preventable surprises

INSTITUTIONAL INVESTORS AND CLIMATE-RELATED SYSTEMIC RISK

26 OCTOBER 2015

This paper is designed to provoke discussion about the case for forceful stewardship being an investor strategy for managing climate related systemic risk which is at least as important as divest-invest (i.e. divestment combined with green investments eg climate bonds, green equity and other asset class funds) and portfolio carbon management (i.e. portfolio decarbonization, tilting, strategic asset allocation). The paper also looks at how forceful stewardship guidelines can be implemented in different countries and through different players in the investment system. Readers who are interested in this practical agenda may also like to see "Investors, Climate Risk and Forceful Stewardship: An Agenda for Action" which is free to download on the home page of www.preventablesurprises.com

Acknowledgements

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Preventable Surprises is a 'think-do' tank which seeks to assist institutional investors align their activities with the long-term needs of their members and customers. In so doing, we help address daunting systemic challenges such as climate disruption.

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The problem of climate-related systemic risk

Climate change creates specific risk for investors in industries most likely to be affected, and systemic risk from general economic damage. High climate damage could have a large impact on future dividends and the cash flow from other asset classes. This should be of concern to long-term investors, in particular pension funds, life insurance companies, indexed funds, mutual funds, endowments and sovereign wealth funds.

Specific risks, and opportunities, arise both from the effects of climate change and from policy changes to reduce emissions. The significant increase in specific risk to the fossil fuel industry from the possible growth in renewables and electric vehicles correlates with a decrease in overall systemic risk across a balanced portfolio, but does not come close to eliminating this risk.

There is at present no consensus about the likely scale of climate-related damage to the world economy. Estimates of damage if warming reaches 2.5° range from a 4% to a 50% reduction in world gross domestic product compared to what it would have been without warming. In a plausible worst case, with a probability of occurrence of around 3%, the current contingent value impairment to an investment portfolio due to warming tipping global growth into global decline later this century is around 10% and is increasing by 0.5% per annum.

Given the size of the potential loss in value and the likelihood that it will not be known with any certainty how large the loss will be until it is too late to prevent it, investors should do what they reasonably can to prevent this outcome now.

Forceful stewardship as a third strategy for investors

Institutional asset owners are legally bound by a duty of care and loyalty and must place the needs of their beneficiaries above other considerations. They must also control for risk. It follows that long-term asset owners need to balance their responsibilities to future and to present beneficiaries, and manage systemic as well as specific risk.

Past experience suggests that systemic risks tend to build, largely unnoticed, over time, and then reach a tipping point and may trigger collapse. The effects can be widespread and very costly, including costs of recovery.

Current investor initiatives (divest-invest and portfolio carbon management) have already demonstrated considerable value in the signals they send to carbon intensive companies and governments/the public, and can offset risks in particular sectors. But the direct impact they have on systemic climate-related risk is limited.

INSTITUTIONAL INVESTORS AND CLIMATE-RELATED SYSTEMIC RISK

The only means of reducing systemic climate risk is to make a rapid transition to a low carbon economy. According to Mercer, a 2° scenario may not even have negative return implications for long-term diversified investors at a total portfolio level. Investors therefore, have an important role to play, alongside governments, in bringing about this transition. Through forceful stewardship they can require the companies of which they are owners to produce business plans consistent with this transition and with operating in a world where warming does not exceed 2ºC: in shorthand we call this a "2° Transition Plan".

The proposed forceful stewardship guidelines allow investors to fulfil their fiduciary responsibilities to future as well as current beneficiaries, in adopting risk management strategies fit for the 21st century. Following these guidelines curbs the threat of legal action by beneficiaries concerned over material risk management failures and is a cost-effective means of supporting system change. Using the phrase forceful stewardship or something similar is helpful but *acting* in accordance with the guidelines is what really counts.

INSTITUTIONAL INVESTORS AND CLIMATE-RELATED SYSTEMIC RISK

Climate Risks to the Financial System[1]

By Howard Covington[2]

In a speech to insurers and investment experts at Lloyd's of London in October 2015, Mark Carney, the Governor of the Bank of England, expressed concern about the risks to financial stability from climate change. He observed that an agreement by governments to limit warming to 2°(centigrade, compared to pre-industrial) will create a specific risk for the fossil fuel sector through the changes in asset values it will trigger. In the absence of an agreement, the systemic risk to the world economy from future climate damage will continue to rise. Either outcome may create financial instability.

SPECIFIC RISK

Much work has been done on the risks to the fossil fuel sector that assets will be stranded by policy developments[3]. Even without further actions by governments, however, fossil fuels will experience increasing competition from renewables. In the last decade wind and solar grew by 20% and 40% a year respectively and now jointly account for just under 5% of electricity generation[4]. They are at or approaching cost parity in many markets and their costs are expected to go on falling. The advent of cost-effective domestic batteries and the development of smart metering in the next decade will further boost demand for domestic solar. Industry projections of long-term average growth in annual installations of generating capacity are in the range 0% to 4% for wind and 5% to 10% for solar. These translate into 10% to 15% pa near-term growth in renewables generating capacity. It takes seven years to double capacity at 10% pa growth and 5 years at 15% pa. Three capacity doublings would lift the renewables market share of generation towards 40%. Cost-effective batteries will bring the capital cost of electric vehicles below those of petrol vehicles in the early 2020s with life-time ownership costs expected to be significantly less. Sales of electric vehicles may increase by around 40% a year in the next five years, taking their share of light vehicle sales from less than 0.5% now to around 3%. Growth in autonomous vehicles in the 2020s and their use with taxi hailing apps have the potential to transform urban light vehicle use and to boost the share of electric vehicles in global light vehicle sales.

A sense of the consequences of these technology changes can be obtained by starting from industry projections for coal and gas use in electricity generation and for oil use in transport and adjusting them for reasonably fast growth in renewables and electric vehicles. This produces a picture of coal and gas demand for electricity generation that peaks in the 2020s and for oil demand in transport that peaks in the 2030s. In both cases demand declines rapidly after the peak – see Figures 1 and 2. The reductions in demand are on a large enough scale potentially to create supply surpluses, depress fossil fuel prices and undermine the investment case for high-cost, long-life extraction projects. These simple projections suggest that on a timescale of a decade or so fossil fuel

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[1] A version of a paper being prepared for the Finding Petroleum forum 'Investing in Petroleum under a Carbon Cloud' being held on 19 November 2015 in London.

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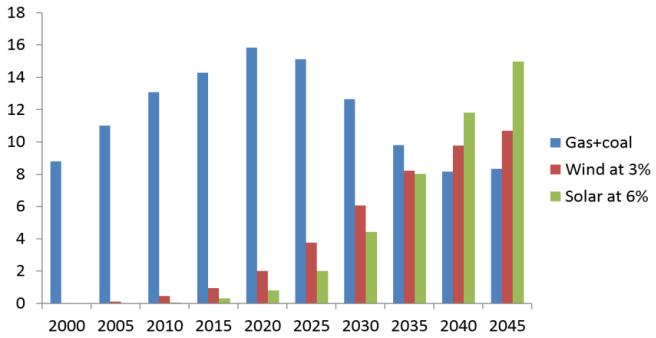
[3] See, for example, the work of the Carbon Tracker Initiative and the Stranded Assets Programme of the Smith School (University of Oxford).

[4] Sources and bases are set out on pages 8 to 10.

assets are vulnerable to being stranded by competition from renewables and electric vehicles. Further regulations to reduce emissions will only accelerate this technological stranding. Unless investors, insurers and lenders take this possibility into account monitoring progress towards it and adjust their portfolios accordingly, there is a risk that a decline in fossil fuel use will end up surprising them.

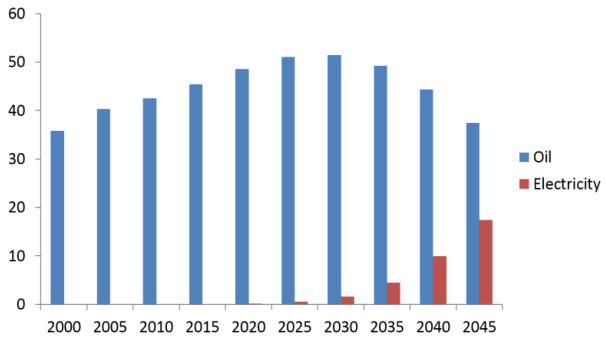
In time, fossil fuel companies will begin to adjust to the unavoidable long period of declining demand that lies ahead. Those with the lowest cost reserves will preserve value for shareholders by managing themselves to maximise cash-flow during this period. Others will seek economies through mergers and acquisitions. In any event, the downside risk for the industry will increase significantly until it has adjusted itself to the coming changes.

Fig 1: Coal and gas generation peak in the 2020s



Note: Units are '000 tera-Watt hours of electricity.

Fig 2. Oil in transport peaks in the 2030s



Note: Units are million barrels of oil per day

The future depicted in Figures 1 and 2 may seem to be technologically optimistic. Although fossil fuel use for generation and transport decline rapidly after the peak, these only account for around half of aggregate fossil fuel use. In the absence of stricter regulations, total fossil use only declines slowly, so that damage to the economy from warming continues to be a significant systemic risk.

SYSTEMIC RISK

A simple calculation illustrates the scale of the systemic risk to the financial system from climate change. According to elementary finance theory, the value of a financial asset is the present value of its expected future income, calculated using a market discount rate. It follows that the value of a stream of dividends that grows steadily from unity is approximately the reciprocal of the difference between the discount rate and the growth rate. In the very long term, dividends from a well-diversified portfolio might be expected to grow at the same rate as the world economy, all other things being equal. If the world warms by several degrees, the rate of growth of world gross domestic product (GDP), and therefore of dividends, may be reduced compared to what they would have been without warming.

Suppose, for example, that in the absence of warming the world economy is expected to grow at 2.5% a year, but that economic damage from warming in a 'plausible worst case' brings growth to a halt before 2100. If this happened in the mid-2080s then by 2100 world GDP would be 30% less than it would have been without warming. The net effect would be to reduce to 2.1% the average expected growth rate to 2100. A typical long-term discount rate used by investment analysts for discounting dividends might be 6.5%. The consequence is that the value of a portfolio would be 10% lower if economic damage of this magnitude were expected than if it were not. This is the contingent value reduction or 'impairment' due to future climate damage.

If dividends were 30% lower in 2100 than they would have been without warming and no dividend growth was expected after 2100, then the value of a portfolio would by then be 57% lower. The value impairment of the portfolio due to climate damage in this plausible worst case would have increased by 47% over 85 years, an annual rate of increase of around 50 basis points a year.

Economists have estimated that growth might come to a standstill if climate damage were to reduce world GDP by about half compared to what it would have been without warming. The chance of such an outcome is estimated below at a few percentage points. In other words, if the experiment of warming the atmosphere were repeated a hundred times then it might be expected that a few times out of a hundred the damage would climb so high that it terminated economic growth. Permanently halting growth might therefore be regarded as a plausible worst case outcome for climate damage.

The expected warming this century may be as low as 2.5° on a best-case analysis of pledges made by governments or as high as 4.0° in a worst case under current policies. This range might be extended by 0.5° at either end to allow for modelling uncertainty so that a range of actual warming by 2100 might be 2.0° to 4.5°. Where things actually come out depends very much on whether governments implement and keep to the radical actions needed to honour their pledges. These will, of necessity, have to accelerate and broaden the kinds of technology changes we have already discussed. At the moment investors understandably remain sceptical. In what follows, partly for simplicity but also in recognition of this scepticism, it is assumed equally likely that warming this century will come out anywhere in the 2.0° to 4.5° range.

Provided that a broad-brush view is taken, it is simple to estimate the chance of high economic damage this century. The warming that would cause 50% economic damage is anyone's guess. Although it might turn out to be higher or lower, assume for the purposes of illustration that this level of damage lies in the range 4° to 7°. The joint probability of actual warming and the warming for 50% damage both being in the range 4° to 4.5° (where they overlap) is then about 3% if all outcomes are equally likely. A more detailed analysis also suggests that the probability that warming by 2100 will be enough to produce damage of 50% is 3%. The expected reduction in the present value of dividends that results in this case leads to a portfolio value impairment of around 10%, currently increasing at 50 bps a year. This is the same value impairment as in the simple calculation with which we began.

A similar analysis can be made for the likelihood of economic damage rising to 25% of world GDP. For a family of models of climate damage, the warming that produces 25% damage is about 85% of the warming that produces 50% damage. The probability of damage reaching 25% by 2100 for this family is around 12%. The expected impairment to the current value of a portfolio is 5%, increasing by 25 basis points a year.

Fig 3. Systemic Risk

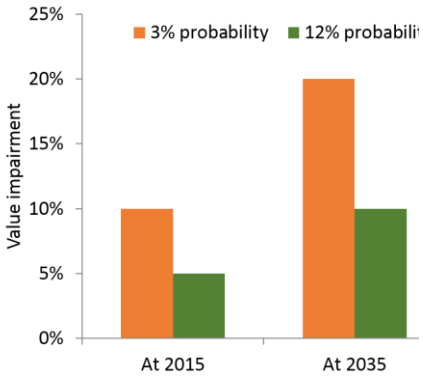


Figure 3 illustrates these results. Value impairment is calculated both as at 2015 and as at 2035, the difference reflecting less years of discounting to the period in which high climate damage occurs.

When financial institutions calculate the impairment to their assets that might result from a financial shock they typically look at a plausible worst case as one with a probability of occurrence between 1% and 5% in a given time period. Given the probability, they define what they call 'value at risk' as the impairment of assets from this plausible worst case. By analogy, and in view of the size of its probability, damage of 50% of world GDP by 2100 seems to qualify as a plausible worst case for climate damage. The value at risk this century from future climate damage might therefore be defined as the impairment of the value of portfolio in this plausible worst case.

The total value of the shares listed in the world's equity markets is around $70 trillion, suggesting that the value at risk is currently $7 trillion and, until we are confident that a low-carbon energy transition is well under way, is increasing at £350 billion a year. This is a measure of the systemic climate risk to the world's equity markets from plausible worst case climate damage. The value of other assets such as bonds and property would also be affected in this plausible worst case.

The probability of the plausible worst case has been estimated above at around 3%. This probability will change both as our understanding improves of the likely damage from future warming and as we obtain a better sense of where warming is likely to come out. For example, as we understand better the effects of warming on labour productivity it may be possible to put a lower bound on damage for high levels of warming. Other things being equal, this may increase the probability of the plausible worst case. On the other hand, if good and rapid progress is made towards an international agreement to reduce emissions, then this probability may decrease.

CONTROLLING SYSTEMIC CLIMATE RISK

Senior lawyers have concluded that investment fiduciaries, such as fund managers, insurers and pension trustees, who manage money on behalf of clients or beneficiaries, have a fiduciary duty to control for risk. By finance industry standards a change of value of 5% is considered material. Expected impairments to portfolio value of between 5% and 10% from future climate damage, increasing annually at between 0.25% and 0.5%, and with a probability of occurrence of between 12% and 3% cannot therefore just be ignored.

This value impairment is a systemic risk that arises from damage to the economy as a whole, so it cannot be controlled by hedging or limiting exposure to particular assets. One might therefore ask how investment fiduciaries are controlling this risk. In many cases, the answer is that they are not and may therefore be in breach of their fiduciary duty. As the chief executive of a large asset manager summarised his firm's view in 2015: "We don't ignore climate change, we just neglect it. Maybe it's time we didn't".

If they chose to, investment fiduciaries could act to reduce systemic climate risk. The largest 500 companies listed on world stock markets account for about half of market value and 15% of emissions suggesting, crudely, that all listed companies account for around 30% of emissions. Investors could seek to reduce these emissions by acting as 'forceful stewards' and proposing and voting for well-considered shareholder resolutions aimed at increasing or preserving value while reducing emissions.

There are promising signs that a few forward-looking investors are beginning to think in this way. Companies are also beginning to respond by testing their asset portfolios against the eventuality that emissions will have to be reduced consistent with warming being limited to 2°.

Guidelines have been published that indicate how investors could act to control systemic risk and are discussed in greater detail in the accompanying paper. These propose that investors declare their intention to vote in favour of prudently formulated shareholder resolutions that reduce systemic climate risk while protecting shareholder value in the long-term and instruct their voting agents to vote automatically in favour of such resolutions.

The guidelines envisage investors voting in favour of resolutions that call for listed companies to publish robust analyses of their assessments of the physical, policy and economic impacts to their businesses of warming of 2° and 4°. They also suggest that investors declare their intention to vote in favour of resolutions that call for listed companies to publish business plans that describe how, without damaging shareholder value, they can reduce their emissions each year by an appropriate amount for their industry and/or adapt to a carbon price that rises to $100 per tonne of carbon dioxide by 2030 and/or describe how their business could adapt to regulations aimed either at meeting a 2° warming target or restricting atmospheric carbon dioxide to 450 parts per million.

These are small steps towards bringing down emissions from the listed companies owned by investors while we all wait to see whether governments will have the tenacity to implement the changes necessary to reduce emissions. None of the steps is particularly onerous for investors to support or for the companies they own to comply with. If "2°C Transition Plans" were in circulation, companies might be enabled to agree amongst themselves a level playing field for jointly reducing emissions.

That investors and companies are still hesitating, notwithstanding all the information available to them on the climate risks that they are running, has been described as 'irrational apathy'. It is surely time for investors to shrug off their apathy for a moment, reflect on their legal duties and act to control systemic climate risk while they can.

SOURCES AND BASES

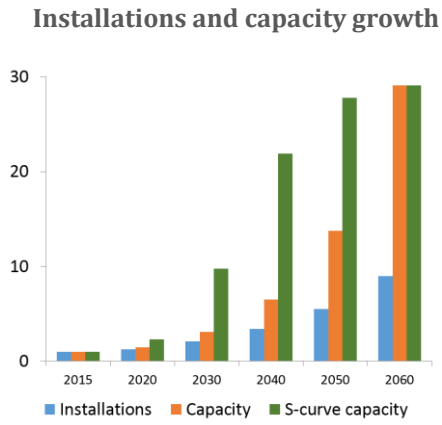
For general background see Covington and Thamotheram 2015 (parts 1 and 2) and Covington 2015.

P1. Wind and solar grew by 20% and 40% a year respectively.
See GWEC 2015, EPIA 2014.

P1. Wind and solar are at or approaching cost parity and their costs are expected to go on falling.
See Shah 2015, Lazard 2014.

P1. Industry projections of annual installations are 0% to 4% for wind and 5% to 10% for solar.
See GWEC 2014, Fürstenwerth 2015.

P1. Installations growth translates into 10% to 15% pa growth in generating capacity.
There is a three step model: (a) project installations growth to 2060; (b) calculate capacity in 2060 as the sum of installations over a previous period equal to the plant lifetime; (c) assume that 2060 capacity is actually reached according to an S-shaped (logistic) curve and obtain the growth in capacity from 2015 to 2035 from this curve. The chart to the right illustrates this model assuming 5% pa growth in installations.



P1. Electric vehicle sales may increase by 40% a year.
See Hummel 2014.

P1. A sense of the consequences of technology changes can be obtained.
The charts are constructed from BP's forecasts of fossil fuel use to 2035 [BP 2015] extrapolated to 2045 and on the assumption that projections for wind and solar on the one hand and electric vehicles on the other partially displace fossil fuel use projected by BP. Wind and solar projections are based on 3% and 6% annual installations growth respectively. Electric vehicle projections are based on a logistic curve for market penetration of light vehicles sales that reaches 15% by 2030. Electricity demand for electric vehicles is assumed to be an additional source of demand for solar.

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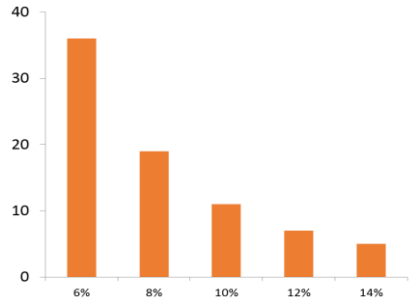
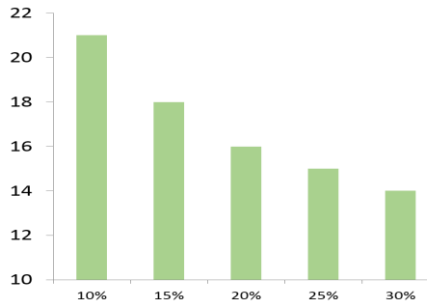
P1. The decade or so starting in 2020 is when peak demand is likely.
The sensitivity of the year of peak demand for coal and gas in generation and oil in transport is illustrated in the following charts.

Years to peak coal and gas in generation



Renewables generation growth

Years to peak oil in transport



2030 EV sales penetration

P2. Fossil fuel for generation and transport accounts for half of aggregate fossil fuel use.
See BP 2015.

P2. Total fossil use only declines slowly.
See Covington 2015. The rate of decline is about 0.6% pa.

P2. A typical long-term discount rate might be 6.5%.
See Covington and Thamotheram 2015 for a justification.

P2. A simple calculation illustrates the scale of the systemic risk.
This is just the discounted dividends model, $Value = \frac{d}{k-g}$.

P3. Economists have estimated that growth might come to a standstill.
See Dietz and Stern 2015.

P3. The expected warming this century may be as low as 2.5°.
See Carbon Action Tracker 2015.

P3. This range might be extended by 0.5°.
Actual warming might be expected to be roughly normally distributed around expected warming, although there might be a long tale. The standard deviation at around 4° is 0.7° IPCC 2014. For explanatory convenience, the calculation here treats warming as if it were uniformly distributed. A better calculation is given in Covington 2015.

P3. The warming that would cause 50% economic damage might be between 4°and 7°.
Covington 2015 estimates this range as 3.7° to 9.0° based on models produced by a number of climate economists. A narrower range is used here for explanatory convenience.

P3. The joint probability is about 3%.
This assumes uniform distributions and independence. The calculation is $\frac{0.5}{2.5} \times \frac{0.5}{3.0} = 0.033.$

P3. A more detailed analysis suggests a probability of just this amount.
See Covington 2015 for the methodology. The detailed calculation assumes that actual warming is normally distributed about its expected value with a standard deviation of 0.7° and calculates the probability that warming by 2100 is at least equal to the warming that gives rise to 50% damage. It is assumed that 50% damage may occur for warming in the range 3.7° to 9.0° with a uniform probability distribution.

P3. The warming that produces 25% damage is 80% of the warming that produces 50% damage.
This is the case for the family of S-shaped climate damage functions based on Weitzman 2012 discussed in Covington 2015.

P3. The probability of damage of 25% by 2100 is around 12%.
See Covington 2015 for the methodology.

P3. The expected value at risk is 10%, currently increasing at 0.5% a year.
This is the expected value impairment conditional on warming by 2100 being at least equal to the warming that gives rise to 50% damage. The rate of increase is a consequence of there being fewer years of discounting to the period of significant climate damage as time elapses. See Covington 2015 for details.

P4. The largest 500 companies account for half of market value and 15% of emissions.
See World Federation of Exchanges 2014, Dullforce 2015, Moorhead and Nixon 2014, Covington 2015.

P4. Senior lawyers have concluded that there is a fiduciary duty to control for risk.
See Law Commission 2014.

P4. Companies are testing their asset portfolios.
See BHP Billiton 2015.

P4. Guidelines have been published.
See chapter 2 of ‘Investors, Climate Risk and Forceful Stewardship: An Agenda for Action’, Preventable Surprises, October 2015 – www.preventablesurprises.com

INSTITUTIONAL INVESTORS AND CLIMATE-RELATED SYSTEMIC RISK

Fiduciary Capitalism, Systemic Risk and Forceful Stewardship[5]

By Raj Thamotheram[6]

FIDUCIARY CAPITALISM

Fiduciary capitalism is a financial system in which the investment decisions of institutional investors are based on considerations of intergenerational equity, in which negative externalities are minimized and positive externalities maximized to benefit beneficiaries across time (Rogers, 2014). One of the most important implications is that enables a fundamentally different risk management strategy to address portfolio-wide systemic risks like climate change.

As Rogers, the former CEO of CFA Institute explains, the institutional asset owners that are the dominant players in capital formation "are legally bound to a duty of care and loyalty and must place the needs of their beneficiaries above all other considerations". When these asset owners (such as pension funds, endowments, insurance companies, and sovereign wealth funds) place considerations of intergenerational equity at the heart of their investment processes they will (re)shape behaviour in the financial markets and the broader economy – and encourage long-term thinking. "As 'universal owners', fiduciaries foster a deeper engagement with companies' management teams and public policymakers on governance and strategy", continues Rogers.

The problem is that fiduciary capitalism is not yet incorporated into asset owner risk management systems and culture. This means that the capacity of institutional asset owners to rise above being passive consumers of market trends to become "future makers"[7] that have the potential to collectively influence systemic, market-wide risks by assertively engaging with policy makers and investee companies is work in progress and requires encouragement which is "supportive but stretching"[8].

THE REQUIREMENT FOR A FUNDAMENTALLY DIFFERENT RISK STRATEGY

As described in the earlier paper, systemic risk captures the risk of collapse inherent to an entire financial system or entire market segment; one consequence of which are stranded assets – defined as assets that suffer from unanticipated or premature write-offs, downward revaluations or are converted to liability (Ansar, Caldecott & Tilbury, 2013). Due to the nature of systemic risks, they tend to build up over time, reach a tipping point and then cause a collapse in asset values. The effects can be widespread and (very) costly. For example the Global

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[5] A version of a paper being prepared for the Finding Petroleum forum "Investing in Petroleum under a Carbon Cloud" being held on 19 November 2015 in London. The author would like to thank Ian Tozer for his considerable help with an earlier working paper.

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[7] A phrase popularized by Mercer is its most recent climate report, "Investing in a Time of Climate Change" (Mercer, 2015).

[8] This is the motto of the Aiming for A coalition of investors, in their highly innovative and effective work with companies (Wildsmith, 2012). The same approach is clearly needed with investors, in particular those large investors who have most influence but who also been the most silent on systemic climate risk.

INSTITUTIONAL INVESTORS AND CLIMATE-RELATED SYSTEMIC RISK

Financial Crisis wiped $5.4 trillion in value off global pension assets (Yermo & Severinson, 2010) and would have resulted in greater stranding of assets had governments not acted to bail out many financial institutions.

The risk management paradigm that is dominant in the investment industry today – i.e. diversification, hedging and "constructive engagement" with companies – is not fit for climate related systemic risk management.

The only viable solution for managing big climate risk is to make a rapid transition to a low carbon economy, which means shrinking high carbon energy as well as growing low carbon energy. And this means adopting significantly different risk management strategies than those applied to sectoral or asset class risks.

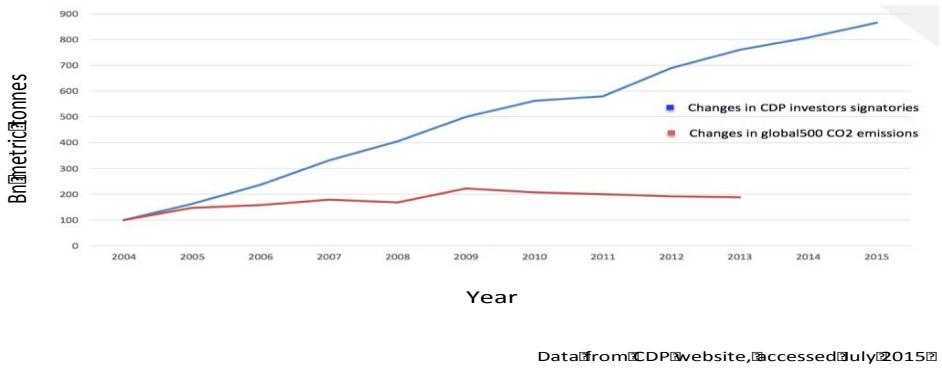
This was the consensus from a week long virtual dialogue which Preventable Surprises ran with 77 senior finance, investment, risk and other professionals. 85% of the participants agreed with the proposition that "fiduciary capitalism requires a fundamentally different risk management strategy to address portfolio-wide systemic risks" (Preventable Surprises, 2015).

LIMITATIONS OF CURRENT RISK MANAGEMENT STRATEGIES

As the accompanying paper documents, the systemic risks resulting from climate change are considerable. Yet many investment professionals continue to ignore them, conforming to the dominant culture within the financial community, whose intellectual framework does not acknowledge climate risk[9]. Attitudes amongst North America investment professionals are of particular importance given that many global financial institutions are headquartered there and that even non-US financial institutions often have senior staff from this region.

More relevant to readers that are not in denial about climate risk is the fact that the dominant risk management instruments (e.g. GHG disclosure, portfolio decarbonization, tilting, strategic asset allocation, green investments and 'business as usual' engagement) are not today forcing change at a rate that addresses the challenge.

Figure 4: Changes in Carbon Disclosure Project (CDP) investor's signatories vs. change in global 500 CO2 emissions downloaded July 2015



Data from CDP website, accessed July 2015

[9] https://preventablesurprises.com/blog/investment-professionals-in-different-countries-show-markedly-different-awareness-of-climate-risk/

INSTITUTIONAL INVESTORS AND CLIMATE-RELATED SYSTEMIC RISK

Reducing specific risk through diversification or divestment may offset the damage to a particular asset class but this does not deal with systemic risk. Climate risk is so widely spread across asset classes and sectors (Mercer, 2015) that it renders diversification ineffective as a risk management response. And whilst Environmental, Social and Governance (ESG) integration strategies for dealing with sector specific carbon risk (e.g. hedging, portfolio decarbonisation, etc.) are all valuable, their impact on systemic risk is limited.

In a forthcoming study entitled "Unhedgeable Risk" (which was referenced by the Bank of England in its own paper on climate risk and the insurance sector, (Bank of England, 2015)) a research team co-ordinated by the Cambridge Institute for Sustainable Leadership has concluded that only half of the expected negative impacts on investment portfolios resulting from policy and market reactions to climate change can be offset by diversification strategies. According to the Bank of England: "… while industries are differentially affected by climate change, the risks are close to systematic rather than idiosyncratic, requiring policy action" – or we would add forceful stewardship – "to mitigate". The authors have also demonstrated that there are plausible scenarios for thinking that investors could experience significant negative financial impacts over the next five years, i.e. much sooner than has previously been expected.

Investors have traditionally sought to manage climate risk by encouraging corporate disclosure of greenhouse gas (GHG) emissions (see Figure 4). This push for disclosure of GHG emissions is undeniably important, and has made great strides in the last decade or so. In itself, however, disclosure will not a low-carbon economy make, any more than disclosure of executive pay has solved that problem.

The Divest-Invest movement[10] has been hugely successful in drawing attention to the risks of investing in fossil fuels, in particular, stigmatizing the fossil fuel industry and so reducing its political influence. It has also had some success in directing capital to support low carbon development, through strategic asset allocation, green bonds and equity funds. But there are many institutional investors who are firmly against divestment (Hens, 2015) and particularly so when the debate extends from coal to oil and gas[11]. And the scale of growth in green investments needed is much greater than is happening today12. Even if this scale of investment happened, just adding low carbon energy is not enough to keep within the 450 ppm ceiling – parallel action to contract high carbon energy and increase the efficiency of energy use are equally important.

As the accompanying paper details, the only way to deal with the systemic risk resulting from climate change is to accelerate the move to a low carbon economy, with implications for the whole portfolio, not just fossil fuel companies. However, the latter – which account for 80% of anthropogenic carbon emissions – present a particular challenge, as their senior management have powerful and personal financial incentives not to act (Institute of Policy Studies, 2015).

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[10] http://divestinvest.org/

[11] It is said that funds controlling $2.6tn in total assets have made divestment related commitments. Most of these commitments are likely to be related to coal. In the absence of effective monitoring, it is not possible to be more precise. www.ft.com/cms/s/0/cfcb2d14-6130-11e5-9846-de406ccb37f2.html#axzz3mXjnmc00

12 It has been estimated (in October 2014) that investors had committed approximately $250 bn pa in new green investment against the approximately $1 tr pa that the IEA say is needed. See: https://preventablesurprises.com/wp-content/uploads/2015/06/Carbon-Risk-and-Forceful-Stewardship-RI-Europe-2015.pdf

FORCEFUL STEWARDSHIP – THE 'THIRD LEG' OF INVESTOR ACTION ON CLIMATE CHANGE

Given the urgency and importance of reducing GHG emissions, and given that the other investor strategies – important as they are – cannot fully manage this risk on their own, we propose forceful stewardship as the third leg of investor action. The forceful stewardship initiative seeks to ignite fiduciary capitalism and harness its power to change behaviours in the financial markets and the broader economy by encouraging investors in companies to push for 2° transition plans, using their shareholder voting rights to signal their intentions. We believe that this approach will align asset owner conduct with their twin legal duties to both manage investment risk and to exercise their voting rights in a manner that reflects the best financial interests of their beneficiaries.

Figure 5: Investor action on climate is unbalanced without a strong 3rd leg

Forceful stewardship takes shareholder engagement to a new level of intensity.

1. It can be used in relation to high carbon intensity users of fossil fuels (e.g. transportation, agriculture, infrastructure) and enabling sectors (e.g. the insurance and banking sectors), as well as fossil fuel companies.
2. Rather than shift the ownership of assets and GHG emissions, with the hope of indirectly affecting company behaviour and assuming that the new owners are also concerned about climate risk[13], forceful stewardship seeks to change company behaviour directly.
3. And because the fundamental ask is the simple one – i.e. "Show us your 2° transition plan" - it is as easy to monitor as divest:invest. The guidelines are cheap to operate because all investors vote. All that is

[13] The former chair of the London Pension Fund Authority has voiced a commonly held view amongst investment professionals that coal may again become a 'buy' when the price falls low enough. If investors who end up owning coal companies have no interest in climate risk, this could be a serious unintended consequence. (Marriage, 2015). Tobacco companies are an example of a sector which has faced serious and effective stigmatization but which are considered good stocks, at their price, by large mutual funds: https://preventablesurprises.com/wp-content/uploads/2015/08/Biggest-investors-in-energy-tobacco.pdf

needed is a policy decision to vote in a forceful stewardship manner, which can be taken by a fund of any size. And with time and enough client demand, voting advisors should provide an up-skilled service to support this demand.

The participants in the recent online dialogue have therefore agreed upon the following Forceful Stewardship Guidelines as a best practice framework to guide investor action:

1. Declare your intention to vote in favour of prudently formulated shareholder resolutions that will help reduce systemic climate risk while protecting shareholder value in the long-term.
2. Instruct your voting advisors to vote automatically in favour of such resolutions. If current voting agents are unable to support this obligation, find agents who will.
3. Vote in favour of resolutions that call for listed companies to publish robust analyses of their assessments of the physical, policy and economic impacts to their businesses of global warming of 2° and 4° respectively.
4. Declare your intention to vote in favour of resolutions that call for listed companies to publish business plans that describe how, without damaging shareholder value:
    I. They can reduce their emissions each year by an appropriate amount for their industry; and/or
    II. How their business could adapt to a carbon price that rises to $100 per tonne of carbon dioxide by 2030; and/or
    III. How their business could adapt to regulations aimed at meeting a 2° warming target and/or restricting atmospheric carbon dioxide to 450 parts per million (ppm).
5. Actively consider, on a case-by-case basis, voting against the re-election of the chairman of the board, or against the report and accounts (or in the USA, initiating a 'book and records' request), where there have been persistent and unacceptable practices related to climate risk (e.g. repeated non-disclosure of greenhouse gas emissions, funding of climate denial organisations).
6. For asset owners: require consultants to actively support the above process by including these principles in manager research, screening, selection, and the review process. If current investment consultants are unable to support this approach, find consultants who can. And for investment managers: instruct analysts and credit rating research partners to assess "2°C Transition Plans" and adapt recommendations in accordance with these principles.
7. Redouble efforts to engage with credible and well-informed scientists, economists and civil society experts and wherever possible in alliance with these and corporate business leaders[14], engage with legislators and regulators. Investors need to support those governments that have made 'good' Intended National Determined Contributions (INDCs) so that these commitments are implemented and encourage governments that are lagging to catch up. One area where diversified and long-horizon investors have a strong business case for acting is reform of fossil fuel subsidies. There is already a government-business-civil society initiative – the Friends of Fossil Fuel Subsidy Reform[15] – which climate-aware investors could and should be supporting.

[14] One corporate leadership group that is committed to action is We Mean Business: http://www.wemeanbusinesscoalition.org/
[15] http://fffsr.org/

INSTITUTIONAL INVESTORS AND CLIMATE-RELATED SYSTEMIC RISK

WHO NEEDS TO DO WHAT[16]

The Guidelines ensure that those who may be tempted to use the idea of forceful stewardship do not simply rebrand 'business as usual' stewardship activities, which James Bevan, the CIO of CCLA, has called "tea & biscuits engagement". The following actors all have critical roles to play:

1. **Forceful stewards** – a group of investors who are willing to take first-mover role and propose resolutions and lobby other investors to support them.
2. **Scientists and academics** - to verify the legitimacy of resolutions and monitor the technical and scientific bedrock of any enquiry. We recommend forming an expert panel that can judge whether any particular resolution meets the standards set out in the forceful stewardship principles and who rule that, therefore, all investors who support the principles should vote in favour of these resolutions (or not, if such is the case)[17].
3. **Commercial pressure** - the award of mandates to fund managers, investment consultants and voting advisors who have upskilled to implement these guidelines will encourage the wider community of investors and information intermediaries to align with this emerging standard of best practice.
4. **Legal action** – for breach of fiduciary obligation that is intended to cause pension funds and other related fiduciaries to instruct their fund managers to sign up to these principles.
5. **Awareness** - underpinning all, academics, NGO and communication specialists to raise awareness of climate science, value at risk and fiduciary capitalism, collectively promoting the forceful stewardship related investment beliefs and guidelines. In the absence of a natural constituency behind forceful stewardship in the way that there is for divestment (which campaigners have successfully made high profile) and portfolio carbon management (which investment professionals support), foundations who want to see the agreements that come from COP21 ratcheted up will want to review how they can best support forceful stewardship related investment beliefs and guidelines[18].

CONCLUSION

If, as appears likely, forceful stewardship is a viable mechanism to mitigate climate-related systemic risk and the costs are low, it should be regarded as a legal obligation, not an option. Institutional investors have grown enormously in the last few decades in numbers and size. The top 1,000 retirement funds control over US$9 trillion – enough to buy all of Europe's listed companies. These 'super fiduciaries' have the muscle to effect change in the companies whose shares and debt they own. They have long time horizons, and their beneficiaries will stretch across future generations. There is no excuse, and every incentive and duty, for institutional investors to pitch in and mitigate the dangerous path we are on. By working together with a vital objective in mind, much can be achieved.

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[16] Appendix 1 contains details of sector based and country based pilot initiatives that are already being launched by Preventable Surprises.

[17] The report released by BHP Billiton in September 2015 ("Climate Change Portfolio Analysis") and the debate provoked about whether it is acceptable or not, illustrates the need for such a panel.

[18] According to one leading thinker in the field, foundations are "one of the best vehicles for promoting progressive social change. They have great advantages as a donor. They are financially secure, so they can make long-term commitments. And because they don't continually have to look over their shoulder, they have more confidence to do the difficult things, to support the innovative, risky things. Ford – and other foundations – are ideally placed to promote the changes we are looking for." (Interview with Michael Edwards, then Director, Ford Foundation's Governance and Civil Society Unit). http://www.alliancemagazine.org/interview/interview-michael-edwards/

Appendix 1: Forceful stewardship pilot programmes

The role of 'positive mavericks' as change agents is now well established in the corporate sector (Pascale, 2010). It is only just beginning to be accepted in the investment community – a recent advocate being Paul Smith, the President of the CFA Institute who is quoted as saying that 'the CFA wants its members to be agents for change within their companies, rather than just to see their qualification as simply a path to a good career' (Rowley, 2015).

Preventable Surprises is working on 3 country pilots and 3 pilots focusing on information intermediaries. In addition to "positive mavericks" we see the need for action research type academics to help support a "learning by doing" culture and also provide air cover to the practitioners,

1. The Netherlands

Holland has the ability to set a high benchmark for other national investment systems. 886 Dutch citizens sued their government for its inaction on climate change (Urgenda, 2015). With a civil society that has already taken successful legal action, a range of world-class sustainability aware companies, and high credibility in the investment community, Dutch investors are in a good position to show substantive leadership on climate risk scenario planning.

Possible action research questions regarding the Netherlands:

What advantages/disadvantages will the Dutch companies face, in practice, if Dutch funds use their full power to force change and can this be done in a way in which cause the respective industrial sectors (i.e. non Dutch companies) to change?

2. Canada

Canadian institutional investors have an international reputation for good governance and long-term thinking, and the recent election should change what was a profoundly unsupportive national context. But even in this context, sub-national governments have taken a lead on climate policy and action (i.e. British Columbia, Quebec, Ontario), and the Canadian public are concerned about climate change (Angus Reid Global, 2012). Yet, Canadian pension funds are amongst the most carbon intensive globally. There is an opportunity to engage concerned citizen investors on climate change, and build on the notable success of Aiming for A resolutions.

Possible action research questions regarding Canada:

How do Canadian investors, who rightly consider themselves as long-term and well governed, reconcile their position vis-à-vis climate risk and might the coming change in national politics affect investment beliefs and stewardship actions?

3. USA

The USA is polarised on climate policy. Some asset owners have shown leadership on value at risk from climate change (e.g. CalPERS, CaLSTRS) and there is a fairly robust stream of information from investment banks and

sell-side analysts detailing climate risks. Despite concerns, there are potential benefits of bringing forward an Aiming for A type resolution in the US. It would force the debate into the public arena, cause large mutual funds to explain their thinking, push the SEC to consider climate resolutions, and influence greater disclosure on climate sensitivity analysis. The growing gap between mutual funds on climate resolutions is an opportunity for exploration (CERES, 2014).

Possible action research regarding USA:

How do the largest US mutual fund managers, who reject the idea that they may be systemically important, explain their position on climate risk?

4. Investment Consultants

Pension funds trustees and other related fiduciaries are, in many markets, heavily dependent on the advice of investment consultants. Consultants are well positioned to a) educate clients about how to manage the systemic risks associated with climate disruption and b) evaluate fund managers, their investment beliefs and strategies, and specifically their voting policy on issues related to corporate "2°C Transition Plan" resolutions.

Possible action research regarding investment consultants:

How can investment consultants change the investor focus on "climate beta" in a way in which does not compromise their own business model? And are investment consultants being forceful stewards with regards to the assets they manage as fiduciaries?

5. Voting Advisors

How voting advisors develop their voting recommendations is often unclear (Larker, McCall & Tanya, 2015). There seems in most firms to be little scientific rational given to justify their recommendation (Preventable Surprises, 2015). Proxy agencies have an opportunity to inform themselves and their trustees on climate risk but disclosure and vested interests currently is a point of contention that remains to be resolved.

Possible action research regarding voting advisors:

What are the worldviews of voting adviser decision-makers about climate risk, what are their assessment methodologies and does this correlate with outcomes to-date on resolutions related to climate?

6. Sell Side and Credit Rating Agencies

There are significant biases and structural flaws within both sell-side and credit rating research that contributes to short-termism and a lack of focus on sustainability across financial markets which can be expected to reduces the desire of investors to take forceful stewardship action (Preventable Surprises, 2015).

Possible action research questions regarding sell side and credit rating agencies:

Some firms have specialists who focus on climate/ESG matters. Do these firms have company/sector notes which differ significantly from competitors who do not have such in-house expertise?

7. Action research implications for Value at Risk (VaR)

A comparative analysis of VaR methodologies (Covington & Thamotheram, 2015; Economist Intelligence Unit, 2015; Mercer, 2015) – i.e. assumptions, sensitivities, yields – would help practitioners and regulators understand what climate-change induced economic damage could mean for investment portfolios.

Possible action research implications for Value at Risk:

How do different models deal with the significant uncertainty associated with calculating VaR. Specifically, do they address plausible worst case scenarios and if so how (e.g. probabilistic vs. possibilistic thinking)? Do the models reference a high or low climate damage function, and how does this choice of damage function affects outcome assumptions and findings?

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