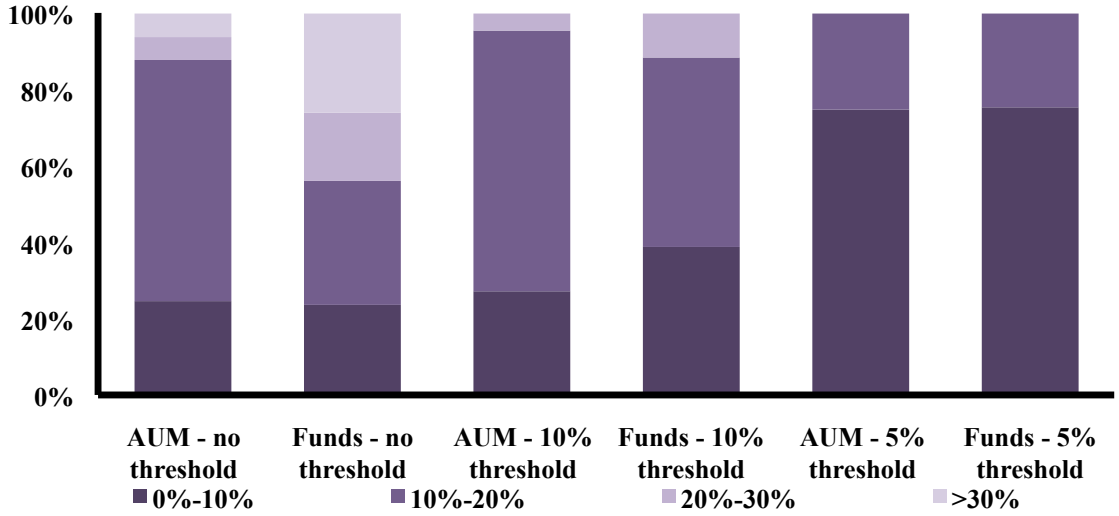
This study identifies four main uses of benchmark indices: in passive investing, in closet indexing, by active investors, and as parent indices for thematic indices. Passive investors invest directly in an index. The allocation of their investment is thus entirely determined by the index. While there are naturally choices available when deciding to engage in a passive investing strategy and in selecting indices, the core feature remains. The asset

allocation in terms of sectors, and by extension of technologies, is externally determined. In terms of trends, PriceWaterhouse Coopers (2014) predicted that passive investments (both for equity and other financial assets) would grow from $7.3 trillion to $22.7 trillion by 2020. In addition to passive investing, there is growing evidence of what has been labeled *closet indexing.* Closet indexers, as defined by Petajisto and Cremers (2013) are investors with less than a 60% active share. According to their estimates, the share of closet indexers in U.S. mutual funds has reached roughly 30%.

While it can be assumed that the sector allocation of passive investors and closet indexers is significantly driven by that of the index, it is unclear to what extent indices influence active investors. In principle, active investors have two uses for indices—either as sector allocation guidelines and/or as determinants of the "investable" universe (that being the index). It is in this context that they also appear as performance metrics. The mechanism (in theory) works as follows: Active investors replicate the sector allocation of indices that they are being measured against in order to reduce the tracking error with the index.

While the use of indices in this way is widely recognized at a qualitative level, there is currently no quantitative data on the extent of this usage, beyond "tracking error" figures. An analysis was conducted of an active sector share of assets under management for a sample of non-indexed funds and non-indexed, non-thematic funds (using 10% and 5% as cut-off points) (Figure 1). The methodological description of this analysis can be found in the Appendix.

Figure 1: Active Sector Share of a Sample of 185 Funds Benchmarked to the MSCI World



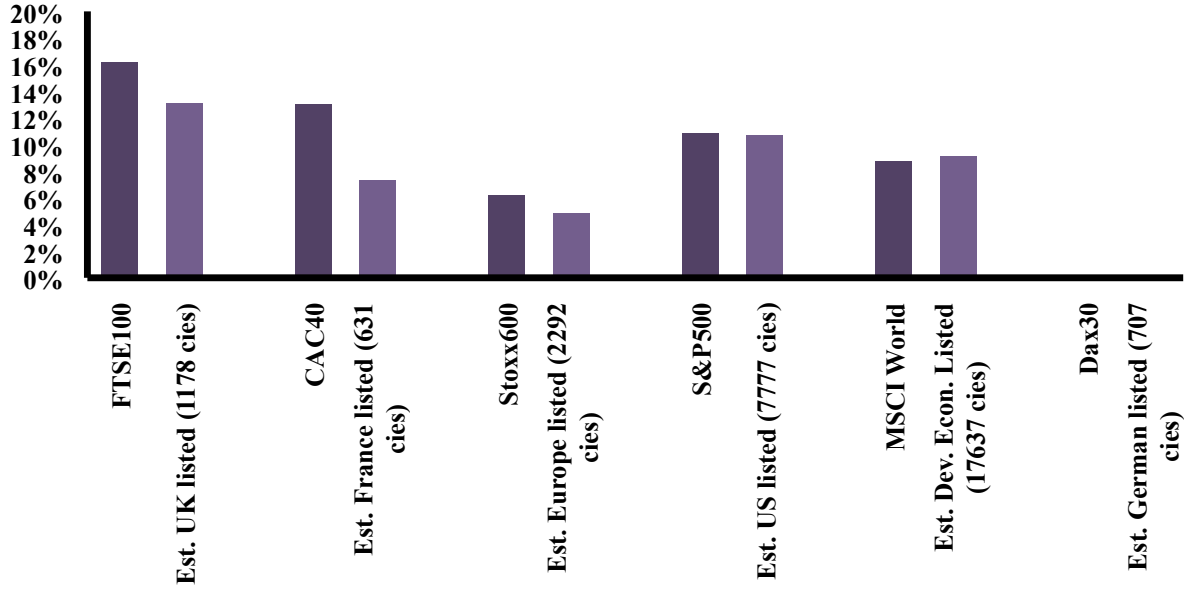
Source: *Authors, based on Morningstar data.*

Given that there is no golden rule, or unmistakable guideline, about when a fund clearly does not take the sector diversification of the benchmark into account, two arbitrary cut-off points were chosen to strengthen the analysis. The chart shows that the weighted average active sector share for non-thematic funds in the sample is 7.5%–14.3% (depending on the cut-off point) and the average active sector share is 8.1%–12.6%. In other words, the average fund replicated roughly 85%–92% of the sector allocation of the index. Analysis on a smaller sample of funds benchmarked to the S&P 500 yielded similar results. The results suggest that indices act as "hard" sector allocation guidelines for roughly 25% of funds (assuming a 10% thematic threshold) and "soft" sector allocation guidelines for an additional 68% of funds. It appears likely that a significant share of the funds with little sector diversification are not also closet indexers—when looking at the active industry share (based on 148 sectors), no fund had an active share of less than 50%.

Diversification of Cap-weighted Equity Indices

In principle, cap-weighted equity indices should not diverge significantly from the listed equity universe they are designed to represent. Indeed, the "larger" indices more closely represent the listed equity universe. When looking at the oil and gas sector, however, the FTSE 100 and CAC 40 demonstrate significant divergence: by 3% for the FTSE 100 and 5.71% for the CAC 40 (Figure 2). A 3% divergence may not appear large at first sight, however, it is important to put this difference into context.

Figure 2: Share of Oil and Gas in Index versus Listed Equity Universe

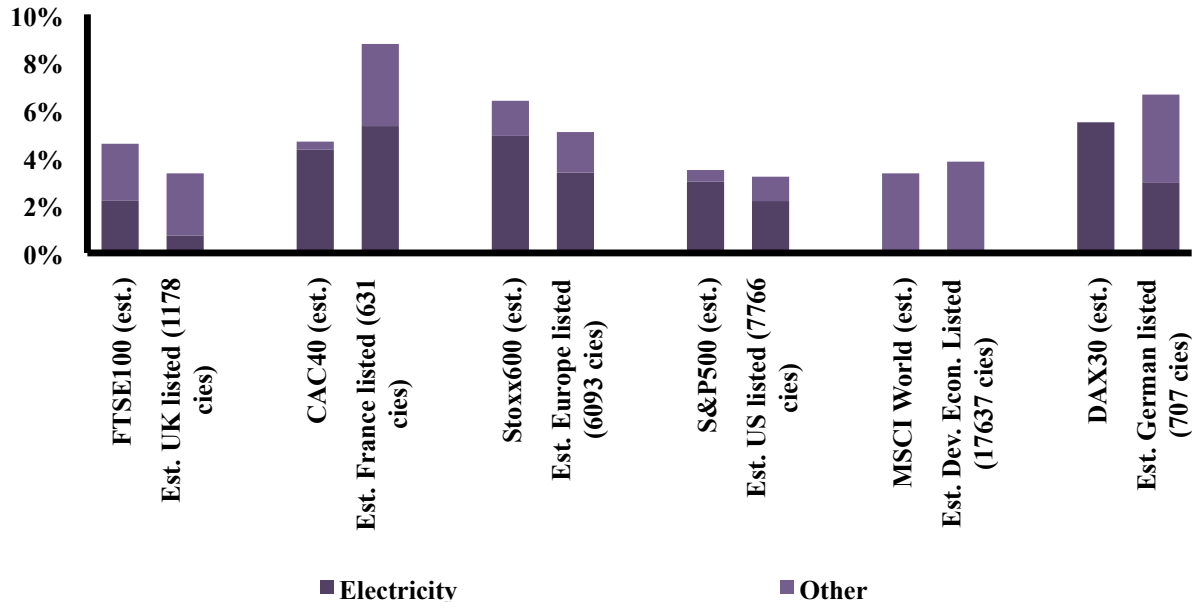


Source: *Authors, based on index factsheets, Damodaran 2014, and Datastream data*.

Based on this "active sector share," the CAC 40 would, in the sample analyzed in the previous section, appear in the top 15% in terms of active funds—assuming the French-listed equity universe were the benchmark. Similarly, the FTSE 100 would appear in the top 30%. All other indices under review exhibited significantly lower divergence—with the STOXX 600 even slightly underweighting. Caveats to this analysis are that the stock prices were not captured at the same point in time and that some of the divergence can be explained by fluctuations in stock prices that will be corrected when the index gets recalculated—divergences of 1% or less can thus easily be "blamed" on these fluctuations.

For the automobile sector (auto parts and automobile manufacturers), none of the indices appear to have a significant bias. For the utility sector, the results show a divergence (Figure 3). When looking at all types of utilities (electricity, gas, and water), it appears that a number of indices—notably the DAX 30 and the CAC 40—actually underweight the utility sector. The divergence of the other indices is limited—in the range of 0.3%–1.2%.

Figure 3: Share of the Utility Sector in Cap-Weighted Equity Indices and Listed Equity Universe



Source: *Authors, based on index factsheets, Damodaran 2014, and Datastream data.*

At the same time, during a transition to a low-carbon economy—or energy transition—the real questions naturally are what type of utility will supply energy and what the fuel mix will be. While the question of fuel mix will be returned to later in this section, the authors attempted to estimate the shares by type of utility for both the index and the listed equity

universe. This exercise will be a rough attempt by default, since utilities will frequently operate as both gas and electric suppliers. Thus, all numbers are only estimates based on industry classification and a review of annual reports. For simplicity's sake, utilities were classified as either "electric" or "other." MSCI World was not estimated, given the number of utilities and the associated potential error.

The preliminary results suggest that while the DAX 30 marginally underweights utilities, it actually overweights electric utilities by roughly 2.5% relative to the German-listed equity universe. Given the potential errors in the estimate, however, these results cannot be described as conclusive.

The analysis did not address the coal sector, arguably the sector most affected by an energy transition. This is due to the limited and declining representation of the coal sector in equity markets. In the United States, the coal sector only constitutes 0.13% of the U.S.-listed and 0.49% of the European-listed equity universe.

In an energy transition, it is not just the sector, but also the energy technology that matters. Thus, the potential alignment of an index with the equity market by itself does not inform on adequate or optimal diversification. For the oil and gas sector, key questions in this regard relate to the oil and gas companies' exposure to low-cost and high-cost projects, the breakdown of high-cost projects by energy technology, and the potential climate impact associated with these different technologies.

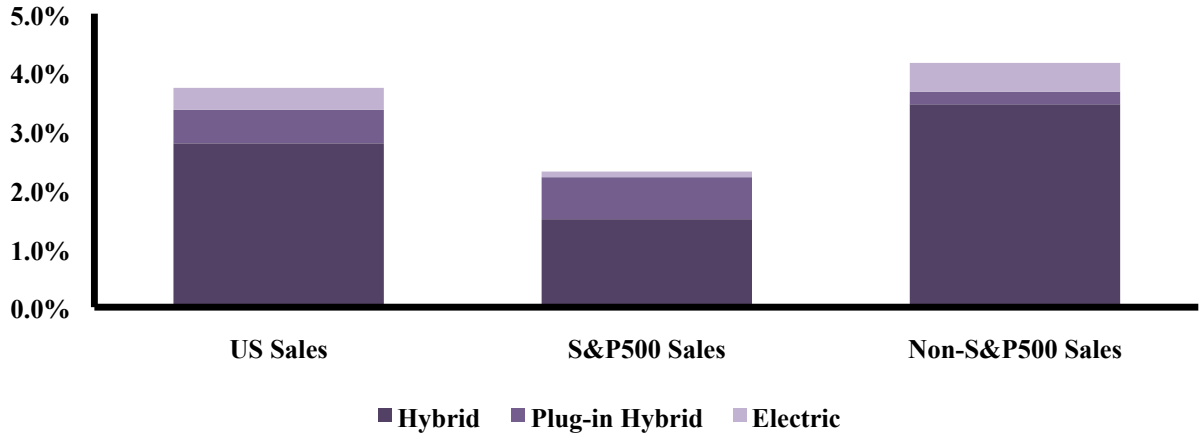
This study, however, focused in particular on diversification from a low-carbon and high-carbon technology perspective. The analysis is thus limited to the utility and automobile sectors, where two types of technologies already co-exist.[2] There are a number of different ways to identify diversification within the automobile sector—notably in the breakdown of sales by vehicles: light vehicles, SUVs, and so on. Alternative measures can relate to the fuel efficiency of the automobile manufacturer's car fleet, or even the exposure to automobile manufacturers versus auto parts—although there are likely to be limited diversification benefits when investing according to this measure. Moreover, the industry concentration in the listed automobile sector is very high. In other words, there are limited choices. For example, there are 16 automobile manufacturers in the European-listed equity universe.

This report focused on alternative technologies in the U.S. market to provide one case study for diversification in the automobile sector. While these markets are still in their infancy, and are thus likely to be subject to significant upheaval in the next decade, the current trends are clear. In the S&P 500 companies of the U.S. index, domestic hybrid and

2. While CCS may play a major role in the oil and gas sector in the future, it does not appear prominent today.

electric vehicle sales are only marginally represented (albeit interestingly slightly overrepresented among plug-in hybrids) (Figure 4). The crucial message here is not about the hierarchy of technologies, but, given the uncertainty about the future of road transport, it is about the need for an investment tool that manages exposure to these competing technologies.

Figure 4: Estimated Share of Alternative Fuels in Car Sales Nov 2013—Oct 2014

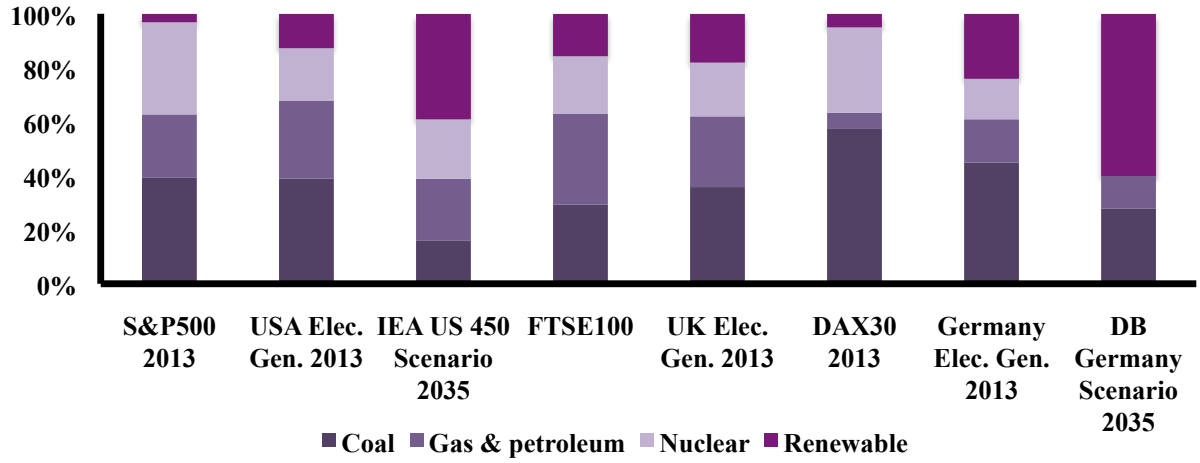


Source: *Authors, based on Hybridcars.com and NADA data.*

The utility sector is arguably the most interesting sector to analyze at energy-technology level because here there is a true competition between high-carbon and low-carbon technologies. At the same time, the analysis is complicated by the fact that it is challenging to measure the fuel mix of the listed equity universe the index is intended to represent. As a result, the analysis compares the electric utilities in the indices to the electricity mix of the economy. The analysis is limited to the FTSE 100, the DAX 30, and the S&P 500.

The results suggest that listed equity indices do not overweight high-carbon fuels relative to the generation of electricity. At the same time, the S&P 500 and DAX 30 underweight renewable energy, by 10% and 19%, respectively (Figure 5). This suggests significant suboptimal diversification. Interestingly, while the FTSE 100 is the worst performer in terms of exposure to the oil and gas sector, it is the best performer for the utility sector, with a well-diversified fuel mix. The fuel mix is weighted by electricity generation and not by the share of the companies in the index.

Figure 5: Comparison of Index Electricity Generation with Economy and Scenarios



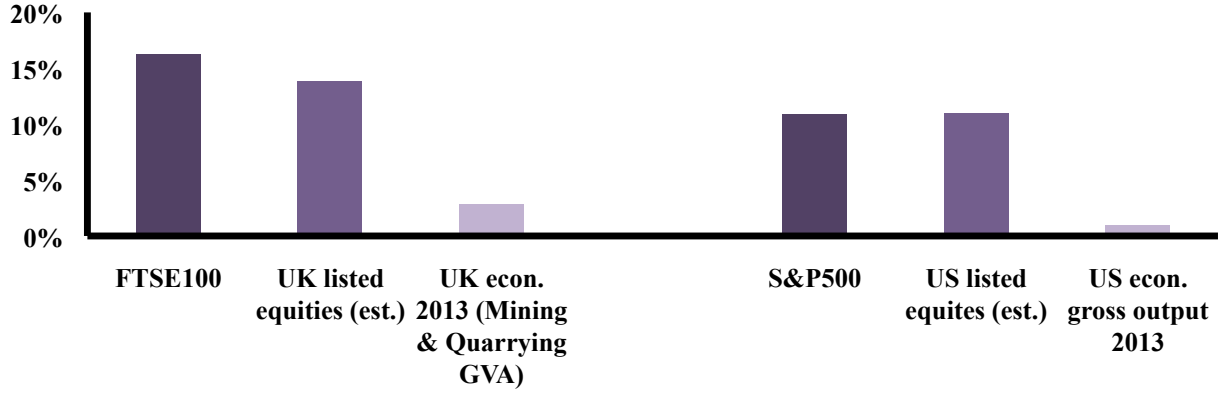
Source: *Authors, based on US EIA data, annual reports, U.K. DECC, Bundesnetzagentur, and Deutsche Bank 2012.*

Beyond diversification relative to the current economy, a key question, naturally, is: What will the trajectory be? To date, the annual reports of companies and the relevant databases do not provide a breakdown of capital expenditure of utilities by energy technology. As a result, it is currently impossible for investors to measure their diversification, or exposure, to the future. While the data is missing, the trajectory is clear. Scenarios suggest a significant increase in green technologies for both the German and U.S. electricity sectors. As outlined above, the analysis is not "clean" because it does not compare the fuel mix of the index with the fuel mix of the listed equity universe. In the United States, this is likely to be relevant with regard to electricity generation by public agencies like the Tennessee Valley Authority, which is not listed on the U.S. stock market. In Germany, renewable power generated by households or by municipalities is similarly not captured. While this may balance the results somewhat, it is unlikely to explain the 10% and 19% divergences, respectively. Moreover, it does not address the larger risk to the utility business model that may result from the broad "greening" of electricity generation.

The benchmarks used so far to analyze the diversification of cap-weighted equity indices at sector level were related to the listed equity universe. At subsector level, this standard was somewhat loosened, for it can be argued that exposure to the sector achieved through equity markets is largely designed to mirror the diversification of the sector. In any event, it seems unlikely that any bias within a sector is managed and actively counterbiased at portfolio level. It should be said in advance that the comparison of equity indices to the real economy is not a fair comparison. They are not built to mirror the real economy. Nevertheless, it is a helpful exercise when thinking about diversification. To demonstrate the relationship between the equity index and the economy, this study looks at the share of

the oil and gas sector in the United States and the United Kingdom, the only two national geographies that have significant domestic upstream oil and gas exploration and production. The disconnect between these two metrics is apparent (Figure 6).

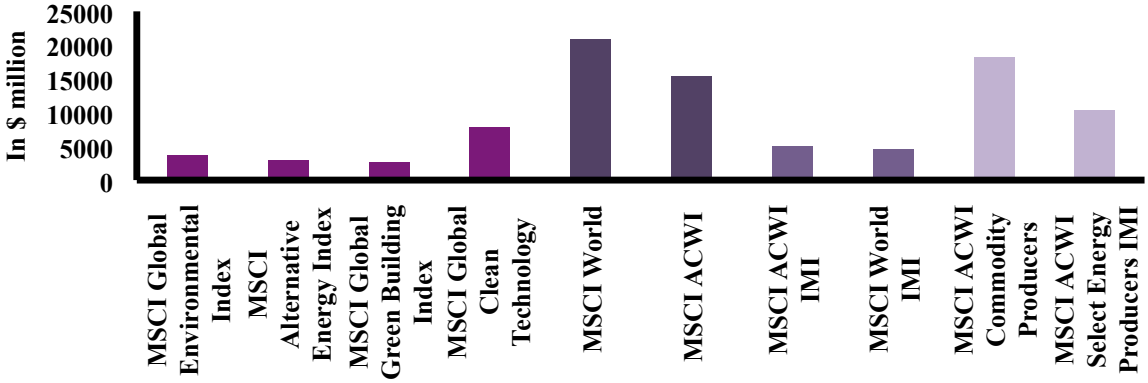
Figure 6: Index Diversification Compared to Listed Equity Universe and Economy



(Source: *Authors, based on index factsheets, Damodaran 2014, U.K. ONS data, and US BEA data.*

The underweighting of green technologies is likely to be a function of the size bias of market capitalization-weighted indices. Given the emerging nature of many climate-friendly industries and technologies, and the less-concentrated nature of these industries (for example, the renewable energy sector), they are likely to be less prominent among the largest companies in the market, compared to concentrated high-carbon sectors (Figure 7).

Figure 7: Average Market Capitalization of MSCI Cap-Weighted, Investable Universe, and Thematic Indices



Source: *Authors, based on MSCI index factsheets*.

Conclusions

The previous analysis suggests a diversification bias of cap-weighted equity indices. While there is some uncertainty about the degree of diversification bias, by default given varying measures of optimal diversification, the analysis shows relatively conclusively the presence of this bias across indices, at sector level or energy-technology level or at both levels. As a result, passive investors and active investors using these indices as sector allocation guidelines expose themselves to asset-specific risk that is not hedged in the equity share of the portfolio. This analysis adds to the growing literature on the shortcomings and challenges of index investing, both in terms of the different types of biases (for example, geography, size, and so on), and the new types of risks that appear as index investing grows. It also suggests that, while divestment would indeed lead to reduced diversification, current diversification strategies also don't appear optimal, particularly given the likely transition to a low-carbon economy.

The analysis shows that investors replicating these indices (in whichever form) make an implicit bet on a certain type of future—a future represented by the index's constituents. Crucially, the question then is not whether betting on such a future is risky or not, but rather the extent to which this implicit bet, not properly identified in nonclimate specific sector breakdowns of indices, is an explicit part of the investors' strategy.

The study thus suggests that in the context of the energy transition, it no longer suffices to aim for a diversified exposure to sectors—investors also need to manage their exposure to energy technologies within sectors. The relevant metrics, then, are not only related to current diversification (such as installed capacity for the utility sector), but also to the forward-looking exposure of companies, particularly apparent in their capital expenditure decisions.

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Appendix:

The ‘active sector share’ of funds was calculated based on the following equation:

$$Active\ Sector\ Share = \frac{1}{2}\sum_{i=1}^{n} w_{fund,i} - w_{index,i}$$

with $w_{fund,i}$ equal to the weight of the sector i in the fund and $w_{index,i}$ equal to the weight of the same sector in the fund’s benchmark index, in this case the MSCI World. The calculation is based on Morningstar fund data from January 2014. The calculation was performed based on 10 sectors. The methodology is based on Petajisto (2013) in his work on the active share – the difference is the focus on sectors as opposed to stocks. Results are presented both in terms of assets under management (AUM) and number of funds.

Example: If the share of oil and gas in the fund is 12% and the share is 10% in the index, the absolute difference is 2%. If the absolute difference for all sectors is 2%, the fund has an active share of 10%.

To control for funds with factor bets or concentrated stock picking, the authors excluded funds from the sample that diverge more than 10% from any one sector, and a sample excluding funds that diverge more than 5% from any one sector.

Biographies

Jakob Thomae currently works as the Program Manager for the 2° Investing Initiative (2°ii). He is the author and co-author of a number of studies, including those on the topics of stress-testing long-term and carbon risks, artificial short-termism, the role of financial regulatory policies in shifting private capital to climate-friendly investments, and financed emissions methodologies. Jakob is currently pursuing his PhD at the Conservatoire National des Arts et Métiers on the implications of climate change for financial portfolios.

Stanislas Dupré initiated the 2° Investing Initiative and now serves as its Global Director.

Manuel Coeslier - Manuel Coeslier is an analyst with 2° Investing Initiative and Mirova. He is currently pursuing his PhD on climate performance metrics for companies at Ecole Centrale de Nantes, Audencia School of Management.

Alexandre Gorius is a graduate student from Paris Dauphine University. For 2° Investing Initiative, he has contributed research on tax incentives on savings interest and the use of benchmark indices by investors.

Danyelle Guyatt is Managing Director of Collaborare Advisory, a research and advisory company that is dedicated to promoting long-term sustainable investment. Danyelle completed a PhD on the behavioral impediments to long-term responsible investing, and over the years have held various positions in academia, investment consulting, and funds management.

Reinvesting after Divesting: A Few Fossil-Fuel-Free Options

Robert Schwarz, MBA, MS

Although much has been written lately in the responsible investing (RI) space about divestment from fossil fuels, very little of the content identifies actual market-based capital re-allocation choices for investors who want to adopt a fossil-fuel-free (FFF) investing strategy. Investors may be armed with a basic understanding of the issues, but they lack the full capacity to act and thus are potentially left thinking, OK, now what?

In the interim between any further thought or research and subsequent action, the need to meet one's obligations and address everyday concerns crowds out even the best of intentions. These largely unavoidable time constraints keep investors from prudently managing their portfolio to the degree they'd likely prefer. This inertia may be manifested in inefficiencies such as volatility, uncompensated risk, and losses. More generally, but no less significantly, this inaction unintentionally signals agreement with business-as-usual practices, thus potentially contributing to the perpetuation of bad corporate behavior.

Insofar as this scenario applies to fossil fuel divestment, the basic argument currently in favor runs as follows. The Carbon Tracker Initiative (CTI) has demonstrated that burning all of the world's fossil fuel reserves will cause unprecedented changes to Earth's climate, which will result in what has been coined rolling collapses, that is, "cascades of events, especially food and water stress, that overload the coping abilities of societies at a regional level, triggering wide-spread failure." Specific examples of such environmental, social, and economic consequences in the United States are described in the recently released Risky Business Report. CTI has also concluded that fossil fuel companies have plotted a course of significant value- (if not self-) destruction by allocating trillions of U.S. dollars to CAPEX for projects that are virtually certain to result in stranded assets and negative return on investment.

Despite the well-supported analysis provided by CTI, fossil fuel companies maintain that their investments in high-risk extraction projects are justified based on future global demand and scientific uncertainty regarding the likelihood and severity of the effects of climate change. The sector's position on these issues is exemplified by documents issued

by Shell and ExxonMobil. The mindset embedded in these reports has led many investors to conclude that engagement is not a viable strategy in seeking to convince fossil fuel executives to re-orient their business strategies toward scaling back oil and gas exploration in favor of a global transition to renewable sources of energy.

This poor outlook for continued long-term gains from investments in fossil fuel companies, combined with the negative environmental and social externalities the industry is infamous for causing, has contributed to much debate about the pros and cons of divestment. Included in the debate is how best to ensure that one's portfolio continues to perform well after divesting. While the former matter is beyond the scope of this article, the crux of it lies in the latter. That is, just because one has decided to divest from fossil fuels, it does not mean one is ready or willing to sacrifice returns. Although some studies demonstrate that an FFF portfolio will perform just as well as a portfolio that includes investments in fossil fuel companies, there is no universal consensus on these findings. Furthermore, and understandably, the studies do not offer any FFF investment options beyond those offered by the firms that sponsored them.

Further tension between divesting from fossil fuels and maintaining portfolio performance arises when one considers that, taken to its logical conclusion, FFF investing would exclude virtually all companies from one's potential investment universe. After all, fossil fuels still supply the energy that runs corporate America as well as virtually every material aspect of American life. Given this reality, a taint of hypocrisy is part of living on the grid post-divestment of one's fossil fuel holdings. Yet, there are income, retirement, and savings goals to meet. Perhaps even more fundamentally, investors are anchored to capital appreciation levels consistent with investments in fossil fuel companies. With these issues in mind, it is plain to see that fossil fuels are deeply woven into the American way of life; thus, there is no easy solution to the quandary of how to quickly disentangle oneself from reliance on them.

Despite the inconsistencies, there are grid-dwelling investors who refuse to profit directly at the expense of intergenerational equity or to support the environmental and social injustices perpetrated by fossil fuel companies. Some have even made a formal pledge in keeping with this ethical concern. In effect, until a critical mass of retail investors commits to FFF investing, such a statement, however well meaning, will not make it to the ears intended to hear it. Nevertheless, if the movement is to gain more traction and momentum, the statement must be made.

Putting pure logic aside in favor of practicality, there is still no standard definition of FFF investing. The assurances given by the mutual funds listed below, however, range from portfolios that have "no direct exposure to fossil fuels" to those that "avoid investing in companies engaged in the extraction, exploration, production, manufacturing or refining

of fossil fuels." In recognition of this uncertainty, the folks at As You Sow are engaged in an effort to work out a FFF investing standard. Another gray area in the pursuit of a FFF strategy is investing in a fund that happens to be FFF but is not explicitly so. That is to say, investors have no guarantee that the fund will remain FFF as it engages in new investments and experiences turnover.

Market-Based Mutual Funds

A variety of FFF market-based mutual funds are available to retail investors who wish to divest. Whether their intention is to: (1) re-channel capital previously invested in fossil fuels into renewables in order to support an energy transition; (2) avoid risk and to apply commonsense in keeping with the aforementioned fossil-fuel industry outlook; (3) align their values with sustainability and investing objectives; or (4) pursue any combination thereof. The following funds are advertised as explicitly FFF and are committed to this strategy. [N.B.: The author is wholly unaffiliated with and otherwise uncompensated by any of the listed firms.]

- Green Century Funds: Balanced
- Green Century Funds: Equity
- Parnassus: Endeavor
- Trillium Asset Management: Sustainable Opportunities & Fossil Fuel Free Core
- Portfolio 21: Global Equity
- Pax World Investments: Global Environmental Markets
- Horizon Investment Services: Enhanced SRI Fossil Fuel Free
- Shelton Capital Management: Shelton Green Alpha Fund
- Jantz Management: 350 and Fossil Free Portfolios

Caveat emptor: While researching to ascertain whether the list of funds are indeed FFF and committed to remaining that way, I learned that some otherwise RI-focused funds made it clear that in favor of active engagement strategies, they do not support an FFF strategy (for instance, Domini Social Investments and Calvert Investments). Similarly, among the firms I spoke to that are not so committed, attempts were invariably made to sway me from transitioning to a strictly FFF portfolio to one that favors the particular RI strategy employed by the firm, such as Best in Class or ESG Integration. So, if one's goal is FFF, one must be sure to make that requirement clear from the outset of any personal research.

Other Options

An option that enables one to retain concentrated exposure to the energy sector yet remain FFF is to invest in renewable energy mutual funds. Although these funds have not consistently beaten their benchmark, they hold the promise of delivering potentially

outsized market returns over the long term, especially if tougher fossil fuel energy regulations are enacted. They also offer investors pursuing a FFF strategy the peace of mind that comes with knowing that their capital will be working toward an energy transition. For the more sophisticated FFF investor who is comfortable with taking on some additional risk, a few well-placed direct bets on renewable energy companies could also prove enriching.

Although there are a multitude of single sector and alternative asset-class options that are implicitly devoid of fossil fuel holdings and will remain FFF, for example REITs, Community Investing, and Impact Investing, water mutual funds may also hold appeal for fossil fuel divestors. Specifically, they offer the opportunity to realize competitive returns while keeping one's values aligned with one's investing strategy. Five such funds that have performed well historically are offered for further consideration:

- Water Asset Management
- Allianz Global Investors Global Water Fund
- Invesco PowerShares Water Resources Portfolio
- Guggenheim Investments S&P Global Water Index ETF

Responsible Investment Advisors

For those investors who have investable capital of USD two million or more and are interested in pursuing a FFF investing strategy, an appropriate first step is to consult with a wealth advisor about exposure to the industry. In the case that this party is not fully apprised of FFF market development, all of the market-based mutual fund firms listed above offer individual account services. Several independent RI advisory firms are also available for consultation, including the following:

- Veris Wealth Advisors
- Royal Bank of Canada
- The Clean Yield
- Aperio
- Boston Common Asset Management

As anyone who has been following the divestment debate can attest, the issue tends to raise participants' animal spirits. In recognition of the irrationality so added to an already complex dilemma, I have sought to provide an overview of the facts and a variety of options for investors committed to mitigating portfolio risks associated with climate change.

Biography

Robert Schwarz, MBA, MS, is a responsible investing professional. His work involves enabling institutional investors to simultaneously meet fiduciary responsibilities and improve corporate environmental and social outcomes through the integration of environmental, social, and governance key-performance indicators into investment decisions. Robert can be reached via email at apostrate@yahoo.com

The Demise of Divestment

Gerrit Heyns
Co-Founder of Osmosis Investment Management

Divestment as an investment strategy is inherently flawed. The protest leadership is well aware of this but marches on, hoping to gain greater public awareness. At best, the complete closure of every listed fossil fuel business on the planet would impact less than 70% of the world's combustible carbon reserves, most of which are held by state-owned companies in largely single-commodity countries. At worst, even nominal success would result in the ownership of listed fossil fuel businesses by more people and institutions that have less interest in protecting the environment, further gridlocking the ability to make changes within these businesses. There may be a sense of political currency, but there is no win for the planet in an institutional divestment strategy.

It is well understood that the primary goal of the campaign is to alter attitudes toward climate risks rather than to ensure the closure of fossil fuel businesses. However, the divestment message is fleeting and less influential than its supporters would like to believe or admit claims of historic victories against apartheid, tobacco, sweatshop labor, and other such injustices are grander in the memories of past protesters than they are in their real impact. The Occupy movement is the latest example of a fizzled message. Its rightful claim of social exploitation by a group of disproportionately wealthy bankers with a distinctly cavalier attitude toward social and economic equality went viral. Yet it lasted a few short months before being cast aside by a public that initially cared but soon forgot. The cavalier attitude of the bankers outlives the protest against them.

To be clear, current and growing greenhouse gas emissions leave us in an untenably precarious position. There is an incredibly short time before the median temperature of the planet increases by more than a safe amount, generally regarded by science and at least acknowledged by most governments as approximately 2°C. More dramatically, since this is uncharted science, only a range of predicted outcomes can be determined; these include less dire consequences and far greater ones, all of which are highly dependent on the continued and increasing demand for fossil fuels.

However, divestment campaigners choose to address not the demand for fossil fuel products but its supply. In calling for university endowments and other institutional investors to abstain from ownership in fossil fuel businesses, they hope to influence government attitudes toward the supply of fossil fuels in the face of increasing demand from their consuming public. Using the economic argument that even the reserves currently held by fossil fuel producers cannot be fully burned for fear of severe

climate disruption, divestment campaigners hold that those and any future additions to reserves are "stranded assets" and should be rendered worthless by the investment community.

Near the end of last year, ExxonMobile suggested that transforming all of its current and projected future assets into energy is essential to meeting growing energy demand worldwide and in preventing consumers from becoming stranded in the global pursuit of higher living standards and greater economic opportunity. Similarly, Royal Dutch Shell held in an open letter to the public at about the same time that by focusing on stranded assets, we risk distracting attention from the realities of a growing population, increasing prosperity, and growing energy demand.

The debate very pointedly expressed by big oil companies is one of incessant demand growth versus catastrophic climate disruption. Clearly, the latter is not preferable, but while interrupting supply from a small percentage of fossil fuel producers may have a marginal impact, it cannot have nearly the impact of a campaign to systematically destroy demand.

While there is no doubt that demand will grow as population increases and the middle classes swell, it may be surprising that demand is already being destroyed. According to Carbon Tracker, falling demand for coal in the United States since 2008 has caused at least 26 coal companies to go into bankruptcy. During this period, the value of coal companies fell an average of 29%, while equity markets rose more than 30%. This has come about through a combination of regulation, efficiencies, and alternatives not through divestment. However, it may better explain why some notable endowments and foundations have publicly "divested" from these rather poor investment prospects.

The same fate awaits oil and gas companies that fail to adjust to changing demand patterns. Reuters reports that since 2005, the U.S. population increased by 20 million people and output increased by over 10%, yet the consumption of petroleum products in the United States declined by more than 2 million barrels per day. In fact, the International Energy Agency recently reduced its global oil demand forecast for 2015 for the fourth time in 12 months. OPEC has again reduced their 3-year forecasts of demand to a 14-year low. Even with the collapse in oil prices, there has been precious little increase in demand over the past 9 months.

While consumers in the United States and parts of the developed world are proving that demand can be destroyed in an economic manner, it is not happening with the urgency that is required, and clearly not globally. Population increases, particularly in the developing world, are leading to the largest increases in demand over the near future. Any

plan to curtail greenhouse gas emission will lean heavily on the need of the developing world to adjust its appetite for fossil fuel.

Regardless, it is clear that demand destruction is the only sustainable, long-term answer. For that to happen, scalable substitutes are needed. Fortunately, most of the technology required to begin a rapid transition to less carbon-intensive energy is available today. Unfortunately, it is not at current economically viable levels. Technologies must advance and demand for fossil fuels must be hindered.

While investment in alternative energy supplies over the past 100 years has been in excess of a meaningful $250 billion, it represents only a fraction of what the fossil fuel business intends to spend on new exploration over the next decade alone. Using "engagement" to influence this expenditure by directing it to alternatives that are more productive has been discussed and debated widely, but only in a historical context.

The powerful fossil fuel lobby around the world has successfully blocked most attempts to stifle changes to management or strategy. Even convincing the SEC to force transparent disclosure of lobby spending is extraordinarily problematic. Vigorous engagement is required. A campaign to implore endowments to force change within the fossil fuel companies they own would have similar awareness appeal and may even bring about dynamic changes.

Ultimately, the only real way to significantly influence demand is to alter the economic equation; it must be more expensive. A global comprehensive greenhouse gas tax is urgently required to help stymie the growth of demand while substitutes are refined. It must be a cost that does not exempt the most significant emitters regardless of their importance in global, regional, or national economies. Furthermore, full participation is required because greenhouse gas in the atmosphere is geographically indiscriminate. This is the size of the challenge facing the delegates at the Paris Conference of Parties (COP21) at the end of this year.

Successful and rapid implementation of an emissions tax will lead to a transition away from fossil fuels, which will indeed strand any reserves still in the ground and diminish the value of fossil fuel businesses that do not adjust to a new regime.

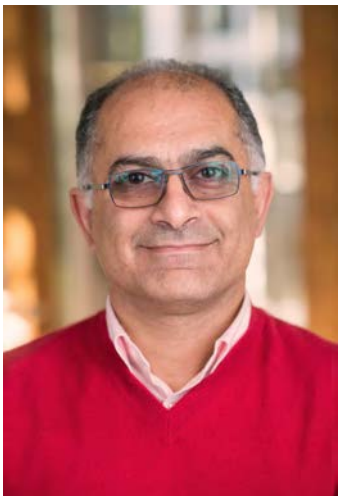
Both vigorous engagement and demand destruction require courage, compromise, and investment far beyond what has been seen to date. A real price for greenhouse emissions is only the beginning. Demand destruction requires alternative infrastructure development and retrofitting beyond current estimates. It includes dramatic increases in efficiencies and greater advances in innovation. Above all, it requires a collective change in attitude from near-term gain at the expense of long-term benefit that pervades all levels of society around the world. It is the end game that the divestment campaign seeks, but with greater specific purpose.

Biography

Gerrit Heyns is a London-based co-founder of Osmosis Investment Management, a global investor in resource efficiency. He was named as one of the top 50 people influencing global finance in 2013 by the Institute of Chartered Accountants.

What Divesting May Yield: Revisiting "The Grasshopper and the Ant" in the Context of University Endowments

J. Ritchie
Institute for Resources, Environment and Sustainability, University of British Columbia



H. Dowlatabadi, PhD
Canada Research Chair in Applied Mathematics and Global Change, University of British Columbia; University Fellow, Resources for the Future

Abstract

Fossil fuel divestment campaigns have focused attention on the holdings of oil, gas, and coal companies in the portfolios of university endowments. In this paper, North American universities with endowments larger than USD 1 billion are characterized by how they may handle a divestment commitment based on their priorities of income (Grasshoppers) or growth (Ants). The divestment tradeoff is most challenging for institutions deeply reliant on dividend returns from their endowments, the Grasshoppers in our story. A characteristic Grasshopper institution is analyzed for the benefits it receives from holding investments in fossil fuel companies, including its receipt of dividend income and price returns. Three strategies are considered for how this institution could reduce its holdings in fossil fuel investments from 2010 through 2014 while balancing its operating budget: (a) by investing in other sectors with higher income potential and less volatility, (b) by

investing in fixed-income green bonds, and (c) by reducing operating costs on campus (for example, through energy and water efficiencies). In each case, selling off oil and gas holdings during this period provided a comparable or surplus benefit. However, this analysis takes place over a relatively bearish period for energy equities. In the case of re-investing in campus efficiency, these benefits would be difficult to realize in the context of university governance and budgeting processes.

What Divesting May Yield: Revisiting "The Grasshopper and the Ant" in the Context of University Endowments

Fossil fuel divestment campaigns have challenged educational institutions to sell their investments in oil, gas, and coal companies. Their goal is to generate momentum for political action on climate change by stigmatizing fossil fuel companies in the eyes of the public. One way to achieve such public awareness is by scrutinizing the investment returns received by individuals and institutions from these industries with high greenhouse gas emissions. Universities, however, have been reluctant to divest, emphasizing the importance of returns from endowments to their operating budgets.

Both sides have valid arguments. Any harm to the endowment's returns would have an impact on the ability of the institution to achieve its educational mission. Universities worry that excluding fossil energy industries from the endowment will harm overall returns. For example, in a 2013 speech, Harvard University President Drew Faust[1] said "Despite some assertions to the contrary, logic and experience indicate that barring investments in a major, integral sector of the global economy would . . . come at a substantial economic cost." Yet, are institutions ignoring significant financial risks by relying on investment income from companies that will dramatically need to alter their operating strategy to curtail GHG emissions?[2]

One can argue that moral leadership is part of a university's core mission and that this should enter the calculus of any "cost" associated with divestment. However, the ability of different institutions to pay the price of such leadership depends on how much they rely on income from their endowments to balance their operational budgets. Some institutions will be more capable of leading the way on divestment.

1. Faust, "Fossil Fuel Divestment Statement."
2. A portfolio adjusted for climate risk promises to shed light on this question by reflecting the certainty and dynamics of transition in the economy.

Opinions on the financial impacts to institutions from divestment are flourishing.[3] Many comparisons have been made between the performance of unrestricted and divested equity indices. However, there has been limited discussion about the real contribution of fossil fuel stocks to model portfolios based on the asset allocation of an actual university endowment. Holding stock in oil, gas, and coal companies has been attractive primarily for sustained dividend yields alongside growth potential.[4]

As with any portfolio, endowments are managed to generate a balance between assured short-term income and potential medium- to long-term growth. The size of the endowment and the budgetary requirements of each university dictate how its endowment is managed.

This distinction has critical implications for whether an institution may choose to divest and how its commitment may be implemented. Furthermore, there is the societal question of whether these divested funds could be used to support companies pursuing the development of a low-carbon economy, thus reducing emissions in line with the broader motivations driving these campaigns.[5]

In this paper, the question of divesting from fossil fuels is framed around the reliance of university endowments on returns from investments. We then analyze our own university's endowment and estimate its income from holdings in the fossil energy sector over the last eight years. Then, we suggest ways to substitute for this income by (a) changing the sector allocation of the endowment's equity investments, (b) modifying the asset mix by investing in fixed-income securities that are focused on mitigating climate change, such as climate or green bonds, and (c) exploring opportunities to reduce costs on campus by investments in efficiency. Although the efficacy of these strategies will vary based on specific context, opportunities may exist for most universities to reinvest on campus by reducing operating costs while enabling emission reductions.

3. Morgan Stanley Capital International, *FAQ: Responding to the Call for Fossil-Fuel Free Portfolios*; Bullard, *Fossil Fuel Divestment: a $5 Trillion Challenge*; IMPAX Asset Management, *Beyond Fossil Fuels: the Investment Case for Fossil Fuel Divestment*; Fischel, *Fossil Fuel Divestment: a Costly and Ineffective Investment Strategy*; Cleveland and Reibstein, *The Path to Fossil Fuel Divestment for Universities: Climate Responsible Investment.*

4. Note that the growth potential is itself driven by the specter of a supply-demand imbalance for the resource.

5. As more institutional funds are committed to divest from fossil fuel companies, a broader pool of assets are created that could be used to hasten the transition to an economy based on sustainable practices and renewable energy.

Income versus Growth Endowments: Scale Driven Approaches to Investing and Divesting

North American universities have access to endowments that range from a few million to tens of billions. The operating budgets of these universities will rely to varying degrees on returns from their endowment. This allows for categorizing endpoints of growth and income on the divestment commitment spectrum. Institutions that hold a small endowment relative to their operating budget will tend to focus on investing for *income*—and *hereafter are called Grasshoppers*. Institutions with endowments considerably larger than their annual operating budget can opt for longer-term *growth*—and *hereafter are called Ants.* In the context of divestment, Ants are capable of investing with a reduced reliance on the immediate yield provided by oil and gas or fossil-intensive utility stocks.

The ratio of endowment-to-budget requirements will determine which universities are Ants and which are Grasshoppers. The vast majority of public universities have rising enrollments and falling public subsidies per enrolled student. They have to balance the challenge of tight budgets, competition for top students and faculty, and the demands of various stakeholder groups. These Grasshopper institutions depend on income from their endowment holdings to balance their books. In such operating contexts, a commitment to divest will be difficult unless it is combined with strategies that replace lost income and/or reduces operating budgets.

Ant institutions have more ability to trade income for *growth* potential in the future. With an endowment much larger than their immediate needs, Ants can have the financial resources and patience to generate both income *and* investment with long-term growth in mind. These universities can manage a larger portion of their endowment at elevated levels of risk, and more easily commit to divesting a portion of their funds. Ants have the highest potential among universities to develop the market for fossil free and low-carbon financial offerings.

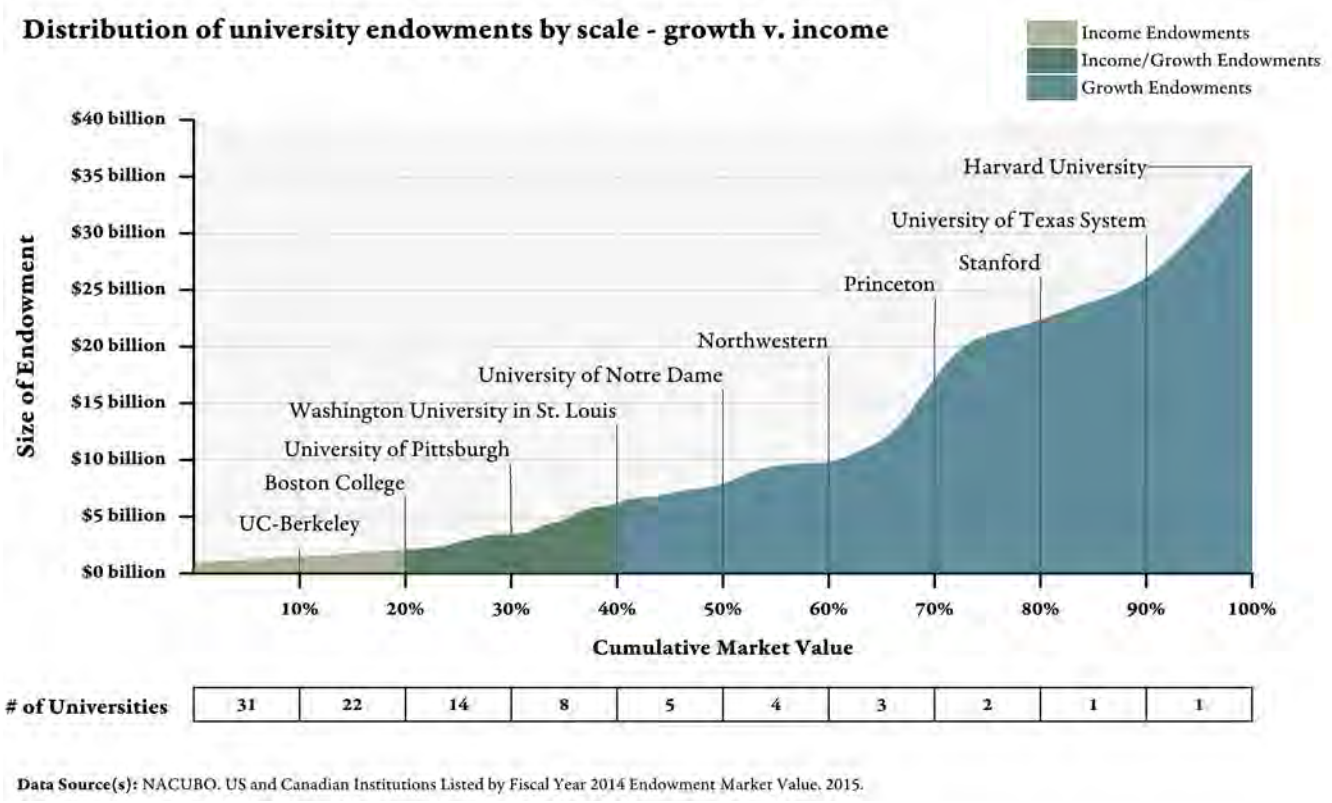
Growth companies offer securities with low or nonexistent dividends while they develop new processes or technologies. Their value proposition often lies in offering more economic output per unit of mobilized primary resources. In some cases, their products are consistent with a low-carbon economy, though they use fossil fuels and raw materials. Companies manufacturing solar cells and wind turbines are typical of growth investments, currently delivering upside potential but few dividends along the way.[6]

6. Ritchie and Dowlatabadi, *Fossil Fuel Divestment: Reviewing Arguments, Implications and Policy Opportunities.*

The National Association of College and University Business Officers (NACUBO) reported in 2014 that 92 North American[7] universities had endowments of at least USD 1 billion in assets.[8] The aggregate value of these endowments totaled $385 billion, and their distributions varied (Figure 1). Twelve of these endowments account for $200 billion.[9]

Figure 1: University Endowment Distribution by Scale

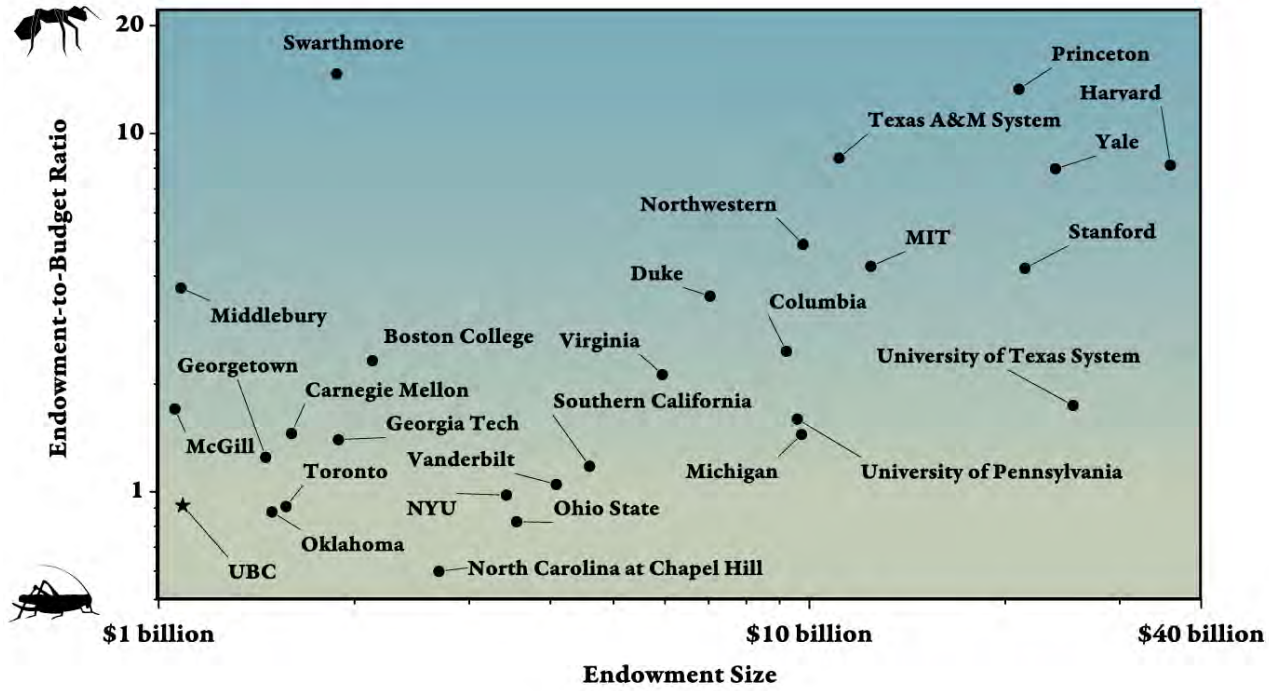
Income versus Growth Endowments—examples of universities at each point along this curve are provided.



7. NACUBO data includes universities in the United States and Canada.
8. NACUBO, *U.S. and Canadian Institutions Listed by Fiscal Year 2014 Endowment Market Value.*
9. Harvard, the University of Texas System, Yale, Stanford, Princeton, MIT, the Texas A&M system, Northwestern, University of Michigan, University of Pennsylvania, Columbia, and Notre Dame.

Endowment size is not an indicator of whether the institution has chosen to depend on its endowment income to support the scope and scale of its services (as highlighted in Figure 2). In reality, all institutions are a hybrid of Ants and Grasshoppers. They hold mental accounts in which some portion of their portfolio is reserved to ensure survival and the remainder is invested in the hope of riches. Annual operating budgets ranged from 7% to 167% of their endowment's market value for the universities considered.

Figure 2: Endowment-to-Budget Ratio for 28 Universities



While having the largest investment portfolio, Harvard derives 35% of its operating income from endowment returns. Although the targeted payout ratio from Harvard's endowment is within a reasonable range of 5% to 5.5%, the sheer size of the endowment will generate large components of revenue. Thus, Harvard is more appropriately a hybrid income and growth endowment. Conversely, Swarthmore College has a $1.88 billion endowment with an annual operating budget of $128 million. Despite a relatively small endowment, it is likely more capable of committing to divestment[10].

10. Because there is no universal standard for university budget reporting, there are unique factors on every campus in Figure 2, which we were unable to consider, but that will move them further toward the Ant or Grasshopper.

Endowment Case Study: How Much Did Fossil Fuel Companies Contribute to Income and Growth?

Our home institution, The University of British Columbia (UBC), has an endowment of USD 1 billion and an annual operating budget of USD 1.2 billion.[11] This institution is a prime example of one with an endowment managed to maximize income.

Dividend income was estimated for our university's equity holdings in the 10 major sectors over eight years from 2007 to 2014 (Figures 3 and 4).[12] Data on specific holdings were gathered from the public statements on the Campus's Treasury website, as reported in 2013.[13] In a recent paper, we analyzed the UBC endowment for its exposure to carbon emissions.[14] Over half of the endowment's market value is in public equity holdings in eight pooled investment funds.

Endowment holdings were clustered into ten sector indices: (1) basic materials, (2) communication services, (3) consumer discretionary, (4) consumer staples,[15] (5) oil and gas, (6) financial services, (7) healthcare, (8) industrials, (9) technology, and (10) utilities. The proportion of the endowment's market value in oil and gas holdings ranged from 11.7% to 16.3% during the period examined. Relationships between dividend yield and average sector share prices highlight the volatile cycles for equities in each sector (Figure 4).

11. When considering Canadian university endowments and operating budgets, we use the foreign exchange rate at the end of 2014 for USD 1 = CAD 1.16.
12. The eight-year period of assessment was dictated by availability of data for dividend yield.
13. *UBC Endowment Investment Holdings* in PDF Format—Run Date October 23, 2012. Using this data, we assumed a static number of shares held in each sector over the time-series. Each sector index provided the dividend yield and price data.
14. Ritchie and Dowlatabadi, "Understanding the Shadow Impacts of Investment and Divestment Decisions: Adapting Economic Input–Output Models to Calculate Biophysical Factors of Financial Returns."
15. The difference between consumer discretionary and consumer staples lies in partially distinguishing between companies that operate in consumer wants versus needs. In times of recession, consumer staples tend to do quite well, as demonstrated by the low deviation in the dividend of stocks from these sectors. Consumer staples are demonstrative of an income sector because of their low growth potential and high sustained dividends.

Figure 3: Dividend Yield by Sector from 2007 to 2014

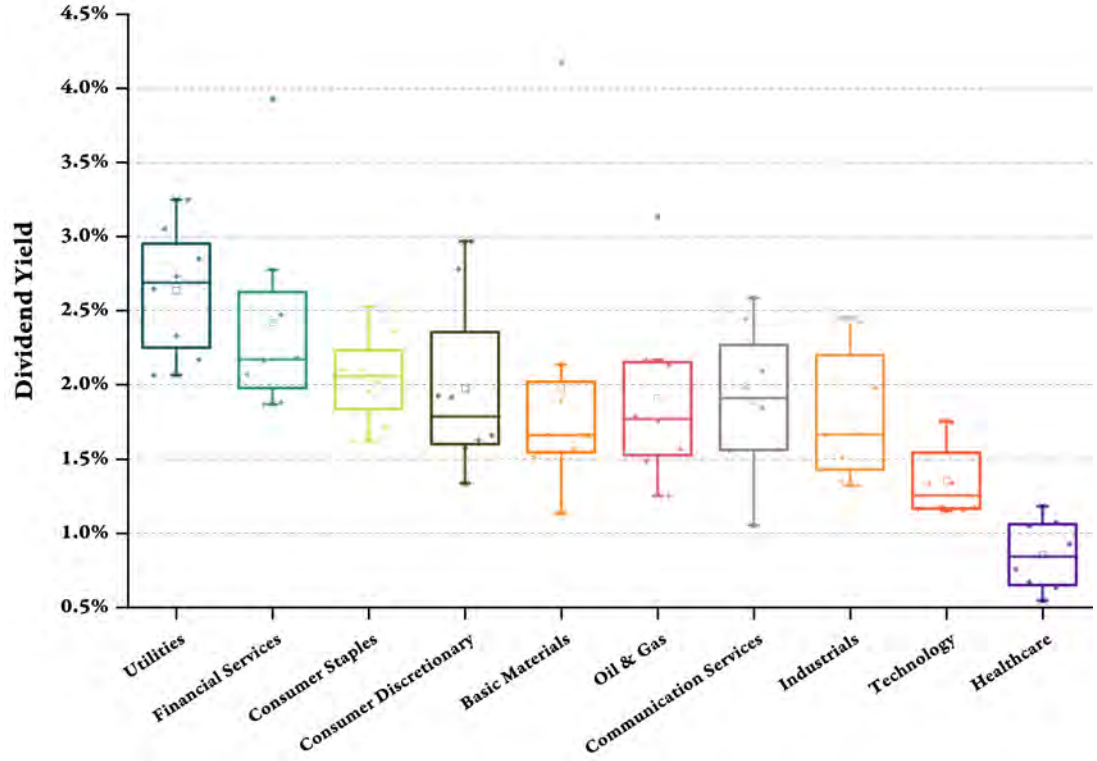
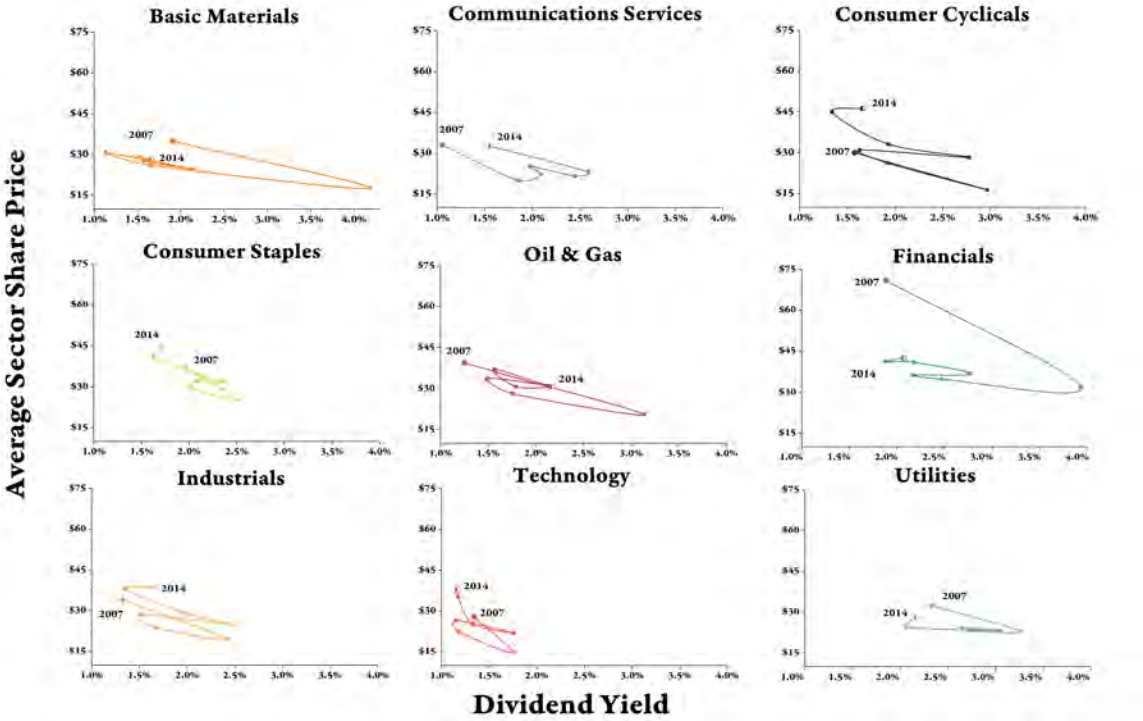


Figure 4: Volatility of Growth and Yield from 2007 to 2014



Note: In Figure 4, the initial year of 2007 is marked with a circle (•) and the ending year of 2014 is marked with an open square (◧); the healthcare sector has been excluded from this 3x3 matrix, since it is the sector generating the least amount of dividend income.

The income generated for the endowment by holdings in each of these sectors was estimated; that is, the dividends the endowment would have received in real terms,[16,17] before management fees, from each of these sectors by assuming a static holding of shares in each sector over the eight-year period. In total, over the eight years these investments yielded $75 million of income.

Five sectors generated roughly 80% of the cumulative dividend income for this endowment: (1) financial services ($24.7 million), (2) oil and gas ($12 million), (3) basic materials ($8.4 million), (4) industrials ($7 million), and (5) consumer staples ($6.9 million).

The endowment's managers are already optimizing for income. Sectors with the highest dividend yield performance within this time frame constitute the highest proportion of the endowment's market value: financial services, oil and gas, industrials, and consumer staples. If growth potential was the goal, we could expect that healthcare, technology, communication services, and consumer discretionary would occupy a larger proportion of the endowment's market value.

Our university's oil and gas equity holdings generated an average of $1.5 million each year. Those holdings were one of two sectors also showing above-average dividend yield and risk-adjusted income as well as income growth. Only investments in consumer discretionary companies had similar performance.

Many investments in the utility sector are associated with high levels of GHGs from the combustion of coal and gas. We estimate that approximately 80% of utility-sector dividend income is related to fossil fuels, slightly more than the amount of U.S. electricity generation from fossil fuels. Thus, the total cumulative fossil-fuel-related income generated for the endowment by these public equity investments was approximately $2 million per year.

16. Bureau of Labor Statistics, *CPI Detailed Report—Data for January 2015.*
17. Adjusted for inflation using BLS CPI-U data, all values for income in constant 2007 dollars.

The risk-adjusted income over these eight years was calculated by dividing the average dividend income per sector by the standard deviation: where $R_{dividend}$ is the risk-adjusted dividend returns, calculated for each sector, $D_{sectoraverage}$ is the sector average dividend income, and σ_{sector} is the sample-corrected standard deviation of the dividend income. The results of these calculations can be seen alongside the average proportion of the endowment's public equity market value in each of these sectors (Figure 5).

Figure 5: Endowment Risk-Adjusted Income by Sector

Ranked in order of risk-adjusted dividend income (***$R_{dividend}$***)

Sector	Avg. Market Value *(% of UBC endowment)*	Average Dividend Income† *(thousands USD)*	σ_{sector}	$R_{dividend}$	Dividend Growth *8 yr CAGR*
Consumer Staples	8.8%	$860	$76,407	$11.28	–2%
Utilities	3.4%	$620	$60,977	$10.20	–2%
Consumer Discretionary	9.3%	$700	$81,495	$8.55	2%
Industrials	12.7%	$880	$104,170	$8.41	1%
Oil and Gas	14.7%	$1,490	$194,185	$7.69	1%
Communication Services	3.6%	$430	$57,240	$7.43	3%
Financial Services	28.9%	$3,090	$643,388	$4.80	–5%
Technology	6.0%	$240	$53,013	$4.44	4%
Basic Materials	10.0%	$1,050	$329,586	$3.17	–7%
Healthcare	2.7%	$80	$28,297	$2.80	0%

†Average annual dividend income over eight years.

Risk-adjusted incomes by sector fall into three categories: (1) well above average with negative growth (consumer staples and utilities); (2) above average with moderate growth (consumer discretionary, industrials, communication services and oil and gas); and (3) below average. Although the financial services sector constitutes the largest portion of UBC's endowment's value, it experienced a 5% decline in its real dividend income over the last eight years.

Dividend income is only one component of the total returns considered by the endowment manager. However, from the perspective of university operations, dividends will take priority. Although income could also be gained through fixed-income investments and other asset classes, public equities are attractive because of the potential for dividend growth and returns from capital appreciation in share valuation.

Financial markets are highly stochastic and subject to many noneconomic factors. In the absence of omniscience, it is not possible to time the market buying at the nadir and selling at the zenith of a stock's valuation. Hence, the value of portfolios and their returns vary according to the time-period considered. This is illustrated by showing the Compound Annual Growth Rate (CAGR) for UBC's endowment in these 10 sectors as measured for different time frames (Figure 6).

Figure 6: Endowment Market Value Growth Per Sector Over 6, 7, and 8 Years
Ranked in order of 6-year compound annual growth rate

Sector	**CAGR:** ***6 Years*** ***(2008–2013)***	**CAGR:** ***7 years*** ***(2008–2014)***	**CAGR:** ***8 Years*** ***(2007–2014)***
Consumer Discretionary	17.37%	15.76%	4.64%
Technology	14.86%	13.75%	3.14%
Healthcare	13.11%	13.67%	5.29%
Industrials	11.96%	11.16%	2.19%
Oil and Gas	8.54%	4.57%	–3.70%
Basic Materials	8.09%	5.41%	–4.86%
Consumer Staples	7.23%	8.01%	2.06%
Financial Services	5.93%	5.41%	–4.95%
Communication Services	5.51%	5.55%	–0.77%
Utilities	3.28%	4.64%	–0.74%
Average	**9.59%**	**8.79%**	**0.23%**

The perceived performance of these sectors will vary based on the period of time considered. Events such as the market crash that began in late 2007 and the 2014 declines in commodity prices influence any analysis that is shorter than the return period of market gyrations. Each of these sectors has experienced various stochastic and secular trends in the last decade. Regardless, these results suggest that holdings in oil and gas and utilities performed below average through all time frames considered. Yet, even if 4–9% returns were below the ten-sector average, they would provide a notable contribution to the university's endowment, especially when dividends are sustained at a high level. Holdings in consumer discretionary, technology, healthcare, and industrial sectors performed above average regardless of the time frame, demonstrating that they are largely "growth" sectors. However, each sector will have a distribution of mature income companies and young companies with potential.

In the following section, we explore three potential alternatives that could be considered to compensate for income loss due to implementing divestment from fossil fuel holdings.

Exploring Options for Income Substitution

Whenever income is placed at risk or novel investment strategies are considered, such as screening an entire sector, behavioral factors will unavoidably be at play. Investors selling their oil and gas assets will likely demand a higher sale price to offset the present value of expected income, or seek an alternative that would not only meet but exceed the income of the previous choice.[18]

Because investors tend to hold different mental accounts for portions of their portfolio, segments of their portfolio will represent a varying range of goals and aspirations. It is possible that, especially for Canadian investors, oil and gas investments represent a hybrid portion of the portfolio that can achieve aims of safety through income and the aspiration of higher prospective returns.[19]

In order to divest without impacting operations and growth aspirations, the Trustees of our University would be seeking more than $2 million in annual income or operational savings to cover the risk-premium of divesting from the $1.5 million of annual income provided by oil and gas. Furthermore, the campus's fossil fuel divestment campaign is requesting that the university divest over five years. Thus, we have used back-casting to explore three options that could have been put into place five years ago as illustrative examples for the divestment decision in our future. *Let us also note that we do not believe that past market performance is in any way indicative of future trends*.[20]

Option 1: Modifying the Sector Distribution of Equities

In analyzing the contribution of various sectors to the income and growth of our university's endowment, we noted that investments in consumer staples stood out for their steady growth and high risk-adjusted income. It is likely that an income-seeking university could have traded many of its oil and gas stocks for companies representative of strong performers in consumer staples.

18. Kahneman and Tversky, "Prospect Theory: An Analysis of Decision Under Risk."
19. Rengifo, Trendafilov, and Trifan, "Behavioral Portfolio Theory and Investment Management."
20. Additionally, we want to emphasize that making a case for any of these scenarios in 2010 would have been a difficult task.

We considered a case in which our university started trading its oil and gas holdings for consumer staples at a steady amount in 2010, zeroing out fossil fuel investments by the close of 2014 (Figure 7). At the end of this five-year divestment strategy, there would have been little impact on income from dividend yield and a notably higher market value in the endowment, an average net benefit over each of the five years of $5.2 million,[21] well above our $2 million per year threshold.

Figure 7: Oil and Gas Stocks Traded for Less Volatile Slow Growth and High-Yield Sector
(all values in thousands USD)

Endowment Actual Case
Using performance data modeled from university endowment holdings

Allocation	*Market Value*	2010	2011	2012	2013	2014	Price CAGR	Cumulative Income
8.34%	Consumer Staples	44,200	42,500	46,000	52,400	59,100	5.98%	4,760
16.17%	Oil and Gas	85,800	77,200	74,800	86,100	71,900	-3.44%	7,170
Total		**130,000**	**119,000**	**120,000**	**138,000**	**131,000**	**0.17%**	**11,900**

Modeled Case
Oil and gas market value to obtain zero balance by end of 2014

Market Value	2010	2011	2012	2013	2014	Cumulative Income
Consumer Staples	61,400	74,400	95,300	126,000	156,000	9,780
Oil and Gas	68,600	46,300	30,100	17,300	0	2,820
Total Market Value	130,000	121,000	125,000	143,000	156,000	12,600
Market Value/Income Net Benefit (+/-)	**-**	**1,020**	**4,620**	**4,850**	**25,500**	**700**

Note: In this case, the endowment's oil and gas holdings are drawn down over five years to reach zero in 2014. The sell rate was 20%, 25%, 33%, 50%, and 100%, respectively, in order to achieve a balanced quantity of market value sold each year ($14.5 M +/- 1.4 M). At the end of each year, (a) the previous year's sector performance was factored in (b) the respective sell-off rate was applied to the remaining oil and gas holdings, and then (c) this amount was transferred to holdings in consumer staples.

21. These results didn't consider the costs of executing such trades, but it is likely that with these robust performance numbers, commissions could have been easily covered and the research that went into considering a drawdown in fossil fuel company investments would also be accounted for. Numbers may not add up due to rounding.

Although it is much easier to develop such an analysis in hindsight, it seems unlikely (in early 2015) that volatility in the oil and gas sector has ended; the upside potential is likely to be determined by whether deflationary trends and sentiments in developed and emerging markets are secular or cyclical. Given the consistency of the income and growth performance of the aggregate consumer staples sectors, it seems that this pathway for divesting could have provided many universities with better income and growth potential for their equity portfolio.

If we extend our comparison between these two sectors further back in time, we find that removing exposure to oil and gas companies doesn't provide favorable results for the endowment. Over seven years (2000–2006), oil and gas stocks outperformed consumer staples by an average of 7.5% per year. A similar divestment scenario run from 2002 to 2006 would have resulted in net unrealized gains averaging $4.2 million each year.

A similar set of results could be achieved for income substitution by selecting specific utility companies. In the context of fossil fuel divestment, additional effort would be needed to screen fossil-intensive utilities while targeting the companies that are leading the way in expanding the renewable portion of their generation portfolio.

Income Substitution Option 2: Green Bonds

Although fixed-income investments will offer different characteristics than equities, they are currently the strongest pathways for allowing institutional funds to leave fossil fuel companies while also providing financial resources for developing a low-carbon economy.

For universities that seek to invest directly in the infrastructure and technologies that can aid in climate change mitigation and adaptation, there are more options available in fixed income than in equities. Adopting a stronger position in climate bonds or green bonds would require changing the risk profile of the endowment portfolio and would also remove the potential for dividend growth and much of the price returns offered by equities. A number of pension funds and universities are increasing their exposure to infrastructure, finding a liquidity premium in their search for yield.[22] Our campus is following this path.

In 2013, our university adopted new policies for its target asset mix that seek to increase investments in infrastructure by 8.5% while drawing down investments in equities from 61% to 45% of the portfolio. Achieving this policy mix would give a university the

22. Andrew Ang, Dimitris Papanikolaou, and Mark Westerfield, NBER Working Paper Series, September 12, 2013.

opportunity to draw down investments in fossil fuel companies while also adopting a policy that invests in infrastructure to support a low-carbon future.[23]

The green bond market has grown from USD 1 billion when the first World Bank Green Bond was issued in 2008 to more than $40 billion issued in 2014 and a projected $100 billion in issuances in 2015.[24] Now there are over $500 billion in climate-themed bonds available that are investing in transport ($358.4 billion), energy ($74.7 billion) and finance ($50.1 billion).[25] In the domain of energy, utilities like EDF, Iberdrola, and GDF Suez are issuing green bonds to finance renewable energy projects, though utilities are only beginning to pick up on this possibility. In transportation, China Railways is the largest single issuer of low-carbon transport bonds to support the development of rail projects.

The World Bank has been a key player in developing the green bond market, issuing slightly more than 6% of the green bonds listed on the Barclays green bond index. Through early 2015, the World Bank had issued USD 8 billion in 80 offerings,[26] with an average coupon of 3.3% and average maturity of 7 years. The Calvert Green Bond Fund aims to invest 80% of its assets in green bonds with an average coupon of 3.26% and average duration of 4.8 years.[27,28]

With this context, we provide a scenario in which our campus began drawing down its oil and gas investments five years ago, transferring the balance each year to green bonds that yield 2.40% each year (Figure 8).[29] In this case, we assume no appreciation in the value of the bond holdings.

Had this option been chosen, it would have generated $1.4 million in additional income and would have avoided $7.2 million in losses, a total surplus of $8.6 million over the base case. This provides an average of $1.72 million in benefits each year, slightly less than our target of $2 million each year but more than the annual average fossil fuel income. In this scenario, holding on to the potential upside returns of fossil fuel companies would have been a net cost to the university.

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23. University of British Columbia Investment Management Trust Inc., *2014 Annual Report.* We would use their actual investments for our example here, but the reported progress toward achieving this policy mix has been limited.
24. Barclays, *Barclays MSCI Green Bond Index.*
25. Climate Bonds Initiative, *Bonds and Climate Change.*
26. World Bank, "Green Bond Issuances to Date."
27. Though given the early stages of the green bond market, currently the largest holding of this fund is in U.S. Treasuries (about 25%).
28. YCharts, "M:CGAFX - Quote and Charts for Calvert Green Bond A."
29. A yield of 2.40% accounts for deducting 0.9% for management fees from the average return of 3.3%.

Figure 8: Endowment Investments in Green Bonds
(all values in thousands USD)

Modeled Case
Equal market value in green bonds and oil and gas stock

Market Value	2010	2011	2012	2013	2014	*bond + oil and gas* Cumulative Income
Oil and Gas *Market Value*	68,600	46,300	30,100	17,300	0	
Green Bond *Income*	410	780	1,140	1,550	1,900	5,790
Oil and Gas *Dividend Income*	1,020	990	536	270	0	2,820
Total Income	1,430	1,770	1,680	1,820	1,900	8,600
Net Benefit (+/-)	**160**	**124**	**338**	**476**	**339**	**1,430**

Income Substitution Option 3: On-Campus Reductions in Energy and Resource Use

In the first two scenarios, we proposed alternative investments to fossil fuel companies for our campus endowment that would have resulted in more income and a higher market value for its holdings. In this third scenario, we consider the potential for reducing costs on campus by reducing the use of energy and resources with investments in efficiency that curtail university utility operating expenditures.

Since our campus earns $2 million in income each year from its fossil fuel stock holdings, these revenues could be apportioned to a holding fund specifically earmarked for improving the resource efficiency of the campus, or the principal could be invested directly. A green revolving loan fund has been maintained at our campus since 2010 which currently aims for a 20% to 50% return on investment (ROI) on projects ranging from $10,000 to $200,000. Revolving loan funds and other approaches to energy efficiency have the potential to be a strong alternative to conventional approaches to endowment investing. Divestment campaigns have suggested green revolving loan funds as a way to invest funds that have been divested from fossil fuel companies.[30]

30. gofossilfree.org, "Fossil Fuel Divestment Communications Guide."

The Sustainable Endowments Institute (2013) studied 36 green revolving-loan funds across North America with a median return on investment of 28%.[31] We assume that the heavy investment in energy efficiency and carbon-reduction projects on our campus over the two decades have placed it below the minimum threshold for returns from energy efficiency projects. From 2001 to 2008, our university implemented a $39 million program to upgrade 288 academic buildings, assuming a 4.16% ROI. These projects were reported to yield guaranteed utility savings of at least CAD $2.6 million per year. In addition to a lower realizable return from efficiency investments, an additional unique characteristic of our campus is that we are subject to British Columbia's carbon tax rate of $30/tonne plus a mandatory $25/tonne GHG offset fee for public institutions. Thus, the university has an effective carbon cost of $55/tonne and incurs on-going costs of approximately CAD $3 million annually due to campus GHG emissions of roughly 60 $ktCO_2e$.

The campus utility budget for energy and water for 2014 is estimated at USD 18.9 million (2% of the total annual operating budget), including the carbon tax. Our campus has been able to reduce emissions at an average of 2% per year over the last five years, but expenditures on other utilities have increased at more than 4.7% per annum.

Next, we consider a scenario in which our campus sells off its oil and gas investments at a steady amount each year and uses those funds to invest in energy and resource efficiency projects that yield a 3% ROI, while reducing greenhouse gases at 5% per year (Figure 9).[32] Because the campus would be investing in capital infrastructure over several decades, we estimate that this infrastructure depreciates at the Canada Revenue Agency Class 1 Rate of 4% each year.

31. Sustainable Endowments Institute, *Greening the Bottom Line.*
32. The rates of increase for utility operating expenses each year were drawn from university budgets over previous years, and annual GHG emissions were obtained from campus inventories.

Figure 9: Endowment Trades Oil and Gas Holdings for Campus Energy Efficiency
(dollar values in thousands USD)

Endowment and Campus Actual Case
Using performance data modeled from university endowment holdings

Market Value	2010	2011	2012	2013	2014	CAGR	Cumulative Income, GHGs c Cost Over 5 Years
Oil and Gas *Market Value*	85,800	77,200	74,800	86,100	71,900	-3.44%	$ 7,170 in income
Campus GHG Emissions *tCO2e*	61,000	68,000	65,000	56,000	55,000*	-2.05%	305,000 tCO2e
Annual Utility Spend *including USD $47/tonne*	(15,900)	(16,000)	(17,600)	(17,800)	(18,900)	3.60%	$ (86,300)

*estimate

Modeled Case
Oil and gas holdings sold over five years and invested in 3% average annual ROI energy efficiency projects w/ 5% annual GHG emission reduction

Market Value	2010	2011	2012	2013	2014	CAGR	Cumulative Income, GHGs, Efficiency Investment or Co Over 5 Years
Oil and Gas *Market Value*	68,600	46,300	30,100	17,300	0	-100%	$ 2,820 in income
Campus GHG Emissions *tCO2e*	57,950	61,370	62,124	54,180	46,408	-4.3%	282,000 tCO2e
Annual Utility Spend *Including USD $47/tonne*	(15,200)	(15,000)	(14,200)	(12,360)	(10,100)	-8%	$ (66,700)
Annual Investment in Efficiency	17,200	15,400	14,800	17,300	14,500	-3%	$ 79,200
Capital Infrastructure Depreciation Realized	0	(686)	(1,300)	(1,900)	(2,600)	-39%	$ (6,500)
Total Net Benefit: *Utility and Carbon Tax Savings + Oil and Gas Income +Value of Capital Infrastructure Over Base Case – Capital Depreciation*							**$ 14,300**

Investing $79 million at an annual 3% ROI in energy efficiency over five years results in $18.4 million of avoided utility costs over the base case, and $1 million in carbon tax savings. When the market value of fossil fuel holdings and their dividend yield is considered, the total annual net benefit over the base case is approximately $14.3 million or $2.9 million each year. These savings exceed the estimated value of the fossil fuel income over this period by 45%.

By following this option, the campus would have lower GHG emissions and utility bills, thus reducing the budgetary pressure to generate income from fossil fuel holdings. Such a scenario is favorable for institutions with high-energy costs and inefficient infrastructures. Smaller and more efficient campuses are less likely to realize the same net benefits from investing so heavily in on-campus energy efficiency.

However, we haven't considered the potential rebound effects of increased energy use on our campus or the difficulties in realizing these savings in a meaningful way. Institutional budgets regularly face discrepancies between departmental, research, operational, and capital funds: savings in one department are rarely passed on to another. The incentives to pursue a scenario like this are often diffuse in a complex governance hierarchy.[33]

Since we have considered only the past, projecting similar scenarios into the future should be weighed against the potential considerations of utility cost increases, the social cost of carbon, discount rates, and oil and gas market dynamics. Perhaps universities could make guaranteed savings possible in this method by offering green bonds to other institutions: the Ant could provide a resource to the Grasshopper.

Summary

In this paper, we have characterized North American universities for their ability to divest in the context of their varying investment objectives. These approaches have been framed by the relationship between camps endowments and budgets, leading some universities to invest as Grasshoppers and others as Ants. We have suggested that committing to divestment will be an easier decision for universities that rely less on their endowment's dividend yield to immediately balance their operational budget (Ants). Universities with

33. We have also assumed that because our university has a robust campus sustainability department to implement a program such as this, the overhead for implementing this program is largely covered and most of the investment results in fixed capital. Reducing utility expenditures as we have modeled would also take place on a relatively static campus environment, with no additional buildings or growth in the student body.

endowments that are not significantly larger than their annual operating budget will favor investment in mature industries that provide high yields and moderate growth potential. Persuading Ants to divest should be a more straightforward task. Their endowments can be patient with returns. Persuading Grasshoppers to divest will require their trustees to be convinced that the alternatives do not impinge on their future growth and do not subtract from the discretionary budgets.[34]

In considering how divestment could have an impact on universities, we were able to find three attractive alternatives to holding fossil fuel stocks over the last five years. Shifting our campus endowment's equity sector allocation, investing in green bonds, or investing in campus energy efficiency were all compelling substitutions. While our university likely obtains $2 million per year in dividends from holding fossil fuel stocks, these scenarios indicate that replacing this income isn't an insurmountable challenge. However, we assumed omniscience about dividend returns and equity values over a five-year time horizon. It is useful to note that the period in question begins immediately after the deepest economic recession in 80 years, followed by a double-dip recovery and a slowdown of the world's second- and third-largest economies (EU and China), and ending with a bearish period for oil and gas.[35] None of these factors would have been predictable with any degree of detailed confidence in 2009 or during the five years covered in our scenarios. All of these factors served to depress oil and gas equity values. Today, in early 2015, we are exactly at a point when portfolio managers would most resist divestment because they hold very high expectations of an upside potential from rising oil and gas equity prices due to an energy commodities market in contango. So, while all three alternatives considered here have painted a rosy picture, they framed divestment positively because the world economy has behaved in unexpected ways. And the world is unlikely to behave in wholly expectable ways during the years ahead.

Epilogue

This paper is about alternatives that universities may consider in response to divestment campaigns. However, we have not considered the deliberate choices universities make in designing the scope and scale of their services. As discussed earlier, some consider moral leadership an inalienable part of the university mission. It is also widely acknowledged that research and training at universities fuel the engine of economic development. A carefully designed strategy of divestment can signal strong moral leadership as well as

34. These considerations have also reflected a relative level of uniformity around reported operational budgets. Many campus budgets are likely to be more nuanced than reflected because endowment earnings will be channeled toward capital projects, research funding, or student support that may not be immediately apparent in operational budgets.
35. A bearish period for energy driven by Saudi Arabia's geopolitically focused energy policy along with broader deflationary trends and sluggish demand growth.

deliver targeted R&D and training that will hasten transition to a sustainable economy. Such choices are not a matter of comparative dividends, but of true leadership by our academic institutions.

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Biographies

Justin Ritchie is studying low-carbon financial strategies and the economics of energy transition as a PhD Candidate at The University of British Columbia's Institute for Resources, Environment and Sustainability. He can be reached by email through justin@blueterminal.org.

Hadi Dowlatabadi sees the world in terms of interacting social, economic, and environmental systems. He studies how these systems create and respond to challenges over time. He has helped 44 students complete their PhDs on a wide range of topics. He designed LEAD, and co-founded Offsetters, GreenErg, and HydroRun Technologies. He is Canada Research Chair in Applied Mathematics and Global Change at UBC, Adjunct Professor in Engineering & Public Policy at Carnegie Mellon University, and University Fellow at Resources for the Future. He received his BSc and PhD in Physics from Edinburgh (1980) and Cambridge (1984) Universities, respectively.

Carbon Bubble & Divestment Trouble: Investor Reactions, An Analysis

John Byrd, PhD
Senior Instructor, Finance & Managing for Sustainability Programs,
Finance Faculty, Business School, University of Colorado Denver

Elizabeth S. Cooperman, PhD
Professor of Finance & Entrepreneurship, Finance Faculty, Business School, University of Colorado Denver

Abstract

Carbon Bubble & Divestment Trouble: Investor Reactions, An Analysis

Those concerned about catastrophic climate change argue that a large portion of known fossil fuel reserves cannot be extracted and burned. The valuation effect of these unburnable or stranded assets has not been fully impounded in the share prices of oil and gas and coal companies, suggesting that there is a carbon bubble in prices: prices are too high. In response to these two factors—unburnable assets and a carbon bubble for share prices of fossil fuel companies—a divestment movement has emerged. We examine how investors in oil and gas and coal companies have reacted to news announcements about carbon bubbles, divestment, and related topics. We document abnormal negative stock returns, on average, corresponding to these announcements, with investors in coal companies reacting somewhat differently than those in oil and gas companies.

Carbon Bubble & Investment Trouble: Investor Reactions An Analysis

"According to the Assets Disclosure Project, 55% of the average pension portfolio is invested in carbon-intensive assets or exposed to climate change risks, but until now investors have largely ignored this. It will be difficult for them to do so in the future." [Mike Scott, Forbes, December 11, 2013]

Climate scientists argue that to avoid the disastrous effects of climate change at least one-third of fossil fuel reserves should not be burned. President Obama stated in an interview with *New York Times* columnist Thomas Friedman, referring to the world's fossil fuel reserves, that "We are not going to be able to burn it all" (Friedman 2014). Concerns about stranded assets increased recently after the release of a study by climate scientists in *Nature,* which argues that leaving only one-third of carbon reserves unburnable underestimates the scale of the problem. The researchers estimate that 82% of coal, 50% of gas, and 33% of oil reserves must remain unburned (McGlade and Elkins 2015). These unburnable or stranded assets have led commentators to claim that there is a "carbon bubble" in share prices; that is, share prices of fossil fuel companies haven't yet taken into account the possibility of these reserves never being extracted or being consumed only at much higher prices due to carbon taxes or similar regulatory mechanisms (Greenstone 2015). In response to the role of fossil fuels in climate change and the concept of a carbon bubble, a fossil-fuel-divestment movement, organized by 350.org and its founder Bill McKibben, has gained momentum.

Whether investors in fossil fuel companies have heeded these warnings or are ignoring stranded asset risks is unclear. This study sheds light on how investors in fossil fuel companies react to news announcements about the possible carbon bubble in prices and divestments of fossil fuel stocks by investors. We examine stock market reactions by major fossil fuel companies to 27 news announcements that specifically mention a carbon bubble or divestment or are closely related to the topic of stranded assets. We began our documentation with Carbon Tracker's initial report on unburnable carbon from July 2011 and continued through the end of 2014. Computing abnormal stock returns for 19 large publicly-traded oil companies and 8 publicly-traded coal companies, we found statistically significant negative stock price reactions overall, and that the share prices of coal companies are particularly sensitive to divestment announcements, while oil companies are more affected by discussions of a carbon bubble.

The article is organized as follows:

- Overview of stranded assets and divestment.
- Arguments for and against divestment
- Hypothesized investor reactions
- Discussion of the data and methodology
- Empirical results
- Conclusion

Stranded Fossil Fuel Assets and Divestment

The concept of unburnable carbon reserves or stranded assets was first brought up in financial literature on July 11, 2011, in a report on "Unburnable Fossil Fuels" by the Carbon Tracker Initiative (CTI). The report predicted that a large percentage of fossil fuel reserves would be unburnable in the future, and that fossil fuel companies were significantly overvalued. This forecast was based on climate scientists' estimates that in order to have about a 50% chance of less than 2°C of warming, the maximum aggregate carbon dioxide emissions that can be released from 2000 through 2050 is less than 1,000 billion tons of carbon dioxide (Gt CO_2) (Meinshausen et. al. 2009). As of February 2015, only about 565 Gt CO_2 of that carbon budget remain (NOAA 2015). In 2012, author and activist Bill McKibben began an educational tour across 21 U.S. cities to present the math of climate change in a "Do the Math Tour," named for the safe level of atmospheric CO_2 concentrations of 350 parts per million. As part of the tour, a divestment movement was initiated (modeled after the anti-apartheid divestment movement of the 1960s) to pressure investors to sell their stakes in fossil fuel companies. The divestment movement has gained traction, especially on college campuses, and a separate organization has emerged to spearhead it (GoFossilFree.org). Among the universities that are removing fossil fuel stocks from their endowments are Stanford and the University of Dayton in the U.S. and Glasgow University in the U.K. The Norwegian Sovereign Fund and some other institutional investors have also announced divestments, especially of coal companies.

Arguments For and Against Divestment

With news of significant risks associated with the burning of fossil fuel reserves, now projected to generate emissions that would raise temperatures 16.2 degrees globally (Greenstone 2015), the question of whether to divest or not to divest has become an important issue for institutional investors. From a moral point of view, such as that stated by the United Methodist Church, General Board for Pension and Health Benefits on its website, institutional investors with religious or environmental convictions find that burning fossil

fuels is ethically wrong, given its possible contribution to catastrophic global warming. From an economic perspective—or the perspective of fiduciary duty—if regulations about carbon emissions are implemented, the likelihood of a burst in a current carbon bubble could result in a huge drop in the valuations of fossil fuel companies in the future (Gilbert 2015). By divesting, investors would be taking heed of these significant risks before it is too late—they would be classifying stranded fossil fuel assets as toxic assets, in a manner somewhat similar to the collateralization of subprime mortgage debt obligations, which took place before the subprime loan crisis.

As Gilbert (2015) and Bloomberg (2014) point out, investors—and institutional investors in particular—are concerned about a significant loss in diversification if fossil fuel companies are divested from portfolios. Gilbert (2014) notes that a report by Sustainable Insight Capital Management (SICM) in New York finds that with divestments of fossil fuel companies, investors would lose access to 11 to 19 percent of the S&P 500 index, depending on how broadly fossil fuel companies were defined in terms of end user companies.

According to a report by Bloomberg New Energy, the ability to rebalance has to be carefully managed. For portfolio managers it is easier to divest from coal companies, which are a relatively small asset class, than from oil companies, which are a huge asset class and offer favorable attributes for portfolios, including high dividend yields, scale, liquidity, and growth potential (Bloomberg 2014). In their annual reports, many oil companies argue that rather than changing business strategies, they will continue searching for new reserves and are also working to develop new disruptive technologies. These technologies would capture and store carbon before it is released, or possibly afterwards, by pulling it from the atmosphere. However, as Greenstone (2015) notes, much further research is necessary before this can happen. In the event that such technologies become available, the notion of unburnable reserves would largely vanish, and, depending on the costs of the technologies, fossil fuel companies would continue to be viable enterprises far into the future.

Hypothesized Investor Reactions

The likelihood of mandatory carbon emission regulations is growing. In November 2014, President Obama pledged to reduce US emissions by 26% to 28% by 2025, compared to 2005 levels. This pledge is part of a deal negotiated with China, which has pledged to cap emissions, in advance of the Paris Climate meeting in December 2015 (Taylor and Branigan 2014). Obama is also asking federal agencies to cut emissions over the next 10 years by 40% from the 2008 levels (Davis 2015). Thus, there is growing momentum for some sort of

global climate agreement that will almost certainly include a curb on fossil fuel use. This suggests that concerns about a carbon bubble are legitimate, and we expect negative stock-price reactions for fossil fuel companies to news about the carbon bubble.

As discussed above, it is easier for portfolio managers to divest from coal companies than from oil companies. Moreover, when coal is used for electricity generation, its carbon emissions are much higher than those for either natural gas or oil: 2,249 lbs. per MWh of carbon dioxide is released for coal compared to 1,135 lbs. for natural gas and 1,672 lbs. for oil (EPA 2014). In the United States, Environmental Protection Agency (EPA) restrictions on carbon emissions for utilities are also more imminent. Since coal has greater comparative emissions and is easier to divest from, we expect a more negative reaction from coal companies to announcements about the carbon bubble and divestment.

Discussion of the Data and Methodology

The events that we searched for and examined were news announcements that included the following key terms: carbon bubble, stranded assets, unburnable carbon, and fossil fuel divestment. (Figure1). We began by looking at 32 events but deleted five because, on the announcement date, oil prices fell by more than 2%. The 2% fall in oil prices was an arbitrary cut-off, but we felt that it would be impossible to distinguish the effect of the news announcement from the effect of a drop in oil prices, so these observations were eliminated.

The remaining 27 announcement events include 10 divestment events, 6 carbon bubble events and 11 other events (Figure 1). Announcement dates include the earliest publication date by major news sources, including *Bloomberg, S&P,* the *Wall Street Journal,* the *New York Times,* and other major news sources. The news announcements were categorized as Divestment, Bubble, or Other, and we described the corresponding oil price change for the event period (Figure 1).

Figure 1: News announcements used in the study categorized as a Divestment Event or an Oil-Specific Event and with the corresponding oil price change over the announcement period. The announcement period includes three trading days with the event date at the center of the period. Events with an oil price decrease of more than 2% were deleted from the sample. The type column identifies events that specifically mention either the carbon bubble (B) or divestment (D).

Event Date	Type	Description
20130419	B	Carbon Tracker: Carbon Bubble will Plunge the World into another Financial Crisis & Update $674 Billion Annually spent on Unburnable Fossil Fuel Assets
20130422	B	NYT: Earth Day Debate: Is there a Carbon Bubble?
20130503	B	NY Times on "Unburnable Carbon" and Specter of a "Carbon Bubble"
20130516	B	WSJ: Here's the Carbon Bubble
20130612	B	Forbes: Unburnable Carbon
20131029	B	WSJ: Op. Ed Al Gore & David Blood: The Coming Carbon Asset Bubble
20120719	B	McKibben: Rolling Stone Article: Global Warming's Terrifying New Math
20121106	D	Bill McKibben & 350.org Kick-Off Nationwide "Do the Math" Tour
20130802	D	Is it Time to Divest from Fossil Fuels?
20140128	D	Norwegian Sovereign Fund Halves Investments in Fossil Fuels
20140129	D	17 of World's Largest Philanthropic Foundations Pull $ Out of Fossil Fuels
20140130	D	Norway's oil fund to debate ending fossil fuel investments - FT.com
20140131	D	Norway spurs rethink on fossil fuel companies - FT.com
20140504	D	Stanford to Divest from Coal Companies
20140623	D	University of Dayton Divests $670 in Fossil Fuel Stocks: Over Carbon Bubble
20140922	D	Rockefellers & Others Announce $50 bil. Divestment from Fossil Fuels
20141008	D	Glasgow becomes first university in Europe to divest from fossil fuels
20130130		HSBC: Study Published on Unburnable Reserves for Oil & Gas Companies
20130203		Climate Ambition Could Slash Value of Oil Firms
20130326		Citigroup Research Report: Is the End is Nigh' for Global Oil Demand
20110711		Carbon Tracker Initial Report on Unburnable Carbon published
20120119		News Report on Fossil Fuels as Sub-Prime Assets
20121113		Intl. Energy Agency: Fossil Fuel Boom is a Climate Disaster in the Making
20131024		Carbon Risk Initiative: Investor Group Sends Letters to 45 Large Fossil Fuel Companies on Unburnable Carbon
20131026		NYT: Climate Change Could Put $6 trillion in fossil fuel reserves at risk
20140212		Shareholder Resolutions Files with 10 Large Fossil Fuel Companies to report on Climate Risks and Business Strategies to Reduce these
20140508		Carbon Tracker Identification of Oil Projects Not Making Economic or Climate Sense

The information collected about the companies in the sample, which were categorized as coal or oil and gas, included their total assets and market capitalization at the end of 2013 (Figure 2). We also looked at each company's years of reserves computed as total reserves, as reported at the end of 2013, divided by production in 2013. The sample

includes major fossil fuel companies that are publicly traded in the United States with available data on CRSP-Daily returns tapes for AMEX, NYSE, and NASDAQ securities. The sample firms include 27 large corporations with an average market value of $68.8 billion and total assets of 88.1 billion. These include 19 major oil and 8 major coal companies that are publicly traded in the United States. The coal companies in the sample have the largest ratios, averaging 40.68 years compared to 13.50 years of reserves for the oil companies.

Figure 2: The sample of coal and oil companies with years of fossil fuel reserves shown. "Years of reserves" are computed as total reserves divided by production based on values reported for 2013. For CNOOC the data was from 2012. Financial data is as of the end of the 2013 fiscal year.

Company Name	Industry	Ticker	Years of reserves	Total Assets	MV Common Stock
Arch Coal	Coal	ACI	39.55	8,990.19	944.65
Alpha Natural Resources	Coal	ANR	49.48	11,799.26	1,578.03
Apache Corporation	Oil	APA	9.52	61,637.00	34,012.73
Anadarko Petroleum	Oil	APC	9.80	55,781.00	39,953.48
Alliance Resource Partners	Coal	ARLP	22.53	2,121.90	2,846.15
BHP Billiton	Oil	BHP	10.87	138,109.00	153,448.42
BP	Oil	BP	2.55	305,690.00	150,784.09
Peabody Energy	Coal	BTU	37.16	14,133.40	5,275.05
CNOOC	Oil	CEO	9.80	102,660.03	83,785.50
Chesapeake Energy Corp.	Oil	CHK	10.98	41,782.00	18,026.12
Cloud Peak Energy Inc.	Coal	CLD	13.32	2,357.43	1,096.13
Canadian Natural Resources	Oil	CNQ	32.62	51,754.00	39,078.35
CONSOL Energy	Coal	CNX	105.26	11,393.67	8,716.71
Conoco Phillips	Oil	COP	16.49	118,057.00	86,612.59
Chevron	Oil	CVX	34.62	253,753.00	239,028.15
Devon Energy Corporation	Oil	DVN	11.90	42,877.00	25,119.22
Eni S.p.A.	Oil	E	10.87	190,620.06	87,834.74
EOG Resources Inc.	Oil	EOG	11.39	30,574.24	45,834.75
Hess Corporation	Oil	HES	11.88	42,754.00	27,001.06
James River Coal Co.	Coal	JRCC	29.71	1,204.00	96.50
Occidental Petroleum	Oil	OXY	12.53	69,443.00	75,698.74
Sinopec Corp.	Oil	SHI	9.52	6,051.97	3,082.32
Statoil	Oil	STO	8.96	146,001.29	76,707.15
Suncor	Oil	SU	24.74	78,315.00	55,052.45
Total	Oil	TOT	5.01	239,053.25	138,988.79
Walter Energy Inc.	Coal	WLT	28.38	5,590.86	1,040.67

Exxon Mobil	Oil	XOM	12.53	346,808.00	438,702.00

Methodology

To investigate the reaction of the oil and gas and coal companies in our sample we used a standard event-study methodology. We calculated abnormal stock returns for each firm on each event date by comparing the actual returns over the three trading days from one day before the news announcement to one day after. We designated these as "days -1, 0, 1." We computed the expected stock return using the capital-asset pricing model (CAPM), with betas being computed using the daily stock returns from July 1, 2009, through June 30, 2011. The expected stock return is a company's beta multiplied by the market returns over the event period. Abnormal stock returns are calculated by subtracting the expected return from the actual return. Any excess return (actual less expected) is ascribed to the news announced during that period.

The significance of the average abnormal returns for each event date is tested with t-tests, and the average abnormal returns are calculated for all events for the entire sample as well as for announcements that specifically mention divestment or the carbon bubble. In addition, average abnormal returns are calculated separately for oil and gas companies and coal companies.

To investigate the reaction of the oil and gas and coal companies in our sample, we calculate abnormal returns for each firm in the sample for each of the event dates by using a traditional CAPM. Cumulative abnormal stock returns (CARs) are calculated for days -1, 0, 1 surrounding each event date in excess of the expected return based on the CAPM, with betas being computed by using daily stock returns from July 1, 2009, through June 30, 2011, and by using the CRSP value-weighted index for the market index.

The significance of the average CARs for each event date is tested using t-tests, and the mean CARs are calculated for all events for the entire sample. We also test for the significance of particular types of events, including divestment events and oil specific events. In addition, mean CARs are calculated separately for oil and coal companies.

Empirical Results

We compiled a statistical summary of the average event date abnormal returns for the 27 announcement dates (Figure 3). For the entire sample, the mean for all events is an abnormal return of -0.687% with a t-statistic of -2.712, which is significant at the 1.4% level. Over all event dates the average abnormal return for oil companies alone is -0.198%, which is not statistically significant. For coal companies, the average CARs for all events is -1.886%, which is significant at the 0.6% level (t-statistic of -3.10).

Figure 3: Summary statistics of Event-Date abnormal stock returns from 27 news events related to a carbon bubble and/or fossil fuel divestment for 8 coal companies and 19 oil companies from July 7, 2011, through October 8, 2014.

Abnormal stock returns are the return over a three-day period around the event date in excess of the expected return based on the CAPM, with betas being computed by using daily stock returns from July 1, 2009, through June 30, 2011, and the CRSP value-weighted index.

All Events	Entire Sample	Oil Companies	Coal Companies
Average Abnormal Return	-0.687%	-0.198%	-1.886%
t-statistics	-2.712	-1.153	-3.100
p-value	0.014	0.202	0.006
#events	27	27	27
Divestment Events			
Average Abnormal Return	-0.600%	-0.018%	-2.048%
t-statistics	-1.234	-0.054	-1.837
p-value	0.178	0.388	0.079
#of events	10	10	10
Carbon Bubble Events			
Average Abnormal Return	-0.895%	-0.520%	-1.789%
t-statistics	-1.370	-1.588	-1.099
p-value	0.149	0.112	0.204
#events	7	7	7
Other Events			
Average Abnormal Return	-0.629%	-0.153%	-1.791%
t-statistics	-1.940	-0.546	-2.200
p-value	0.067	0.331	0.044
#events	10	10	10
# Companies	27	19	8

In examining announcements that specifically address the issue of divestment or announcements stating that an investor had divested, we see a- 0.60% CAR for the entire sample, a -0.018% average abnormal return for oil companies, and a -2.048% CAR for coal companies, which is significant at the 7.9% level (t-statistic of -1.837). While the share price of oil companies did not respond to announcements about divestment, the share price of coal companies did as we predicted. This is consistent with the hypothesis that coal companies are more likely to be targeted for divestment.

While a -2.048% CAR doesn't seem large, it would be roughly equivalent to a loss of $535 million of aggregate market value for the eight coal companies in the sample, or about $66 million per company based on year-end 2013 market capitalization.

The results for announcements that specifically mention a carbon bubble have negative average abnormal return for the entire sample and the oil and coal companies separately, but none are statistically significant. The response for oil companies (-0.52%) is greater than for divestment or other announcements, suggesting that oil company investors are not concerned so much with divestment as with the general concept of a carbon bubble. While this result is not statistically significant (t-statistic of -1.588 and p-value of 11.2%) it may be economically significant. A 0.52% loss for the oil company sample is equivalent to a drop in market capitalization of approximately $9.4 billion dollars or about $490 million per company.

The average abnormal return for other types of announcements is -1.79% for coal companies, which is statistically significant at the 4.4% level. This strong result causes the average abnormal return for the entire sample to be significantly different than zero.

We tested the robustness of these results by removing the most extreme abnormal returns and re-computing the results. There is little qualitative difference between those results and the results we report (not shown for the sake of brevity).

We looked at the CAR for each announcement for the entire sample and for the oil companies and coal companies separately (Figure 4). When comparing the average CARs for the divestment announcements (which are highlighted in yellow in the figure), it can be seen that coal companies are consistently negative (seven negatives for ten announcements), and that the final five announcement dates are all associated with negative average abnormal returns, four of which were statistically different than zero. Although the sample of companies and announcements is too small to test whether this trend is significant, it suggests that investors in coal companies are becoming more sensitive to the divestment discussion.

Figure 4: Event-date abnormal stock returns for 27 events for the entire sample, just coal companies, and just oil companies.

Abnormal stock returns are the return over a three-day period around the event date in excess of the expected return based on the CAPM, with betas being computed using daily stock returns from July 1, 2009 through June 30, 2011 and the CRSP value-weighted index. The Type column refers to Carbon Bubble events (B), Divestment announcements (D), and Other related announcements (O). The asterisks denote statistical significance. One asterisk (*) means the result is significant at the 10% and two asterisks (**) denote significance at the 5% level.

	All	Coal	Oil	Type	15 character description
20130419	0.12%	0.51%	-0.05%	B	Carbon Tracker:
20130422	-4.09%**	-9.75%**	-1.71%**	B	NYT: Earth Day
20130503	-0.77%	-1.79%	-0.35%	B	NY Times on "Un
20130516	-1.04%*	0.22%	-1.57%**	B	WSJ: Here's the
20130612	-1.43%**	-4.05%**	-0.32%	B	Forbes: Unburna
20131029	0.36%	1.28%	-0.03%	B	WSJ: Op. Ed Al
20120719	0.59%	1.05%	0.39%	B	Rolling Stone A
20121106	-1.80%*	-6.39%**	0.14%	D	Bill McKibben &
20130802	-1.23%*	-4.55%**	0.16%	D	Is it Time to D
20140128	1.37%**	2.86%**	0.74%**	D	Norwegian Sover
20140129	-0.07%	0.73%	-0.41%	D	17 of World's L
20140228	0.94%*	2.10%	0.46%	D	Norway's oil fu
20140304	-1.78%**	-2.67%**	-1.41%**	D	Norway spurs re
20140504	1.04%**	-1.02%	1.80%**	D	Stanford to Div
20140623	-0.70%*	-2.02%*	-0.21%	D	University of D
20140921	-0.59%	-2.48%*	0.11%	D	Rockefellers &
20141008	-3.18%**	-7.04%**	-1.56%**	D	Glasgow becomes
20130130	1.07%*	-0.19%	1.60%*	O	HSBC: Study Pub
20130203	-1.91%**	-5.63%**	-0.34%	O	Climate Ambitio
20130326	-0.06%	-0.33%	0.06%	O	Citigroup Resea
20110711	-0.60%*	-0.27%	-0.73%*	O	Carbon Tracker
20120119	-0.99%*	-0.46%	-1.22%**	O	News Report on
20121113	-1.18%	-4.98%**	0.42%*	O	Intl. Energy Ag
20131024	0.37%	1.81%	-0.23%	O	Carbon Risk Ini
20131026	-0.20%	-1.60%	0.39%	O	NYT: Climate Ch
20140212	-0.74%*	-1.81%*	-0.29%	O	Shareholder Res
20140508	-2.05%**	-4.43%**	-1.18%*	O	Carbon Tracker

Conclusion

Our results suggest that investors in fossil fuel companies are concerned about stranded asset risk. In particular, investors in coal companies responded negatively to news about divestments, as predicted. The divestment movement is affecting coal companies. Even with a small sample of companies and announcements, we found statistically (and economically) significant results for coal companies. The carbon bubble concept has some effect, and although it is not statistically significant in our sample, it appears to be economically significant. Our results suggest that investors in fossil fuel companies are beginning to embed the possibility of divestment and a carbon-bubble risk premium into their valuations for these companies.

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Biographies

John Byrd is senior instructor in the finance and managing for sustainability MBA programs in the Business School at University of Colorado Denver. His research interests are primarily in corporate governance and sustainable business. He is currently working on projects about stranded assets, science-based sustainability targets, and shareholder resolutions related to climate risk. He has an MPPM (Master of Public and Private Management) degree from Yale University and a PhD in finance from the University of Oregon. mailto:John.Byrd@ucdenver.edu

Elizabeth S. Cooperman is a professor of finance and entrepreneurship in the Business School at the University of Colorado Denver. Her research focuses on financial institutions and sustainability and corporate governance. She is currently working on a textbook, *Managing Financial Institutions* with a sustainability focus (Routledge) and is an author and co-editor for *A Simple Path to Sustainability: Green Business Strategies for Small & Medium-Sized Businesses* (ABC-CLIO) 2011. She has an MBA and a PhD in finance from the University of Georgia. mailto:Elizabeth.Cooperman@ucdenver.edu

An Excerpt of *Invested in Change: Faith Consistent Investing in a Climate-Challenged World* Published by the Interfaith Center on Corporate Responsibility in April of 2015

To read the full paper, including endnotes and a list of resources, click here

As an organization that for over four decades has advocated that social and environmental justice issues can be influenced through active ownership of stock and direct engagement with corporate leadership by shareholders, the Interfaith Center on Corporate Responsibility (ICCR) believes it is critical that all investors thoughtfully consider their role in responding to climate change.

ICCR's coalition is largely comprised of the investment arms of some of the largest faith-based institutions. These institutions have investment guidelines that are rooted in their faith traditions and developed to align with their respective missions. While each institution has social justice and environmental priorities that they strive to address through their respective ministries, there are many issues where our membership's interests intersect: action on climate change is one such issue.

Among virtually all faith groups is a universal call to be in right relationship with the earth, to act as responsible stewards of the planet, and to preserve its health and resources for future generations. With a missionary presence and faith-based relationships in the world's most vulnerable communities, faith institutions recognize climate change's potential to exacerbate the suffering caused by extreme poverty and inequality which are at the root of so many existing social justice issues. Risks to land, food and water security,

forced migration, global health and human rights—perennial challenges religious groups are addressing in vulnerable communities worldwide—will all increase along with global temperatures unless mitigation and adaptation measures are taken.

Looking beyond these concerns, however, the responsible investment community also sees the economic prospects presented in transitioning to a low-carbon economy. There is already enormous demand for funding for renewable energy, conservation, and adaptation programs that will build sustainable, climate-resilient businesses and communities. At present, the gap between what exists and what is required to build a sustainable energy future is vast, and forward-looking investors are poised to capitalize on these opportunities.

FIGURE 1: THE CLEAN ENERGY INVESTMENT GAP

Clearly there are many roles to be played in this global movement to counter climate change threats and many strategies that can and should be deployed. While others are better-suited to lead more public-facing activist campaigns from the outside, our role is to remain on the inside to build will and urge companies to plan, manage and set the carbon reduction goals necessary to bring about systemic and enduring change, and actively encouraging others in the investment community to join us in this work as they can. We view these inside/outside strategies as complementary and mutually empowering, not at odds with one another.

What is also clear is that investors can no longer afford to be passive about the effects of climate change; they must raise their voices, exercise their right to vote both in and out of the corporate boardroom and use their influence through whatever means possible to accelerate change. This mandate extends beyond the responsible investment community to encompass all investors as well as investment professionals, including analysts and proxy voting services. Shareowners of carbon-intensive companies, like the shareowners of any controversial company or industry, have an extraordinary responsibility to use these stocks to their best advantage. These shareowners must, at absolute minimum, vote their proxies

to ensure that they are supporting shareholder proposals that seek to advance climate solutions. They may be called upon to vote on board directors and they should know what the candidates' positions are on environmental issues and whether they have specific expertise that will help the company transition to low-carbon models. Institutional investors have additional responsibilities and may want to consider participating with ICCR and other investor coalitions in shareholder campaigns on climate change. Without question, having more of us at the table will only increase our influence.

ICCR'S 2015 Climate Change Strategy

Investors adapt their engagements with companies depending on current business models, disclosures, and impacts. Nearly 200 total shareholder proposals may be filed in any given year on discrete subjects and often multiple resolutions are filed at each company. There are an equal number of dialogues held between ICCR members, management team members, and other relevant stakeholders including NGOs and groups representing impacted communities. In these dialogues, held in person or via conference calls, participants address the integration of ethical, social, and environmental considerations in corporate business plans on a more holistic level. Discussions related to climate change are included in approximately one-third of all corporate dialogues held each year.

INVESTOR IMPACT: CLIMATE CHANGE MITIGATION

The Sisters of St. Dominic of Caldwell, NJ

DRIVING DOWN EMISSIONS AND DRIVING UP FUEL ECONOMY IN THE AUTOMOTIVE SECTOR

The Sisters of St. Dominic of Caldwell, along with other ICCR members, began engaging Ford Motor Company and General Motors in the mid-1990s on climate change, then called "planetary global warming". Ford was the first U.S. company to leave the Global Climate Coalition, a well-funded group dedicated to refuting the science of climate change, and when many more companies ICCR was engaging followed suit, the association ultimately was forced to close its doors. In 2003, a resolution was withdrawn when Ford agreed to a holistic report that included disclosure of its emissions, elements to increase fuel efficient technologies, and public policy. In 2005, Ford released a first-of-its-kind climate risk report in the auto industry analyzing the business implications of climate change on the company's strategic planning and overall competitiveness, and in 2008, Ford established a Greenhouse Gas Reduction Plan for its entire operation and pledged to reduce GHG emissions for its new vehicle fleet by at least 30% by 2020. It now continues to make commitments under this Climate Stabilization Commitment, reducing emissions in both its facilities and in the end use of its products through increased fuel efficiency – important steps needed to balance environmental and social concerns with the drive for strong returns for its investors that were brought about by shareholder engagement. Investor advocacy also facilitated Ford's support of robust Corporate Average Fuel Economy (CAFE) Standards[18] to significantly reduce emissions generated by their products.

1. Climate Change Mitigation

These engagements call for the measurement, disclosure, and reduction of GHG emissions including setting quantifiable, specific, science-based and time-bound reduction targets. That is, GHG reduction targets are placed within the larger context of the emissions reductions necessary to meet the maximum 2 degrees Celsius global temperature increase. Other proposals have focused on carbon asset risk or the funding of new fossil fuel exploration in light of potential climate regulation. Many companies, including the top five U.S. oil companies, recognize the risk and opportunities associated with climate change and are taking action, including integrating carbon pricing into their business plans as they assess the economic viability of projects.

2. Public Policy

Our members maintain that in disclosing lobbying and political spending activities, including spending through third party associations and memberships, companies and investors can ensure that these activities are in alignment with corporate policies on environmental concerns. Members Walden Asset Management and Calvert Investments have published a Policy Engagement Toolkit.

INVESTOR IMPACT: PUBLIC POLICY

Walden Asset Management and Trillium Asset Management

SEEKING CORPORATE DISCLOSURE OF CLIMATE-RELATED LOBBYING AND POLITICAL EXPENDITURES

Inconsistencies between companies' commitments to address climate change and their public policy positions can pose reputational risks, as well as undermine companies' actions to mitigate and adapt to climate change. To manage those risks, over the last several years investors have asked over 200 companies to disclose spending for both political and lobbying purposes, and ensure they have internal processes established to align any spending with corporate climate commitments. Accenture, Bristol Myers Squibb and Intel have developed clear disclosures on lobbying. Over 100 companies decided to end their relationships with the American Legislative Exchange Council (ALEC), while others have begun to voice support for state-level regulations promoting renewable energy, which has the potential to advance and strengthen these important initiatives. ALEC has been on the forefront of attacks on state renewable energy programs and other legislative efforts to address climate change.

Trillium has filed shareholder proposals and had active engagement with important companies in the fossil fuel supply chain including, Halliburton, Hess, and Marathon Petroleum leading the companies to make major improvements in political and lobbying expenditure disclosures that include disclosures of payments to trade associations and other third party conduits. Through a year-long effort, Trillium was instrumental in persuading eBay to not renew its membership in the American Legislative Exchange Council (ALEC).

3. Corporate Reporting and Accountability

Disclosure is a powerful tool to drive performance improvements and accountability and ICCR members continue to press companies for increased disclosure related to climate change. Through the CDP (discussed below) climate survey, members ask companies to disclose their carbon emissions, the risks and opportunities associated with climate change, as well as the governance structures established within companies to address these risks. Additional, more specific disclosure requests have been developed for industries such as oil and gas and banks. ICCR members also supported work led by Ceres and the Environmental Defense Fund (EDF) in 2010 that led the Securities and Exchange Commission (SEC) to issue interpretive guidance regarding company disclosure of climate risk in 10-K filings.

INVESTOR IMPACT: CORPORATE REPORTING

Investor Environmental Health Network & the Sisters of St. Francis of Philadelphia

INVESTOR GUIDELINES AND RECOMMENDATIONS FOR SAFER FRACKING OPERATIONS IN SHALE

In 2011, ICCR and IEHN published "Extracting the Facts: An Investor Guide to Disclosing Risks from Hydraulic Fracturing Operations"[23], which recommended corporate goals, practices and key performance indicators to oil & gas companies engaged in shale development ("fracking"). The guidelines have been used by JPMorgan Chase, the nation's largest energy lender, in reviewing its energy portfolio. In response to investor pressure, several companies have begun reporting the specific measures they are taking to use safer chemicals and to reduce risks from radioactive materials. The guidelines have also been the basis of engagements calling for improved reporting and management practices by major oil and gas companies. ICCR's Social Sustainability Resource Guide[24] has strengthened the case for the implementation of corporate human rights policies that fully integrate the social and community impacts of fracking operations. As a result, oil and gas companies are actively working with ICCR members to improve human rights policies and grievance mechanisms.

4. Climate Change Adaptation

These engagements request formal climate risk assessments and management plans that will help companies and investors assess climate change impacts to companies' direct operations as well as throughout their supply chains. Members press companies to develop proactive plans to address potential climate change impacts such as storms or droughts in order to prevent operational disruption and to ensure sustained financial performance.

INVESTOR IMPACT: CLIMATE CHANGE ADAPTATION

Calvert investments

MITIGATING CLIMATE RISK DUE TO STORM SURGES/SEA LEVEL RISE

Calvert has engaged companies such as Phillips 66 to issue specific disclosure regarding the company's awareness of and preparation for physical impacts and risks related to climate change including storm surges and sea level rise. Diminished refining utilization rates, potential downtime or closure of facilities due to direct damage to the facility, danger to employees, disruption in supply chains, and power supply due to storm surges or sea level rise are proven to have a material financial impact on these companies' production and cash flows: investors view these disruptions as significant risks. As a result of this engagement, various companies have agreed to undertake substantive discussions with Calvert regarding the physical risks posed by climate change to their operations and will discuss how they identify and mitigate those risks.

5. ICCR's Advocacy and Climate Finance Initiatives

A key barrier for shareholders pressing for corporate climate reform as well as investors interested in the climate finance space has been the absence of strong public policy frameworks that will help propel the shift to a low-carbon future. For that reason, the responsible investment community is continuously advocating for stronger climate-related regulations at the state and federal levels. In addition, members are actively promoting proactive investment or climate finance among our allies in the investment community and in our engagements with the private sector.

INVESTOR IMPACT: IMPACT INVESTING & CLIMATE FINANCING

Boston Common Asset Management

PUTTING CAPITAL TO WORK IN THE GREEN ECONOMY

Boston Common led an investor coalition with $540 billion in assets under management in sending letters to 63 banks asking them to explain their long-term approaches to climate risk. Over 20 banks responded, and both PNC Financial and JPMorgan have modified or developed policies and programs to address climate change, actively incorporating investors' feedback. Further, as a result of ICCR member engagement, PNC Bank recently announced it would no longer finance mountain-top coal removal a practice known to have devastating environmental and social impacts.

Questions and Considerations for Investors in Responding to Climate Change

If you are an institution concerned about climate change, please consider these key questions as you develop/refine your own climate change engagement programs:

- Has your organization assessed the carbon footprint of its portfolio and of its own operations and if so, what plans are in place to remediate/improve carbon efficiencies?

- Does your organization have a formal responsible and sustainable investment policy and does it include specific guidelines that account for the economic, environmental and social risks of high carbon investments and/or climate change?

- Do you have proxy voting policies specifically addressing climate change and do you vote all of your shares?

- If high-carbon footprint companies are held in your institution's portfolio, are they being actively engaged and, if so, what assessment tools and metrics have been developed to track compliance/performance?

- Do you have criteria to determine if and when an engagement has reached an end, and if so, do you have a policy for determining next steps?

- What avenues are available to your organization to help promote responsible public policy on climate?

- How can your organization best use its influence to catalyze climate action among its peers and across networks and constituents?

- Is impact investing/climate finance being considered by your organization to accelerate the transition to low carbon energy?

- Is there adequate communication and alignment between your institution's internal investment arms, i.e., Chief Investment Officers, investment committees and/or Board of Directors, and shareholder advocacy staff and external financial consultants/advisors?

- Have you asked your fund managers how they assess their securities holdings for carbon asset-risk exposure and if they ask companies in their portfolios to take action to reduce such risks?

We hope these questions are useful in stimulating productive discussions among the relevant stakeholders of your organization and would greatly appreciate any feedback about how they were used and how they might be improved.

About the Interfaith Center on Corporate Responsibility (ICCR)

Currently celebrating its 44th year, ICCR is the pioneer coalition of active shareholders who view the management of their investments as a catalyst for change. Its 300 member organizations with over $100 billion in AUM have an enduring record of corporate engagement that has demonstrated influence on policies promoting justice and sustainability in the world.

Excerpt from: Acting on Climate Change: Solutions by Canadian Scholars

Catherine Potvin, PhD, and Co-Authors*
Department of Biology, McGill University

Since 2013, United Nations Secretary-General Ban Ki-moon has been urging countries around the world to adopt ambitious climate change policies so as to avoid a global temperature increase of more than 2°C during this century. Answering this call, we formed the *Sustainable Canada Dialogues*, an initiative that mobilizes over 60 researchers from every province, working to identify a possible pathway to a low-carbon economy in Canada. Participating scholars represent disciplines across engineering, the sciences, and social sciences, with sustainability at the heart of our research programs.

Our position paper, *Acting on Climate Change: Solutions from Canadian Scholars,* launched in March 2015, identifies ten policy orientations illustrated by actions that could be immediately adopted to kick-start Canada's necessary transition to a low-carbon economy and a sustainable society. Scholars from *Sustainable Canada Dialogues* unanimously recommend putting a price on carbon.

Besides putting a price on carbon, *Acting on Climate Change: Solutions from Canadian Scholars* examines how Canada can reduce its greenhouse gas emissions (GHG) by (1) producing electricity with low-carbon-emissions sources; (2) modifying energy consumption through evolving urban design and transportation advancements; and (3) linking the transition to a low-carbon economy with a broader sustainability agenda, through the creation of participatory, well-coordinated, and open governance institutions that engage the Canadian public. Our proposals take into account Canada's assets and are based on the well-accepted "polluter pays" principle. They are presented in detail in the core document, which can be downloaded from the *Sustainable Canada Dialogues* website.

In the short term, policy orientations that could trigger climate action in Canada include:

- Implementing either a national carbon tax or a national economy-wide cap and trade program;
- Eliminating subsidies to the fossil fuel industry and fully integrating the oil and gas production sector into climate policies;
- Integrating sustainability and climate change into landscape planning at the regional and city levels to ensure that, among other goals, new and maintenance infrastructure investments are consistent with the long-term goal of decarbonizing.

In the short to medium terms, the transition to a low-carbon economy could be facilitated by

- East-West intelligent grid connections that allow provinces producing hydro-electricity to sell electricity to their neighbors while taking full advantage of Canada's low-carbon energy potential;
- Well-managed energy-efficiency programs that produce significant positive economic returns across the board, through cost savings as well as job creation. Energy-efficiency programs could target the building sector and other industries.

In the short to long terms, the transition could support a transportation "transformation":

- Transportation strategies that move the sector away from its dependence on fossil fuels could rest on the implementation of a basket of options, ranging from electrification to collective and active transportation.

Because renewable energy resources are plentiful, we propose that Canada could be 100 percent reliant on low-carbon electricity by 2035.[1] This makes it possible, in turn, to adopt a long-term target of at least an 80 percent reduction in emissions by the middle of the century, consistent with Canada's international climate mitigation responsibility and current targets adopted by other leading Organization for Co-operation and Development (OECD) nations and trade partners.[2] In the short term, Canada, in keeping with its historical position of aligning with United States' targets, could adopt a 2025 target of 26%–28% GHG reductions relative to our 2005 levels.

We envision climate policy as the ongoing, long-term project of making the *transition* to a low-carbon society and economy.[3] This notion of transition[4] has many advantages: the

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80% target establishes the direction of change, allowing Canada to plan for the future while recognizing that goals will take time to accomplish. It permits governments, businesses, and citizens to situate their activities within a context of predictable changes. As with other major transitions (past or future), such as industrialization or electrification, there will be controversies and setbacks. Some economic sectors will contract as others expand. The most important aspect of Canadian climate policies is to build a sustainable future *starting today*.

The international landscape has changed substantially since Canada withdrew from the Kyoto Protocol in December 2011. Canada's major trade partner, the United States, signed a major climate agreement with China. They also doubled their GHG emissions reduction target in 2014, sending a clear signal to the industry. According to Bloomberg *New Energy Finance,* clean energy investments in the USA alone increased from USD 10 to USD 50 billion between 2004 and 2014,[5] with homes becoming a "competitive battleground, with utilities, device vendors, third-party solar providers, and even telecom companies indicating that they may have a role to play in intelligent residential energy systems." Rooftop solar is the fastest growing form of distributed energy.

Furthermore, in 2011, the International Energy Agency estimated that investments for energy efficiency were worth USD 310–360 billion.[6] In 2012, direct clean-energy sector jobs in Canada totaled 23,700—just above the 22,340 direct oil sands jobs.[7] A clear climate policy would increase certainty in Canada's business environment, encouraging companies to further invest in low-carbon technologies.[8]

As early as 2007, the United Nations Framework Convention on Climate Change (UNFCCC) published a report[9] examining the investment and financial flows needed to

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reduce greenhouse gas emissions. A key conclusion was that investments made at the time of renewing infrastructure were among the most efficient, since they avoid premature replacement of capital stock. The report concluded that "investment decisions…taken today will affect the world's emission profile in the future." More recently, in 2014, the *New Climate Economy Report*[10] dedicated a chapter to finance, concluding that the transition to a low-carbon economy will demand significant investment by all sectors of society, from industry to households, and emphasizing the essential role governments will need to play through direct investment in infrastructure and by putting in place policies and regulations that will orient private investment toward the low-carbon economy.

The UNFCCC Financial Flow report[11] also concluded that, in the absence of investment in climate change mitigation, the cost of adaptation would soar. For example, in the United States, natural catastrophes (floods and extreme weather events) that are predicted to increase in frequency as the climate changes cost the insurance industry $35 billion in property losses, up $11 billion over the last decade's average. In 2011, a report from the National Roundtable on Environment and Economy estimated that the cost of climate change for Canada will be roughly $5 billion per year in 2020, with a four- to eight-fold increase by 2050.[12] Effective climate change mitigation will actually reduce costs over the long run.

The specific transition pathways to a low-carbon economy in Canada that we propose could build on Canadians' expectations of social and environmental well-being toward a collective vision of regenerative sustainability. The World Commission on Environment and Development (1987)[13] recognized that certain forms of economic development were causing environmental damage, which led to the notion of sustainable development as ''development that meets the needs of the present without compromising the ability of future generations to meet their own needs.'' More recently, discussions in relation to sustainability have begun to view sustainability as a property of desired futures that takes into account the ecological, social, and economic consequences of different courses of action.[14] This view led to the development of the concept of regenerative sustainability, which proposes looking for human activities that improve both environmental and human

10. The Global Commission on the Economy and Climate. 2014. *The New Climate Economy.* Available from http://newclimateeconomy.report/

11. United Nations Framework Convention on Climate Change (UNFCCC). 2007. "Investment and Financial Flows To Address Climate Change." Available from http://unfccc.int/resource/docs/publications/financial_flows.pdf

12. National Round Table on the Environment and the Economy. 2011. "Climate Prosperity: Paying the price: The economic impacts of climate change for Canada." Available from http://www.fcm.ca/Documents/reports/PCP/paying_the_price_EN.pdf

13. World Commission on Environment and Development. 1987. *Our Common Future*. Oxford: Oxford University Press.

14. Robinson, J. 2004. "Squaring the Circle: Some thoughts on the idea of sustainable development." *Ecological Economics* 48(4): 369-384.

well-being.[15] In this context, many mitigation measures, such as those related to the transformation of transportation system and urban spaces, are "worth doing anyway"—independent of climate change.[16]

This novel vision of sustainability breaks away from early discourses that cast sustainability in terms of reducing harm and that have been criticized as uninspiring.[17] We have identified viable policy orientations that will have a large impact derived from our expertise and dialogue among our members. We do not claim to offer all possible policies or incentives to achieve sustainability, and we understand that further analysis, debate, and refinement will be required. However, in virtually all cases, our proposals to decarbonize are consistent with international[18] and national[19] analyses of viable policy options.

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15. Svec, P., R. Berkebile, and J.A. Todd. 2012. "REGEN: toward a tool for regenerative thinking." *Building Research & Information* 40(1): 81-94. See the 2015 special issue of *Building Research and Information* on "Net-zero and net-positive design" 43(1).

16. See, for example, Sathaye, J., A. Najam, C. Cocklin, T. Heller, F. Lecocq, J. Llanes-Regueiro, J. Pan, G. Petschel-Held, S. Rayner, J. Robinson, R. Schaeffer, Y. Sokona, R. Swart, H. Winkler. 2007. "Sustainable Development and Mitigation." In *Climate Change 2007: Mitigation,* Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, edited by B. Metz, O.R. Davidson, P.R. Bosch, R. Dave, and L.A. Meyer, 691-743. Cambridge: Cambridge University Press. On mainstreaming climate change into underlying sustainable development pathways, see Burch, S., A. Shaw, A. Dale, J. Robinson. 2014. "Triggering transformative change: A development path approach to climate change response in communities." *Climate Policy* 14(4): 467-487.

17. Robinson J. and R.J. Cole. 2015. "Theoretical underpinnings of regenerative sustainability." *Building Research & Information* 43(2): 133-143.

18. IPCC. 2014. *Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, edited by O. Edenhofer, R. Pichs-Madruga, Y. Sokona, E. Farahani, S. Kadner, K. Seyboth, A. Adler, I. Baum, S. Brunner, P. Eickemeier, B. Kriemann, J. Savolainen, S. Schlömer, C. von Stechow, T. Zwickel and J.C. Minx. Cambridge and New York: Cambridge University Press. Available from http://mitigation2014.org/report/publication; The Global Commission on the Economy and Climate. 2014. "The New Climate Economy." Available from http://newclimateeconomy.report/; European Commission. 2015. "EU action on climate." Last updated March 26. http://ec.europa.eu/clima/policies/brief/eu/index_en.htm; Ministère de L'Écologie, du Développement Durable et de l'Énergie. 2013. "Rapport de la France: Au titre du paragraphe 2 de l'article 3 de la décision n°208/2004/CE du Parlement européen et du conseil du 11 février 2004. Actualisation 2013." Available from http://www.developpement-durable.gouv.fr/IMG/pdf/Fr_RMS_2013__.pdf; Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety. 2014. "Climate Protection in Figures Facts, Trends and Incentives for German Climate Policy". Available from http://www.bmub.bund.de/fileadmin/Daten_BMU/Pools/Broschueren/klimaschutz_in_zahlen_broschuere_en_bf.pdf; Ministry of the Environment: Government of Japan. 2013. "Japan's Climate Change Policies." Available from http://www.env.go.jp/en/focus/docs/files/20130412-68.pdf; https://www.regjeringen.no/pages/38117723/PDFS/STM201120120021000EN_PDFS.pdf; Department of Energy and Climate Change. 2010. "Beyond Copenhagen: The UK Government's International Climate Change Action Plan. Available from http://www.theclimategroup.org/_assets/files/DECC-International-Climate-Change-Action-Plan.pdf; The Whitehouse Washington. 2013. "The President's Climate Action Plan." Available from http://www.whitehouse.gov/sites/default/files/image/president27sclimateactionplan.pdf

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We believe that presenting serious options is long overdue in Canada and hope that our input will help governments at all levels to make ambitious and thoughtful commitments to emission reductions before the December 2015 Paris-Climate Conference.

Sustainable Canada Dialogues collaborated with the OURANOS consortium, which carried out climate simulations for the position paper. The simulations, based on greenhouse gas mitigation scenarios of the Intergovernmental Panel on Climate Change (IPCC), show that immediate global actions to reduce greenhouse gas emissions would successfully limit temperature increases in Canada. The time is now ripe to initiate ambitious climate-change mitigation efforts in Canada.

Corresponding author:

Catherine Potvin
Department of Biology, McGill University
1205 Dr Penfield, Montreal, H3R 2B7, Québec, Canada
Phone: 514-398-3730

Co-Authors

Aitken, S., Faculty of Forestry, University of British Columbia; **Anctil, F.**, Institut en environnement, développement et société, Université Laval; **Bennett, E.**, Department of Natural Resource Sciences, McGill University; **Berkes, F.**, Natural Resource Institute, University of Manitoba; **Bleau, N.**, Programme environnement bâti, Ouranos; **Bourque, A.**, Programme impacts et adaptation, Ouranos; **Brown, B.**, Department of Philosophy, University of Lethbridge; **Burch, S.**, Department of Geography and Environmental Management, University of Waterloo; **Byrne, J.**, Department of Geography, University of Lethbridge; **Creed, I.** Department of Biology, Western University; **Cunsolo Willox, A.**, Department of Nursing and Indigenous Studies, Cape Breton University; **Dale, A.**, School of Environment and Sustainability, Royal Roads University; **de Lange, D.**, Ted Rogers School of Management, Ryerson University; **Dyck, B.**, Asper School of Business, University of Manitoba; **Entz, M.**, Department of Plant Science, University of Manitoba; **Etcheverry, J.**, Faculty of Environmental Studies, York University; **Fenech, A.,** Climate Laboratory, University of Prince Edward Island; **Fraser, L.,** Faculty of Science, Thompson Rivers University; **Godbout, S.**, Sciences biologiques, Université Laval; **Henriques, I.**, Schulich School of Business, York University; **Heyland, A.**, Department of Integrative Biology, Guelph University; **Hoberg, G.**, Faculty of Forestry, University of British Columbia; **Holden, M.**, Department of Urban Studies and Department of Geography, Simon Fraser University; **Huang, G.,** Institute for Energy, Environment and Sustainable Communities, University of Regina; **Jacob, A.**, Department of Geography,

University of Victoria; **Jodoin, S.**, Faculty of Law, McGill University; **Kemper, A.**, Faculty of Entrepreneurship, Ryerson University; **Lucotte, M.**, Département des sciences de la terre et de l'atmosphère, Université de Québec à Montréal; **Maranger, R.**, Département des sciences biologiques, Université de Montréal; **Margolis, L.**, John H. Daniels Faculty of Architecture, Landscape and Design, University of Toronto; **Matthews, R.**, Department of Sociology, University of British Columbia; **Mauro, I.**, Department of Geography, University of Winnipeg; **McDonnell, J.**, School of Environment and Sustainability, University of Saskatchewan; **Meadowcroft, J.**, School of Public Policy and Administration, Carleton University; **Messier, C.,** Département des sciences biologiques, Université de Québec en Outaouais; **Mkandawire, M.**, Verschuren Centre for Sustainability in Energy and the Environment, Cape Breton University; **Morency, C.**, Département des génies civil, géologique et des mines, École Polytechnique de Montréal; **Mousseau, N.**, Département de physique, Université de Montréal; **Oakes, K.**, Department of Biology, Cape Breton University; **Otto, S.**, Department of Zoology, University of British Columbia; **Palmater, P.**, Departments of Politics and Public Administration, Ryerson University; **Palmer, T. S**., Knowledge Transfer Consultant; **Paquin, D.**, Simulations et analyses climatiques, Ouranos; **Perl, A.**, Department of Political Science, Simon Fraser University; **Potvin, A.**, École d'architecture, Université Laval; **Ramos, H.**, Department of Sociology and Social Anthropology, Dalhousie University; **Raudsepp-Hearne, C.**, Consultant; **Robinson, J.**, Institute for Resources, Environment and Sustainability, and Department of Geography, University of British Columbia; **Simard, S.**, Faculty of Forestry, University of British Columbia; **Sinclair, B.J.**, Department of Biology, Western University; **Slawinski, N.**, Faculty of Business Administration, Memorial University; **Stoddart, M.**, Department of Sociology, Memorial University; **Sylvester**, **S.**, Centre for Dialogue, Simon Fraser University; **Villard, M-A.**, Département de biologie, Université de Moncton; **Villeneuve, C**, Département des sciences, Université de Québec à Chicoutimi; **Wesche, S.**, Department of Geography, University of Ottawa; **Wright, T.**, Faculty of Science, Dalhousie University.

Really? Teaching Chevron at Bard's MBA in Sustainability

Kathy Hipple
Finance Lecturer, Bard College MBA in Sustainability, and Founding Partner, Noosphere

Hunter Lovins
Professor, Sustainable Management Bard MBA, President Natural Capitalism Solutions

Juzer Rangoonwala
Bard MBA in Sustainability, Class of 2015

Abstract

The Bard's MBA in Sustainability Finance course asked students to work in groups to tackle some of the complex questions facing Chevron. Their journey mirrored the one most of us in sustainability undertake—from naïveté to maturity in our thought processes as we strive to solve the direst problems facing us today. Students rightly assumed that an energy transition is both inevitable and well underway. Their initial impulse, however, was to call for an immediate and nearly wholesale shift from fossil fuel assets to

renewable energy, ignoring the impact on revenues, employees, and global energy needs. Then, they were armed with probing questions to help them and were given three weeks to refine their thinking. Their initial advice to pivot wholly toward renewables evolved into a nuanced exploration of how an entrenched super-major oil and gas company could either be opportunistic or remain an obstructionist powerhouse. The students' thinking matured. They became strategists.

Their earlier radicalism to divest from fossil fuels became tempered. Their recommendations to Chevron, and the shareholder resolutions they crafted as part of their assignment, became realistic. The possibility that Chevron would totally divest itself from fossil fuels did not make the final cut. Perhaps it was edited out. Perhaps it appeared to them—after careful consideration—too radical a possibility. This, too, seemed an important teaching lesson, one that mirrors the real world. Managers at most legacy companies do not seriously entertain the idea of divesting from a profitable business—often until it's too late.

Really? Teaching Chevron at Bard's MBA in Sustainability

Our ability to solve problems in the future will derive from the depth and quality of discussions in our classrooms today. The debates in MBA classrooms presage the debates in the boardrooms of the future. BARD MBA in Sustainability encourages such debates in the classroom with an integrated, bottom line focus. As a BARD MBA in Sustainability finance professor, my goals are to teach core finance and inspire a new way of thinking—to challenge and solve the problems of our future by reshaping our thinking today. To that end, along with the problem sets that focus on traditional finance concepts—time value of money (TVM), capital-asset pricing model (CAPM), weighted average cost of capital (WACC), and the like—I wanted a finance course assignment to include a case study that illustrated complex, real-life challenges requiring the most demanding financial calculations and one based on a company that sustainability students would find generally difficult to embrace. We all love Patagonia and Unilever. But how do we reform a super-major oil and gas producer, especially one that, for many, embodies the most intransigent of the major oil companies?

The Case Study

Searching for a meaty, yet thorny subject, we homed in on Chevron. Unfortunately, the Harvard Business School (HBS) case study, "What Should Chevron Do?" was not yet available for non-HBS students, and was still undergoing revisions, according to co-author George Serafeim. Cary Krosinsky, sustainability author and editor (including of the *JEI*), suggested we put together our own case study based on a variety of publicly available sources, including the Carbon Tracker, Bill McKibben's article in Rolling Stone, the BP *Energy Outlook,* and Chevron's own financial statements. This case study would allow students to wrestle with the same issues.

The class of 13 was divided into three randomly selected groups that would consider Chevron's situation separately.* What should Chevron's fundamental business strategy do so that the company could adapt to the changing realities of our times while continuing to provide value to its shareholders? Can Chevron shift a business model that is currently based on an assumption about the sustained market demand for their products to one that addresses the reality of a carbon-constrained world? What does an alternate reality look like for Chevron with billions of dollars already invested in oil explorations that, in the future, may not provide the expected ROI because the company may not be allowed to extract and sell oil? Should Chevron take a proactive stance acknowledging trends in the energy markets or continue to hedge its bets on growth driven by fossil fuels?

Such questions and analyses are routine for traditional business schools but are rarely asked from a perspective that encourages system thinking, holistic transformative business-model innovation, or shareholder activism. At Bard MBA in Sustainability, the faculty and administration strive to impart in-depth knowledge of core business skills through the lens of sustainability. The curriculum provides all the management essentials, but with a continual focus on the Integrated Bottom Line: economic success, based on environmental integrity, and social equity.

Students met in groups for 30 minutes to prepare a 10-minute address, answering three questions, which my colleague Robert Schwarz, manager, Investor Initiative for Sustainable Exchanges, at Ceres, helped me craft.

The questions were:

1. How can Chevron be most opportunistic during a rapid transition to renewable energy?
2. How would Chevron adapt to a sudden, globally implemented $100/ton price on CO_2 emissions (assuming that a carbon tax is applied at the point where carbon enters the economy)?
3. How should Chevron respond to activist investors who claim that the company has not adequately disclosed risks in its financial statements, including whether the assets on its books are at risk for becoming stranded if oil prices remain at $50 to $75/barrel or if carbon regulation is imposed?

Initial Recommendations to Chevron's Board: Idealistic or Simplistic?

The three groups made their presentations to an imaginary Chevron board. Their recommendations, crafted hastily by necessity, suggested that Chevron pivot almost entirely toward renewables, disclose potentially stranded assets, and lead the energy transition to renewables as a global energy company. Their responses, not unexpectedly, were idealistic and overly simplistic. The rapid-fire-response style of classroom presentations did not afford students sufficient time to consider the difficulties a legacy company might have in radically transforming its business model. The subsequent part of the case study—written answers to the same questions, and preparation of three related shareholder resolutions—would illustrate their maturing thought process as they considered Chevron's dilemma more deeply.

Thinking Evolves Rapidly

The students' written responses, submitted two weeks later, were well thought out and far more nuanced than their initial presentations. The prevalent thought was that an energy transition is not only inevitable but well underway. This transition, according to one group, offers Chevron a chance to rebrand itself.

> *Shifting from oil to renewable energy empowers Chevron to enrich the company vision with a new brand. Chevron can rebrand itself as 'green' and own its position as the market and industry leader in green energy—challenging the notion that the world is run on oil . . . . Green is the new black.* (Columbare et al.)

All three groups recommended that the company move rapidly to engage with renewables but recognized the complexity of any such corporate action, given Chevron's core competency in the oil and gas business—acknowledging a complexity that had not been expressed in their initial presentations. *"Positioning Chevron to capitalize on a rapid transition to renewable energy would be virtually impossible without some foresight and longer-term planning from its management."* (Kalafa et al.) However, Chevron's "*attendant expertise in exploration, infrastructure development, supply chains logistics can be positioned as a service to the renewable energy sector.*"

Beyond suggesting the rapid expansion into the renewables sector, all groups observed that Chevron could be most opportunistic by acquiring renewables companies, given its strong financial position and rich human resources.

> *Chevron can utilize its strong financial positions to hedge against the risks of this global shift by investing in cleaner, more sustainable sources of energy. . . . Chevron can leverage its financial position to bring in top-tier engineers and scientists, as well as strategists and consultants, to formulate an overall plan that enables Chevron to maintain market share and define the emerging market for replacements to fossil, liquid hydrocarbon fuels.* (Souza et al.)

No Calls for Divestment

Divestment was not mentioned—even once—in any of the students' written work. It had been raised during group discussions but had not made it into the final drafts. In sharp contrast to their initial classroom presentations, divestment—in the form of a spinoff or by separating into two companies—was not offered as a potential solution for Chevron.

This was especially striking given the students' awareness of both E.ON and RWE, Europe's two biggest utility companies, both of which are now undergoing profound

business transformations. E.ON had agreed to spin off its fossil fuels, nuclear, and hydropower assets; RWE, after its profit dropped $5.8 billion in a year, opted to transform its business model to become a distributed utility, also shedding its fossil and nuclear holdings. Students calculated, however—or learned from others' calculations—what might happen if Chevron's high-cost fossil fuel assets became stranded. However, divestment didn't present itself as the optimal choice for these students. Why not? Did they see a spinoff as effectively shifting the problem rather than solving it?

To Move Quickly or Use Time as an Asset?

It is indeed a conundrum for an entrenched company to focus on emerging technologies when abundant cash flows from its core business continue to dwarf those produced by smaller, newer products and services. Throughout history, it seems more likely that an upstart company will disrupt an industry than a legacy company will pivot in time. One student group assumed Chevron would have time to pivot its business.

> *Renewable energy is not a threat to Chevron's market share in the near future. Time is a valuable asset not often quantified, but Chevron should leverage time to assess options that increase their already large competitive advantage."* (Souza et al.)

An opposing view of time was expressed by another group. These students urged Chevron to move quickly, since renewable energy companies would be less eager to sell or collaborate with Chevron as they become more successful and *"Chevron's financial clout will have less power within renewables."* (Kalafa et al.) They described how Chevron could use its ample cash flow and assets to absorb competitive renewable energy companies quickly and compete in the new sector.

> *A spree of acquisitions in the energy sector would most likely emerge from the previous oil and gas giants, so beginning that process sooner would be most cost-effective and allow Chevron an advantage over its larger competitors.* (Kalafa et al.)

No Longer Naïve, Still Optimistic

Throughout their writing, the students remained optimistic about Chevron's potential to use its financial leverage for what we, in the sustainability space, perceive to be the greater good. Only one group raised the possibility that Chevron may choose "myopic tactics": being obstructionist or opting to leverage its financial clout to buy and kill emerging leaders in the renewable energy sector, *"impeding the transition to a less fossil-fuel-intensive global economy."* (Kalafa et al.) However, they ultimately believed these tactics, if undertaken by Chevron, would only *"delay rather than prevent a transition from fossil fuels."*

This was not a group to bash companies, even those whose past corporate actions may give us pause.

> *Chevron has tremendous financial and human capital. Strategic planning will allow the company to continue accessing the full extent of those capitals should protection of natural capital be required.* (Souza et al.)

Dissenting Views on Adequate Disclosure of Risk

Had Chevron, in its financial statements, adequately disclosed the risks of potentially stranded assets should oil remain at $50 to $75/barrel or if climate protection makes extraction non-viable? The groups' responses varied considerably. *"Chevron has adequately disclosed risk in financial statements because the risk of assets being stranded has been assessed and determined to be low."* (Kalafa et al.) Another group disagreed.

> *Chevron must differentiate itself from its competitors by publicly recognizing certain aspects of fossil fuel risk rather than completely denying these risks. Strategically embracing the dynamics of this shift in mentality at both the regulatory and business level enables Chevron to turn a potential impediment to continued success into an opportunity to gain an advantage in the energy industry.* (Souza et al.)

Shareholder Resolutions Call for Investments in Renewables; Concern About Stranded Assets

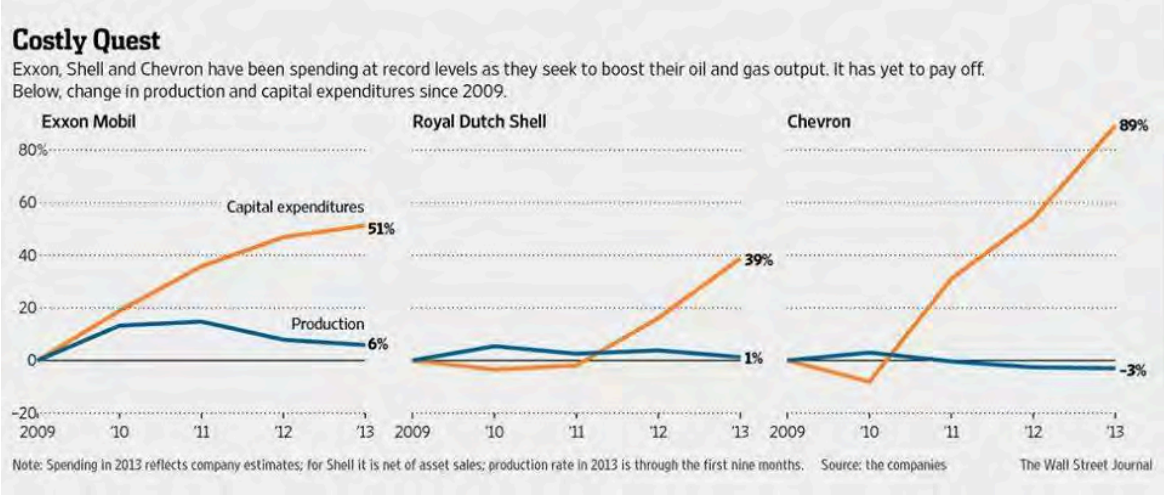
As part of the assignment, students were asked to craft shareholder resolutions. In their resolutions, all three groups focused on increasing transparency about levels of investments in renewables or called for increasing investments in renewable energy.

One group (Souza et al.) suggested that executive compensation be tied to environmental spending and risk, and recommended setting up a fund to withhold compensation for five years with a claw-back mechanism should excessive risk lead to potentially ill-gotten compensation. Another group recommended investing in carbon offsets. (Marino et al.)

One group (Kalafa et al.), sounding much like activist investors not typically associated with sustainable investors, asked Chevron to increase its dividend until a long-term

strategy for renewables is adopted, fearing that excess cash might encourage investing in *"high-cost, high-risk projects that yield decreasing profits," due to the "rising possibility of stranded assets and Chevron's 'capex crisis.' "*(Figure 1)

Figure 1: Costly Quest—Change in Production and Capital Expenditures



Source: *"Big Oil Companies Struggle to Justify Soaring Project Costs," by Daniel Gilbert and Justin Scheck.* The Wall Street Journal, Jan. 28, 2014.

No Despair

If the only sin is despair, the students demonstrated they were far from that risk. But although their optimism radiated throughout the assignment, it was not the blind optimism of the uninformed. Theirs was tempered by their realistic sense that Chevron may remain an obstructionist player in the energy space. Steeped in their sustainability studies, they understand the importance of addressing carbon emissions, and identified Chevron's role in geothermal as a potential opening. Similarly, they mentioned its large position in natural gas as an opening for the company to lead the effort to reduce carbon emissions, if fracking concerns are addressed.

Conclusion

During the three weeks the Bard MBA in Sustainability students explored Chevron's predicament, their thinking evolved from a simplistic "switch to renewables" stance to a refined exploration of how a super-major oil and gas company could pivot responsibly to renewables, potentially rebrand itself, and leverage its position as a global energy supplier to lead an energy transition. While the process of refining their thinking made them more "reasonable," it trapped them into the belief that the company had the luxury of time. By backing away from their earlier calls for Chevron to divest, they mirrored the behavior of our entire society that believes we can solve the climate crisis incrementally. Had a

reasonable dollop of realism replaced a radical solution? Or had they assumed that Chevron could find ample time to transition when—we believe inevitably—they will have to exit their fossil fuel business.

Class discussion brought home to us all that this remains the critical issue of our times, and that none of us yet has an easy answer.

Biographies

Kathy Hipple, a graduate of Marlboro's Sustainability MBA, is a founding partner of Noosphere Marketing, and an adjunct professor at Bard's MBA for Sustainability, where she teaches Finance through a sustainability lens. At Noosphere, she works with mission-driven organizations, financial services, and tech firms to advance—and communicate—their ESG initiatives. While teaching Finance, Kathy infuses sustainability and regenerative capitalism into a traditional finance curriculum.

Prior to launching her firm, Kathy had an extensive background on Wall Street, working with international institutional clients at Merrill Lynch, and in local search, where she ran a NYC-based media company with nearly 200 employees and $35 million in revenues and served on the national board of the Local Search Association.

She is a founding member of the Generative Council, a group of women leaders in the for-profit and not-for-profit sector. She serves on the boards of Meals on Wheels in Bennington, Vermont; Sawah Bali, in Bali, Indonesia; and The Center for Nature and Leadership, in Washington, DC. She is working to launch a Sustainable Women's Investment fund, which will select investments through a gender and sustainability lens. The mother of three, she is a passionate outdoorswoman, a competitive cyclist, and classical pianist.

She is keenly interested in:

- How financial capital can be leveraged to create a flourishing future
- Paradigm shifts
- The outdoors and how it deeply connects us to nature.

KathrynHipple@gmail.com

L. Hunter Lovins is President of Natural Capitalism Solutions. NCS, helps companies, communities, and countries implement additional regenerative practices profitably. A professor of sustainable business management at Bard College, Hunter was named a Master at the De Tao Academy in Shanghai. She sits on the steering committee of the Club of Rome, Alliance for Sustainability And Prosperity, and Capital Institute Advisory Board. A founding mentor of the Unreasonable Institute, she teaches entrepreneuring and coaches social enterprises around the world. She is a founding partner in Principium, an impact-investing firm.

A consultant to scores of industries and governments worldwide, including International Finance Corporation, Unilever, Walmart, the United Nations, and Royal Dutch Shell, as well as sustainability champions Interface, Patagonia, and Clif Bar, she has briefed heads of state, leaders of the numerous local governments, the Pentagon, and about 30 other countries, as well as the UN, and the U.S. Congress.

Hunter has written 15 books and hundreds of articles. She has won dozens of awards, including the European Sustainability Pioneer award, and the Right Livelihood Award. Time Magazine recognized her as a Millennium Hero for the Planet, and Newsweek called her the Green Business Icon.

Juzer Rangoonwala, Bard MBA in Sustainability, Class of 2015, is a proven leader in IT management, and an aspiring sustainability professional, with an affinity for numbers and a keen interest in sustainable finance. www.linkedin.com/in/juzerzr.

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Divestment and Climate Bonds

Jordan Sabin

Over the past few months, the divestment movement has gained momentum at universities around the globe, and what started as a niche movement has quickly turned into a worldwide call for change. Comparing themselves to the anti-apartheid movement, divestment campaigners have called for university endowments to immediately divest from fossil fuels.

The general argument for divestment is simple: society is responsible for climate change and has a moral responsibility to stop it. This is difficult to dispute; an ever-growing body of scientific evidence demonstrates that global climate change is a result of human activity, and most scientists agree that a global increase in temperature will have devastating effects.

Certainly, divestment campaigners are correct to argue that we are burning carbon at an unacceptable rate. Nonetheless, there is a fine line between being an activist and an alarmist: both groups recognize problems; however, activists take steps to correct them while alarmists exacerbate them.

What the campaign does not seem to realize is that divestment will not solve the unburnable carbon dilemma. We are not facing a carbon bubble because *producers continue to drill for oil*. We are facing the bubble because *consumers continue to burn carbon*. As long as cars run on gasoline and heaters use oil, we will face the same problem. As long as we are reliant on oil to enjoy a modern standard of living, companies like BP will have an incentive to drill, regardless of their stockholders' views.

We don't need divestment. We need investment.

The transition to a low-carbon economy will require investing in a technological revolution. We need advances in clean transportation and heating systems that curb our appetite for oil. We need advances in renewable energy and grid technology to reduce the need to burn coal.

Only through technological progress can we hope to limit our dependence on fossil fuels.

Historically, universities have driven such changes in technology—there is no need to change this now. Instead of asking endowments to divest from fossil fuel holdings, we should be asking them to invest their returns into the research and development of green technologies. In this way, fossil fuel companies will indirectly finance the energy transition.

Now, admittedly, there is a significant problem with this approach: research and development take decades, time we do not have in the immediate fight against climate change. Fortunately, many green technologies are now mature enough to implement on a large scale. Unfortunately, many lack the capital necessary for widespread deployment. University endowments can solve this problem.

Diversification is central to institutional management, and endowments frequently hold bonds as part of their portfolio. Considering these facts, climate bonds offer endowment managers an opportunity to demonstrate their universities' commitment to building a sustainable future. In the past, universities have offered green bonds, but the time has come for them to act as purchasers as well.

The purchase of green bonds should appeal to universities for two reasons. First, it offers managers an opportunity to implement technologies often developed on their campuses. It is common for university innovations to languish in labs because of the high cost of entry into markets. Endowment managers can help facilitate the widespread use of technologies developed by their researchers through the purchase of green bonds in solar and other green technology projects.

More importantly, as divestment groups begin to take legal action, investment in climate bonds allows managers to prove they are factoring climate change into their investment decisions. Demonstrating that they are considering multiple investment futures will contradict claims that endowments are in breach of their fiduciary duty.

The divestment campaign has become an unexpectedly complex movement in its short history. Despite its growing popularity, it seems unrealistic to expect divestment to meaningfully curb climate change. Climate bonds, however, offer an opportunity to direct funds to those projects with the best chance of mitigating global warming. If endowments want to prove that they are considering the impact a changing climate has on the future, they should be investing in green bonds, not divesting from fossil fuel.

Biography

Jordan is a rising senior at Yale University where he studies mechanical engineering and economics. From northern Connecticut, Jordan grew up in an environmentally conscious town, and during college has become interested in how technology and financing can solve the climate challenges we are facing. For the *JEI,* he covers climate bonds and related green finance topics. In his free time, Jordan loves hockey, skiing, golf, and wasting time on Netflix.

What to Do about Europe's Market Fundamentalism: Embrace the European Tradition of Social Banking and Investing

Frank Jan de Graaf
Amsterdam University of Applied Sciences, CAREM, Wenckebachweg, Amsterdam The Netherlands

Sean Kidney
Climate Bonds Initiative

Abstract

In this article, a revised version of a response to the European Commission's 2013 Green Paper, *Long-Term Financing of the European Economy*, we argue that European thinking is trapped in a narrow conceptualization of financial markets, which hinders long-term sustainable development and an economy that should serve future generations. We then make a case for a hybrid banking system that will enable a freer and more sustainable European financial market.*

*This article is based on the response of the Network for Sustainable Financial Markets to the European Union green paper on long-term finance. Dr. Frank Jan de Graaf, Amsterdam University of Applied Sciences/University of Amsterdam Business School, and Sean Kidney, Climate Bonds Initiative, were major contributors to the Network's response, which was supported by: Individuals supporting this response: Daniela Carosio, Director, Sustainable Equity Value; Ralf Frank, Secretary General, DVFA Society of Investment Professionals in Germany; John Fullerton, President & Founder, Capital Institute; Hazel Henderson, President, Ethical Markets Media; Chris Hewett, Fellow, The Finance Innovation Lab; John Jarrett, Partner and Co-Founder, BHJ Partners; Keith Johnson, Chair, Reinhart Institutional Investor Services;Cary Krosinsky, Executive Director, Sustainable Financial Markets; Kazutaka Kuroda, Social Media Director, Network for Sustainable Financial Markets; Jeremy Leggett, Chair, SolarCentury; Tim MacDonald, Stonebridge Partnerships; Michael Musuraca, Pension Fund Manager; Nick Silver, Callund Consulting; Steve Podmore, CEO, Transform Capital Management, UK; Peter Sweatman, Chief Executive, Climate Strategy & Partners; Raj Thamotheram, CEO, Preventable Surprises; Gabriel Thoumi, CFA, Integra LLC; Mark Van Clieaf, Managing Director. MVC Management Corp.; Stephen Viederman, Chair, Finance Committee, Christopher Reynolds Foundation; Prof. Cynthia Williams, Osler Chair in Business Law, Osgoode Hall Law School, York University, Toronto. Signatories are supporting this document in their personal capacities; organizational affiliations were listed for identification purposes only.

What to Do about Europe's Market Fundamentalism: Embrace the European Tradition of Social Banking and Investing

Early in 2013, the European Commission published the Green Paper, *Long-Term Financing of the European Economy*. Although the general approach of the paper was positive, it demonstrated that European thinking is trapped in a narrow conceptualization of financial markets that is hindering long-term sustainable development. In our response, we argue for a hybrid banking system that will enable a freer and more sustainable European financial market.

A strong and free financial market in the European Union needs a healthy social infrastructure in which stakeholders and the financial sector interact and ensure social goals. Investments should be aligned with social well-being to strengthen societies over the long term.

Europe could benefit from a renewed emphasis on financial markets in which businesses and other stakeholders work in concert, something that was once a longstanding tradition. Cooperatives in banking and insurance, pension funds in which employees and employers collaborate, development banks and other forms of private-private partnerships, and public-private partnerships have built European economies. New changes, like those in the environmental field, call for hybrid organizations and institutions comparable to such cooperatives.

In light of the recent financial crisis and continuing instability in developed market economies, a normative debate about how to create healthy economies is needed. If we change our thinking about markets, we can redevelop our financial system.

Market Fundamentalism

Over the last three decades, the EU's free-market ideal has been narrowly interpreted, resulting in a concept that can be called "market fundamentalism." We define *market fundamentalism* as a model in which market interventions are limited to legal measures to ensure effective financial transactions (Stiglitz 2004).

Market fundamentalism is based on the idea that the role of governments is only to set the regulatory constraints of market participants. The better the regulation, the more effectively market participants will operate and the more an economy will flourish. In this model, apart from addressing regulatory frameworks, governments do not actively participate in the market.

This first assumption is further developed by other assumptions of "neoclassical" economic thinking. For example, "clear and transparent standards lead to a market with one level playing field" (assumption 2), and "all information should be available," so that participants, who are only focused on their own interest (assumption 3), can make rational choices (assumption 4). Given these assumptions, the market will be unbalanced at some points, but in the end, it will find some kind of balance between demand and supply. Here on the outskirts of economics, at the overlap between economics and management science, we hit an extensive debate on methodology. Stiglitz (2004, 2010) is well known for criticizing the influence of mainstream economic thinking on development policies. Economists have certain ideological premises that strongly influence their analysis. (See also Frankfurter 2006.) These preferences can also be related to cultural and institutional circumstances (for example, Nooteboom 1999; Aguilera and Jackson 2003; Jackson and Deeg 2008).

Neoclassical thinking is mainstream today in economics. For example, transaction-cost economics, institutional economics, and behavioral economics are linked directly to neoclassical thinking and have all influenced current financial theory. Modern portfolio theory is built on these assumptions. Slowly, however, the critique of modern portfolio theory is increasing. Slager and Koedijk (2007) state that very little has been empirically proven in investment theory. Both Taleb (2007) and Soros (2008) criticize the nonreflective character of modern economic theory as it is applied in investment.

Others have made similar assessments of these methodologies. Nooteboom (2000) argues that economic methodology does not take reflectivity into account or, in other words, it neglects the social constructive dimension of financial markets. Frankfurter (2006) questions the unwanted consequences of current market practices and tries to outline some suggestions for a different market paradigm.

At a micro-economic level, agency theory and contract theory, in which firms are seen as a nexus of contracts, align with this theoretical perspective. Current agency theory has been the critical bridge that some economists (mainly in institutional economics and finance) and law scholars have used to make comparative analyses between various economic models. Within this tradition, the work of La Porta, et al. (1999; 2008) is well known, even to having been given its own acronym, LLSV. These authors try to compare economic systems by relating the level of legal protection extended to shareholders to the successful financial development of a country. Traditionally, a country's development has been measured in stock price development, but more recently, it has also taken into account some GDP measures.

Critical to this concept is the role played by institutions; mainstream economics follows North by defining institutions as "the rules of the game" (North 1990, 1), but only as the

legislative rules. This view contrasts with a more sociological view of the economy in which normative and cognitive aspects of economic transactions are also taken into account (e.g. Aguilera and Jackson 2003; Nooteboom 2003; Jackson and Deeg 2008).

According to this view of market fundamentalism, financial markets operate like any other market. Private parties should lead in the market and preferably should be quoted on the stock market to ensure optimal transparency, which, in turn, should lead to the lowest costs of capital for individuals and companies.

In recent years, the widespread adoption of market fundamentalism by European regulators has led to a neglect of what had been a fruitful European tradition in finance, one in which more subtle mechanisms were emphasized.

Building on a Successful European Tradition of Finance

The key objective of financial markets is to enable individuals and companies to invest in economic activities that serve long-term sustainable development.

Gaining access to capital is a critical mechanism for economic development. At various times in history, private initiatives were unable to tackle socio-economic challenges. Not purely economic, these challenges addressed social issues, such as poverty in rural areas, post-war reconstruction, or economic development in post-unification East Germany. When money was too expensive to enable certain investments, people searched for alternatives and developed structures that would facilitate such investments.

At those times, hybrid partnerships were formed. Public-private partnerships were one form; banks with a cooperative structure, another. When founders did not choose a private company structure, it was most often because risks were difficult to assess—which generally led to a higher cost of capital—and/or certain social objectives were not being met. But most often, it was a combination of both difficult risk assessment and neglect of social objectives. For example, cooperatives were founded in the nineteenth century to develop rural areas where, at the time, lending money to poor farmers was seen as high risk. Risk-sharing in a structure that differed from a private company gave farmers and other small entrepreneurs access to capital.

Europe's Long Tradition of Public-Private Partnerships

Europe has a long tradition of public-private partnerships in finance. In many countries, such as the Netherlands, the main financial institutions were founded by the state or by groups of individuals trying to solve market inefficiencies. *Landesbanken*, cooperative banks, state-owned banks, banks founded by groups of merchants and factory owners are

all examples of this in Europe. (To compare, see Millineux and Terberger 2006; Mettenheim and Butzbach 2012.) One of the first stock markets came into existence when merchants of Amsterdam tried to share risks that they could not undertake individually or share with limited private parties. In developed economies, national states have acted similarly, and in many countries, noncommercial institutions run pension fund systems.

In recent years, similar, European-style, institutions have been founded, such as the European Investment Fund owned by the European Commission, the European Investment Bank, and European stakeholders. Close cooperation among the various partners in finance is called for in the principles of the organization and is demonstrated within its structure and within the partnerships that execute the policies.

Thinking about Financial Regulation Has Been Driven by False Assumptions

Substantial parts of the financial markets are actually organized by noncommercial institutions, even though the mainstream thinking about regulation is that profit-driven, publicly owned companies are dominant (De Graaf & Williams 2009).

The *social* objectives of banks have been underestimated in the last three decades. Neoclassical economists and financial markets theorists have instead emphasized the role of a free market with private companies. They portray privately held, publicly listed banks as role models but portray state-owned companies and other financial organizations that have a different structure as disturbing.

This viewpoint has important implications in the thinking on banking in general and for banking regulation more specifically.

A blind belief in markets as the main force for economic development and discipline is one of the reasons for the current financial crisis according to many critics (Turner 2009; De Graaf and Williams 2009; Stiglitz 2010). For these critics, agency theory guides regulator behavior, and economic participants serve their own interests solely. To control agents (the managers), the shareholders (the principals) need complete information and full control measures. And so, clear control measures—regulation and contracts—are seen as necessary for effective organizations and markets.

However, in Europe the roots of a more complex system exist.

Complement Regulation with Emphasis on Governance and Reputational Interdependencies

Traditionally, the continental European perspective on banking and control has been different: Besides regulation, it has emphasized the role of diverse governance structures

and the role of reputation—regulation and contracts were generally not enough. In this framwork, banks should be designed to create interdependencies between various stakeholders; when one of the stakeholders misbehaves, it should lose its reputation, which will weaken its market position.

Mechanisms influencing reputation have been critical in all forms of finance that have a social objective. They are even more critical in organizations that combine a financial objective with a social one. This is because social objectives and social impact are difficult to measure and, therefore, to regulate and formulate in contracts; as a result, mechanisms relating to reputation and other forms of social control are important.

Within structures in which financial and social objectives are met, long-term finance becomes possible. Long-term finance needs two standards: return on capital and contribution to societal goals. At the moment, however, a "dis-intermediation" is occurring, in the words of Standard & Poor's. Banks are withdrawing from various markets, and other financial institutions are not able to fill the gap left by this withdrawal. Small- and medium-sized enterprises (SMEs), for example, can no longer rely on a long-term stable relationship with their bank and they often need to find alternative financing.

Other means of financing are slowly developing: for example, credit unions in various European countries are growing; mutual guarantees are becoming more important; and institutional investors are developing various bonds to reach other parts of the market.

But Europe's long-term investment challenges—from a social and financial perspective—require mobilization of the full breadth of financial means. When looked at this way, banks and other financial institutions play an essential facilitating role in society, a role in which the "serving function" of finance should be the cornerstone of regulation and governmental policies. Most of the time, this means that hybrid forms of organizations, such as those discussed above, are necessary.

European institutions should lead in promoting the "serving" role of finance to create long-term sustainable markets, learning from a tradition in which stakeholders, governments, and banks together tackle social and environmental issues in a financially sound way.

Hybrid Finance Systems Offer Long-Term Success and Growth

In this article, we have discussed the role of finance in long-term sustainable economic development. We argue for a hybrid finance system, in line with the European tradition.

Financial innovation is of critical importance, as are free financial markets. Only one prerequisite is critical here. Finance should *serve* society by facilitating long-term sustainable economic development. This condition should be the most important principle for regulators. Therefore more hybrid banking structures should be developed.

Finance should be a sector that develops financial instruments that help society to tackle social and environmental issues, instruments that make long-term economic growth possible. The idea that financial companies are there for financial purposes only is a fallacy—a kind of fundamentalism that helps very few in the long term.

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Biographies

Dr. Frank Jan de Graaf is professor (lector) of Corporate Governance and Leadership at the Amsterdam University of Applied Sciences and lectures in the executive education program of the University of Amsterdam Business School.

His research focuses on governance and leadership, with a special interest in financial institutions and the relationship between CSR and internal control. He is co-founder of the Network for Sustainable Financial Markets (NSFM).

Frank Jan started his career as a financial journalist and has been an advisor for responsible investment.

He has published in the *Journal of Business Ethics*; *Critical Perspectives on Accounting*; *UNSW Law Journal*; the *International Journal of Pension Management*; the *Journal of Investing*; *Finance & Control*; *EFMD Global Focus*; and *Business & Society.*

Sean Kidney is the co-founder and chief executive officer of the Climate Bonds Initiative, an investor-focused not-for-profit based in London. It works internationally to mobilize debt-capital markets to fund a rapid, global transition to a low-carbon and climate-resilient economy.

An experienced international speaker, Sean has, over the past year, spoken at conferences and seminars throughout the world. He is a member of the German International Aid Ministry's TRANSfer Expert Group on "Using Climate Financing to Leverage Sustainable Transport," a director of the Network for Sustainable Financial Markets, and a director of the Be Earth inter-governmental organization. He served as a member of the Commonwealth Secretariat's Expert Committee on Climate Finance, is a social marketer and publisher, and was previously an award-winning marketing advisor to a number of the largest Australian pension funds.

THE RISKS AND RETURNS OF FOSSIL FUEL-FREE-INVESTING

John Willis
Portfolio Manager, Sustainable Insight Capital Management

Paul Spence
Head of Portfolio Construction & Analytics, Sustainable Insight Capital Management

1 EXECUTIVE SUMMARY

There is a persistent debate surrounding fossil-fuel-free investing. Financial market participants are examining the implications of such strategies with increasing scrutiny. In this paper, we analyse the performance of three different fossil-fuel-free portfolios, all against the S&P 500 Index. We highlight a number of important considerations the Asset Owner and Asset Manager should contemplate as they embark on the path of fossil-fuel-free investing.

As with all investments clear definitions are necessary. This is particularly true with fossil-fuel-free investments where a wide range of interpretations is possible, in turn, giving rise to a variety of possible investment approaches. Investors must choose whether to opt for the simplicity and clarity of a negative screen or choose the best-in-class approach, perhaps with a carbon tilt, or a highly discretional thematic investment process. Simply by imposing a negative screen, investors can end up omitting anywhere between 11% to close to 20% of the S&P 500 Index.

Prior to examining the returns generated by these portfolios, a suitable benchmark needs to be chosen by which the performance of the Asset Manager can be measured. We find some intriguing decisions on this front, notably the preference for global benchmarks. Interestingly, all three of the fossil-fuel-free portfolios we constructed outperformed the S&P 500 Index over one-year, three-year and five-year time periods, all ending December 2013. Our analysis shows that tighter portfolio constraints do not necessarily hinder performance. Furthermore, with a better performance than their benchmark in an environment of declining volatility, all three portfolios produce a superior risk-adjusted return compared to the S&P 500 Index.

We examine the source of these ex-fossil fuel portfolio returns. Although the omission of the Energy sector may have been anticipated as a significant positive contributor to active returns, the effect on performance by overweighting the Information Technology sector was more difficult to forecast. Performance detractors were also identified; of particular note was the lower beta of the fossil-fuel-free portfolios when compared to the benchmark. Beta alone reduced the active performance of the portfolios by between 3.1 and 4.9%.

Both Asset Owners and Asset Managers need to fully understand both the intentional and unintentional risks associated with a fossil-fuel-free investment strategy before chasing these returns.

2 INTRODUCTION

Over the past year, the idea of creating fossil-fuel-free portfolios has gained traction. The strategies adopted to meet this goal vary. Some argue for engagement with the financial community while others advocate outright divestment of an array of fossil fuel companies.

The campaign for fossil-fuel-free investment can be closely associated with climate change concerns and the rise in atmospheric CO_2 levels. A scientific consensus has emerged that the level of CO_2 in the atmosphere needs to be kept below 450 parts per million (ppm). This crusade has moral overtones and the encroachment into the financial sector is already well underway on a number of fronts. A number of financial institutions, such as the World Bank, are limiting their lending to fossil fuel power generators. Newer financial instruments such as green bonds are blossoming in the fixed income market. But perhaps most important is the steady progress on the accounting front, which may one day prove successful in classifying emissions and carbon reserves as material information that investors are entitled to view and analyse[1]. If carbon measures become embedded in financial valuations then the work of the fossil-fuel-free engagement and divestment camps will be largely done.

As with many financial products, the range of goods on the shelf is numerous; fossil-fuel-free investments are no exception. How fossil fuel free does the Asset Owner want or need to be? Individual requirements can range from excluding companies that own fossil fuel reserves to eliminating the whole carbon chain, from supplier to user (e.g. autos and aviation). Those who prefer a best-in-class approach may try to skew the portfolio to those corporations mitigating carbon risk or significantly reducing their carbon reserves. You might expect to find the latter approach used in some thematic funds.

When evaluating the performance of fossil-fuel-free funds, caution should be taken to compare them to the correct benchmark. This is important as it allows the Asset Owner to determine the skill of the Asset Manager and therefore answer the question of whether or not the fees they are paying are well spent. For example, is the performance of (say) an ex-Energy portfolio attributable to the Energy sector exclusion – after all this is the decision of the Asset Owner – or down to the skill of the Asset Manager who has effectively maximized returns of the ex-Energy portfolio by minimizing unintended risks? Our analysis shows that investors in fossil free funds could have made returns superior to some well-known benchmarks, but unintended risks could easily have eroded these investor returns if portfolio construction was ineffective.

What is clear is that investors, who believe they are doing the right thing, in this case going fossil fuel free in their investments, would not anticipate a sub-benchmark return. If they did, they should not have made the bet – unless of course there are reasons other than return generation as the motivation for making this decision in the first place.

3 SETTING THE PARAMETERS

a/ THE EVOLUTION OF FOSSIL-FUEL-FREE INVESTING

The rise of the fossil fuel divestment movement is tied to rising concerns about climate change, particularly global warming. This cause has been taken up by various groups that appear to have adopted different strategies: one advocates engagement with the financial community, the other divestment.

Adopting the engagement approach is the Carbon Tracker Initiative, a nonprofit organisation focused on improving the transparency of the carbon exposure embedded in financial markets. In particular, it highlights the existing "carbon bubble" comprising known fossil fuel reserves that it believes are unburnable if global warming is to be controlled (see 'Unburnable Carbon – Are the world's financial markets carrying a carbon bubble?' and 'Unburnable Carbon 2013: Wasted capital and stranded assets'). Essentially, it encourages "action now" to ensure that the financial markets avoid a "carbon crash." Other institutions support this approach, such as the Stranded Assets Programme at Oxford University.

Notable in the divestment camp is Bill McKibben's 350.org, which advocates that colleges' and universities' portfolios should divest from fossil fuels in order to protect the Earth's climate from irreversible change. A large number of campus campaigns are already well established following the 2012 "Do the Math Tour," while a small number have already pledged to sell their fossil fuel investments. Perhaps inevitably, comparisons with the anti-apartheid divestment campaign have become increasingly common.

Although fossil-fuel-free investing started as a moral issue – to save the planet from destruction – it has developed a financially based momentum. For example, some of the World's largest financial institutions have announced plans to phase out lending to fossil-fuelled power stations. This includes behemoths such as the World Bank, the European Investment Bank, and the European Bank for Reconstruction and Development. New financial instruments have been constructed to satisfy rising demand. An example of this is the rise of the green bond, created to finance environmentally friendly projects. Also, financial markets have been re-examining the value of existing investments. Much of this debate has focused on the concept of stranded assets. The thinking is that if already discovered reserves of coal, gas, and oil, are exploited then climate catastrophe is inevitable. There is a possibility that such reserves will be unburnable, causing them to be left stranded in the ground and therefore worthless. Carbon Tracker has requested that the Financial Accounting Standards Board (FASB) make the disclosure of carbon content by public companies a requirement. Further pressure is being applied by the Sustainability Accounting Standards Board (SASB), a nonprofit organisation, which is establishing standards for the disclosure of material sustainable issues.

It would be wrong to give the impression that this is a done deal; that carbon accountability and fossil free investing are inevitable. There are many people who still need convincing, from university presidents to pension fund trustees. Big Oil, which has formidable lobbying power, will not go down without a fight. Recently, ExxonMobil, BP, Chevron, and Shell, have all been responding to the attack on the unburnable carbon thesis. Interestingly, the success of the anti-apartheid divestment campaign, which is heralded as a pathfinder, may contain salutary warnings. It was in 1962 that a UN Resolution (number 1761) called for a boycott of South Africa because of its apartheid policies, but not until 1977 did a US university divest from its South African assets. Real momentum was not achieved until the mid to late 1980s, following persistent student campaigning.

There are some highly visible signposts ahead that will allow investors to judge whether a fossil fuel divestment movement is winning the day. Watch announcements from universities, municipalities, and cities on fossil fuel divestment. Harvard, Cornell, Boston College, and Brown, have all decided to reject their students' divestment requests. Watch investments in the Energy sector; hydraulic fracking seems to be making headway while the approval of the Keystone (oil sands) pipeline's expansion remains hotly debated. However, perhaps more important but less visible to Main Street, is the continued work on accounting standards (notably by SASB). If the SEC officially recognises this work, then these standards will become mandatory reporting requirements, providing investors with greater transparency on sustainability risks. It is when the financial markets price this into securities that the fossil free campaign will know that its work is largely done.

b/ DEFINING FOSSIL-FUEL-FREE INVESTING

A clear definition of terms is a fundamental requirement for an investment strategy. Fossil-fuel-free investing is no exception. We can all agree that fossil fuels comprise coal, oil, and natural gas, all formed from the organic remains of prehistoric animals and plants. However, differences of opinion emerge on the best way to structure an investment process to meet the aim of fossil-fuel-free investing and how extensive the definition of fossil fuels should be.

First, consider the investment process. The simplest process to use is a negative or exclusionary screen. This means that fossil fuel companies are excluded from the investment universe and may not be held by the Asset Manager in the portfolio. (We will discuss which companies fall into this set below.) This simplistic approach is easy to understand and provides little room for misinterpretation. Another approach is a positive screen or best-in-class approach, whereby the portfolio is tilted or weighted to the 'best' fossil fuel companies. Defining the "best" players could involve investing in companies that have or intend to reduce their fossil fuel reserves significantly or those that reduce their carbon emissions by the greatest amounts. If the financial markets are truly concerned about stranded carbon assets and the threat of emissions, then these companies should be financially rewarded for taking such action, because of the lowering of the perceived risk penalty. The downside to this approach is that the portfolio itself is not fossil fuel free and therefore could potentially mislead some investors. To avoid this claim, some Asset Managers propose a thematic approach, which could adopt a carbon reduction strategy. Again, this would involve investing in the improving players (e.g. lowering carbon emissions) and buying those companies that develop technologies enabling this to happen (e.g. carbon capture and storage technologies).

Once we have an investment process, and for the sake of an example, suppose we use a simple negative screen, we need to define what classifies as a fossil fuel investment. At first glance, this may appear simple enough, but there are a variety of interpretations as to the requirements of a fossil free investment. As a minimum, it appears to us that those companies that own coal, oil, and natural gas reserves should be excluded. Using MSCI data, this would require the exclusion of various GICS Industries: Integrated Oil and Oil & Gas Exploration as well as Coal & Consumable Fuels. These GICS Industries exclusions focus on companies that either own or develop fossil fuel reserves. For some, this minimum may be deemed inadequate.

These omissions do not exclude primary users of fossil fuels, such as oil refining and marketing companies or electric utilities which may burn fossil fuels to provide power. Aluminium producers may not burn the fossil fuel directly but the industry is a major consumer of the power, which in turn, could be sourced from coal-, oil-, or gas-fired generation. It can be difficult to know where to draw the line. Should we reject auto-makers and perhaps the auto component companies as well, as they are 'facilitators' in the burning of these fossil fuels? The same would be true for transmission companies, whether they are gas or electricity transporters, who may not own or produce fossil fuels but do transmit the fuel to end-consumers. Few sectors escape the reach of the carbon economy. For example, the financial sector has come under the spotlight of some pressure groups – e.g. Bankwatch, 350.org, and World Development Movement – for lending to fossil fuel projects.

Clearly, it is the Asset Owner who has the right to choose both the investment process and to define the range of fossil fuel companies permitted in the investment universe. This, in turn, has implications on the suitability of particular benchmarks by which to judge the performance of the Asset Manager. We discuss this in **Section 3d**. Also affected are the historic returns of funds adopting varying definitions. This issue will be discussed in Section 5a.

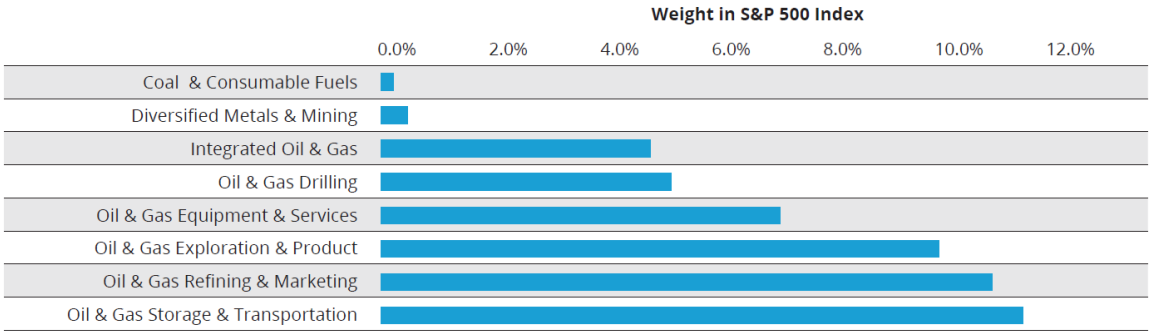
c/ FOSSIL-FUEL-FREE PORTFOLIOS

As stated in **Section 3b**, there are a range of definitions for a fossil free portfolio. An Asset Owner may choose to define the investment universe based solely on their particular beliefs while others may choose to analyse the investment implications of their initial choice before committing their funds.

Below we outline some fossil free definitions available to investors. We provide three possibilities. First, we look at the 'core' approach. Here we classify a fund as fossil fuel free if it excludes companies that directly own and develop fossil fuel reserves. See **Figure 1.** Second, we consider an 'extended' approach. Although this universe makes the same

exclusions as in the 'core' approach, it adds further industries in an attempt to capture more of the carbon economy. For example, we omit industries such as Railroads, Airlines and Trucking, Chemicals and Electric Utilities. See **Table 2.** Third, we use a widely publicised list of the world's major fossil fuel companies as published by the Carbon Tracker Initiative and used by the Go Fossil Free campaigners. See **Table 3.** All three approaches are compared to the S&P 500 Index and we consider the implications for an Asset Owner who uses the S&P 500 Index as their benchmark.

Figure 1: GICS sub-industry exclusions for the 'core' portfolio (benchmark S&P 500 Index)



Source: S&P, SICM
S&P 500 Index data as of 30th June 2014

The 'core' fossil free approach

We view the 'core' fossil free approach as the minimum for the investor who wishes to exclude fossil fuels from their portfolio. Under our 'core' definition, we exclude eight GICS sub-industries. (See Figure 1.) In the case of the GICS Energy sector, all seven sub-industries are excluded, from Oil & Gas Drilling through to Oil & Gas Storage & Transportation. However, only one of the sub-industries in the GICS Materials sector is excluded, Diversified Metals & Mining. (See **Table 1.)**

By excluding these eight sub-industries, a total of 11% of the S&P 500 Index is deemed off limits to the Asset Manager of the 'core' fossil free portfolio. The most significant exclusion by index weight is the Integrated Oil & Gas sub-industry, which comprises four securities in the S&P 500 Index: Chevron, Hess, Occidental Petroleum, and ExxonMobil. Ranked by number of securities, the most significant sub-industry exclusion is Oil & Gas Exploration and Production. This comprises 18 securities from Apache and Anadarko Petroleum through to Southwestern Energy and WPX Energy. At the other end of the scale is the Diversified Metals & Mining sub-industry which comprises only one security (Freeport-McMoRan Copper & Gold) and 0.2% of the S&P 500 Index, and the Coal & Consumable Fuels sub-industry which accounts for a mere 0.1% of the S&P 500 Index and comprises only two securities, Peabody Energy and Consol Energy.

Table 1: GICS sub-industry exclusions for the 'core' fossil free portfolio (benchmark S&P 500 Index) Individual weights of each sub-industry are shown along with cumulative totals of the weights

GICS sub-industry	Weighting in S&P 500	Accumulated weighting in S&P 500
Coal & Consumable Fuels	0.1%	0.1%
Diversified Metals & Mining	0.2%	0.3%
Integrated Oil & Gas	4.5%	4.8%
Oil & Gas Drilling	0.4%	5.2%
Oil & Gas Equipment & Services	1.8%	7.0%
Oil & Gas Exploration & Product	2.9%	9.9%
Oil & Gas Refining & Marketing	0.6%	10.4%
Oil & Gas Storage & Transportation	0.6%	11.1%
Air Freight & Logistics	0.8%	11.8%
Airlines	0.3%	12.1%
Commodity Chemicals	0.2%	12.4%
Diversified Chemicals	0.8%	13.2%
Electric Utilities	1.8%	15.0%
Fertilizers & Agricultural Che	0.5%	15.5%
Gas Utilities	0.0%	15.6%
Independent Power Producers &	0.1%	15.7%
Multi-Utilities	1.2%	16.9%
Railroads	0.9%	17.8%
Trucking	0.0%	17.9%

Source: S&P, SICM
S&P 500 Index data as of 30th June 2014

The 'extended' fossil free approach

For some investors, they may find the 'core' portfolio discussed above, little more than a minimum requirement and may feel they need to exclude more of the carbon chain. So, in our 'extended' portfolio we include additional sub-industries. In addition to the eight sub-industries detailed above, we have added a further eleven (see **Table 2**). We have included other sub-industries which are large consumers of fossil fuels such as airlines and other logistic companies as well as those companies using fossil fuel for feedstock, such as chemicals, fertilizers and gas & power utilities. Whereas the 'core' portfolio excludes sub-industries that account for 11.1% of the S&P 500 Index, the 'extended' portfolio excludes a *total of nearly 18% of the S&P 500 Index. (See* Figure 2.)

Table 2: GICS sub-industry exclusions for the 'extended' fossil free portfolio (benchmark S&P 500 Index). Individual weights of each sub-industry are shown along with cumulative totals of the weights.

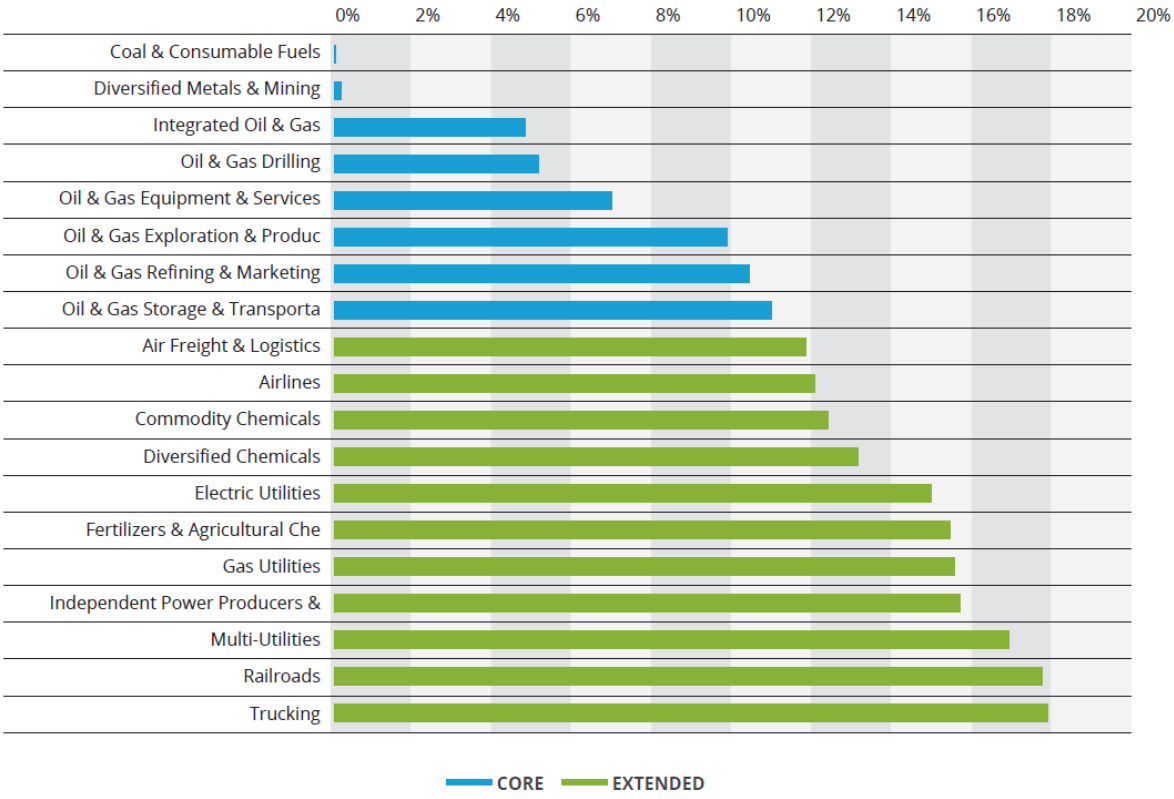
GICS sub-industry	Weighting in S&P 500	Accumulated weighting in S&P 500
Coal & Consumable Fuels	0.1%	0.1%
Diversified Metals & Mining	0.2%	0.3%
Integrated Oil & Gas	4.5%	4.8%
Oil & Gas Drilling	0.4%	5.2%
Oil & Gas Equipment & Services	1.8%	7.0%
Oil & Gas Exploration & Product	2.9%	9.9%
Oil & Gas Refining & Marketing	0.6%	10.4%
Oil & Gas Storage & Transportation	0.6%	11.1%
Air Freight & Logistics	0.8%	11.8%
Airlines	0.3%	12.1%
Commodity Chemicals	0.2%	12.4%
Diversified Chemicals	0.8%	13.2%
Electric Utilities	1.8%	15.0%
Fertilizers & Agricultural Che	0.5%	15.5%
Gas Utilities	0.0%	15.6%
Independent Power Producers &	0.1%	15.7%
Multi-Utilities	1.2%	16.9%
Railroads	0.9%	17.8%
Trucking	0.0%	17.9%

Source: S&P, SICM
S&P 500 Index data as of 30th June 2014

The largest sub-industry by index weighting in the 'extended' portfolio remains Integrated Oil & Gas at 4.5%, followed by Oil & Gas Exploration and Production at 2.9%. Of the new sub-industry additions to the 'extended' portfolio the largest is Electric Utilities. This sub-industry comprises 13 constituents in the S&P 500 Index from American Electric Power and Duke Energy through to The Southern Company and Xcel Energy. The Multi Utilities sub-industry also accounts for just over 1% of the S&P 500 benchmark comprising 14 constituents including securities such as Sempra Energy, PG&E and Consolidated Edison.

We emphasize that this 'extended' portfolio may not be fossil free enough for some investors. For example, they may choose to add the Steel and Aluminium sub-industries to their list of exclusions, arguing that they are very significant consumers of power that could have been generated from fossil fuels. Furthermore, Auto Manufacturers and Auto Retailers along with the Auto Parts & Equipment could be barred on the grounds that they promote the burning of fossil fuels. Should these sub-industries be added – in an 'extended plus' portfolio – then a total of 19% of the S&P 500 Index will be excluded from the Asset Manager's investable universe.

Figure 2: GICS sub-industry exclusions for the 'core' and 'extended' portfolios (benchmark S&P 500 Index) are shown along with their respective weights in the S&P 500 index as at 30 June 2014.



Source: S&P, SICM
S&P 500 Index data as of 30th June 2014

The 'GFF' list

The Carbon Tracker Initiative published a report called *Unburnable Carbon – Are the world's financial markets carrying a carbon bubble?* In this report a list of the top 200 publically listed companies by estimated carbon reserves was published, which comprised 100 coal companies and 100 oil & gas companies, accounting for a combined 746 $GtCO_2$. Carbon Tracker estimated that these companies accounted for around 27% of global proven fossil fuel reserves in terms of carbon emissions potential. (Reserve data published in 2010 was used in their calculations while stock listing information was from February 2011.)

It is this list that was originally used by the Go Fossil Free campaign, to encourage institutions to freeze any new investment in fossil fuel companies and divest from direct ownership and any comingled funds that include fossil fuel public equities and corporate bonds within five years. Not all of the original 200 companies are still in existence. For example, Massey Energy, ranked at number 36, was on the original list but was acquired by Alpha Natural Resources (ranked 31) in January 2011. Xstrata (ranked sixth) was also on the original 100 top coal companies' list but was

acquired by Glencore in May 2013. In the case of Eurasian Natural Resources Corporation (ENRC), ranked 37 on the coal listing, it delisted from the London stock exchange in November 2013. Of the original 200 securities, 181 remain actively traded as of the end of the first quarter of 2014. These 181 companies are excluded from the investable 'GFF' portfolio investment universe we discuss in this report.

This change in the Carbon Tracker list over time, demonstrates the importance of keeping exclusionary policies up to date. Treat with caution the comment that negative screens are static. Depending on the nature of the screening process, various explicit costs may be incurred. For example, if bespoke screens are demanded by the Asset Owner rather than simple sector or industry based exclusions, then the costs associated with the maintenance of such an exclusions list may have a large impact on the profitability of the investment strategy. Maintenance costs including labour costs, the cost of underlying data sources, and the real risk of errors being made, should make the Asset Owner pause and provide a clarity of thinking when it comes time to decide what best reflects their views, expectations, and the practicality of having their investment guidelines invested.

It is from this list of companies that we have created the 'GFF' portfolio, our third fossil free portfolio. However, the GFF list has a notable international flavour to its make-up, meaning that many of its constituents do not appear in the S&P 500. For example, from the list of the top 100 coal companies by carbon reserves, only four appear in the S&P 500; Peabody Energy, Consol Energy, FirstEnergy and Alcoa. They rank 8th, 17th, 72nd and 96th respectively. In the oil top 100, as compiled by Carbon Tracker, the S&P 500 representation is much more significant. S&P 500 constituents account for three companies in the top 10 as ranked by carbon reserves (Exxon Mobil, Chevron, and ConocoPhillips) and eight of the top twenty (adding Occidental, Devon Energy, Apache, Anadarko, Hess).

Furthermore, these securities can be found in a range of GICS classifications, not just under the Energy sector. For example, FirstEnergy Corp. is classified under the Utilities sector and Electric Utilities at a sub-industry level, while Alcoa is under the Materials sector and Aluminium at a sub-industry level. Although Cliff Natural Resources may also be found within the Materials sector it is classified as Steel at the sub-industry level. See **Table 3.**

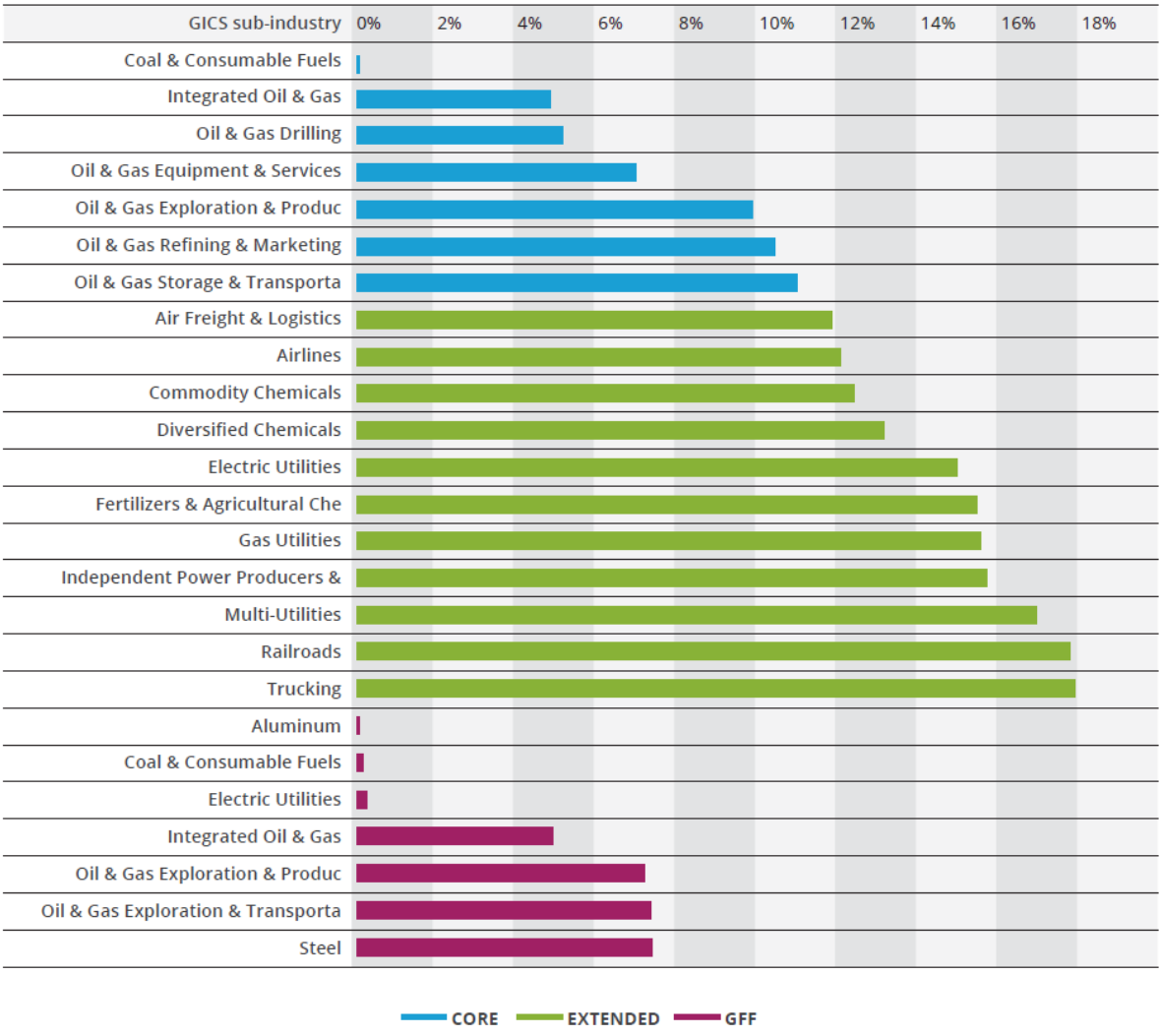
Table 3: GICS sub-industry exclusions for the 'GFF fossil free portfolio (benchmark S&P 500 Index). Individual weights of each sub-industry are shown along with cumulative totals of the weights.

GICS sub-industry	Weighting in S&P 500 Index	Accum. Weighting in S&P 500 Index
Aluminum	0.1%	0.1%
Coal & Consumable Fuels	0.1%	0.2%
Electric Utilities	0.1%	0.3%
Integrated Oil & Gas	4.5%	4.8%
Oil & Gas Exploration & Production	2.8%	7.6%
Oil & Gas Storage & Transportation	0.2%	7.8%
Steel	0.0%	7.8%

Source: S&P, SICM
S&P 500 Index data as of 30th June 2014

Despite the large number of companies originally identified by Carbon Tracker, it is the GFF portfolio that has the least impact on the S&P500 Index. In total, 7.8% of the index's constituents are included by using this filter. See **Figure 3**. This underlies the importance of choosing benchmarks carefully.

Figure 3: GICS sub-industry exclusions for the 'core', 'extended' and 'GFF' portfolios (benchmark S&P 500 Index) are shown along with their respective weights in the S&P 500 index as at 30 June 2014.



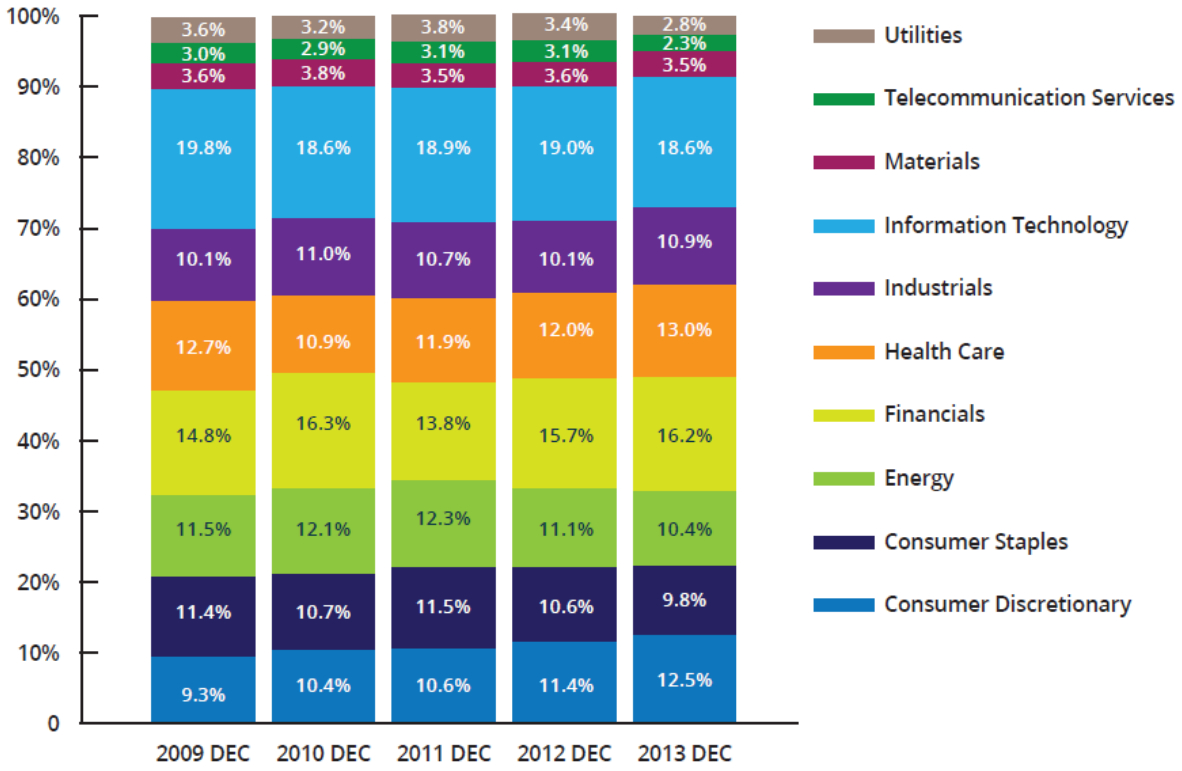
Sources: S&P, The Carbon Tracker Initiative, SICM

As time goes by…

In the discussion above, we have used data as at **30 June 2014**. However, the constituents of benchmarks change over time which, in turn, can impact returns as well as risk exposure.

Consider a simple example. An investor that buys a sector fund or a fund that excludes a particular sector from the S&P 500 Index is exposed to fluctuations over the five-year period from December 2009 to December 2013. Figure 4 shows the sector weightings of the S&P 500 over this time period, at the end of each year. If we use the Energy sector's weighting as an example, we can see that its significance within the S&P 500 benchmark has varied from a high of 12.3% in 2011 to a low of 10.4% in 2013. Of the major sectors, the most dramatic increase in importance has been the Consumer Discretionary sector, which rose every year from a low of 9.3% in 2009 to 12.5% by the end of last year. Back in December 2009, it was ranked seventh out of the ten sectors by weighting. By December 2013 it had risen to fourth place in order of importance, behind Healthcare and ahead of Energy.

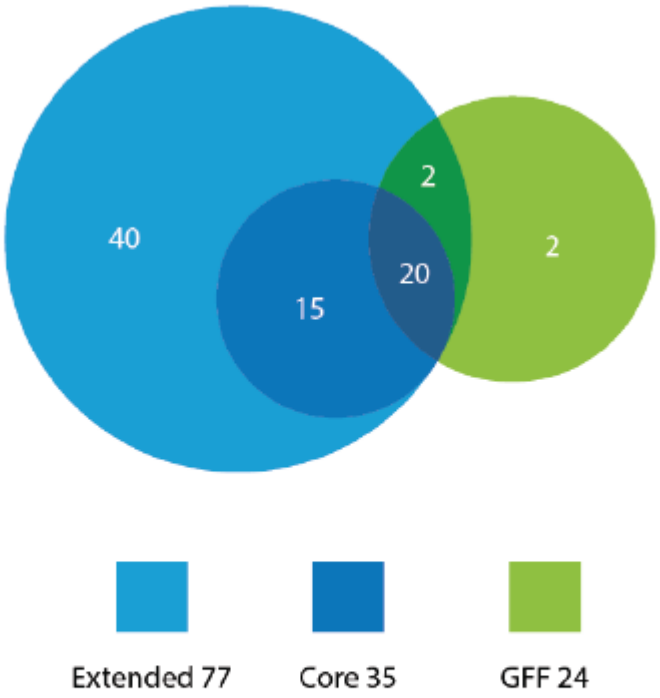
Figure 4: S&P 500 Index sector weightings over time. Only calendar year-end values are shown.



Source: S&P Dow Jones Indices, SICM

We can demonstrate this influence further by examining the effect on the three portfolios we have discussed above. By maintaining the same fossil fuel constraints on all the three portfolios throughout the full five-year period, between January 2009 and December 2013, we can see the number of S&P 500 Index constituents disqualified changes over time. At the beginning of 2009 a total of 136 securities are excluded from all three portfolios with the same 20 securities excluded from all three. See Figure 5. The largest impact was on the 'extended' portfolio where 77 constituents of the S&P 500 were omitted in 2009. This included the same 35 disqualified from the 'core' portfolio as well.

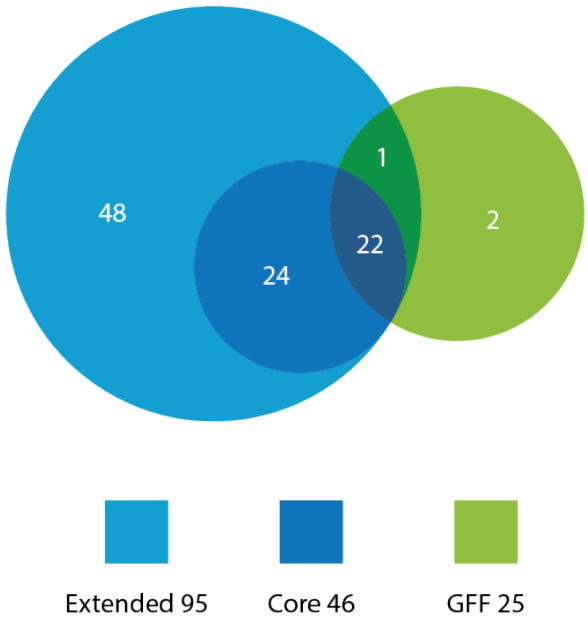
Figure 5: Number of constituents of the S&P 500 excluded from the three portfolios as in January 2009



Source: S&P Dow Jones Indices, SICM

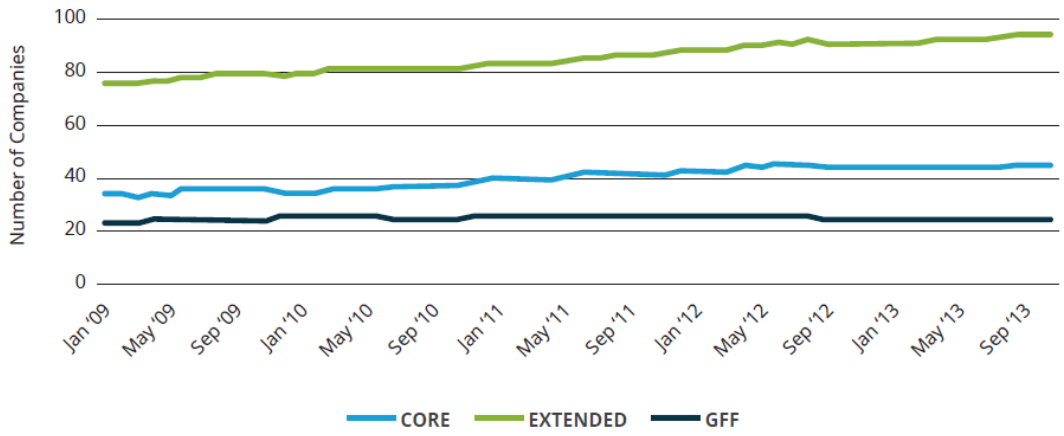
Next, we compare the impact of our constraints at the end of last year (2013), and using the same benchmark portfolio (S&P 500 Index), observe a number of changes. Firstly we discover that the number of disqualified companies across all three portfolios has risen by 30 securities, to 166. The number of companies appearing in all three portfolios increases from 20 to 22. Largely unaffected by the passage of time is the GFF portfolio where the list of excluded corporates rose by only one, to 25 in total. This contrasts with the 'extended' portfolio where the number of exclusions rose 23% to 95 constituents of the S&P 500 Index. See **Figure 6 and Figure 7.**

Figure 6: Number of constituents of the S&P 500 excluded from the three portfolios as in December 2013



Source: S&P Dow Jones Indices, SICM

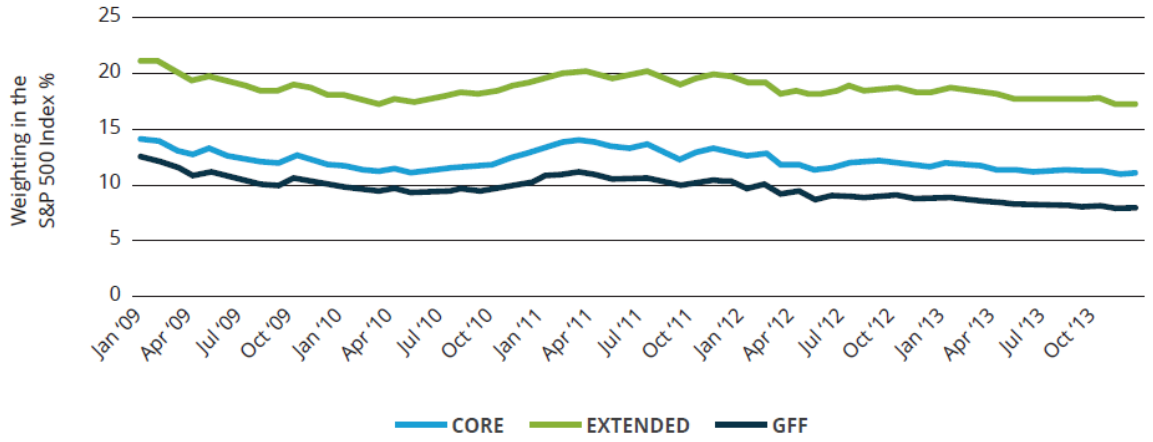
Figure 7: Number of companies excluded (2009-2013) in the three portfolios



Source: SICM

Despite the rise in the number of excluded securities from the three portfolios, on a weighting basis the opposite is true. Figure 8 shows the weighting in the S&P 500 Index of the excluded companies. As we have discussed above, it is the 'extended' portfolio that incurs the highest number of disqualifications, totalling 95 in December 2013, however the weighting of these securities in the S&P Index actually falls from above 20% in 2009 down to 17% by the end of 2013. Both the 'core' and 'GFF' portfolios exclusions show a similar declining trend in their weighting in the S&P 500 Index over this five year period.

Figure 8: Weighting in the S&P 500 Index of companies excluded (2009-2013) in the three portfolios



Source: S&P Dow Jones Indices, SICM

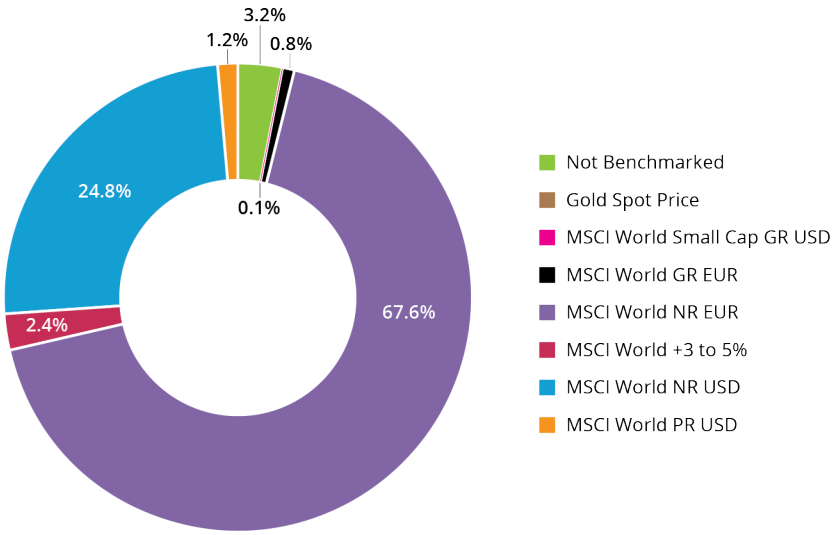
d/ MEASURING THE ASSET MANAGER

If we assume that the Asset Owner clearly defined the fossil-fuel-free investment universe – in **Section 3b,** we identified a number of different interpretations – the Asset Owner will want to agree a benchmark by which to measure the success or failure of the Asset Manager's investment skills. This should not be an afterthought, as it is the all-important measurement yardstick by which to judge the Asset Manager's performance.

We might expect the defined investable universe to be matched by a comparable benchmark, but we find this is often not the case. Consider the following example.

If we take a particular theme to which an Asset Owner may wish to gain exposure, such as water, we may expect the Asset Manager to be measured against a water benchmark. However, an analysis of Morningstar data for the equity water sector in Europe shows that water company based benchmarks are not deemed a suitable yardstick by either the Asset Owner or perhaps the Asset Manager who has convinced the former to use an alternative. When measured by assets under management (AuM) we can see that MSCI World indices account for the vast majority of benchmarks used within this peer group, whether on a gross or net return basis, or one that is US or Euro denominated. Three percent of the water funds by AuM have no nominated benchmark. See **Figure 9.**

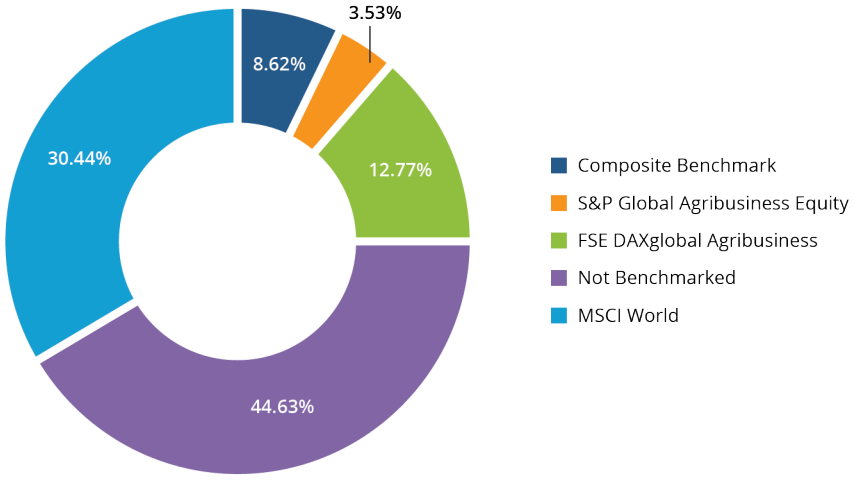
Figure 9: Morningstar Water Equity Sector (Europe) Benchmarks (by AuM).



Source: Morningstar

Looking at another set of specialised funds – agriculture – few funds in this category are measured against an agriculture index. For agriculture funds, as defined by Morningstar, we note that just under half have no nominated benchmark. A further 30% of this peer group use MSCI World indices as their yardstick. Only about 15% of funds use either the S&P Global Agribusiness Equity or the DAX Global Agribusiness Indices. See **Figure 10.**

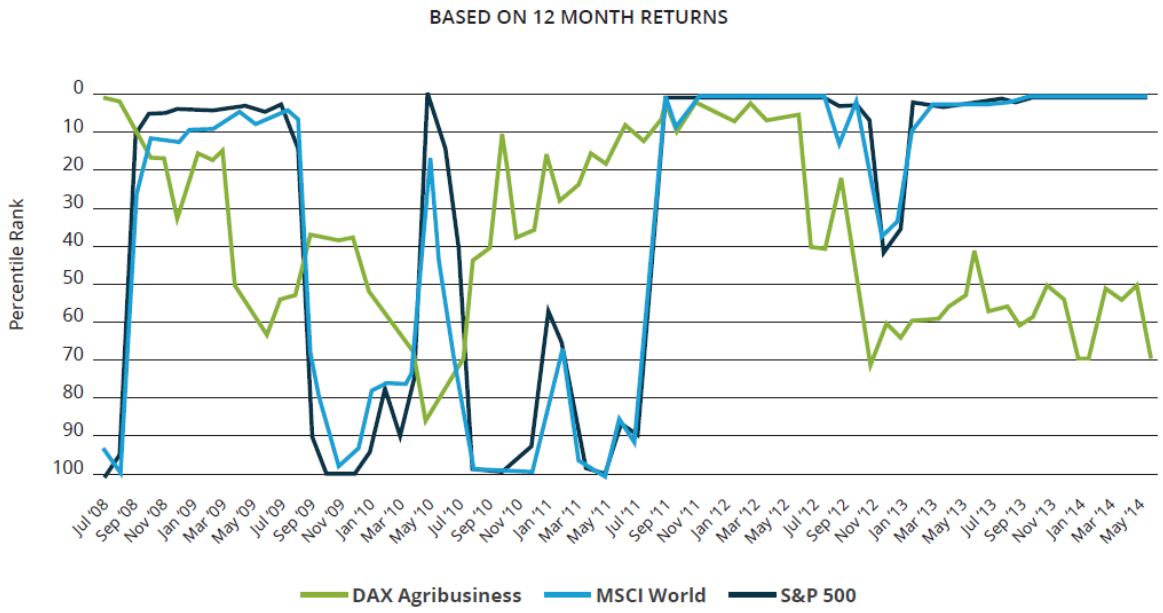
Figure 10: Morningstar Agriculture Equity Sector (Europe) Benchmarks (by AuM).



Source: Morningstar

Why is the case? We argue that Asset Owners have chosen to invest in water or agriculture funds as they believe that this theme will diversify their holdings and/or lead to significant shareholder returns, outperforming the equity market as a whole. Asset Owners may choose to measure the return of their water investment against the market index, such as MSCI World, in order to determine whether they have made a correct forecast. This does not appear to be unreasonable; however this benchmark will not help the Asset Owner determine whether the Asset Manager is skilled. If the water or agriculture themes do indeed deliver superior returns relative to general equity market returns, then the Asset Manager will show a performance track record that beats the MSCI World Index. However, this superior return cannot be solely attributable to the skill of the Asset Manager as under this scenario, all water and agribusiness funds would be expected to outperform world indices.

Figure 11: Morningstar Agriculture Equity Fund performance (Europe)



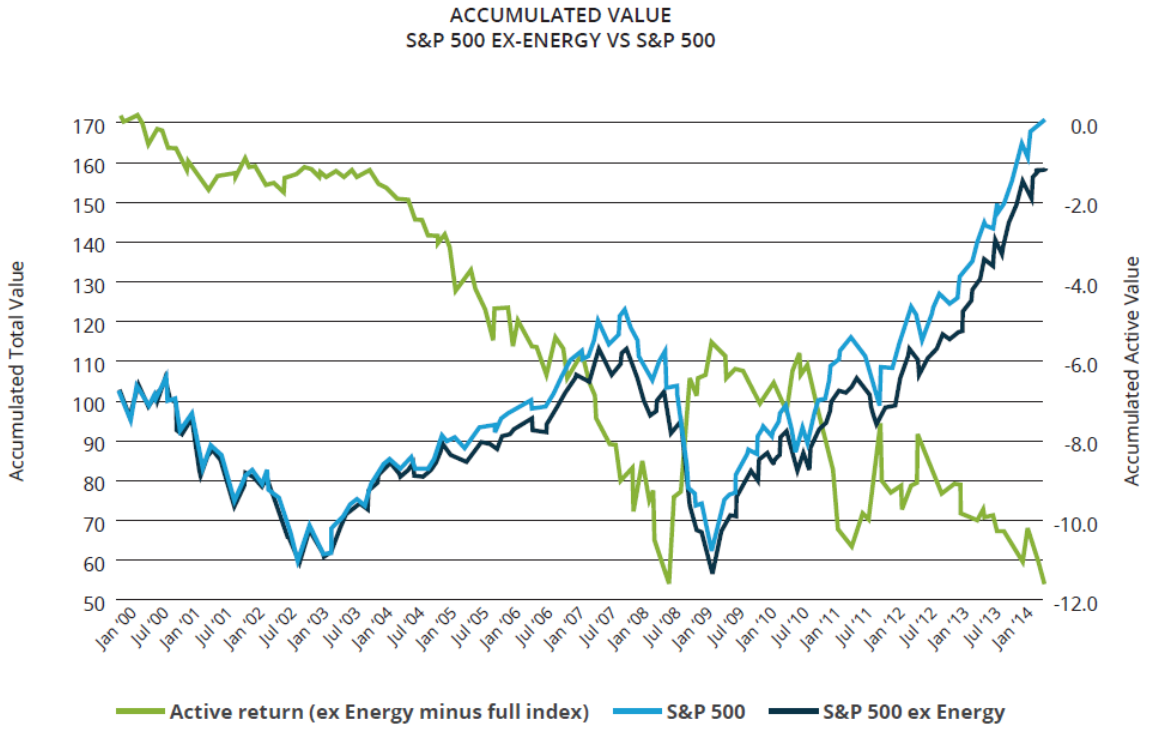
Source: Morningstar, SICM, DAX Indices, MSCI

In **Figure 11,** we show three indices—DAXglobal Agribusiness, MSCI World and S&P 500—against the Morningstar agriculture peer group. On the 'y' axis we show the peer group percentile ranks for the Morningstar agriculture peer group, where zero is the best performer and one hundred the worst performer. It is evident that both the MSCI World and S&P 500 Indices can be seen to fluctuate between the worst and best percentile rankings of this Morningstar agriculture peer group, which comprises 129 funds. Since early 2013, if an Asset Manager had simply tracked the S&P 500 Index when running their agriculture fund, it would have resulted in the fund being a top performer against this European agriculture peer group. The same is true for the period from mid 2011 to mid 2012. It is noteworthy that even the more comparable DAXglobal Agribusiness Index fluctuates in the percentile rankings of this agriculture peer group although it spends less time at the percentile ranking extremes when compared to the MSCI World and S&P 500 Indices.

In the instance of a fossil-fuel-free fund, a range of possible benchmarks is available. If we apply the same thinking as the water fund Asset Owners, it would appear that many are likely to use a global benchmark (e.g. MSCI World or MSCI All Countries World Index) or perhaps one for a single geographical region, such as the USA, where the S&P 500 Index may be more appropriate. By choosing these benchmarks the Asset Owner is able to determine whether the fund can outperform the more traditional and high profile benchmarks. From a marketing point of view, this is a rational strategy. If, for example, an NGO which is promoting a fossil free approach wishes to provide evidence to support its mission, then choosing a well-known benchmark and outperforming it with an ex-fossil fuel fund provides an uncomplicated message to potential investors.

However, we are left with a problem - that it is difficult for the Asset Owner to measure the Asset Manager's skill. We can demonstrate this in **Figure 12**. We have used a very simple premise that the Asset Owner does not wish to invest in US Energy companies. We have therefore measured the differential between the S&P 500 Index, which includes the Energy sector, and the S&P 500 Index ex-Energy. We show the differential between the ex-Energy and the full S&P 500 index as the active return line in **Figure 12.** There are periods, for example for much of the first half of 2011, when the ex-energy S&P outperforms the full S&P 500 Index. This outperformance has nothing to do with the skill of an Asset Manager as these are simply indices. The same is also true during periods of underperformance, for example from mid 2003 through to mid 2008 when Energy stocks were in favour, leading to the ex-Energy index underperforming the full S&P 500 Index.

Figure 12: The performance of the S&P 500 Index and the S&P 500 Index ex-energy



Source: S&P

To be clear, we are not implying that Asset Managers are unable to add value by managing ex-Energy funds. We are saying that the Asset Managers, which are asked to exclude (say) Energy stocks, should be judged against an ex-Energy benchmark as this provides a meaningful way to evaluate the value of their investment skill within the set of variables they

can control. We should also add that relative out- or under-performance of a benchmark is unlikely to be caused solely by the absence of particular Energy stocks, but importantly, also because of unintentional effects due to the omission of these securities. We discuss this effect in more detail in **Section 5b**.

4 METHODOLOGY

We analyse the returns of three different fossil-fuel-free portfolios: the 'core'; 'extended' and 'GFF' portfolios. We make no judgement on whether one portfolio has superior fossil-fuel-free qualities to another; that is the Asset Owner's decision. We only wish to examine the financial characteristics of each portfolio in terms of risks and returns.

In order to make financial comparisons between the portfolios easier, we have compared all three to the S&P 500 Index over the same time periods: one year, three years and five years, all ending on 31 December 2013. In order to capture the opening share prices at the beginning of January we take the closing prices for the last day of trading in December. For a market like Tokyo, where 31 December is a public holiday, we take the closing price on 30 December, when it is not a weekend.

In all three portfolios certain MSCI sub industries and their associated stocks have been excluded. All definitions of the portfolios and their exclusions may be found in **Section 3c** of this report. In all three portfolios, the initial investment that would have been made in these excluded sub industries is instead invested in the remaining S&P 500 constituents, on a market capitalisation pro-rata basis. Then the performance of this portfolio is compared to the full S&P 500 Index (without exclusions) to allow for a comparison of the fossil-fuel-free portfolio with the S&P 500 Index. The difference between the portfolio and its benchmark (the S&P 500 Index) is the active return.

We make no apology for adopting this relatively simple approach – using exclusions rather than a thematic approach or best-in-class approach – as the reader can more clearly observe the variables. The only subjectivity of our exclusionary approach is which sub industries to exclude, rather than whether a particular theme promotes a lower carbon environment or whether a particular company is really the best-in-class. We recognise that Asset Owners may have a myriad of exclusions they may wish to define as fossil-fuel related, but we hope the three portfolios we have chosen provide an indication of the risks and returns an Asset Owner would have incurred.

5 THE RESULTS

a/ FOSSIL-FUEL-FREE RETURNS

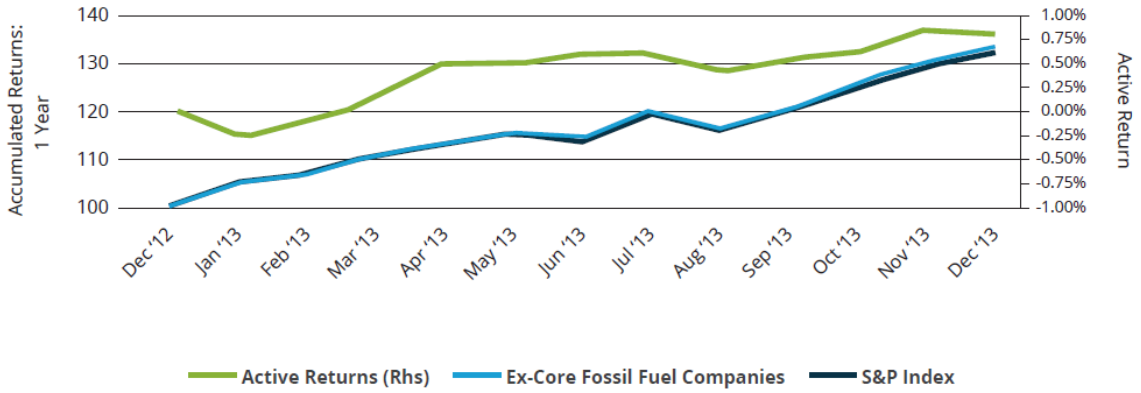
In this section, we discuss the returns that investors would have made by adopting various fossil-fuel-free approaches. As discussed in **Section 3b**, there are various definitions for fossil-fuel-free investing. In **Section 3c,** we provided some examples of fossil-fuel-free portfolios, the 'core' portfolio, which we categorise as a bare minimum for fossil-fuel-free investing, and the more comprehensive 'extended' portfolio, which aims to capture more of the carbon cycle. Also discussed was the 'Go Fossil Free' (GFF) portfolio, which excluded a list of the largest oil and coal companies, ranked by carbon reserves, as compiled by the Carbon Tracker Initiative.

In an attempt to make a clean comparison between these three portfolios and the S&P 500 Index, we simply exclude each of the sub-industries as described in **Section 3c** and invest this sum on a pro-rata basis in the remaining S&P 500 Index constituents. So for the sake of clarity, the 'core' portfolio excludes eight sub-industries, including Oil & Gas Drilling, Coal & Consumable Fuels as well as Integrated Oil & Gas. The initial investment that would have been made in these now excluded sub-industries, is instead invested in the remaining S&P 500 Index constituents on a market capitalisation pro-rata basis. The performance of this 'core' portfolio is then compared to the full S&P 500 Index (with no exclusions) to see which portfolio achieves the best performance over set time periods. The difference between the two returns is called the active return.

'Core' portfolio performance

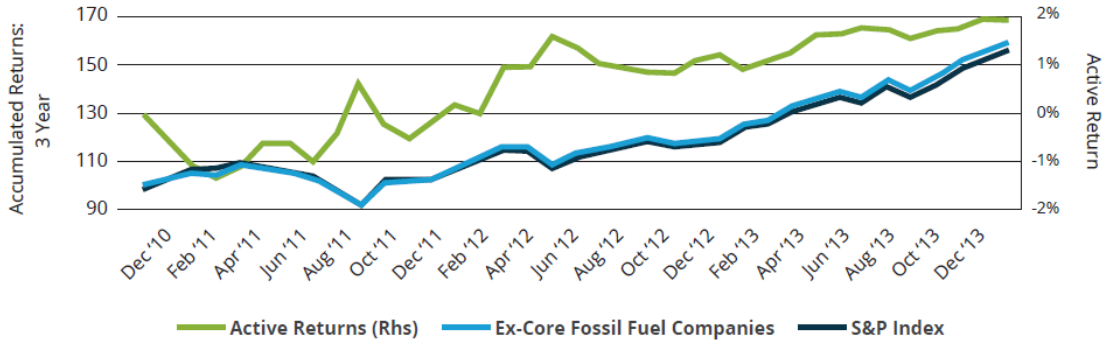
Figures 13 to 15 show the cumulative total returns of the S&P 500 Index and the S&P 500 Index ex the 'core' holdings. Both indices are re-based to 100 at the beginning of the relevant time period, as shown on the left-hand scale. The active return, shown on the right hand scale, is the performance of the 'core' portfolio minus the performance of the S&P 500 Index. A positive active return indicates that the former was a better performer than the latter. A positive active return of 3% would indicate that the 'core' portfolio outperformed the S&P 500 by three percentage points over the measured time period. We show performance over one year (2013), three years (2011 to 2013) and five years (2009 to 2013), all ending 31 December 2013. In order to capture the opening share prices at the beginning of January we take the closing prices for the last day of trading in December. Over all three time periods the 'core' portfolio produced a higher total return (which includes both capital gain and income) than the full index. Certainly over the shortest time period the difference is very small, but over three and five years the outperformance of the 'core' portfolio became meaningful.

Figure 13: Cumulative returns of 'core' portfolio against S&P 500 Index over one year (2013)



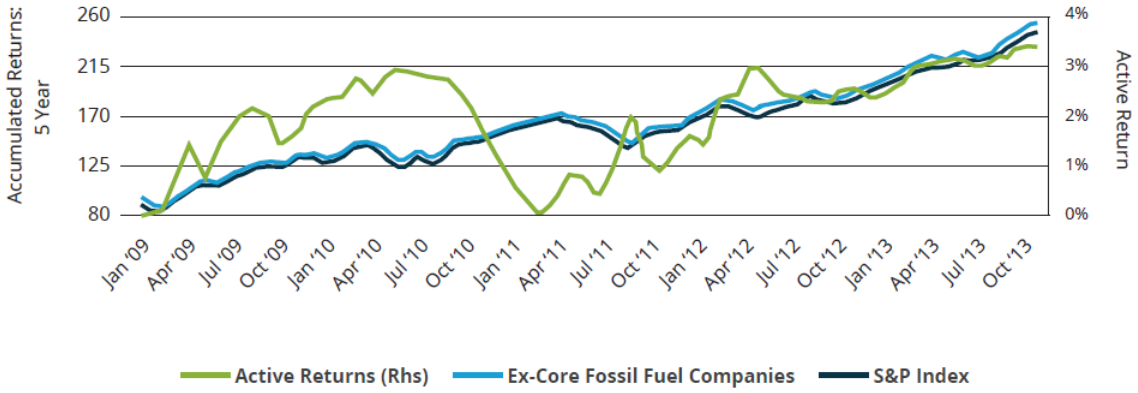
Source: S&P Dow Jones Indices, SICM
Rhs = right hand scale

Figure 14: Cumulative returns of 'core' portfolio against S&P 500 Index over 3 years (2011-2013)



Source: S&P Dow Jones Indices, SICM
Rhs = right hand scale

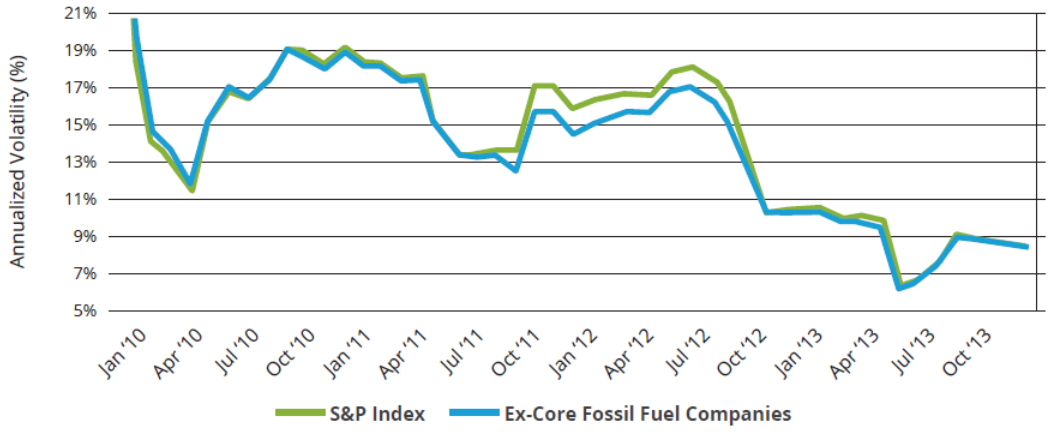
Figure 15: Cumulative returns of 'core' portfolio against S&P 500 Index over 5 years (2009-2013)



Source: S&P Dow Jones Indices, SICM
Rhs = right hand scale

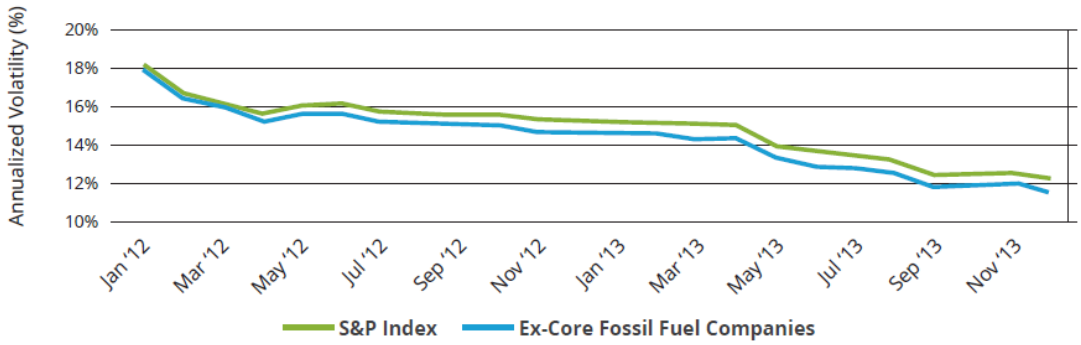
Also of interest to the investor is how volatility is affected by making such an investment. This we show in **Figures 16 and 17**. We estimated rolling one-year and three-year volatility and note that in general, volatility declines for both the 'core' portfolio and the S&P 500 Index. The level of volatility for each moves in tandem. This is not too surprising given the overall bet size represents around 10% of the portfolio on average and as we are simply pro-rating the residual weight back into the other sectors the final portfolio is still relatively close to the benchmark. Although the Energy sector might be considered to be one of the more volatile sectors, and therefore we might reasonably expect a decline in the volatility of the ex-Energy portfolios, the additional weight is allocated to other sectors like Financials and Information Technology, which are themselves reasonably volatile. Therefore, the final portfolio appears to exhibit the same overall level of volatility as the broad market index. Perhaps more interesting to note is the general decline in volatility after the Global Financial Crisis: Over the longer estimation window, i.e., 3 years, we observed a 33% decline in the volatility levels of both the portfolio and the benchmark.

Figure 16: Rolling volatility of the 'core' portfolio over 12 months



Source: SICM

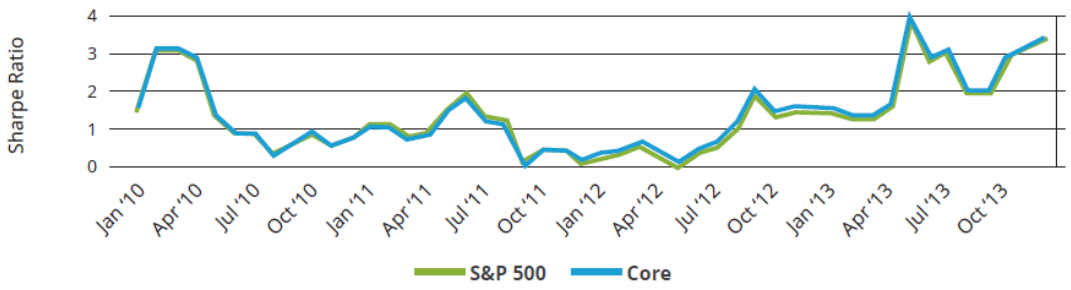
Figure 17: Rolling volatility of the 'core' portfolio over 3 years



Source: SICM

With higher returns and a commensurate level of volatility it is no surprise that the Sharpe ratio – a risk-adjusted measure of return – of the 'core' portfolio is higher than that of the S&P 500 index. This indicates that excess return above the benchmark is not being generated via additional volatility. See **Figure 18.**

Figure 18: The 12-month rolling Sharpe Ratio for the 'core' portfolio and S&P 500 Index

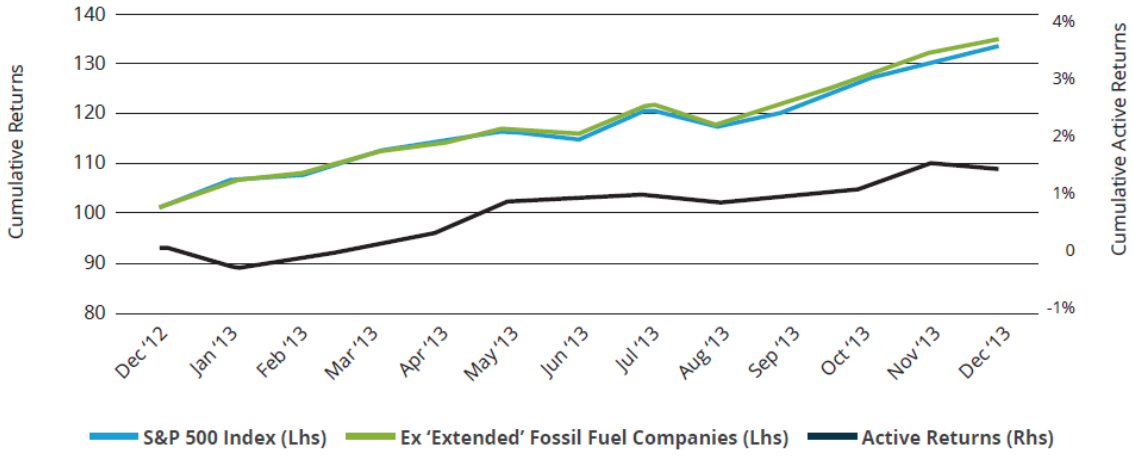


Source: SICM

'Extended' portfolio performance

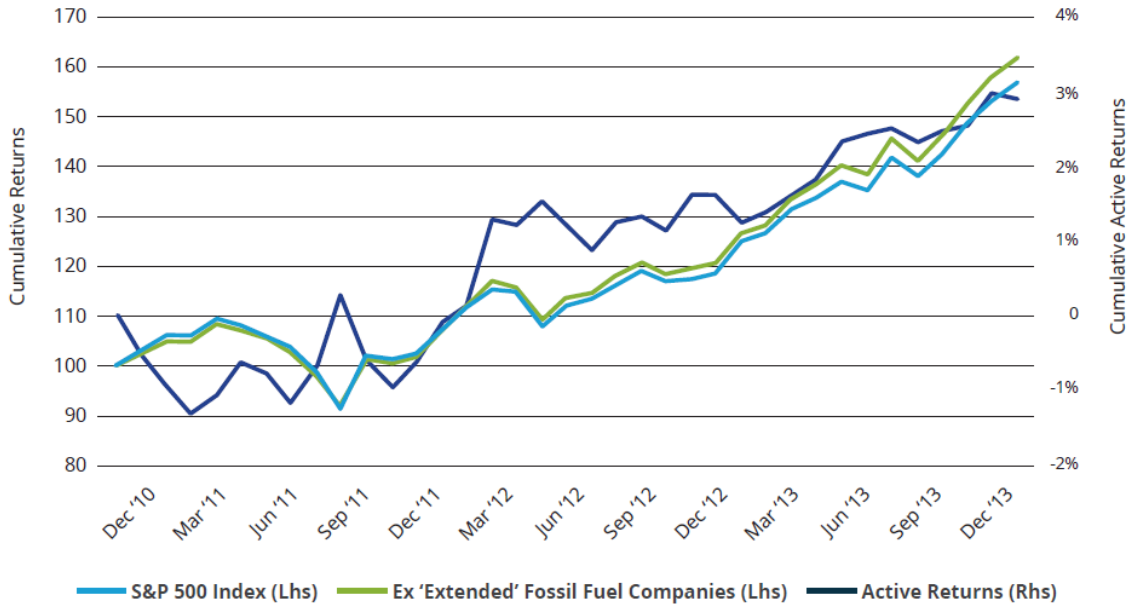
Figures 19 to 21 show the cumulative returns of the S&P 500 Index and as well as that of the S&P 500 Index ex the 'extended' holdings. Both indices are re-based to 100 at the beginning of the relevant time period, as shown on the left-hand scale. The active return, shown on the right hand scale, is the difference between the performance of the 'extended' portfolio and the S&P 500 Index. Performance is shown over one year (2013), three years (2011 to 2013) and five years (2009 to 2013), with all periods ending 31 December 2013.

Figure 19: Cumulative returns of 'extended' portfolio against S&P 500 Index over one year (2013)



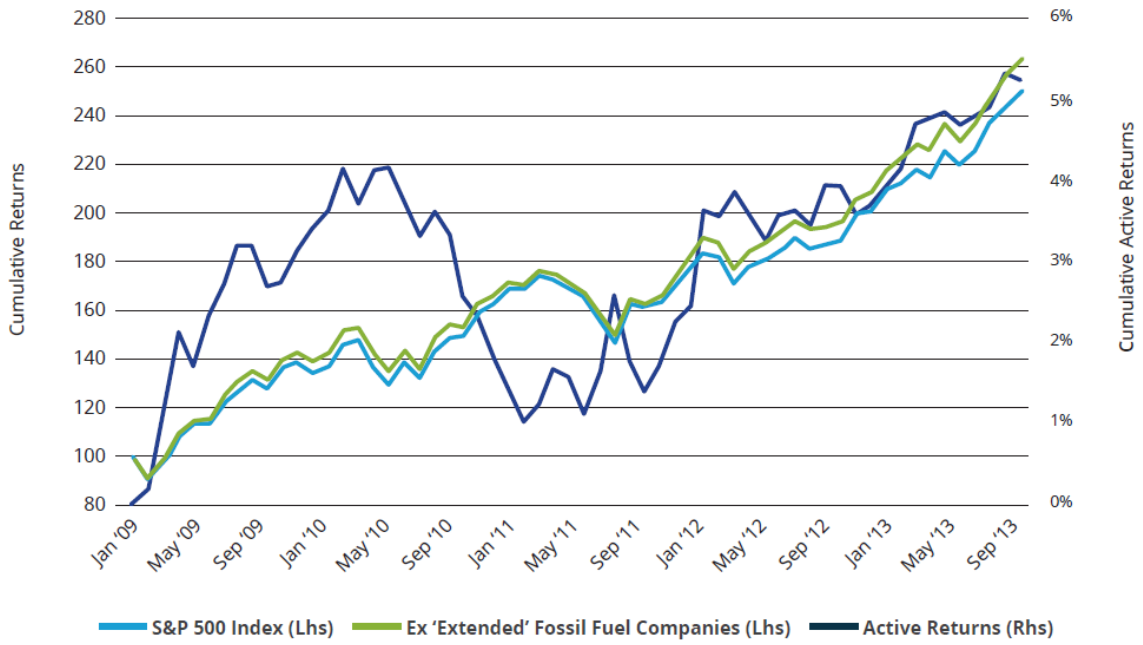
Source: S&P Dow Jones Indices, SICM
Lhs = left hand scale
Rhs = right hand scale

Figure 20: Cumulative returns of 'extended' portfolio against S&P 500 Index over 3 years (2011-2013)



Source: S&P Dow Jones Indices, SICM
Lhs = left hand scale
Rhs = right hand scale

Figure 21: Cumulative returns of 'extended' portfolio against S&P 500 Index over 5 years (2009-2013)

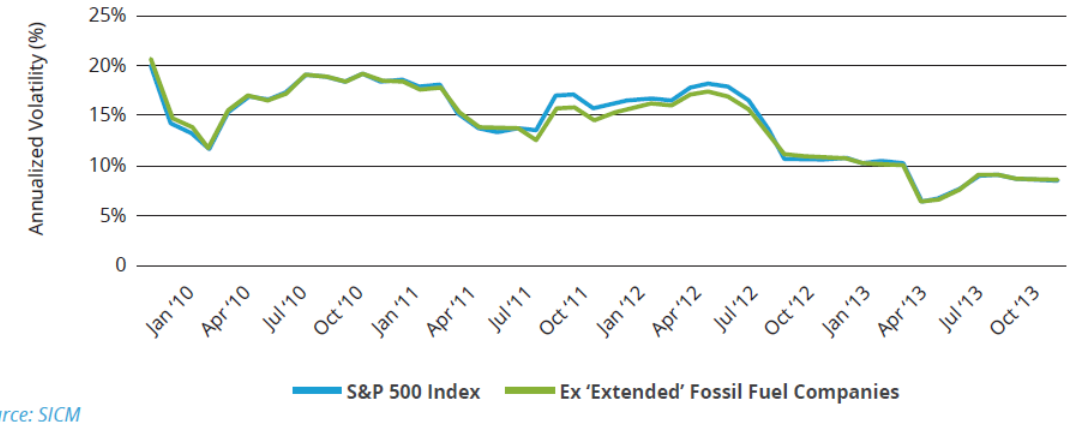


Source: S&P Dow Jones Indices, SICM
Lhs = left hand scale
Rhs = right hand scale

As with the 'core' portfolio, over all three time periods the 'extended' portfolio produced a higher total return (both capital gain and income) than the full index. Over the full five-year period, the outperformance of the 'extended' portfolio exceeded 5%. This is superior to the performance observed for the 'core' portfolio over the same time period.

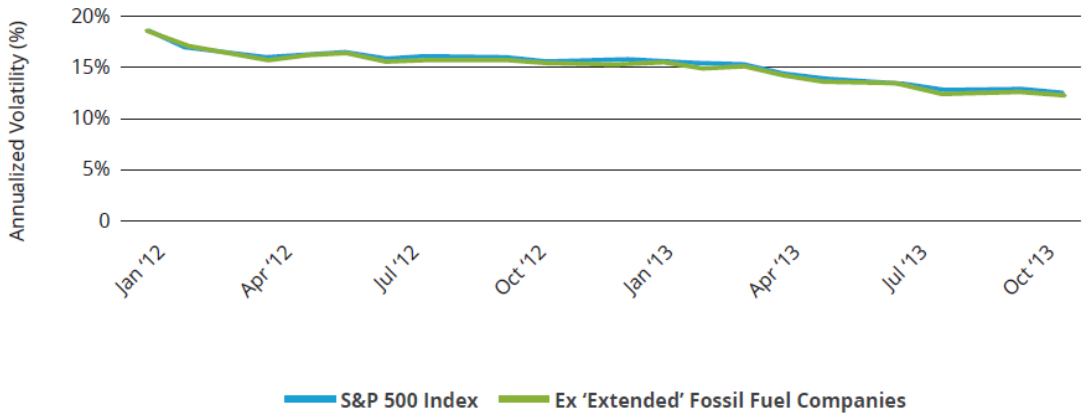
As with the 'core' portfolio we are able to observe that the improved performance was not simply the result of increased volatility; the opposite is true. See **Figures 22 and 23**. Both the S&P Index and the 'extended' portfolio demonstrate declining volatility on rolling 12- and 36-month bases. As mentioned in the previous section, we look at how volatility is affected by making such an investment. Rolling one-year and three-year volatility is estimated and as previously noted, volatility declines for both the S&P 500 Index and in this case, the 'extended' portfolio. The level of volatility once again moves in tandem.

Figure 22: Rolling volatility of the 'extended' portfolio over 12 months



Source: SICM

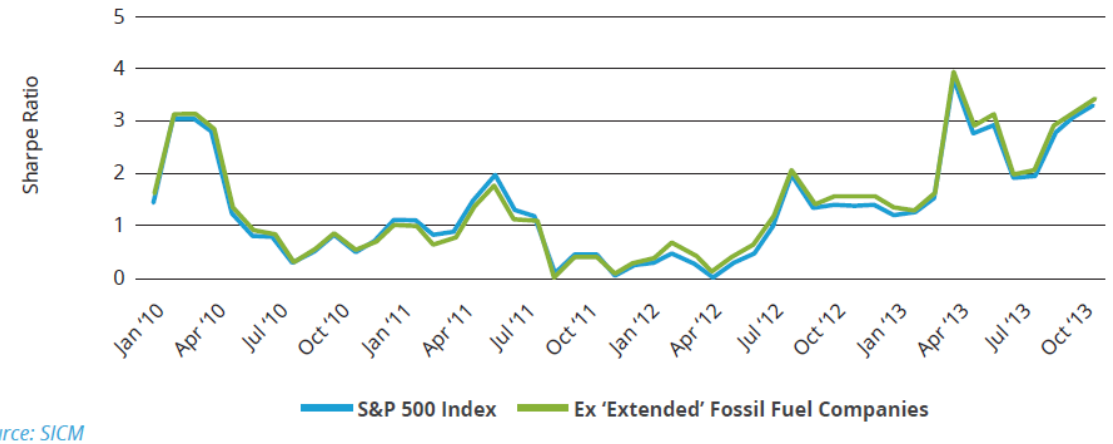
Figure 23: Rolling volatility of the 'extended' portfolio over 3 years



Source: SICM

With a positive active return over the S&P 500 Index and falling volatility, we observe a rising Sharpe Ratio between 2010 and 2013, although this is not a steady improvement, as marked volatility between mid-2010 and mid-2012 can be seen. See **Figure 24**.

Figure 24 : The 12 month rolling Sharpe Ratio for the 'extended' portfolio and S&P 500 Index

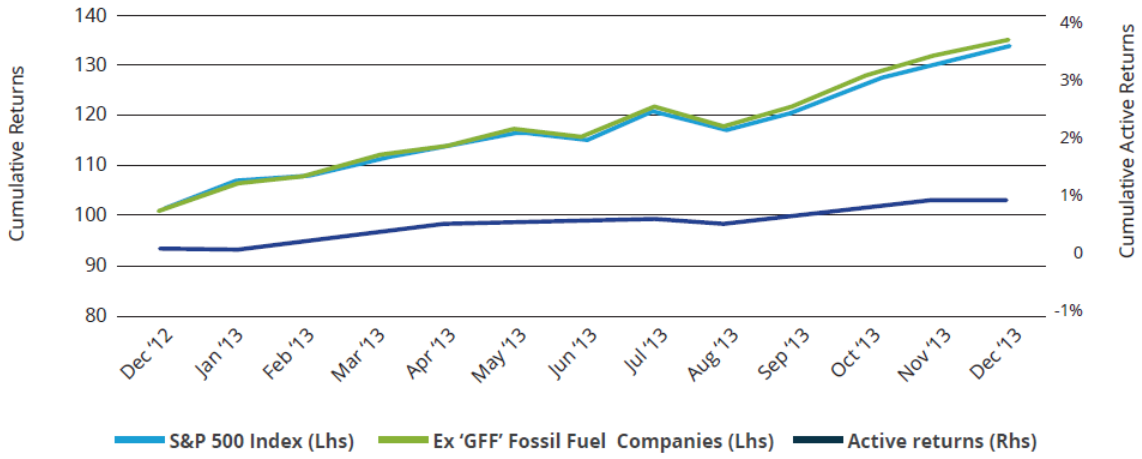


Source: SICM

'GFF' portfolio performance

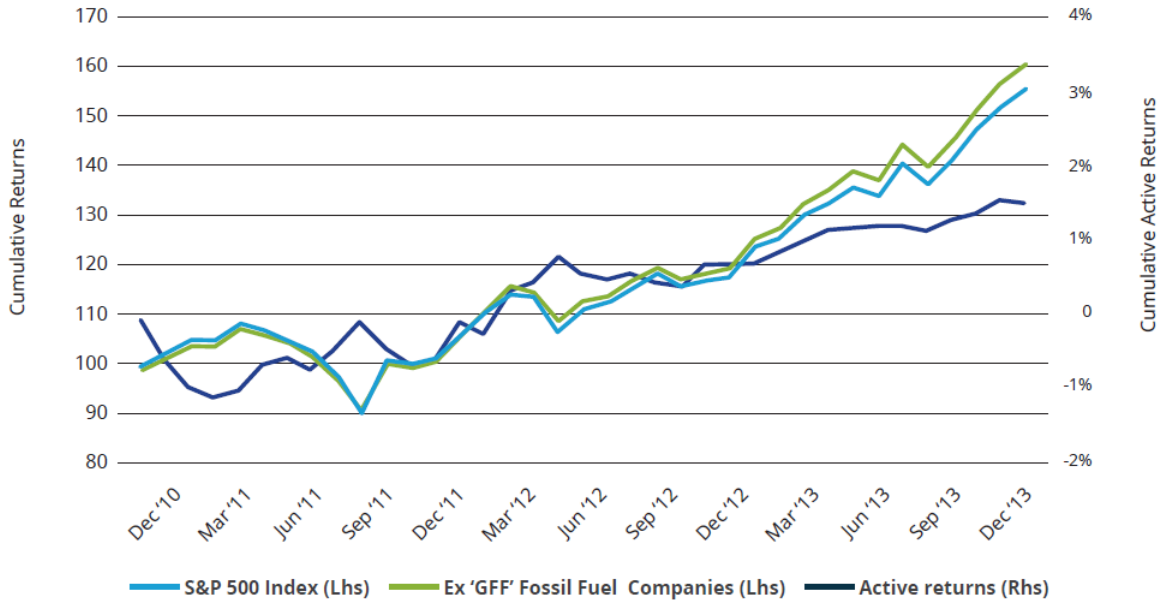
Figures 25 to 27 show the cumulative total returns of the S&P 500 Index and the 'GFF' portfolio. Both indices are re-based to 100 at the beginning of the relevant time period, as shown on the left-hand scale. The active return, shown on the right hand scale, is the performance of the 'GFF' portfolio relative to the complete S&P 500 Index. We show performance over one year (2013), three years (2011 to 2013) and five years (2009 to 2013), all periods ending 31 December 2013.

Figure 25: Cumulative returns of 'GFF' portfolio against S&P 500 Index over one year (2013)



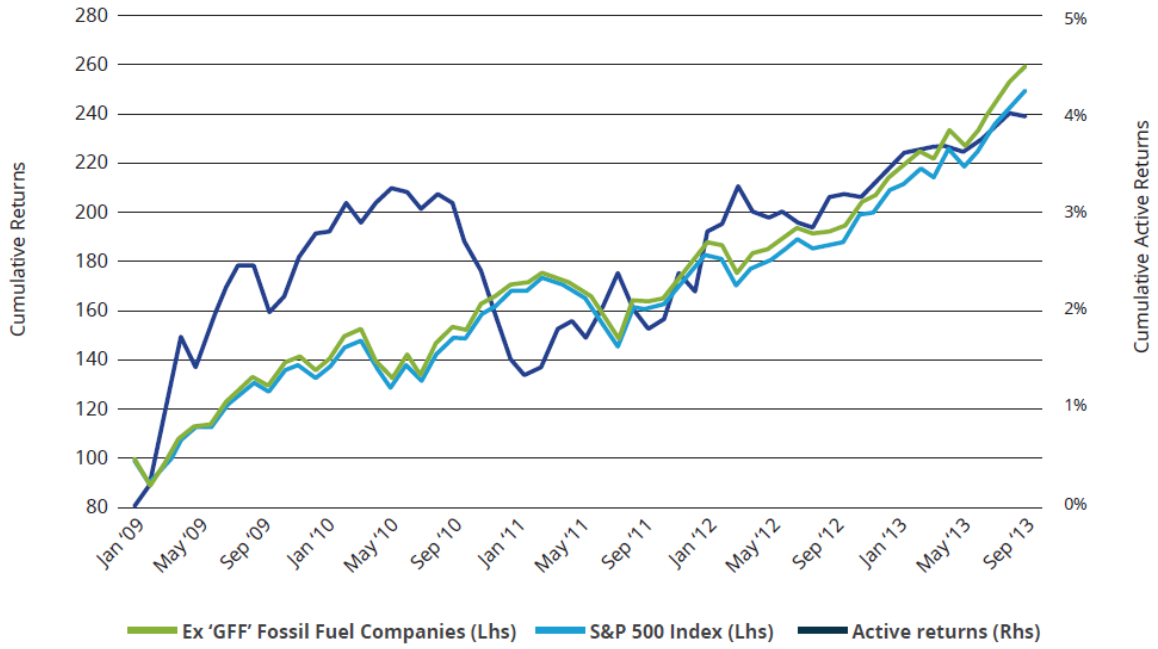
Source: S&P Dow Jones Indices, SICM
Lhs = left hand scale
Rhs = right hand scale

Figure 26: Cumulative returns of 'GFF' portfolio against S&P 500 Index over 3 years (2011-2013)



Source: S&P Dow Jones Indices, SICM
Lhs = left hand scale
Rhs = right hand scale

Figure 27: Cumulative returns of 'GFF' portfolio against S&P 500 Index over 5 years (2009-2013)

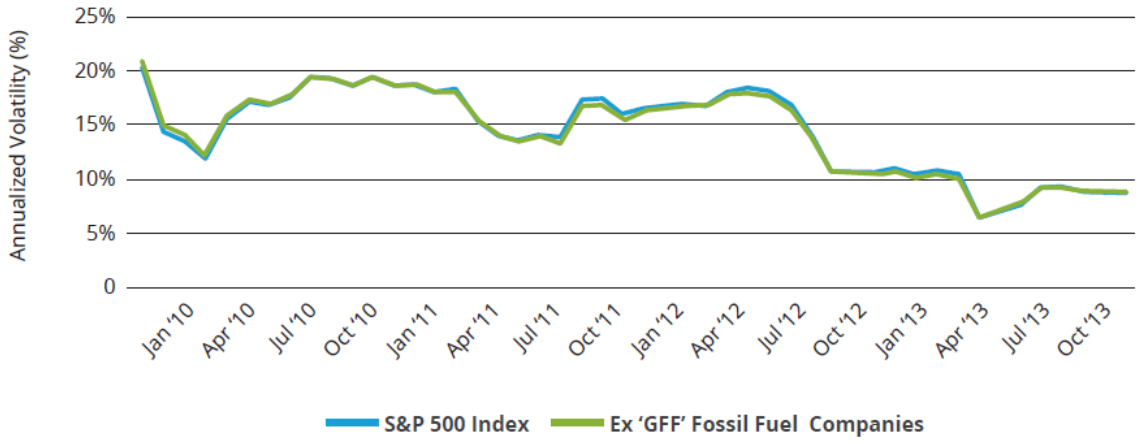


Lhs = left hand scale
Rhs = right hand scale
Source: S&P Dow Jones Indices, SICM

We see that the 'GFF' portfolio provides an accumulated active return, over five years, which is superior to the 'core' portfolio, but inferior to the 'extended' portfolio. Over the three-year period of 2011 to 2013, the GFF portfolio provides the lowest cumulative active return of all the strategies.

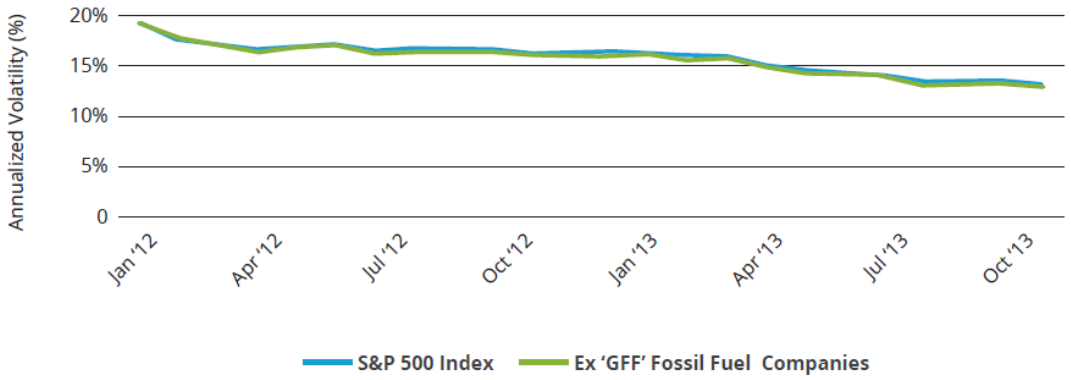
What is entirely consistent with the other two portfolios is the declining rolling volatility over both a 12 month and 36 months periods, ending December 2013. See Figures 28 and 29. The level of volatility for each moves in tandem. Once again, this is not too surprising given the relatively few exclusions imposed by the GFF constituents within the S&P 500.

Figure 28: Rolling volatility of the 'GFF' portfolio over 12 months



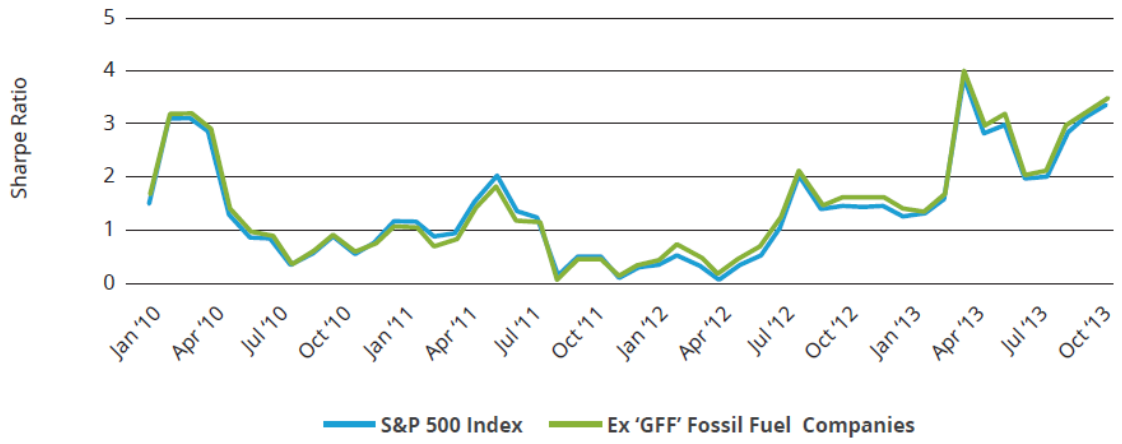
Source: SICM

Figure 29: Rolling volatility of the 'GFF' portfolio over 3 years



Source: SICM

Figure 30: The 12-month rolling Sharpe Ratio for the 'GFF' portfolio and S&P 500 Index



Source: SICM

Again, consistent with the other ex-fossil fuel portfolios, we note the rising trend in the Sharpe ratio. See **Figure 30**. Again, we observe the fall in the Sharpe ratio from mid 2011 to mid 2012 when it reached zero, but subsequently peaked at just above 4.0 in mid-2013.

Summing up performance

All three ex-fossil fuel portfolios outperformed the S&P 500 over five-year, three-year and one-year periods. See **Table 4**. Over the longest time period the 'extended' portfolio provided a significant cumulative active return of 5.2%, the 'GFF' portfolio provided 4.0%, and the 'core' portfolio 3.4%.

Table 4: Cumulative active returns compared to the S&P 500 Index

		5 Years (2009-2013)	3 Years (2011-2013)	1 Year (2013)
S&P 500	Core	3.4%	2.0%	0.8%
	GFF	4.0%	1.6%	0.8%
	Extended	5.2%	2.9%	1.3%

Note that the highest values are shown in blue.
Source: SICM

In terms of volatility, all three portfolios showed similar levels of annualized volatility to each other and to the S&P 500 Index. Driven by the superior performance all three portfolios and declining volatility levels we observed superior and increasing Sharpe ratios when compared to the Index. See **Table 5**.

Table 5: Annualized returns & volatility and Sharpe ratios for the portfolios and the S&P 500 Index

	Annualized Returns			Annualized Volatility			Sharpe Ratio		
	5 Years	3 Years	1 Year	5 Years	3 Years	1 Year	5 Years	3 Years	1 Year
S&P 500 Index	19.9%	15.8%	28.7%	15.2%	12.1%	8.4%	1.30	1.30	3.38
Core	20.6%	16.5%	29.5%	15.1%	11.5%	8.5%	1.36	1.43	3.46
GFF	20.7%	16.3%	29.5%	15.3%	11.9%	8.6%	1.35	1.38	3.44
Extended	20.9%	16.8%	30.0%	15.3%	11.8%	8.6%	1.36	1.42	**3.49**

Source: SICM
Note that the highest annualized returns are shown in blue.

b/ BEWARE THE UNINTENDED CONSEQUENCES

In previous sections of this report we have assumed that the Asset Owner has made a conscious decision to remove certain sub-industries from the investment universe, with the purpose of reducing their exposure to fossil fuels. Now we will examine the effect of this decision, and other collateral decisions, whether intentional or not.

To determine the impact of imposing portfolio constraints (i.e. the exclusion of certain securities) we use a MSCI Barra portfolio management analytics model to help us understand the portfolios' exposures and return attributions effects to various factors. This framework allows us to understand the impact on the portfolios to factors such as countries, industries (sectors), currencies, and risk indices (e.g. investment styles such as Size, Momentum and Volatility). Please see definitions of risk indices in Section 8.

Following on from the Asset Owner's decision to eliminate their exposure to fossil fuel companies, it is the function and responsibility of the Asset Manager to try to maximise the return of the portfolio whilst adhering to these pre-determined constraints. To undertake this role successfully, the Asset Manager needs to understand both the intentional and unintentional risks associated with running such a portfolio.

The key risks in the 'core' portfolio

By running a historical analysis of a simple portfolio structure that excludes those sub-industries associated with the definition of the 'core' portfolio (see **Section 3c** for details) and reallocating the divested portion on a pro-rata basis across the remaining S&P 500 constituents, we scrutinize the five-year results using MSCI Barra analytics in order to determine the how various risk (and return) factors contribute to the cumulative active return.

In Table 6 we show the five highest contributors to the active return of the 'core' portfolio over the last five years. It is probably of little surprise that the omission of Energy stocks was the major contributor, accounting for nearly 10 percentage points of the cumulative active return. What is less obvious is that by pro-rating the Energy sector's allocation to the rest of the S&P 500's sectors, the portfolio benefitted from an overweighting in Information Technology, Health Care and Consumer Staples sectors as well. These 'benefits' may have been unexpected, but they had a positive impact on performance. In addition, by excluding the Energy sector, the 'core' portfolio benefitted from a positive exposure to Momentum, aided by a rising equity market environment. Again, this exposure, and hence risk, would not initially have been expected by the Asset Owner nor the Asset Manager.

Table 6: Five largest positive contributors to cumulative active return in the 'core' portfolio

Best Five Policies	Average Active Exposure (%)	Risk (% Std Dev)	Contribution (% Return)		
			Average	Variation	Total
Energy Sector	-11.31	1.01	9.57	0.77	10.34
Information Technology Sector	3.16	0.14	2.07	-0.20	1.87
Momentum	1.16	0.14	0.48	0.74	1.22
Health Care Sector	1.29	0.07	1.14	-0.09	1.04
Consumer Staples Sector	2.26	0.10	1.04	-0.04	1.01

Source: MSCI Barra, SICM
For definition of Momentum please see Section 8

If we leave aside the contribution from the sector weightings, we can examine what happened to other risk sources – like Momentum – and examine their contribution to the 'core' portfolio's active return. See **Table 7**. We can see that the Momentum factor makes the largest positive contribution to active return and other factors like Growth and Size also make meaningful contributions. Not all risk indices made a positive contribution. As we discuss below, Beta makes a notable negative impact, as does Earnings Yield.

Table 7: 'Core' portfolio attribution report from risk indices (annualized contributions)

Source of Return	Average Active Exposure	Contribution (% Return)			Total		
		Average [1]	Variation [2]	Total [1+2]	Risk (% Std Dev)	Info Ratio	t-Stat
Beta	-0.06	-3.74	-1.14	-4.88	0.41	-0.95	-2.12
Momentum	0.01	0.48	0.74	1.22	0.14	0.61	1.36
Size	-0.01	0.23	-0.04	0.19	0.02	0.71	1.59
Earnings Yield	-0.04	-1.58	0.03	-1.54	0.06	-1.72	-3.84
Residual Volatility	0.02	-0.98	0.47	-0.51	0.16	-0.19	-0.41
Growth	0.02	0.29	0.07	0.36	0.03	0.80	1.78
Dividend Yield	0.00	0.02	-0.03	-0.01	0.02	-0.07	-0.16
Book-to-Price	-0.03	-0.31	-0.34	-0.65	0.04	-1.18	-2.63
Leverage	0.05	0.13	-0.12	0.02	0.07	0.04	0.10
Liquidity	0.01	-0.06	0.15	0.09	0.02	0.28	0.62
Non-Linear Size	0.01	0.15	0.03	0.17	0.01	1.13	2.52
Total				-5.55	0.40	-1.07	-2.38

Source: MSCI Barra, SICM
For definition of source of return please see Section 8

Table 8 shows the major effects that reduced the return of the 'core' portfolio. The greatest negative impact was from the Beta of the 'core' portfolio, the exposure of which was lowered by the elimination of the Energy sector. The cost to the portfolio's cumulative active return was nearly 5 percentage points, cancelling out nearly half of the upside provided by the Energy sector underweighting discussed above. Generally, asset (stock) selection was poor across the portfolio and within the Health Care sector. Note that although the overweighting of the health care sector itself was positive, the investments made in the individual health care stocks were poor. We are careful to note here that stock selection in this case is nothing more that the result of the pro-rating of the additional capital resulting from the exclusion of the Energy sector. There is no "skill" here to measure. As this portfolio is a US-based fund, with no overseas exposure, the asset selection and asset selection for the Americas region shows the same contribution to return.

Table 8: Five largest negative contributors to cumulative active return in the 'core' portfolio

Worst Five Policies	Average Active Exposure	Risk (% Std Dev)	Contribution (% Return)		
			Average	Variation	Total
Beta	-0.06	0.41	-3.74	-1.14	-4.88
Asset Selection	N/A	0.73	N/A	N/A	-2.76
Asset Selection - Americas Region	N/A	N/A	N/A	N/A	-2.76
Earnings Yield	-0.04	0.06	-1.58	0.03	-1.54
Asset Selection - Health Care Sector	N/A	N/A	N/A	N/A	-1.06

Source: MSCI Barra, SICM
For definition of source of return please see Section 8

The key risks within the 'extended' portfolio

The 'extended' portfolio excluded many more sub-industries and securities than the 'core' portfolio; the core's exclusions being a subset of the 'extended' portfolio's. The 'extended' portfolio was the best performing of the three, over a five-year period. (See Section 5a.)

With this portfolio we can again see that the greatest cumulative contribution to the active return of the fund, when measured against the S&P 500 Index, was the underweighting of the Energy sector. See Table 9.

Table 9: Five largest positive contributors to cumulative active return in the 'extended' portfolio

Best Five Policies	Average Active Exposure	Risk (% Std Dev)	Contribution (% Return)		
			Average	Variation	Total
Energy Sector	-11.30	1.00	9.64	0.77	10.41
Utilities Sector	-3.36	0.21	2.87	0.25	3.12
Information Technology Sector	4.83	0.22	3.11	-0.20	2.91
Health Care Sector	2.33	0.13	2.05	-0.14	1.92
Consumer Discretionary Sector	1.83	0.10	1.66	-0.11	1.55

Source: MSCI Barra, SICM

We are able to view the effect of the sector realignment – pro-rating the excluded sub-industry weightings to the remaining S&P 500 sectors – in further detail. See **Table 10**. Although the Energy sector underweighting made a significant positive contribution of 10.4% other sectors such as Information Technology, Utilities, Health Care, Consumer Discretionary, and Consumer Staples also made meaningful contributions. The Telecommunication Services and Financials sectors made a negative contribution to active returns.

Table 10: 'Extended' portfolio attribution report by industry (cumulative contribution)

Source of Return	Average Active Exposure (%)	Contribution (% Return)			Total		
		Average [1]	Variation [2]	Total [1+2]	Risk (% Std Dev)	Info Ratio	T-Stat
Energy	-11.30	9.64	0.77	10.41	1.00	0.74	1.65
Materials	-1.19	-0.17	0.12	-0.05	0.06	-0.11	-0.25
Industrials	0.05	0.30	-0.01	0.29	0.09	0.29	0.64
Consumer Discretionary	1.83	1.66	-0.11	1.55	0.10	1.16	2.59
Consumer Staples	3.28	1.58	-0.05	1.53	0.13	0.79	1.77
Health Care	2.33	2.05	-0.14	1.92	0.13	0.98	2.18
Financials	3.08	-0.80	-0.17	-0.97	0.14	-0.45	-1.01
Information Technology	4.83	3.11	-0.20	2.91	0.22	0.99	2.22
Telecommunication Services	0.46	-0.10	-0.04	-0.14	0.03	-0.41	-0.91
Utilities	-3.36	2.87	0.25	3.12	0.21	1.12	2.51
Total				20.58	1.37	1.08	2.41

Source: MSCI Barra, SICM

Detracting from performance was again Beta. As with the 'core' portfolio this made the largest negative contribution, over 4 percentage points, to the active return of the portfolio. See **Table 11**. Asset Selection was also a detractor as was Earnings Yield – the difference based on a company's earnings relative to its price – and Residual Volatility – returns from high volatility not explained by the Beta factor. Unless the Asset Manager analyses these returns we believe that it would be hard to predict these influences. Once understood the Asset Manager is able to then manage the portfolio for these effects.

Table 11: Five largest negative contributors to cumulative active return in the 'extended' portfolio

Worst Five Policies	Average Active Exposure	Risk (% Std Dev)	Contribution (% Return)		
			Average	Variation	Total
Beta	-0.05	0.35	-3.03	-1.23	-4.26
Asset Selection	N/A	0.80	N/A	N/A	-3.00
Asset Selection - Americas Region	N/A	N/A	N/A	N/A	-3.00
Earnings Yield	-0.04	0.08	-1.76	-0.01	-1.76
Residual Volatility	0.04	0.21	-1.80	0.34	-1.46

Source: MSCI Barra, SICM
For definition of source of return please see Section 8

The key risks of the 'GFF' portfolio

The 'GFF' portfolio, which was the least constrained by the exclusions, has a similar set of positive contributors to active return as the 'core' portfolio. The underweighting of the Energy sector is again the largest contributor to active return at nearly 9 percentage points. See **Table 12**. Also the increased exposure to the Information Technology sector, Momentum and Consumer Staples also reappear.

Table 12: Five largest positive contributors to cumulative active return in the 'GFF' portfolio

Best Five Policies	Average Active Exposure	Risk (% Std Dev)	Contribution (% Return)		
			Average	Variation	Total
Energy Sector	-8.61	0.73	8.09	0.61	8.70
Information Technology Sector	2.56	0.11	1.70	-0.15	1.55
Momentum	0.01	0.11	0.44	0.85	1.29
Consumer Staples Sector	1.90	0.08	0.86	-0.02	0.84
Asset Selection - Energy Sector	N/A	N/A	N/A	N/A	0.79

Source: MSCI Barra, SICM
For definition of source of return please see Section 8

On the negative side, as with the other two portfolios ('core' and 'extended') Beta tops the list. See **Table 13**. The lower beta of the 'GFF' portfolio caused the portfolio to give-up returns in an on-average rising market, hampering returns by 3 percentage points. Residual volatility and Earnings Yield also acted as a drag on active returns. This is similar to the 'extended' portfolio's negative contributors to return.

Table 13: Five largest negative contributors to cumulative active return in the 'GFF' portfolio

Worst Five Policies	Average Active Exposure	Risk (% Std Dev)	Contribution (% Return)		
			Average	Variation	Total
Beta	-0.03	0.22	-1.83	-1.23	-3.06
Earnings Yield	-0.04	0.06	-1.51	0.05	-1.47
Residual Volatility	0.03	0.14	-1.39	0.21	-1.18
Asset Selection - Health Care Sector	N/A	N/A	N/A	N/A	-1.01
Asset Selection	N/A	0.65	N/A	N/A	-0.87

Source: MSCI Barra, SICM
For definition of source of return please see Section 8

c/ SUMMING UP THE EFFECT OF BOTH INTENTIONAL AND UNINTENTIONAL EXPOSURES TO RISK

Many professional investors may well have been able to forecast that the single largest, positive contributor to returns would be the large underweighting of the Energy sector. In all three portfolios this was the most important, positive contributor to active returns, when measured against the S&P 500 Index. Perhaps more difficult to predict was the positive contribution made by the overweighting of the Information Technology sector in all three fossil-fuel-free portfolios. Likewise, the importance of the Health Care sector in two of these portfolios would not instantly spring to mind.

On the negative side of active return contribution, was the decline in the beta, relative to the S&P 500 Index. This was the single most important negative contributor. An Asset Manager running fossil-fuel-free portfolios should bear this in mind when constructing the portfolios, and manage this unintentional risk, particularly if the market goes on a sustained upward trend. It is also noteworthy that Earnings Yield – the return difference based on a company's earnings relative to

its price – was a major negative contributor in all three portfolios. Again, a robust portfolio construction process would adjust for this and manage this unintended risk.

The Asset Owner chose to reduce fossil fuel exposure, however, assuming no control of other risk factors, ended up overweighting Information Technology and Health Care (and being rewarded with higher returns) whilst reducing Beta and Earnings Yield exposure, which turned out to be detrimental to active returns.

6 CONCLUSION

Whether to adopt a fossil fuel divestment strategy is highly topical. Initial nonchalance by the financial community has given way to more rigorous scrutiny. It is possible to push the moral argument to one side and solely examine the financial implications of such an investment strategy.

Initially Asset Owners need to be clear with their definition of what a fossil-fuel-free portfolio should include and exclude. There are a range of options available. These portfolios can exclude different parts of the carbon cycle – ranging from eliminating only the owners and developers of fossil fuel reserves, to rejecting the many consumers of fossil fuels as well (e.g. airlines and auto makers). In addition, there are a variety of investment processes that attempt to capture fossil-fuel-free returns. At the simpler end, but providing clarity, is the negative screen. More complex can be a portfolio tilting approach to those companies with 'better' carbon strategies. Most subjective is the thematic investing approach.

It appears the financial market is not entirely agreed on how best to measure the performance of an Asset Manager of these more specialised funds. An investigation of themed funds such as water and agribusiness implies that many Asset Owners are comfortable judging the performance of their funds relative to global benchmarks.

We examined three different ex-fossil fuel portfolios, adopting different negative screens, and compared all three to the same benchmark (S&P 500 Index). By using only one country, we minimised geographical influences. We found that the excluded part of the S&P 500 Index varied considerably over time from 11% to 19%. In turn, this had implications for the risks and returns of these portfolios.

All three ex-fossil fuel portfolios outperformed the S&P 500 Index's over the one-year, three-year and five-year periods ending December 31, 2013. The best performing ex-fossil fuel portfolio produced a cumulative active return of 5.2% over a five-year period. Helped by superior performance and volatility levels commensurate with the S&P 500, all three portfolios demonstrated a superior Sharpe ratio to the S&P 500 Index over the five-year period (ended 31 December 2013).

An analysis of the cumulative active returns of the three ex-fossil fuel funds revealed some unexpected sources. Although the absence of the Energy sector was a predicted source of positive returns, the importance of an overweighting of the Information Technology and Health Care sectors was less so. There were also negative contributors to the funds' returns, notably the lower Beta of these portfolios relative to the S&P 500 Index and also the underweighting of the Earnings Yield factor. Beta alone reduced active performance in the portfolios by between 3.1 and 4.9%.

Fossil-fuel-free investing did deliver superior returns relative to the S&P 500 Index during several recent time periods. Interestingly, the most constrained portfolio, which had the highest level of exclusions, performed the best. We showed that the returns of these portfolios could have been further improved if the Asset Manager had controlled the unintended risks associated with implementing an ex-fossil free investment strategy.

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Biographies

John Willis has 27 years of investment experience. Prior to joining SICM, John was a Managing Director at Deutsche Asset Management, where he served as the Global Head of Trading, Securities Lending, and Research. He was also Head of the Market Research Strategy Investment Team, which oversaw the management of eleven mutual funds. These funds covered a range of investment strategies including Global, European, Emerging Markets, and Value. Before DeAM, John held a number of sell-side roles at Deutsche Bank (2000–2005), Bankers Trust (1999–2000), NatWest Markets (1996–1999), Kleinwort Benson (1993–1996), and Yamaichi (1987–1993). John holds a Bachelors of Arts from Oxford University.

Paul Spence has 24 years of experience in the field of portfolio construction and risk management. Before joining SICM, Paul was Global Head of Risk and Portfolio Analytics at Deutsche Asset Management (2006–2012). He was also a Portfolio Manager for the global equity (developed and emerging markets) strategies. During Paul's tenure, he developed and successfully implemented innovative analyst measurement systems. He was responsible for the delivery of a global, integrated risk management platform. His previous positions included: Head of Quantitative Research Asia-Pacific at Zurich-Scudder (1997–2006), SVP at Barra International (1994–1997), and Quantitative Analyst at Prudential Portfolio Managers (1989–1994). Paul holds a Bachelors of Applied Science (Mathematics) from University of Technology, Sydney.

About SICM

Sustainable Insight Capital Management (SICM) is an SEC-registered investment management firm that combines a disciplined security selection process with environmental, social and governance (ESG) principles. Our investment philosophy is founded on three core principles: (1) Analyst skill level is fundamental to delivering positive expected returns; (2) Environmental, Social, and Governance (ESG) factors are becoming increasingly material to asset valuations; (3) Minimizing common risk factors isolates security selection skill leading to improved expected positive alpha.

Launched in February 2013, SICM is striving to create the leading sustainable asset management platform. The firm was founded by Kevin Parker, CEO and Chairman of the Board. Kevin was a Member of the Management Board of Deutsche Bank for over 10 years and the former Global Head of Deutsche Asset Management from 2004–2012. Our partners include Capricorn Investment Group and The Kresge Foundation. Presently, we are 14 people with offices in New York (headquarters), London, and Sydney.