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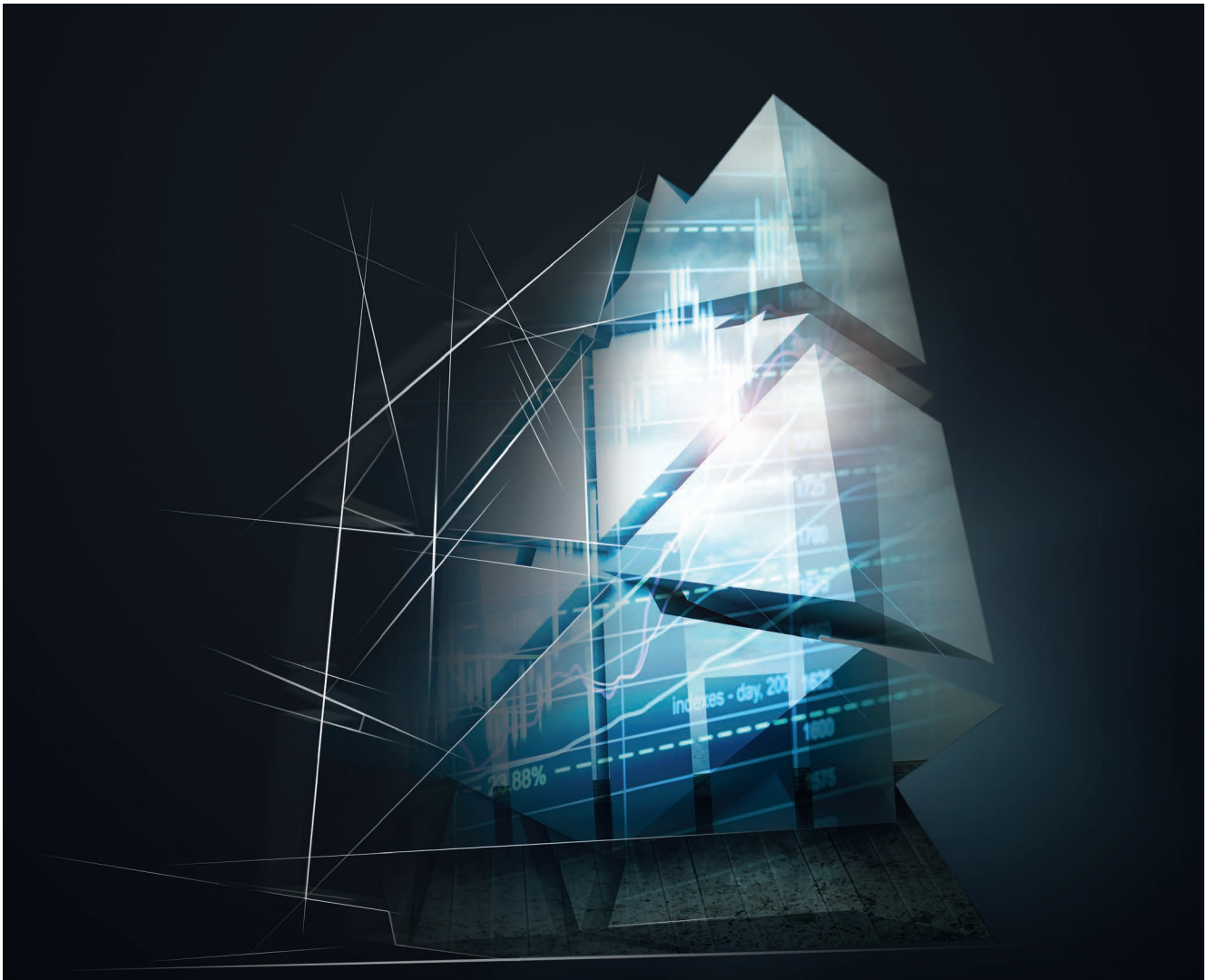

November 2018 / Responsible Investments

EXPERTS ON CLIMATE CHANGE

Everything you need to know about climate change from a scientific, legal, actuarial, accounting, investment consultant, and portfolio management perspective

November 2018

November 2018 / White paper

Experts on climate change

Everything you need to know about climate change from a scientific, legal, actuarial, accounting, investment consultant, and portfolio management perspective

Summary

Until recently it would have seemed far-fetched that a climate scientist would be the opening keynote speaker at a conference of central banks and financial sector regulators. But earlier this year Dr. Emily Shuckburgh of the British Antarctic Survey found herself doing exactly that at a landmark event in Holland.

Equally, eyebrows would have risen at the idea of a major law firm publishing a report on climate change, or that the UK association of actuaries might issue a professional 'risk alert' on climate change to its members.

These, as well as other developments, inspired DWS – the new name of Deutsche Asset Management – to bring together experts from the UK's scientific, legal, actuarial, accounting, and investment consultant communities to produce this new paper.

Our aim is to present expert perspectives on the actions that institutional investors can and should take to manage climate risk while using their influence to accelerate the shift to a sustainable, resilient, and just society.

Climate is front of mind. With 2018 another year for record-breaking extreme weather, the risks and impacts of climate change are becoming starker. At the same time, more financial institutions, companies, governments, central banks, and regulators are stepping up their action in response. But more is required as the IPCC warned recently that carbon emissions still pose an existential risk to society.

Over the next two years, the UN and many heads of state and prominent individuals will lead an international effort to encourage all institutions to take stronger action to address climate change. The aim of this collective effort is to put humanity onto a path to meet the Paris Agreement goals to limit climate change by dramatically cutting carbon emissions and making financial flows constistent with a sustainable and resilient future.

Murray Birt – Senior ESG Strategist

Contributors to this report include:

Pinsent Masons – has one of the UK's largest pension legal teams twinned with a cross-border team of investment specialists, ideally placing this law firm to advise trustees and fund managers on the duties (and opportunities) associated with climate risk management. They are the leading law firm advising in this area, with particular specialisms in renewable energy and infrastructure, and a strong track record of advising on sustainability issues for the UK's largest schemes and investors.

Grant Thornton is one of the world's leading organisations of independent assurance, tax and advisory firms, and has been involved in numerous responsible investment initiatives. Grant Thornton participates in the UK Impact Investing National Advisory Board, it was the first professional services firm to join the World Benchmarking Alliance, and remains the only professional services firm on the Future Fit Business Benchmark development council.

Redington is an independent, London based, investment advisor to 90-plus long-term global investors, including pension funds, insurance companies and wealth managers. The company's vision is to help improve more than 100m people's financial security via clear and differentiated outcome-based advice. Redington was founded in 2006 and has 150 staff advising on £430bn of assets.

DWS published its first climate report for clients in 2007, has the strongest track-record voting in favour of US climate shareholder resolutions, and is developing the first passive strategy incorporating physical and transition risk. DWS has UN Green Climate Fund accreditation and was recognised as the 2017 Responsible Investor of the Year[1] for its cross-asset class actions. DWS has been present in the UK for several decades, employs 500+ staff in the UK (~4,000 globally) and manages €687bn of assets.

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Scientific view: the scale and the urgency

Preventing damaging climate change impacts requires dramatic and rapid emissions reductions

Summary

Central bankers worry about financial stability. By contrast, polar scientists such as me fret about ice sheet stability. Yet it is increasingly clear that the latter is at risk from climate change and could threaten the former.

Today's atmosphere is unpredented throughout human history, prehistory and beyond. To find equivalent levels of CO_2 you have to travel back in time more than three million years. Ancient air bubbles recovered from the Antarctic ice sheet tell us how CO_2 levels have varied naturally in the past, demonstrating that the dramatic increase since the industrial revolution lies far outside the natural cycle.

The physics of the "greenhouse effect," which explains how more CO_2 in the atmosphere leads to warming, has been known since the mid-nineteenth century. Consistent with this understanding, the temperature, averaged over the surface of the land and oceans, has increased by about 1°C over the past 150 years. The past three years rank as the warmest on record, with the decade being on-course to be the forth in a row of record-breaking warmth.

The impacts of climate change are already being felt here and now. Around the world, meteorological records are being broken again and again, as what were once extreme conditions are starting to become normal. Evaluation of recent extreme weather events has revealed numerous cases where the risk of occurrence has increased as a consequence of the climate change we have already seen.

For instance, analysis indicates that the kind of heavy downpours responsible for some of the terrible flooding of recent years in the UK have become more likely because of climate change. The result has been billions of pounds worth of damage.

Nations agreed in Paris in 2015 to keep temperatures well below a 2°C increase versus pre-industrial times – if possible limiting the rise to 1.5°C. Nevertheless, we are currently on a pathway to reach 3°C by the end of the century.

The greater the warming, the greater the risks to all sectors of society and to the natural world. The IPCC's recent report methodically articulates how the risks of extreme weather and sea level rise, of species loss and extinction, and of a deterioration in many dimensions of human wellbeing increase substantially from 1.5 to 2°C of warming.

Recent millennia have been characterised by unusual stability, but we know that dramatic and rapid regional change in temperature can occur: there are numerous recorded examples of such "black swan" events in the last 100,000 years. This is a fundamental non-linear characteristic of the earth's system: it has happened in the past; it could happen in the future. There is evidence, for instance, that catastrophic loss of ice sheets in Greenland and Antarctica, which would eventually result in many metres of sea level rise, could be triggered at around 1.5 to 2°C of warming.

The amount of CO_2 that can be released before dangerous levels of warming are reached can be seen as a "carbon budget". At present rates of fossil fuel use, deforestation and soil damage we are on course to exhaust this budget if we are to have a good chance of staying below 1.5°C within the next 10 to 15 years. Keeping temperatures below 1.5°C requires reducing CO_2 emissions dramatically and rapidly to reach "net zero" by about 2050 – and significantly reducing other greenhouse gas emissions at the same time.

Everyone should take careful note. Decisions made across society over the next few years will make a radical difference to our future climate and will determine the fate of future generations.

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Climate change is a threat to financial stability

Climate and weather-related events, such as heatwaves, droughts, floods, storms and sea level rise can result in large financial losses through the damage and turmoil they wreak and the knock-on effects. Such events can have a direct financial impact through damage to property and other assets and interuptions to business continuity.

Extreme weather events can also have an indirect financial impact as global supply chains are disrupted or as critical resources become scare or expensive. This can result in widespread impacts on different market participants as these events impair asset values, undermine the ability to repay loans, threaten the creditworthiness of borrowers, result in raised insurance premiums, increase credit exposures, challenge portfolio diversification, and so on. Near-term impacts may also be felt through potential changes in investor sentiment or market expectations around climate risk, or in changes to climate-related regulations.

The increasing frequency of severe weather events could also impact macroeconomic conditions through sustained damage to national infrastructure and weaken fundamental factors such as economic growth, employment, and inflation. This could have implications for the market price of sovereign debt for those countries most susceptible to the physical impacts of climate change.

Many potential systemic risks arising from climate change are only just starting to be identified and the potential for catastrophic shocks to global financial stability triggered as climatic tipping points – such as the collapse of polar ice sheets – are passed is not well understood at present.

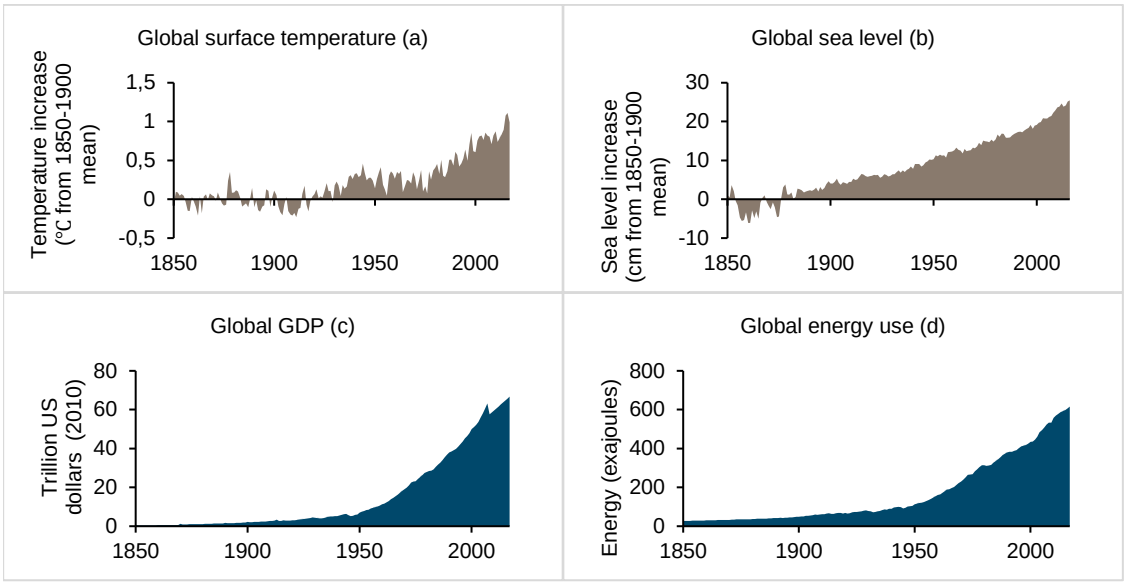
An increasing recognition of this complex landscape is leading to questions regarding whether climate-related risks are currently being adequately accounted for. Here I provide a summary of the current scientific understanding to help inform revised assessments of risk.

What is happening to our climate?

The world is warming, the climate is changing, and it is due to humans

That the world *is* warming and the climate *is* changing is beyond doubt. Records from thousands of weather stations across the world, and ocean data from ships and buoys, show the temperature measured at the Earth's surface has increased substantially over the past century, and especially over the last fifty years. The **global average temperature is now more than 1°C warmer than the pre-industrial era**, **Figure 1(a)**

FIGURE 1. GLOBAL TRENDS SINCE 1850



Source: Dr. Emily Shuckburgh, data from Ladybird Expert Guide to Climate Change, January 2017 with co-authors Tony Juniper and HRH The Prince of Wales

As the world has warmed, changes in many other features of our climate have also been observed. The oceans have been warming not only at the surface but also at depth. As the water warms it expands to fill a larger volume. This expansion, combined with input of water from melting ice from glaciers and the polar ice sheets, has led to **a rise in global sea level of more than 20 cm since 1850**, **Figure 1(b)**. The extent of sea ice in the Arctic has undergone dramatic decline in recent decades. The change is so substantial that the area covered by sea ice at the end of the summer melt season is now about 2 million square kilometres less than at the end of the twentieth century – a difference equivalent to the combined area of the UK, Ireland, France, Spain, Germany and Italy.

Careful scientific assessment has concluded that the warming observed over the past 150 years is predominatly due to human activies. The recent special report of the Intergovernmental Panel on Climate Change, *1.5°C of warming*, concluded that the **estimated warming due to human activities matches the level of observed warming** to within ±20%.

Human society has transformed over the past century and a half. There has been a six-fold increase in population. Back in 1850 the global population was around 1.25 billion. Today, both China and India have country populations in excess of this. At the same time, prosperity has increased enormously, with **a hundred-fold increase in real terms in global GDP since 1850**, **Figure 1(c).** While such economic measures may not be a particularly good indicator of societal progress defined in terms of the wellbeing of people and households, it is nevertheless clear that in broad terms significant societal progress has been made over this period in many countries of the world.

Much of the explosion in prosperity since the start of the industrial revolution has come about precisely because of that industrialization, the increase in which can be tracked by increases in energy use. Total **global energy use has increased twenty-fold since 1850**, incuding all domestic and industrial usage, **Figure 1(d)**. This growth was accompanied by a shift from traditional energy sources – wood, wind and water – towards fossil fuels, first coal and then oil and natural gas. In 2017, fossil fuels made up almost 80% of the world's energy use. Hydropower, wood, biofuels, and nuclear energy together

accounted for just under 20%. New renewable energy sources, such as solar and wind, represented just over 3%, but their share is growing rapidly.

We have also transformed the land surface, cutting down forests to make way for settlements and farming. Both these activities and the burning fossil fuels release carbon dioxide into the atmosphere. The atmosphere forms a remarkably thin layer over the Earth; indeed, it is as thin in relative terms as the skin of an apple. Hence the dramatic increases in our global footprint have been associated with a change in the composition of our atmosphere. As a so-called "greenhouse gas" one would expect an increase in carbon dioxide in the atmosphere to be accompanied by an increase in temperature of the Earth's surface and this is what has been observed.

Today's atmosphere is unprecedented in human history, pre-history and beyond

The last time the Earth experienced broadly comparable levels of atmospheric carbon dioxide was during the mid-Pliocene, 3-5 million years ago. To find levels consistently above those of today you have to look much further back to the mid Miocene some 15 million years ago. To place this in context, the oldest object in the British Museum, a cutting tool made by early humans in Africa, dates from just 1.8 million years ago. Since the ability to create and use tools is the skill that sets us apart from other animals, this can be seen as marking the very start of the journey of humankind.

Hence, **at no point have our forebears lived in a world with atmospheric carbon dioxide as high as it is today.**

Putting the recent change into a longer historical perspective provides a sense of how unusual the current changes in climate are. One of the clearest pieces of evidence that tells us about that are the ice cores drilled from Antarctica. As the snow falls in Antarctica it traps with it air from the atmosphere. As the snow piles up layer-upon-layer, this air is trapped as bubbles in the ice. This means that as scientists drill down through the ice, more than 3 km deep, they are able to recover the ancient air that was in the atmosphere hundreds of thousands of years ago. The air bubbles can be analyzed to determine the carbon dioxide levels and the water in the ice can be analyzed to determine the ratio of different isotopes of oxygen, which gives an indication of the temperature in the past.

The longest ice core record we currently have is 800,000 years old (a European project is currently aiming to drill a core going back 1.5 million years). The world experienced a range of very different climate states over this period. During the last ice age, which peaked about 22,000 years ago, sea levels were some 130 m below where they are today. By comparison, during the last interglacial warm period, about 125,000 years ago, sea levels were probably somewhere in the range 5 to 10 m higher than they are today.

The ice cores show that over the past 800,000 years, carbon dioxide levels have varied between a low of about 180 parts per million (ppm) during the ice ages to a high of about 280 ppm during the interglacial periods. Today's carbon dioxide levels of over 405 ppm vastly exceed this, clearly demonstrating that **the current change lies far outside the natural cycle**.

We are already experiencing increased risk of extreme weather due to climate change

Extreme weather events such as heatwaves, droughts, floods and storms can cause major damage and disruption to human society, with large financial costs and sometimes loss of life. Statistics on natural catastrophes world-wide shows a substantial increase over the past 35 years in the annual total for the number of recorded weather-related events such as storms and floods.

Around the world, temperature and rainfall records are being broken again and again as what were once extreme conditions are starting to become normal. The population-weighted average temperature, which accounts for where people live, has

been increasing at more than twice the rate of the global-average. Extreme heat, especially when combined with high humidity, can prove deadly for vulnerable people. One recent study estimated that already today 30% of the world's population experience such potentially deadly conditions each year.

Evaluation of recent catastrophes has revealed numerous cases where the **risk of occurrence of extreme weather has increased as a consequence of the climate change we have already seen.** The connection with an increased risk of heatwaves is evident, but a warmer atmosphere also holds more water, giving rise in places to more intense rains and increased flood risk.

Analysis indicates that the kind of heavy downpours responsible for some of the terrible flooding of recent years in the UK have become more likely because of climate change. More than 50,000 households and approaching 10,000 businesses were innundated during some of the floods, critical infrastructure was destroyed, a number of people sadly lost their lives and billions of pounds of damage was caused.

Hurricanes provide a stark reminder of the power of nature to wreak devastation on even the most advanced of our societies. The mechanics of tropical cyclones and how they interact with our changing climate is extremely complex, however, it is clear that increases in heavy rainfall, combined with sea level rise and can exacerbate the flooding from hurricane-induced storm surges.

In 2016, a severe drought in Southern Africa resulted in millions of people in need of humanitarian assistance in countries such as Malawi. The other side of the world, Southeast Asia experienced record-breaking heat, with temperatures in Thailand soaring above 40°C. In both cases it has been determined that climate change exacerbated the effects of El Niño. The risks of these two far-away events were correlated. The systemic risks arising from such correlated events can easily be underestimated.

Warming due to our emissions from the pre-industrial period to the present will persist for centuries to millennia and these alone will continue to cause further long-term changes in the climate system, such as sea level rise.

Greenhouse gas emissions continue to increase

The first report of the Intergovernmental Panel on Climate Change warning the threat of climate change due to greenhouse gas emissions was completed in 1990. At the time, total carbon dioxide emisions were about 27 $GtCO_2$/yr. Since then, annual emissions of carbon dioxide from fossil fuel use and industry have grown substantially (they have been growing at about 2%/yr over the past decade) and now stand at over 37 $GtCO_2$. An additional 5 $GtCO_2$ is emitted each year as a result of land use, land-use change, and forestry, meaning the **total carbon dioxide emissions are now around 42 $GtCO_2$/yr**, more than 50% higher than they were in 1990. In terms of per capita emissions, China has recently exceeded the European average and stands at almost double the global average, although it still amounts to less than half the US per capita emissions.

Methane is the second most important long-lived greenhouse gas and at present it contributes about one sixth of the greenhouse effect. The levels of atmospheric methane have increased by more than 150% since pre-industrial times. This long-term increase is mostly attributed to human activity, including cattle breeding, rice agriculture, landfills, biomass burning and fossil fuel extraction.

Time is running out; we are currently on-track for 3°C by end of century

In 1992, the United Nations Framework Convention on Climate Change (UNFCCC) was adopted with the objective of curbing greenhouse gas emissions to prevent dangerous climate change. In 2015, at the 21st Conference of the Parties to

that convention, the nations of the world committed within the Paris Agreement to hold the increase in the global average temperature to well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5°C, recognizing that this would significantly reduce the risks and impacts of climate change.

At present, tempertures are increasing at about 0.2°C per decade due to past and ongoing emissions. With temperatures already 1°C of warmer than pre-industrial times, that means **we are on-course to surpass the level of 1.5°C of warming sometime between 2030 and about 2050.** Despite the declared aims of the Paris Agreement, pathways reflecting current nationally stated mitigation ambition until 2030 are broadly consistent with cost-effective pathways that result in a global warming of about 3°C by 2100, with warming continuing afterwards. Greater ambition is required to limit temperature rise to the Paris Agreement commitments.

The amount of carbon dioxide that can be released before dangerous levels of warming are reached can be seen as a "carbon budget" which equates to the total cumulative emissions of CO_2 since the preindustrial period. The more emissions we generate now, the faster we will have to slash them later to stay within the budget; and we may find that the speed of cuts then required is unachievable, even with new technologies. By the end of 2017, cumulative emissions since the preindustrial period are estimated to have reached approximately 2200 $GtCO_2$. The remaining budget to allow a good chance of staying below 1.5°C is estimated to be around 400-550 $GtCO_2$; at the current rate of emissions of 42 $GtCO_2$/yr that implies **we are heading towards the budget for 1.5°C being exhausted within the next ten to fifteen years.**

Risks increase with warming, posing threats for human wellbeing as well as the natural world and the services it provides

Limiting global warming to 1.5°C rather than 2°C would result in considerably less climatic change, for example, a reduced risk of extreme heat and of drought in places, and a smaller total land area/number of people at risk from inland and coastal flooding. It would also prevent the thawing of an area of permafrost in the range of 1.5 to 2.5 million km^2, equivalent to one to two times the area of Canadian Arctic, and reduce the odds of an ice-free Arctic summer from 1-in-10 to 1-in-100 years.

Limiting warming to 1.5°C, compared with 2ºC, is also projected to result in smaller net reductions in yields of maize, rice, wheat, and potentially other cereal crops, and it would mean fewer heat-related illnesses and deaths, and less risk from vector-borne diseases, such as malaria and dengue fever.

In terms of the natural world, between 2-3 times more plants and animals are anticipated to experience severe habitat loss at 2°C compared with 1.5°C, and with that would come the loss of the services provided to human society. Moreover, it is thought while a small portion of coral reefs would remain at 1.5°C, virtually all would be lost at 2°C, succuming tot he combined influence of warming seas and ocean acidification caused by CO_2 emissions. Indeed, comparable rates of acidification have not been seen since 250 million years ago, when the largest ever mass extinction of species took place. Again, this is not only an environmental threat – healthy coral reefs support commercial and subsistence fisheries, jobs and businesses through tourism and recreation, and contribute billions of dollars each year to the global economy.

Overall, **climate-related risks to health, livelihoods, food security, water supply, human security, and economic growth are projected to increase with 1.5°C of warming and to increase further with 2°C.**

Warming increases the risk of a catastrophic shock

Recent millennia have been characterised by unusual climate stability. But it is clear that as temperatures increase, the risk of triggering catastrophic shocks – climatic black swan events – increases. For some systems this is a concern even within the Paris Agreement limits.

We know that dramatic and rapid regional change in temperature has occured in the past: in the North Atlantic, there are more than 20 examples of this in the last 100 thousand years. The potential for such large changes is a fundamental non-linear characteristic of the Earth system.

Modest temperature rise, for example, may threaten the vast ice sheets covering Greenland & West Antarctica. There is evidence that **ice sheet disintegration could be triggered around 1.5°C to 2°C of global warming, eventually leading to many metres of sea level rise, transforming global coastlines.**

The majority of large cities around the world are located in low-lying coastal regions, often for good historical reasons since they were important trading ports. Moreover, many of the developing megacities in Asia and elsewhere are located on or near the coast. Just a few tens of centimetres of sea level rise, especially in combination with heavy rain and storm surges, could destroy infrastructure and displace hundreds of millions of people; a black swan event involving the polar ice sheets would be devastating. Are these risks being fully accounted for in development planning or scenario analysis?

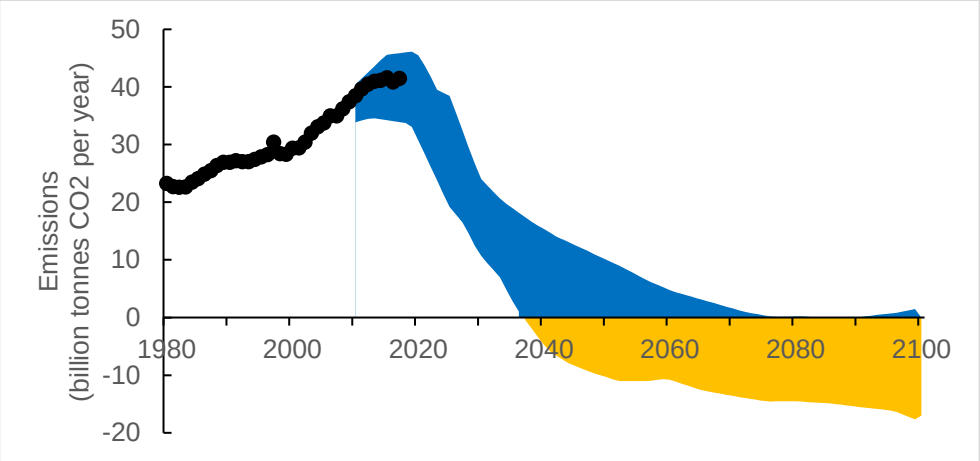
What response is required to limit climate disruption?

We need to reach net-zero by 2050 to meet 1.5°C goal

Let me now turn to the scale and urgency of the challenge of responding to climate change in a way that meets the Paris Agreement objectives. It is evident that the later emissions reductions begin, the more accelerated they will need to be for global temperatures to remain within the limits agreed in Paris.

The recent IPCC special report found that **to keep temperatures below about 1.5°C requires global CO_2 emissions to decline by about 45% from 2010 levels by 2030 and to reach net zero around 2050**, as shown in Figure 2.

FIGURE 2. GLOBAL CO2 EMISSIONS FROM 1980 TO 2017, WITH THE RANGE OF NECESSARY FUTURE EMISSION REDUCTIONS NECESSARY TO LIMIT WARMING TO 1.5C



Source: IPCC Special Report on 1.5°C, October 2018.

This is a dramatic change of trajectory. In broad terms **climate action means a transformation unprecedented in terms of scale, reversing over the next decade the emissions increases that have occured over the past four decades** so

that by 2030 we return to the 1980 CO_2 emissions levels. Deep reductions in non-CO_2 emissions, such as methane and nitrous oxide, are also required. Moreover, reversing ocean acifidication and **limiting on-going sea level rise is likely to require a commitment to net negative CO_2 emissions in the long-term**.

This requires transformation across all sectors, which of course comes with its own risks for businesses and investors. Electricity generatation needs to be essentially decarbonised globally by 2050, with renewables growing enormously to supply 70-85% of electricity and any remaining fossil fuel use being coupled to carbon capture and storage systems. The IPCC report notes that some fossil investments made over the next few years – or those made in the last few – will likely need to be retired prior to fully recovering their capital investment or before the end of their operational lifetime. A reduction of at least 75-90% is also required in terms of industrial emissions by 2050, requiring the deployment of both existing and new technologies and practices, including electrification, hydrogen, sustainable bio-based feedstocks, product substitution, and carbon capture, utilization and storage. Other changes include, for example, major alterations to land use. Moreover, **it is clear that substantial amounts of CO2 will need to be extracted from the atmosphere to compensate for residual emissions**. The carbon dioxide removal approaches that are required to achieve this come with a complex set of risks, costs, trade-offs and benefits.

If managed appropriately, **limiting warming to 1.5°C can postively support the delivery of the UN Sustainable Development Goals.** Improved air quality resulting from required reductions in many non-CO_2 emissions would provide direct and immediate health benefits: indoor air pollution currently causes millions of deaths each year and outdoor air pollution causes millions more. There are also clear co-benefits in terms of greater access to afordable and clean energy, especially when a billion people worldwide still live without access to electricity. Moreover, the number of people both exposed to climate-related risks and susceptible to poverty could be reduced by up to several hundred million by 2050 if temperatures are kept to 1.5°C instead of 2°C.

Businesses and investors must be part of the solution

The greenhouse gas emissions from the 100 largest emitting companies of the world (including their value chains) account for approximately a quarter of global annual emissions. The top 250, which include businesses in the oil, gas, utility, automotive, aircraft, manufacturing, steel, mining and cement sectors, account for approximately one third of the global total. It is evident, therefore that businesses play a critical role in responding the the scale and urgency of the climate challenge as laid out by the scientific evidence.

Those operating in heavily carbon intensive sectors must rapidly diversify and decarbonize their business models if the world is to achieve the level of emissions reductions outlined above. Others too must show leadership to embed the wide-ranging transformations that are required over the coming decades.

Each year's delay in reduction of global emissions necessitates a steeper reduction curve in the future, likely increasing the cost and complexity of the required transformations, and decreasing the probability of meeting targets required for limiting disruptive climate events.

Moving beyond pure financial considerations, the science is absolutely clear that decisions taken today will affect the course of the rest of this century and beyond and determine the destiny of our children, grandchildren and their children
.

Legal view: Time to Act

Whatever their private views on climate change, this is now a governance issue for every trustee. Failure to engage risks trustees being in breach of a board's fiduciary duties.

Summary

The Law Commission's 2014 report on fiduciary duties in the investment chain, concludes that trustees are required to balance returns against risk. Their duty is not simply to maximise returns - risks matter as much as returns – and the risks include risks to the long-term sustainability of a company's performance. Trustees may take account of any risk which could have a financial impact on their investments and must take account of risks that are financially material.

The practical consequence is that trustees will be in breach of duty should they fail to take account of climate risks that are financially material. At the very least, this requires trustees to understand whether climate change presents a financially material risk to their scheme's circumstances.

Specifically, the Government will be enacting legislation[3] which will require trustees, amongst other things, to specify in their Statement of Investment Principles, how they take account of financially material considerations, including those arising from Environmental, Social and Governance (ESG) considerations and also their policies on the stewardship of investments.

In the light of the above and the growing evidence of the risks posed by climate change (as Dr. Emily Shuckburgh explains so vividly), all trustees now need to engage with this issue.

None of this should come as a surprise to pension scheme trustees. In both its DB and DC investment guidance[4], the Pensions Regulator specifically mentions the need for trustees to consider sustainability and, potentially, climate change.

Pinsent Masons' recent report, based on research from Leeds University[5] found that, to date, pension schemes which have engaged in climate risk management have been driven, at least at the outset, more by general environmental values than by considerations of the financial impact of climate risk – and this is consistent with there being low levels of understanding amongst trustees of their duties in this area.

However, irrespective of their values, all trustees now need to recognise the importance of having a proper governance structure around their approach to climate risk. This is not without its challenges – including a lack of regulatory clarity and methodological issues - but these potential barriers should no longer be the "excuse" for trustees not to engage with this issue.

Indeed, in Australia in the first case of its kind, a member is taking his scheme to court because of a lack of information on how the scheme is managing climate change risks and, in the UK, the Shell Contributory Pension Fund is under threat of legal action from a member unless it can prove that it is managing climate change-related risk.[6] This report is therefore a very timely call to action!

In our section of this report which follows, we explore the background to trustees' attitudes to climate risk, the current position with regard to trustees' duties, and what action needs to be taken.

Climate change has the potential to pose material risks to the long-term financial health of pension schemes. As such, climate change denial is no longer a viable option for trustees. Whatever a trustee's private views on climate change, this is now a governance issue for every trustee board and trustees who fail to engage with this issue risk being in breach of their fiduciary duties.

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[3] Government response to DWP Consultation on clarifying and strengthening trustees' investment duties and the draft Occupational Pension Schemes Investment and Disclosure (Amendment) Regulations 2018
[4] Guide to Investment Governance, July 2016, DC Code and Investment Guidance for defined benefit pension schemes, March 2017
[5] Pinsent Masons, Managing Climate Risk in a Changing Environment, April 2018
[6] The case is against the Retail Employees Superannuation Trust and the member is being supported by lawyers at Environmental Justice Australia

The Final Countdown: A Lawyer's Perspective

Introduction

Ever since Arthur Scargill failed in his argument for the trustees of the Mineworkers' Pension Scheme to restrict their investments overseas and in industries that competed with coal[5], there has been a widely-held view that "ethical" investing breaches a trustee's duty to act in the best interests of beneficiaries. As a result, many trustees have chosen not to engage with issues such as climate change, which they perceive as ethical issues.

However, things are changing and the heat is on (no pun intended) for those trustees who fail to consider the possible impact of climate change on their portfolios. Indeed, in Australia in the first case of its kind, a member is taking his scheme to court because of a lack of information on how the scheme is managing climate change risks[6]. And given the clear duties that trustees in the UK have in this area (see below), there is every reason to believe that UK schemes are at similar risk of litigation.

The law

In his review of the UK equity market, published in July 2012[7] Professor Kay noted that:-

> *"some pension fund trustees equated their fiduciary responsibilities with a narrow interpretation of the interests of their beneficiaries, which focused on maximising financial returns over a short timescale and prevented the consideration of longer term factors which might impact on company performance, including questions of sustainability or environmental and social impact".*

Professor Kay recommended that the Law Commission should review the legal concept of "fiduciary duty" to address the misunderstandings in this area and this led to the Law Commission's 2014 report on the Fiduciary Duties of Investment Intermediaries[8].

The Law Commission's report concludes that trustees are required to balance returns against risk. Their duty is not simply to maximise returns - risks matter as much as returns – and the risks include risks to the long-term sustainability of a company's performance. Trustees may take account of any risk which could have a financial impact on their investments and must take account of any risks that are financially material.

The practical consequence is that trustees will be in breach of duty should they fail to take account of climate risks that are financially material. At the very least, this requires trustees to understand whether climate change presents a financially material risk in the circumstances of their scheme.

And leading on from the Law Commission's report, we now have the Government's proposals for legislation[9] which pick up on recommendations that were made by the Law Commission and then developed in a consultation paper earlier this year.[10]

[5] Cowan & Others v Scargill & Others [1984] 3 WLR 501
[6] The case is against the Retail Employees Superannuation Trust and the member is being supported by lawyers at Environmental Justice Australia
[7] J Kay, The Kay review of UK Equity Markets and Long-Term Decision Making: Final Report (July 2012)
[8] Fiduciary Duties of Investment Intermediaries (2014) Law Com No 350 (Report)
[9] see the Government Response of September 2018 to the DWP Consultation on Clarifying and Strengthening trustees' investment duties
[10] DWP Consultation on Clarifying and Strengthening trustees' investment duties

The legislation proposed will apply to schemes having 100 members or more and will mostly take effect from 1 October 2019. In summary, the legislation proposed[11] will:-

_ require all trustees to specify in their Statement of Investment Principles, how they take account of financially material considerations, including those arising from ESG considerations, and also specify their policies on the stewardship of investments;
_ require trustees of schemes offering money purchase benefits (unless the only benefits are those attributable to additional voluntary contributions) to publish their Statement of Investment Principles on a website and alert members to that and to update their default investment strategy to set out how they take account of financially material considerations.

In the light of the above and the growing evidence of the risks posed by climate change (as Emily Shuckburgh explains so vividly elsewhere in this paper), all trustees now need to engage with this issue.

Government, the regulators and industry bodies

None of this should come as a surprise to pension scheme trustees. In both its DB and DC investment guidance[12], the Pensions Regulator specifically mentions the need for trustees to consider sustainability and, potentially, climate change:-

> *"Most investments in pension schemes are long term and are therefore exposed to long term financial risks. These potentially include risks relating to factors such as climate change....these risks could be financially significant, both over the short and longer term.*
>
> *[Trustees] should, therefore decide how relevant these factors are to inform [their] investment strategy"*

Then, in December 2017, the Pensions and Lifetime Savings Association launched its industry guidance, produced in association with ClientEarth, on managing climate risk in pensions portfolios[13]. This guidance is introduced as follows:-

> *"The climate is changing as a result of human activity – and this will have profound consequences for pension funds' investments. As such, governance bodies[14] must take steps to prepare for the economic ramifications of climate change*

Earlier this year, the cross-party Environmental Audit Committee highlighted the issue by asking the UK's top 25 pension funds to explain their respective approaches to climate change risk and the Committee's subsequent report on the findings of its green finance inquiry[15] reinforces the need for pension trustees to consider climate change risk, whilst recognising that "there is widespread misunderstanding amongst trustees on the scope of their duty in relation to environmental risks". The report also calls on the Financial Conduct Authority to issue guidance on climate change risk for contract-based schemes, noting the "worrying disparity" between guidance issued by the FCA and the Pensions Regulator.

A call to action

Our recent report, based on research from Leeds University[16], found that, to date, schemes which have engaged in climate risk management have been driven, at least at the outset, more by general environmental values than by considerations of the financial impact of climate risk – and this is consistent with there being low levels of understanding amongst trustees of their duties in this area.

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[11] The Occupational Pension Schemes (Investment and Disclosure) (Amendment) Regulations 2018 (now the Pension Protection Fund (Pensionable Service) and Occupational Pension Schemes (Investment and Disclosure) (Amendment and Modification) Regulations 2018)
[12] Guide to Investment Governance, July 2016, as part of the DC Code and Investment Guidance for defined benefit pension schemes, March 2017
[13] More Light, Less Heat: A Framework for Pension Fund Action on Climate Change, December 2017
[14] The term "governance bodies" is used to refer to trustee boards, independent governance committees and the pensions committees in the local government sector.
[15] Greening Finance: embedding sustainability in financial decision-making, 23 May 2018
[16] Managing Climate Risk in a Changing Environment, April 2018

However, irrespective of their values, all trustees now need to recognise the importance of having a proper governance structure around their approach to climate risk. This is not without its challenges – including a lack of regulatory clarity and methodological issues - but these potential barriers should no longer be the "excuse" for trustees not to engage with this issue.

It is worth noting that, whilst climate risk is only one of a number of ESG considerations, it is mentioned specifically in the forthcoming legislation, which will define financially material considerations as including (but not limited to):-

> *" environmental, social and governance considerations (including but not limited to climate change) which the trustees of the trust scheme consider financially material"*[17]

The Government's justification for this is that *"the systemic and cross-cutting nature of climate change means that it should be retained as a named factor for consideration"*.

The practical consequence of this is that, whilst there may be no difference in law between trustees' duties in connection with climate change and their duties in relation to other ESG considerations, there will inevitably be a greater focus on climate change, which increases the risk of trustees being found wanting in this area. And this is compounded by the fact that members are more interested in climate change than other ESG factors. As a result, best practice in this area is expected to evolve rapidly and trustees will need to keep up to date with these changes.

Broadly, the climate risk actions that trustees can take focus around four areas - investment strategy, strategic asset allocation, the selection and monitoring of fund managers and stewardship activities. Examples of some possible actions for trustees are set out in **Figure 1.**

FIGURE 1. PENSION SCHEME APPROACHES TO ESG AND CLIMATE CHANGE

Investment strategy	Strategic asset allocation	Selection of investment managers	Stewardship activities
Include climate change in investment beliefs	Diversify passive assets using sustainability and low carbon indices	Consider the investment manager's qualifications to address climate risk	Develop proxy voting guidelines which reflect the fund's climate risk stance
Include climate change in investment strategy statement	For active mandates: diversify across sources of climate risk as well as traditional asset classes	Consider climate change in investment mandates	Co-file shareholder resolutions to request more disclosure on climate risk
Have a climate change policy	Increase sustainable investment or investment in climate sensitive assets	Consider climate change in the monitoring process of investment managers	Directly engage with investee companies
	Consider portfolio decarbonisation	Require fund managers to undertake engagement activities on climate change risks	Join initiatives such as the Institutional Investors Group on Climate Change (IIGCC)
			Engage with policy makers

Source: Pinsent Masons, November 2018

[17] Regulation 2 (4) of the Occupational Pension Schemes (Investment) Regulations 2005 as proposed to be amended by The Pension Protection Fund (Pensionable Service) and Occupational Pension Schemes (Investment and Disclosure) (Amendment and Modification) Regulations 2018

The extent to which any of these actions is appropriate will vary according to the circumstances of each scheme. However, the essential initial step for every group of trustees is to understand the implications of climate risk in the context of their scheme. In practice, this means that trustees should, as a minimum:-

- talk to their investment consultants about whether, and if so how, climate change risk is currently built into their recommendations and what the rationale is for their approach;
- ask their investment consultants and/or asset managers to explain what, if any, measures the managers currently take to address climate risk;
- discuss, as a trustee board, their own beliefs on climate risk;
- develop a written policy on climate risk (probably as part of a wider ESG policy) - the purpose being to give clear guidance on how climate risk should be taken into account when investment decisions are made[18]
- follow the policy every time that a new investment manager is appointed and monitor compliance by requiring each manager to report regularly on climate risk is built into that manager's decisions.

This **five point action plan** is key to a trustee board being able to demonstrate that it has complied with its legal duties. If trustees take no further action, they should at least reach this stage.

Beyond this, trustees can make their own judgement, based on the size and nature of their scheme, on how proactive they need to be in their approach to climate risk - just as they do for any other risk-based governance process. A more proactive approach might involve some or all of the following elements:-

- identifying the managers and mandates which require most attention and working with investment consultants to ensure access to the appropriate individuals at those managers;
- understanding the metrics and methodologies used by managers and how to compare the detail of different managers' methodologies;
- ensuring that investment management agreements reflect the approach on climate risk that has been agreed with each manager
- developing a robust monitoring process - not just reporting by managers but probably also methods of keeping abreast of industry discussions and changing views of best practice, given the amount of uncertainty and the speed of development in this area

Employer covenant?

Finally, a word about the employer covenant. If climate risk is relevant to a scheme's investments, then it is just as relevant to the sustainability of the employers which support that scheme - and trustees must also consider the need to take account of this risk in their covenant assessments.

Conclusion

Climate change has the potential to pose material risks to the long-term financial health of pension schemes. As such, climate change denial is no longer a viable option for trustees. Whatever a trustee's private views on climate change, this is now a governance issue for every trustee board and trustees who fail to engage with this issue risk being in breach of their fiduciary duties.

[18] Some trustee boards, having discussed the issue with their consultants and assessed the impact of climate risk for their particular scheme, may conclude that no action is needed. This is fine, assuming that the trustees took account of all relevant considerations in reaching their decision. The decision should be reflected in policy documents and the decision-making process recorded in formal minutes. The decision should be reviewed at appropriate intervals

Actuarial and audit view: risk alert

The reliability objective for actuarial work – why climate is relevant professionally

Summary

"*Users for whom actuarial information is created should be able to place a high degree of reliance on that information's relevance, transparency of assumptions, completeness and comprehensibility, including the communication of any uncertainty inherent in the information.*"

So states the Financial Reporting Council in its 'framework for technical actuarial standards'[19]. The FRC's statements are important as they set actuarial standards, provide independent investigation and disciplinary hearings and oversee the Institute and Faculty of Actuaries' regulation of the actuarial profession in the UK.

Some assumptions of course, are so universal, so accepted, so understood that they do not need stating. It would be farcical to begin actuarial reports with a long list of universal truths such as: gravity is constant, we orbit the sun, etc.

But if an underpinning assumption is untrue, it can quickly become apparent that the most solid of castles is actually built on sand.

Now, of course, the assumption that the climate is stable, is no longer true. A rapidly warming climate and the transition to a low carbon economy have material capital market implications, which we are only beginning to understand in detail.

Any actuarial advice that ignores these significant changes may therefore be at risk of failing the reliability objective by excluding matters of material uncertainty and not reflecting these changes appropriately in relevant assumptions.

Climate change also appears pertinent for auditors of corporates with pension schemes, given the recent FRC finding[20] in relation to the audit of defined benefit pension obligations and the need for auditors to *'carefully assess the risks for the more sensitive assumptions.'* It is likely to be increasingly considered by auditors of trustee accounts too.

The IFOA has recognised the need to appropriately reflect climate change in actuarial work, issuing a profession wide Risk Alert[21] in May 2017, which stated that:

"Actuaries should ensure that they understand, and are clear in communicating, the extent to which they have taken account of climate-related risks in any relevant decisions, calculations or advice."

Recognising that climate risks are new for many actuaries, the IFOA's Resource and Environment Board is seeking to support members by producing a series of practical guides for different practice areas to raise awareness, encourage discussion, catalyse further research and help actuaries develop their advice.

Currently there are practical guides for defined benefit pensions[22] (supporting reports on covenant assessments[23], mortality assumptions[24] and a planned financial assumptions report) and defined contribution pensions[25].

Given the IFOA risk alert, it appears that all actuaries should acquire an appropriate level of professional knowledge of climate risk and how climate should be included in their actuarial advice. Our stakeholders expect and indeed welcome actuarial leadership.

Sandy Trust

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[19] FRC, Framework for FRC Actuarial Standards, December 2016
[20] FRC, Audit of Defined Benefit Pension Obligations – Findings from 2017/18 Audit Quality Reviews, July 2018
[21] IFOA, Risk Alert – Climate-related risks, May 2017
[22] "Resource & Environment Issues, A Practical Guide for Pensions Actuaries", July 2017, Hails et al
[23] "Resource and Environment Issues for Pensions Actuaries: Implications for Sponsor Covenant Assessments", September 2017, Hails et al
[24] "Resource & Environment Issues for Pension Actuaries: Implications for setting mortality assumptions", Oct 2017, Hails et al
[25] "Climate Risk: A Practical Guide for Actuaries working in Defined Contribution Pensions", March 2018, Trust et al

An actuarial and audit perspective

In his 2015 speech, "Breaking the tragedy of the horizon"[26], Mark Carney, described three categories of risk arising from climate change: physical risk, transition risk and liability risk. The IFOA's Risk Alert also references these risks, any of which could impact asset values, potentially significantly.

What is important to appreciate is that not only is there downside risk here, there is also upside investment opportunity, due to the speed and scale of the energy transition required to mitigate climate risk.

Recognising that these risks are new for many actuaries, the IFOA's Resource and Environment ('R&E') Board is seeking to support members by producing a series of practical guides on climate risk for different practice areas to raise awareness of the topic, encourage discussion, catalyse further research and help actuaries to think about how to develop their advice. Currently there are practical guides for Defined Benefit pensions[27] (with supporting reports on covenant assessments[28], mortality assumptions[29] and a financial assumptions[30]) and Defined Contribution pensions[31] with a number of additional publications covering other areas of actuarial work due to be released later in 2018.

The rest of this section summarises the information in the guides by giving a high level description of the risks, their relevance for pension schemes and recommended actions, which at a high-level are:.

_ **Understand**
Build an understanding of the risks, the implications, the opportunities and the policy and regulatory environment understand how this impacts your scheme, where you sit against peers and how to progress. A key part of this, is starting to develop climate change scenarios, to understand how the complex system of risks and opportunities associated with climate change could progress over the next decade.

_ **Assess**
Appoint an appropriate owner, for example, a trustee or a member of the governance committee, for climate risk and undertake an assessment to quantify the potential impacts for the scheme, taking into account both physical and transition risks. Work with your advisors to develop an appropriate action plan and incorporate into current change portfolio.

_ **Act**
Steps 1 and 2 allow action to be taken, informed by robust financial analyses, to integrate climate appropriately into the overall strategy of the scheme.

This will necessarily be an iterative process, with data, methodologies and industry practices evolving rapidly, as indeed are the underlying risk drivers.

Climate risk for pensions

Resource and environment issues, including climate change, are an important part of the economic and social landscape in which pension schemes operate. They are less visible, less tractable and, arguably, less well understood, than other issues that actuaries typically consider when advising their clients. As such, they present risks and opportunities that may not be reflected fully in current market prices.

In addition to these considerations, there are a number of initiatives, both regulatory and voluntary, at the UK, EU and Global level, recommending the appropriate consideration of climate risk in savings and investments. Many of these are detailed in the IFOA Practical Guides and it appears likely that appropriate consideration of climate change as a material financial risk will become a mandatory requirement for those charged with governance.

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[26] "Breaking the tragedy of the horizon – climate change and financial stability" – speech by Mark Carney, September 2015 http://www.bankofengland.co.uk/publications/Pages/speeches/2015/844.aspx

[27] "Resource & Environment Issues, A Practical Guide for Pensions Actuaries", July 2017, Hails et al

[28] "Resource and Environment Issues for Pensions Actuaries: Implications for Sponsor Covenant Assessments", Sept 2017, Hails et al

[29] "Resource & Environment Issues for Pension Actuaries: Implications for setting mortality assumptions", October 2017, Hails et al

[30] "Resource & Environment Issues for Pension Actuaries: Considerations for Setting Financial Assumptions", November 2018, Jones et al

[31] "Climate Risk: A Practical Guide for Actuaries working in Defined Contribution Pensions", March 2018, Trust et al

The Task Force on Climate-related Financial Disclosures (TCFD), set up at the request of G20 finance ministers and central bank governors, is a particularly influential initiative. As at August 2018, it was publicly supported by 390 companies, including eight of the ten largest investment managers, twenty major global banks and a number of large pension schemes, many of which are from the UK[32].

Scenario Analysis

One of the key recommendations of TCFD, is that entities should undertake scenario analysis, to understand the impact of different possible climate scenarios on their businesses and portfolios. Economic scenario analysis is a well used tool in the pensions world and so, for actuaries, this should be conceptually right in the sweet spot. There is of course the challenge of ascertaining which climate scenarios to use – and then understanding the economic impacts of those climate scenarios. Just what would the FTSE100 do in a 3°C world and how might this impact the appropriateness of key assumptions and the funding position of the scheme?

This is an area which is developing quickly, with collaborations between leading academics, asset owners and economic modelling firms underway, which seek to join the dots between climate science, economic models and pension scheme funding, with early results anticipated later in 2018.

On the assumption that catastrophic climate change is outside societal risk appetite, a particular scenario which will be important to consider is one in which a number of factors such as increased policy ambition, technological disruption and heightened public awareness combine to accelerate the pace of the energy transition in the short to medium term. The potential for this has been highlighted by a range of commentators such as the PRI[33] and Carbon Tracker[34].

Defined benefit pensions

Any material capital market events that occur as a result of climate change will have implications for both funding positions and economic assumptions. There may be further impacts on mortality assumptions in due course and another important area to consider is the impact on the covenant.

As for any area of risk, the funding implications of climate issues are affected by the covenant and investment implications and vice versa. For example, a scheme that is actively managing climate risks in its investments and has a sponsor with relatively low exposure to physical and transition risks, may conclude that no adjustments are needed to the current financial assumptions. Conversely, scheme actuaries may want to suggest a more prudent funding approach in schemes where mitigation of climate risks is not explicitly addressed in the trustees' investment strategy or where climate risk is a major source of covenant risk.

Funding position and economic assumptions

One way to think through the funding implications in the context of the specific circumstances of a particular pension scheme is to use scenario analysis. Recent research on the implications for pension scheme investments indicates a range of possible outcomes. Further research is therefore needed. In the meantime, the uncertainty arising from climate change may be a reason to review the level of prudence in the basis or consider the scheme's potential funding position under a wider variety of scenarios, consistent with TCFD recommendations.

Covenants

Climate related risks and opportunities can be material for businesses, but their importance may be underestimated when assessing covenant strength, which is one of the key considerations for trustees in setting their funding strategy. However, covenant assessments may not adequately reflect climate risks because they are often hard to quantify, have uncertain timeframes or lie outside the core expertise of most trustees, actuaries and covenant advisers.

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[32] TCFD press release, 12 December 2017
https://www.fsb-tcfd.org/wp-content/uploads/2017/12/TCFD-Press-Release-One-Planet-Summit-12-Dec-2017_FINAL.pdf

[33] PRI "The inevitable policy response to climate change", 12 September 2018
https://www.unpri.org/climate-change/the-inevitable-policy-response-to-climate-change/3578.article

[34] Carbon Tracker "2020 vision: why you should see the fossil fuel peak coming", 10 September 2018
https://www.carbontracker.org/reports/2020-vision-why-you-should-see-the-fossil-fuel-peak-coming/

Covenant advice already takes account of climate issues to some extent, for example, for companies in the oil, gas and commodity sectors where they are obviously of immediate relevance. However, climate risks may be overlooked where they are longer-term in nature or primarily arise through indirect routes such as supply chain exposure. Actuaries can encourage trustees to raise these risks in their discussions with their covenant adviser and the employer, to ensure that these risks are given sufficient consideration.

Mortality assumptions

Current and future mortality rates are the most important demographic factors for funded UK defined benefit pension schemes and the most obviously affected by R&E issues. Potential R&E effects on death rates over the next few decades include[35]:

_ Direct effects of rising temperatures - these are generally expected to reduce UK mortality rates (reduction in cold-related deaths more than offsetting an increase in heat-related deaths).
_ Other direct effects of climate change - more extreme weather events (eg flooding) and more insect-borne disease are both expected to increase deaths in the UK, but only by a small amount.
_ Beneficial health effects of mitigation activities - efforts to reduce air pollution and greenhouse gas emissions may improve health by improving air quality, reducing meat consumption and increasing walking and cycling.
_ Harmful health effects of mitigation activities - energy prices could rise (eg due to carbon taxes), making it more expensive to heat homes and import fruit and vegetables.
_ Macroeconomic impacts of R&E issues - could increase deaths by reducing economic growth and increasing food prices, resulting in lower healthcare spending and poorer nutrition.

All of these effects are difficult to quantify. Most quantitative studies to date have focused on air pollution and temperature-related deaths[36]. The IFOA's mortality supplement to the DB Pensions practical guide outlines these studies' findings and comments on how the impacts may vary by age and location. In summary, changes in air pollution-related and temperature-related deaths may increase UK life expectancy over the next few decades, with larger changes from pollution than temperature. However, the combined impact of other Resource & Environment effects could be more material than either of them and work in the opposite direction. For example, the PLSA and Club Vita have illustrated two "low trend" mortality improvement scenarios which incorporate Resource & Environment constraints in their narrative description and indicate reductions in pension scheme liabilities[37].

Defined contribution

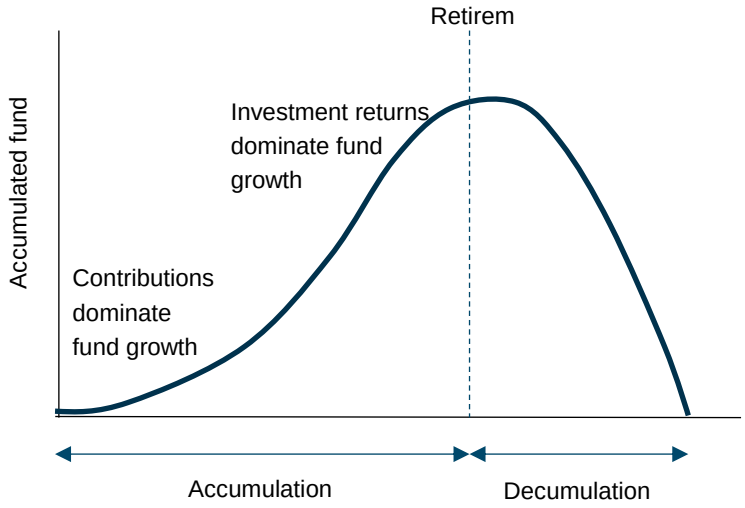
From the perspective of an individual member, contributions together with investment returns accumulate to provide a retirement fund as illustrated below, **Figure 1**. This fund can then be taken as a lump sum, gradually drawn-down to provide a regular income or used to purchase an annuity. Many DC schemes are in a cashflow positive position, with a balance of members in the accumulation phase.

[35] UK Climate Change Risk Assessment 2017 https://www.theccc.org.uk/uk-climate-change-risk-assessment-2017/

[36] See, for example, Every Breath We Take: The Lifelong Impact of Air Pollution https://www.rcplondon.ac.uk/projects/outputs/everybreath-we-take-lifelong-impact-air-pollution and http://jech.bmj.com/content/68/7/641.abstract

[37] Longevity Trends: Does One Size Fit All? http://www.plsa.co.uk/PolicyandResearch/DocumentLibrary/~/media/Policy/Documents/0635170623-16-PLSA-Longevity-model.pdf

Figure 1: Illustrative fund accumulation for a DC saver



Whilst the manner in which funds are invested depends on the options made available and the choices made by the member, the level of investment return targeted and consequently the risks taken typically reduce over time. Retirement income is a function of contributions, investment return (net of charges) and of course member choices at/during retirement. However, member utility in retirement will be impacted by a range of other factors including health, inflation, mortality rates (particularly for annuity purchase) and the state of the planet – both human and natural systems.

In a climate change context, the importance of the state of the planet can be illustrated by considering the investment time horizon of DC members. For example, a 20 year-old joining a defined contribution scheme in 2018 may be saving for a period of 50 years and in receipt of pension benefits for a further 30 years beyond this.

Whilst some of the effects of climate change on the environment such as shrinking glaciers, increased storm severity, enhanced drought periods leading to wildfires and shifts in seasonal behaviours are already occurring[38], this investment time horizon lies within the period when even greater effects of climate change, such as those mentioned in the article from Dr. Shuckburgh's of the British Antarctic Survey. It is therefore reasonable to expect that such a member will be concerned with both the environment that they will be retiring into and the potential impact that climate change could have on their retirement savings.

Research carried out by a number of organisations bears this out – evidencing that people are concerned about the environment and further, have a general expectation that their pension monies will be invested responsibly. On younger generation's attitudes to saving indicates that this is the case.[39]

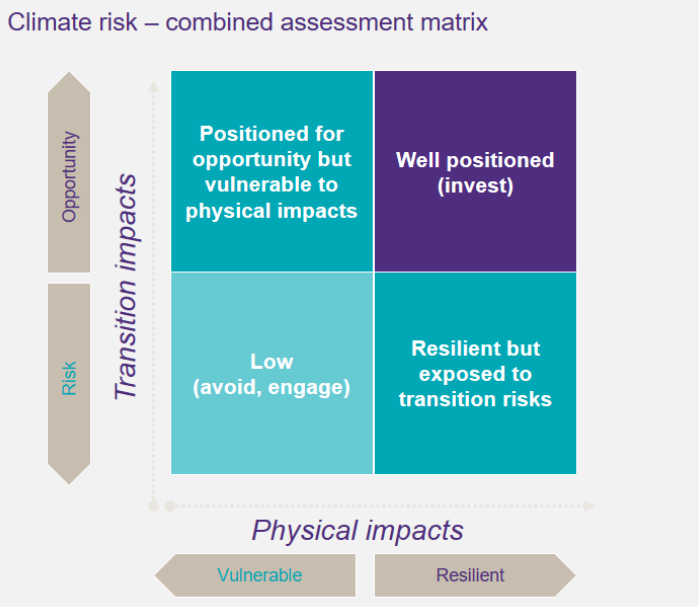
Given the growing role of DC pensions in the UK's financial future – assets in DC schemes are expected to increase six-fold by 2030 to £1.68 trillion[40], a sum equivalent to 15% of the current net wealth of the UK – it is important to consider the interaction between climate risk, DC schemes and their members.

[38] NASA, Global Climate Change, Vital Signs of the Planet https://climate.nasa.gov/effects/

[39] Morgan Stanley Institute for Sustainable Investing https://www.morganstanley.com/ideas/sustainable-socially-responsible-investing-millennials-drive-growth

[40] Law Commission, 2017: "Pension Funds and Social Investments"

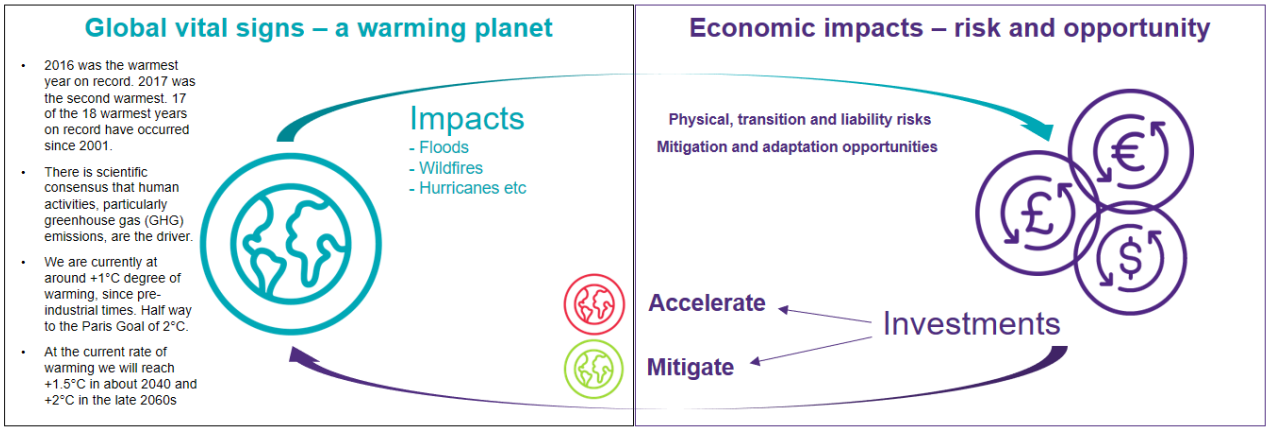
Climate risk insights



It is increasingly recognised that a rapid transition to a low carbon economy is critical to mitigating the impacts of climate change caused by human activity. However, there are many possible climate pathways. Where we will end up on the spectrum between rapid de-carbonisation of our economy (with associated transition risks, such as stranded assets) and significant climate change (with associated physical risks) is unclear.

To understand the implications for financial markets, a basic understanding of climate change is important. Physical risk is complex in itself but its interaction with transition risk increases the challenge of defining an optimal strategy.

Put another way, these risks are not independent. Logically, increasing levels of physical risk may result in abrupt policy decisions, thereby increasing the likelihood of transition risk events for impacted sectors. Similarly, decisions on lending and investment can either mitigate or accelerate climate impacts, as illustrated in the diagram below.



Moving towards a combined assessment

In general insurance, physical risk is well understood and the rapid increase in insured losses from weather events is already hitting balance sheets.

In the investment and lending space, there has been a greater focus on transition risk and opportunity – with increasingly sophisticated analyses being undertaken.

However, in order to fully understand the impact of climate change risks on any business or pension scheme, a combined assessment is required. This reinforces the importance of investigating a number of different climate scenarios to understand the potential impacts that could emerge.

Taking action

Given the IFOA risk alert and other content in this paper, it would appear that all advisors to pension schemes, including actuaries, should acquire an appropriate level of professional knowledge, to understand climate risk, the financial stability

implications and how these should be included in their actuarial advice. Wider stakeholders may expect and indeed welcome leadership from their advisors in this matter, which will require a thorough and up to date knowledge of relevant risks, insights and solutions.

Both the IFOA's DB and DC Pensions Guides contain references to a broad selection of policy, regulatory and technical climate change material which can be referenced. Further specific recommendations for DB and DC pensions advisors, including actuaries, are given below.

Defined Benefit

Here are some actions for those professionals advising defined benefit pension schemes to consider taking, to the extent that they are relevant to their clients and it is proportionate to do so:

_ Encourage trustees to raise R&E issues in discussions with their covenant adviser and the employer.
_ Find out how your clients are addressing R&E risks in their investment processes and consider whether your funding advice is consistent with these risks.
_ Review whether your models adequately incorporate R&E risks and whether the documentation is adequate.
_ Use scenario analysis to explore uncertainty in financial and demographic factors arising from R&E issues.
_ Help trustees adopt an integrated risk management approach that includes R&E risks.
_ When giving advice, communicate your approach to R&E risks and the associated uncertainty.

Defined Contribution

The growth in DC pension provision and the longevity of members within DC pension arrangements could result in many members seeing their retirement affected in some way by climate change.

For those actuaries involved in advising DC arrangements, there are various actions that could be taken in order to develop an approach to climate risk mitigation, including:

_ Consider including an appropriate statement in reports on whether and how climate risk has been incorporated into advice, having regard to the IFOA's risk alert.
_ Consider whether climate risk should be incorporated into the default investment strategy design.
_ Consider whether any communication with scheme members should be undertaken with reference to climate risk.
_ Consider whether scheme governance committees and trustee boards have appropriate knowledge and understanding of climate risk information, as well as specific information on the climate risk exposure of their scheme, to make meaningful decisions on climate risk. The type of decision required will be different for trustees and IGCs, as trustees can make investment decisions. IGCs do not make investment decisions but can decide whether or not they believe a provider is appropriately considering these risks.
_ Consider whether the scheme's self-select funds offer sufficient choice to members with respect to climate risk. Many schemes already offer ethical funds but few currently provide funds with a clear ESG, carbon or climate aware focus as part of their range. Actuaries need to understand how these funds operate, what climate risks they are aiming to mitigate and how effective the various market offerings are in achieving the end mission and goal of members invested.
_ Consider whether DC schemes should be creating more demand for investment solutions that mitigate the risks identified, including multi-asset solutions.
_ Consider the extent to which climate risk and the potential impact on future returns within investment modelling work could affect the design of contribution structures and/or the assumptions made for income projections.

Appendix: Case studies

In response to growing awareness of climate risk and increasing demand from investors, index providers and asset managers have, over recent years, sought to develop a range of "climate aware" investment solutions. These solutions, some of which are targeted towards the DC market, provide elements of both risk mitigation and upside opportunity

exposure. They include actively managed equity funds with long-term objectives, and the emergence of a number of low carbon indices and sophisticated factor-based investments. Many of these also incorporate a more active policy on stewardship, with some investments having clear criteria for active engagement on climate issues.

During this time, there have been a number of examples of both DC and DB pension providers taking account of climate risk in their investment arrangements and we have detailed below, at a high level, the steps these schemes took. Further details are given in the IFOA practical guides.

Defined Benefit Pension Scheme – Integrated Risk Management Study

This case study illustrates how R&E risks to pension scheme funding can be managed by extending a scheme's existing integrated risk management approach. It uses an idealised, fictional example of a UK defined benefit scheme sponsored by a large supermarket chain where the trustees and sponsor are engaged with R&E issues.

Covenant

When assessing the financial strength of the sponsor, the trustees asked their covenant adviser to consider R&E issues as part of standard considerations such as affordability of contributions and balance sheet strength. Based on a combination of published information, management information and discussions with the employer, the covenant adviser concluded that the company was managing R&E issues well in the short to medium term (less than five years) but that the company's approach to managing R&E issues in the longer term (more than five years) was weaker.

Funding

At the latest triennial valuation, the trustees and employer agreed a five year recovery plan to eliminate the deficit on a technical provisions basis. In other words, the trustees expected the scheme to be fully funded, on a reasonably prudent basis, before R&E issues became a greater concern to the covenant. However, the trustees questioned whether R&E issues were fully reflected in the assumptions used.

The trustees therefore asked the scheme actuary to illustrate the funding position under two R&E scenarios: a "2 degree" scenario in which there is rapid transformation to a low carbon energy system; and a "4 degree" scenario in which little effort is made to mitigate climate change or other R&E issues. The scheme actuary worked with the investment consultant and covenant adviser to consider how investment returns and affordability of contributions respectively might be affected in these scenarios. The worse scenario showed a doubling of the deficit and a tripling of the recovery plan length.

Investment

Historically, the trustees had relied on their investment managers to manage R&E risks to their investments as appropriate. However, they had little insight into what this meant in practice and how effective the managers were being. They worked with their investment consultant to ask their investment managers probing questions on how they managed R&E risks. As a result of these discussions and the scenario analysis outlined above, the trustees:

- Decided to continue their existing plans to de-risk the scheme's investments.
- Informed their investment managers that they expected them to integrate R&E issues into investment processes where they had the potential to be financially material, and that insufficient attention to R&E could result in the retendering of their mandate.
- Requested an annual report from their investment managers summarising how they address R&E issues, with particular attention to the R&E risks identified through the covenant assessment.
- Introduced a small allocation to a "sustainable opportunities" equity fund to hedge some of the risks elsewhere in their investment portfolio and offer upside potential.
- Asked their scheme actuary to consider how the actions they had taken to reduce R&E risks to their investment portfolio might feed through into the discount rates used for funding purposes.
- Updated their Statement of Investment Principles to reflect the actions taken.

Ongoing monitoring

The trustees added R&E to their regular monitoring processes, including:

- KPIs in their quarterly covenant monitoring dashboard (eg energy use and food waste),
- ongoing dialogue with the company to understand its inclusion of R&E issues in risk management and long-term business planning and
- Annually refreshing the R&E funding scenarios.

They also started to include R&E issues within annual member communications, to keep members informed of the actions being taken.

HSBC Bank's UK Defined Contribution Scheme ('HSBC')

This case study covers the decision by HSBC Bank (UK) DC Pension Scheme to invest its £1.85 bn equity asset allocation in the default investment strategy into a climate-aware fund.

The fund is based on the FTSE All-World equities index universe (excluding controversial weapons), with the remaining constituents' weights then adjusted to reflect value, size, low volatility and quality factors. The resultant factor-weighted index is then further adjusted to reflect three climate change parameters: carbon emissions, fossil fuel reserves and green revenues.

What drove the discussion?

ESG risks are integrated into the way that the HSBC pension fund trustees think about their fiduciary role. ESG beliefs have been a key topic at trustee offsite days over the years and the group is now in a position where all 13 trustees agree that incorporating ESG considerations into investment decision making is part of the fiduciary duty of a trustee.

How did they assess risk and opportunity?

In June 2015, the Trustee had adopted a Climate Change Risk policy of its own. Following this, it was considering how to incorporate sustainability more fully into its existing investments.

What solutions were considered?

The Trustee approached its existing passive global equity manager and investment consultant along with the index provider to propose the creation of a new fund that would fulfil the following three criteria:

1. Better risk adjusted returns
2. Protection for climate change risks
3. Improve ESG engagement

These four actors worked together to develop a solution. Its equity manager was appointed to the project management role and the CIO of the HSBC Bank (UK) Pension Scheme was appointed as project sponsor.

The CIO stresses the importance of continuous socialisation with stakeholders at the pension scheme and the corporate sponsor. The HSBC scheme has a robust governance process with several layers of approval required before the new fund could be implemented. The CIO was able to make this process happen during a short timeframe due to making sure everyone 'came along on the journey'.

Investment consultant view – key questions

Regulators highlight climate as a mainstream financial risk: what should trustees demand to know?

Summary

This year, the recognition of climate risk as a material financial risk to pension scheme investments has moved firmly to the mainstream. Increased scrutiny began in March with a letter from Mary Creagh, the chair of the cross-party Environmental Audit Committee (EAC), to the UK's top 25 pension schemes asking them how they manage the risks of climate change to their assets.

In May the EAC published its findings and called for new disclosures around climate risk by 2022. Pressure also increased from other arenas including individual beneficiaries and activist groups.

The summer of 2018 closed with new investment regulations from the Department for Work and Pensions which, for the first time, explicitly referenced climate change as a financial risk that pension trustees should consider.

Whilst regulatory bodies have made it clear that climate risk is a financial risk that pension trustees should assess and manage, industry surveys highlight that the reality still lags behind. Mercer's European Asset Allocation report in 2018 showed that, while there had been a threefold increase in pension funds considering climate change, they accounted for less than a fifth of funds. The 2018 Asset Owner Disclosure Project of the top 100 global pension schemes paints an even starker picture, recording that less than one per cent of assets are invested in low carbon strategies.

There are examples of pension funds both assessing and managing climate risk. A recent report on ESG integration by the Pension Policy Institute highlighted the low-carbon default strategy adopted by the HSBC defined contribution pension scheme in 2017. The report also explores the barriers to ESG integration. A key issue identified is that larger, better resourced schemes tend to have made more progress on ESG and climate related risk management than smaller counterparts. If you are a smaller scheme, or have only just started to consider climate risk, how can you discover whether your asset managers are investing with climate risks in mind?

Meanwhile, the 2018 survey of Redington's highest rated asset managers showed that over 80 per cent of them integrate ESG into their investment process, while 60 per cent measure and assess climate risk. The survey covered over 120 managers in 45 separate asset classes. It demonstrates that the industry still has progress to make but it is possible to select an asset manager considering climate risk as part of the investment process.

This is an area where there is both differentiation between asset managers and where we expect to see rapid change over the near term. As an asset owner, what are the best questions to ask both investment consultants and asset managers about management of climate risk?

1. **Investment process**. How is climate risk assessed during the investment process? For example, which data sources are used? Are there any case studies that the portfolio manager can share?
2. **Engagement**. How is good stewardship practiced both for equity and fixed income assets? Can the asset manager share examples of meaningful engagement and who carries out this engagement?
3. **Infrastructure and reporting**. Does the infrastructure support the portfolio management teams to assess and manage climate risk? Is client reporting available?
4. **Accountability**. Who is held accountable for ensuring that climate risks are managed? Is there a clear business commitment and reporting lines?

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What are pension schemes doing in practice?

Whilst regulatory bodies have made it clear that climate risk is a financial risk that pension trustees should assess and manage, industry surveys highlight that the reality still lags behind. Mercer's European Asset Allocation report in 2018 showed that, whilst there had been a threefold increase in pension funds considering climate change, the percentage stands at less than 20%. The 2018 Asset Owner Disclosure Project of the top 100 global pension schemes paints an even starker picture recording that less than 1% of assets are invested in low carbon strategies.

Redington recognise four different approaches by asset owners approaching Environmental, Social and Governance (ESG) risks including climate change, **Figure 1.**

FIGURE 1. PENSION SCHEME APPROACHES TO ESG AND CLIMATE CHANGE

<table>
<tr><th>COMPLY</th><th>MEASURE AND MANAGE</th><th>SEEK ALPHA</th><th>EXTERNAL IMPACT</th></tr>
<tr><td>  </td><td>  </td><td>  </td><td>  </td></tr>
<tr><td>“We comply with the regulations”</td><td>“We monitor and engage on climate issues”</td><td>“We seek opportunities to take advantage of”</td><td>“We target impactful outcomes”</td></tr>
<tr><td colspan="4">Policies on Environmental, Social and Governance factors including climate change documented.</td></tr>
<tr><td></td><td colspan="3">Report or are beginning to report on exposure to, and management of climate-related risks. May start to move away from high carbon assets.</td></tr>
<tr><td></td><td></td><td colspan="2">Allocate to climate-related opportunities.</td></tr>
<tr><td></td><td></td><td></td><td>Invest to drive impact.</td></tr>
</table>

Source: Redington, November 2018

We observe asset owners taking actions across this spectrum: from an ambition only to fulfil basic regulatory requirements up to the desire to invest for impact. In this article I will explore further the different approaches to climate change being taken by institutional investors.

A recent report on ESG integration by the Pension Policy Institute highlighted the low-carbon default strategy adopted by the HSBC DC pension scheme in 2017: a strategy that is designed to actively engage with climate change both as a risk and an opportunity. The report also explores the barriers to ESG integration. A key issue identified is that larger, better resourced schemes tend to have made more progress on ESG and climate related risk management than smaller counterparts. If you are a smaller scheme, or have only just started to consider climate risk, how can you discover whether your asset managers are investing with climate change in mind?

What questions should I ask my asset manager?

The 2018 survey of Redington's highest rated asset managers showed that over 80% integrate ESG into the investment process, and 60% measure and assess climate risk. This survey covered over 120 managers across 45 separate asset classes and, while it demonstrates that the asset management industry still has progress to make, it also shows that it is possible to select an asset manager considering climate risk as part of the investment process.

This is an area where there is both differentiation between asset managers and where we expect to see rapid change over the near term. As an asset owner, what are the best questions and areas to dig deeper and to ask both investment consultants and asset managers about management of climate risk?

1. **Investment process**. How is climate risk assessed during the investment process? For example, which data sources are used, and are there any case studies which the portfolio manager can share.
2. **Engagement**. How is good stewardship practiced both for equity and fixed income assets? Can the asset manager share examples of meaningful engagement and who carries out this engagement?
3. **Infrastructure and reporting**. Does the infrastructure support the portfolio management teams to assess and manage climate risk? Is client reporting available?
4. **Accountability**. Who is held accountable for ensuring that climate risks are managed? Is there a clear business commitment and reporting lines?

Asset owners sit at the top of the investment chain and have the ability to drive systemic change through setting the agenda with their existing asset managers and with other advisors including investment consultants. Asking questions to understand how your key advisors are considering climate related risks is the first step to managing these risks, and is a clear signal of intent.

What are the next steps?

In addition to schemes starting to ask tougher questions to their asset managers some schemes are starting to go further: selecting asset managers based on their ability to manage climate risks; writing specific sustainability criteria into the IMA; and shifting their asset allocation to capture climate related opportunities as well as avoiding risks. Asset owners wishing to measure and manage their climate-related risks are likely to reduce their exposure to high carbon assets while asset owners seeking alpha and target impact are likely to look for investment opportunities in low carbon assets and technologies.

September 2018 marked two years since the launch of the LGIM Future World Fund: a passively managed global equity strategy which aims to actively engage with climate change both as a risk and an opportunity. Climate tilted passive equity strategies are an area where there has been considerable innovation: many strategies offer carbon footprint reduction while aiming to achieve the same risk and return objectives. Points to consider when assessing this asset class include:

- Does the strategy consider both transition risks and physical risks of climate change?
- Does the strategy account for both climate risks and opportunities? Or does it focus purely on one aspect?
- Does the asset manager have a stewardship programme which complements the strategy design?

Climate tilted listed equity strategies are an investment option which offers a low-cost solution to investors wishing to reduce their carbon footprint. Low carbon investment opportunities also exist within the fixed income universe as well as long-dated illiquid assets such as infrastructure and property.

What about reporting on progress?

Institutional investors and their counterparts in the banking and asset management sectors are increasingly vocal about the need for effective policy leadership on addressing climate risk. For example 57 pension funds were among the signatories of a 2017 letter to the G20 calling for the phasing out of fossil fuel subsidies and implementation of the FSB Taskforce on Climate-related Financial Disclosure (TCFD) recommendations on climate reporting.

The framework provided by the TCFD is the emerging industry standard for climate related financial reporting. The TCFD aims to help companies to detect and disclose climate-related risks that are material to their business and report this information to their investors. It is based on four pillars:

1. **Governance:** the organisation's governance around climate-related risks and opportunities

2. **Strategy:** the actual and potential impacts of climate-related risks and opportunities on the organisation's businesses, strategy and financial planning.

3. **Risk management:** the processes used by the organisation to identify assess and manage climate-related risks.

4. **Metrics:** the metrics and targets used to assess and manage relevant climate-related risks and opportunities.

Improved reporting was also a recommendation the Environmental Audit Committee (EAC) highlighted in their report to the UK Government in June. The EAC recommended that the Government consider mandatory climate-related risk reporting for companies and investors. The Government response to the EAC inquiry was published on 1st November 2018 and did not support mandatory reporting at this point in time. The Government justified that widespread reporting by companies needs to be in place before asset owners can report. Despite this position there was recognition that that change at the asset owner level will push consideration of long term value and environmental risks down the investment chain to investee firms. Thus voluntary reporting via frameworks such as the TCFD by asset owners is a key part of changing behaviours around climate-related risk.

The Government response to the EAC inquiry emphasized the importance of reporting and highlighted good work being done in this area. While significant progress is needed before asset owners are able to report on the entirety of their portfolio; it is possible to assess an increasingly large proportion of assets. The TCFD recommend reporting a weighted average carbon intensity expressed in tons of CO2 per million dollars of revenue. Asset owners should ask asset managers whether they have the ability to report on this basis. Alternatively this analysis can be carried out by third party providers including investment consultants and climate reporting specialists.

Conclusion

In 2018 the recognition of climate-related risk as a material financial risk to pension schemes and other institutional investors has moved firmly to the mainstream. Regulation has clarified that climate risk is financially material and asset owners are starting to push for greater transparency from their asset managers and other key advisors. This is increasing demand for strategies that deliver lower exposure to climate risks; seek to profit from climate opportunities; and target change through impact investing. However, while the tools available to asset owner are improving, major barriers still exist. This report outlines some of the actions that investors can take; but collective action from the investment community is needed in order to create the systemic change that is needed to address climate change.

Investment view – it's still about performance

Climate change may be the mother of all risks, but it should be analysed and valued like other risks

Summary

The investor case for action can be seen economically and financially. In 2006, Lord Stern concluded that climate change is the greatest market failure ever seen and that the costs of action are far less than the costs of inaction.

More than ten years after this report, Lord Stern reflected[41] that the risks and costs of inaction were under-estimated, while the cost of reducing emissions are being transformed by rapid technological advances. As Dr. Shuckburgh makes clear earlier in this report, the IPCC has confirmed that there is a very narrow window for sufficient action that avoids a disastrous future[42].

Over the next 15 years, an estimated USD90 trillion is projected to be invested in cities, energy and land-use systems. A prominent group[43] of business, international leaders and top economists have persuasively made the case that it is the nature of these investments (low or high carbon energy systems, compact cities or urban sprawl) that will determine our future growth, prosperity and whether we avoid dangerous climate change. Many of the policy reforms needed to revitalise economic growth and improve well-being may also reduce climate risks as well as creating significant benefits such as improved air quality.

For investors, however, what matters is whether these risks and opportunities are reflected in valuations.

So-called valuation mirages occur often in finance and there is plenty of evidence that capital markets do not recognise 'predictable' risks until too late[44]. For example, market consensus of equity analysts covering a major manufacturing company did not adjust their stock price forecasts until after a fraud was announced, despite warning signals being available. Analysts covering a US coal company believed that profitability would recover, just before it went bankrupt.

Forthcoming DWS analysis examines whether physical climate risks are reflected in stock valuations and capital costs, building on our pioneering effort to examine physical climate risks in equity portfolios[45] with a top data provider.

Such findings can justify an active or passive strategy that seeks to create improved risk adjusted returns by over-weighting leading companies and under-weighting or excluding laggards. ESG/climate funds should also seek to avoid unexpected factor exposure, which our quant equity team has studied[46].

Divesting, or over/underweighting stocks only shifts financial risk and does not truly change real capex decisions unless investor influence is also used to encourage companies and policy-makers to improve policies and practices. A growing number of asset owners are setting engagement expectations, which may help financial performance[47].

Climate change is important, but is only one issue. What about diversity, water/air pollution or how companies treat workers? DWS and the University of Hamburg's analysis[48] of more than 2,000 academic reports found strong positive links between corporate financial performance and ESG issues.

Combining multiple data sources is the key capability of DWS's ESG Engine, our proprietary software which integrates seven data sources into our investment systems and processes, for which all of our active investment professionals have been trained.

An example of what an ESG/climate solution looks like is DWS helping a Dutch pension fund create a €1.5bn custom passive fund that favours companies with lower emissions and that support labour rights and safety.

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[41] LSE, Oct 2016. Ten years on from the Stern Review
[42] IPCC October 2018
[43] New Climate Economy 2014
[44] Two Degrees Investing Initiative, Feb 2017. All Swans are Black in the Dark http://tragedyofthehorizon.com

[45] DWS and Four Twenty Seven, Nov 2017. Measuring physical climate risk in equity porfolios
[46] DWS. Oct 2018. The quant road to ESG integration
[47] Dimson, Karakaş and Li, Aug 2015. Active ownership
[48] DWS and University of Hamburg, 2015. https://dws.com/solutions/esg/research/

The Investor Agenda on Climate Change

Leading by example and influencing governments and companies to take action

In September 2018, a coalition of investor associations published the "Investor Agenda" on climate change for institutional investors to publicly report on their actions and to scale-up commitments to help achieve the goals of the Paris Agreement. Christiana Figueres, one of the key architects of the Paris Agreement, has stated that investors' actions played a key role in supporting governments to reach the Paris Agreement in 2015.

Nearly 400 asset owners and asset managers, including DWS, representing USD32 trillion in assets under management announced that they were taking action in one or more of the following ways:

1. **Investment**: investing in low carbon/climate resilient funds/portfolios, phasing out coal/fossil fuel investment, integrating climate change into portfolio analysis and decision-making
2. **Corporate Engagement**: using investor influence with companies that are the largest carbon emitters, encouraging/requiring them to take stronger action
3. **Policy Advocacy**: encouraging governments to take stronger actions
4. **Investor Disclosure**: leading by example in disclosing investors' own risks, opportunities & risk management actions

DWS's contribution to this *Climate Experts* report focuses on presenting the practical actions that asset owners can take across these areas. So far the "Investor Agenda" has only focused on transition risks. DWS will work with investor associations like IIGCC to expand the focus to include physical climate risk.

Regarding investment, the following DWS article presents:

- The actions that asset owners can take across asset classes
- The pros and cons of different climate related investment data sources, including an overview of physical risk
- Evidence that valuation mirages in equity markets can hide climate risks, thus helping to justify portfolio re-weighting to reduce climate related risks and maximise benefits
- How climate/ESG equity/bond asset class strategies can shift a portfolio's risk and return
- How stronger policy/corporate engagement actions and direct impact/sustainable investments are also needed to accelerate the real economy's reduction of carbon emissions, improve resilience to physical climate risks and address other sustainability issues including the UN Sustainable Development Goals

Regarding corporate engagement, the DWS article will:

- Present major asset managers' voting track-record on US climate related shareholder resolutions
- Highlight evidence that corporate engagement can improve financial performance and suggest that asset owners integrate expectations for corporate engagement into mandates

Regarding policy advocacy, the DWS article will:

- Present the track-record of major asset managers in signing the investor statement on climate change
- Review the investor case for policy advocacy, including the importance of a 'just' transition and suggest that asset owners could integrate expectations for policy advocacy into mandates

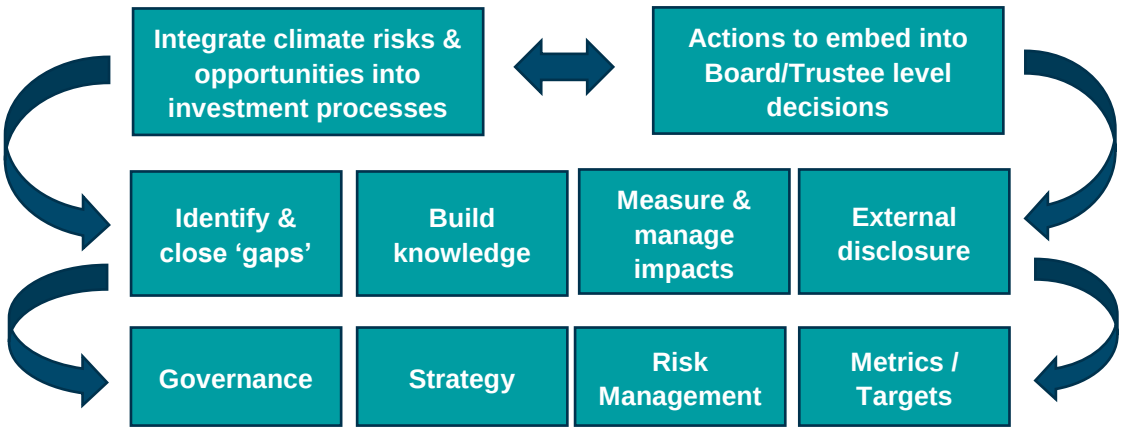
Asset owners' actions across asset classes

Practical suggestions

The Institutional Investors Group on Climate Change (IIGCC), a trade association of 163 members, including DWS, with EUR21 trillion in assets recently published a detailed, step-by-step, 40 page guide on climate risks and opportunities for trustees and boards of asset owners. This article does not seek to duplicate IIGCC's guide, which we commend as an excellent resource for pension funds seeking detailed guidance on integrating climate change into investment decisions.

However, as a brief summary, IIGCC's guide provides a framework, **Figure 1**, to help senior decision makers ensure their organisations are meeting regulatory requirements and aiming to benefit from integrating climate change into investing.

FIGURE 1. TRUSTEE FRAMEWORK FOR INTEGRATING CLIMATE CHANGE INTO INVESTMENT PROCESSES



Source: IIGCC, September 2018. Addressing Climate Risks and Opportunities in the Investment Process
http://www.iigcc.org/press/press-release/investor-group-representing-21-trillion-calls-on-all-pension-funds-to-addre

IIGCC's framework is built on the Financial Stability Board's private sector led, Taskforce on Climate-related Financial Disclosure (TCFD). This Taskforce was set up by Bank of England Governor Mark Carney at the request of the G20 in 2015. The Taskforce was chaired by Michael Bloomberg and included a broad range of companies and financial institutions.

The TCFD recommends that corporations and financial institutions disclose their climate risks and opportunities under the four areas of Governance, Strategy, Risk Management, and Metrics/Targets. As of September 2018, the TCFD framework is voluntarily supported by over 500 companies (with a total market capitalization of nearly USD8 tn) including many of the world's largest banks, asset managers (including DWS) and pension funds, responsible for assets of nearly USD100 trillion.

The IIGCC trustee guide represents detailed, applied guidance for pension funds to implement the TCFD framework. So practically, what should pension funds do? **Figure 2** gives broad examples of what assessment and integration of climate change can mean across different asset classes.

FIGURE 2. CLIMATE RELATED INVESTMENT OPPORTUNITIES BY ASSET CLASS

Asset class	Opportunities
Equities	Create low climate risk benchmarks for passive funds and to evaluate active funds; Combine ESG with low carbon data as a starting point Ensure climate is a core part of ESG integration efforts in all active funds Thematic funds: There are ~700 companies with more than 25% of their company revenue related to the Sustainable Development Goals (including climate action) and that also have strong ESG scores (based on MSCI and DWS analysis).
Bonds	**Green/climate bonds:** According to CBI (Sept 2018), climate aligned bonds grew from USD174bn in 2012 to USD1.45tn in 2018. Labelled green bonds are a subset: USD 389 bn outstanding bonds

	DWS's recent *Green Bonds Explained*[49] (Nov 2018) report concludes that while it cannot yet be shown that a specific green bond has accelerated green investment, green bonds have expanded investor and issuer understanding and focus on climate and other societal issues. This in turn has helped financial sector regulators to begin taking a variety of actions. These are important benefits of the green bond market that should not be discounted. Continued allocation to green bond funds are important to continue the market's momentum and the wider positive influence it is having within the capital markets, with companies, governments and regulators. Mortgage backed securities (MBS): the European Mortgage Federation is leading an EU funded program aiming to create a standardised "energy efficient mortgage", where building owners are incentivised to improve the energy efficiency of their buildings or acquire an already energy efficient property. This initiative could lead to more green mortgage bonds **Integrate climate and ESG risk assessment in actively managed fixed income funds and passive funds**: starting in 2013, S&P (Oct 2015) found 299 cases where environmental and climate risks resulted in or contributed to a rating revision. In 56 cases, this had a direct and material impact – 80% of rating changes were negative. From July 2015-August 2017, S&P found 717 cases where environmental and climate concerns were rating relevant and 106 cases of rating revision (S&P Nov 2017). S&P (Nov 2015) concluded that climate change is a global mega-trend for sovereign bond risk. Moody's (Sept 2018) found 11 sectors with USD2.2tn of debt had elevated environmental risk exposure.
Infrastructure	Assess, manage, monitor and report on ESG and climate risks through the entire investment process Target low-carbon technologies within general infrastructure funds Target urban infrastructure technologies to support smart/compact city growth
Real estate	Improve the energy efficiency of directly owned buildings Assess and aim to reduce the physical climate risks of directly owned buildings Integrate climate/ESG analysis into liquid real estate funds and use shareholder influence
Private equity	Opportunities to support the expansion of new technologies, such as in China Investors can use IIGCC's (2016) private equity climate guide to ask general partners about their climate risk and opportunity identification, regulatory assessment, management and reporting General partners can use the guide to ask their current and potential investees similar questions
Private debt	Particularly for some emerging markets and/or new sectors/technologies, using public capital to reduce private investor risk is an important way to deploy capital where needed and create new sources of yield for investors that also contribute to sustainability and climate goals

Source: DWS Nov 2018, Climate Bonds 2018, IIGCC 2016, S&P Oct 2015, Nov 2015 and Nov 2017, Moody's Sept 2018.

Evidence that valuation mirages can hide climate risks

Justifying portfolio re-weighting to reduce climate related risks and maximise benefits

Valuation mirages can often occur and there is evidence that capital markets do not recognise predictable risks until too late.

For instance, in the first major speech on climate change by a central banker, Bank of England Governor Mark Carney concluded that there is a 'tragedy of the horizon'. The impacts of climate change occur beyond the traditional horizons of different institutions in society: beyond the business cycle, credit cycle, political cycle and the horizon of institutions like

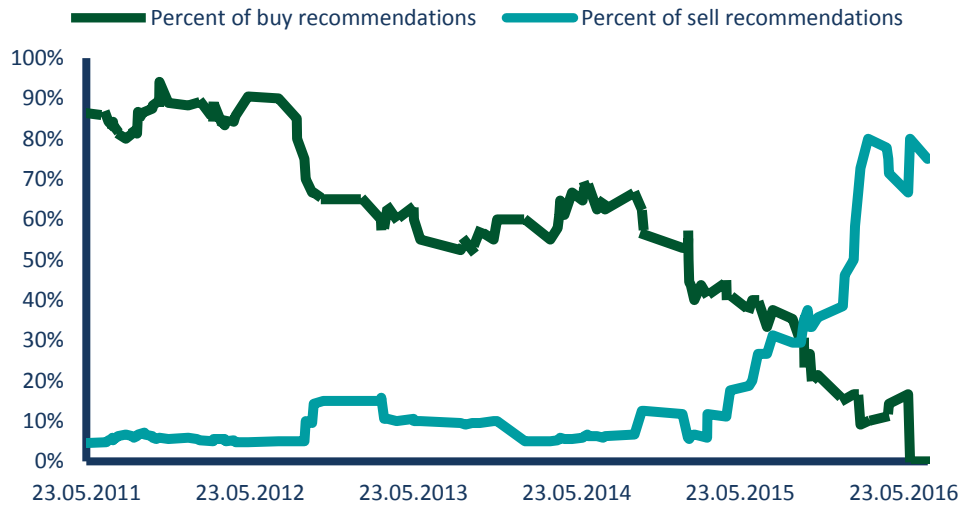
[49] http://www.dws.com/solutions/esg/research

central banks (Bank of England September 2015). Governor Carney suggested that there could increasingly be more 'Minsky Moments' of rapid and unexpected re-valuations of financial assets.

The think-tank 2 Degrees Investing, which has been very influential in EU policy on sustainable finance, extended Governor Carney's insight to demonstrate how there is a fundamental mis-match between the relatively short term horizon for conventional financial analysis (i.e. typical 1-2 year portfolio manager evaluation, investment strategies of 3-5 years etc) and the time horizon of many asset owners' liabilities, the life-time of companies' underlying real assets like buildings and power plants and the risks of climate change.

For instance, 2 Degrees Investing published a number of case studies where financial markets did not correctly assess 'predictable' climate related risks. **Figure 3**, shows how the percent of buy/sell recommendations evolved prior to a US coal company's bankruptcy. An asset owner could ask their active managers if they avoided this situation as an indication of whether future risks could be managed. In a passive portfolio, investors would likely need to move away from a market-cap weighted index to avoid such downside risks occurring in their portfolio.

FIGURE 3. MOST EQUITY ANALYSTS BELIEVED A US COAL COMPANY'S PROFITABILITY WOULD RECOVER UNTIL JUST BEFORE THE COMPANY WENT BANKRUPT



Source: 2 Degrees Investing Initiative, Sept 2017, based on Zacks/Quandl.

There are many examples of technology and social developments occurring faster than previously was expected. For instance, the influential energy analyst and innovator Amory Lovins (Oct 2018) notes that the number of American households owning a car went from 8% to ~80% in just over a decade (to 1928) as the Model T Ford price was cut 62% and the financial innovation of car loans was developed.

In the modern world, the IEA's 2018 World Energy Outlook predicts that oil use in cars could peak in seven years[50].

An indication that company valuations do change from such trends can be seen in analysis of the automotive industry. In October 2018, the Financial Times' 'Big Read' article concluded that major car makers faced an 'iphone' moment due to a combination of factors affecting the industry's prospects, with some companies leading and others lagging.

These points illustrate why asset owners should consider tilting their portfolios to avoid/benefit from valuation changes.

[50] Forecasts are based on assumptions, estimates, views and hypothetical models or analyses, which might prove inaccurate or incorrect.

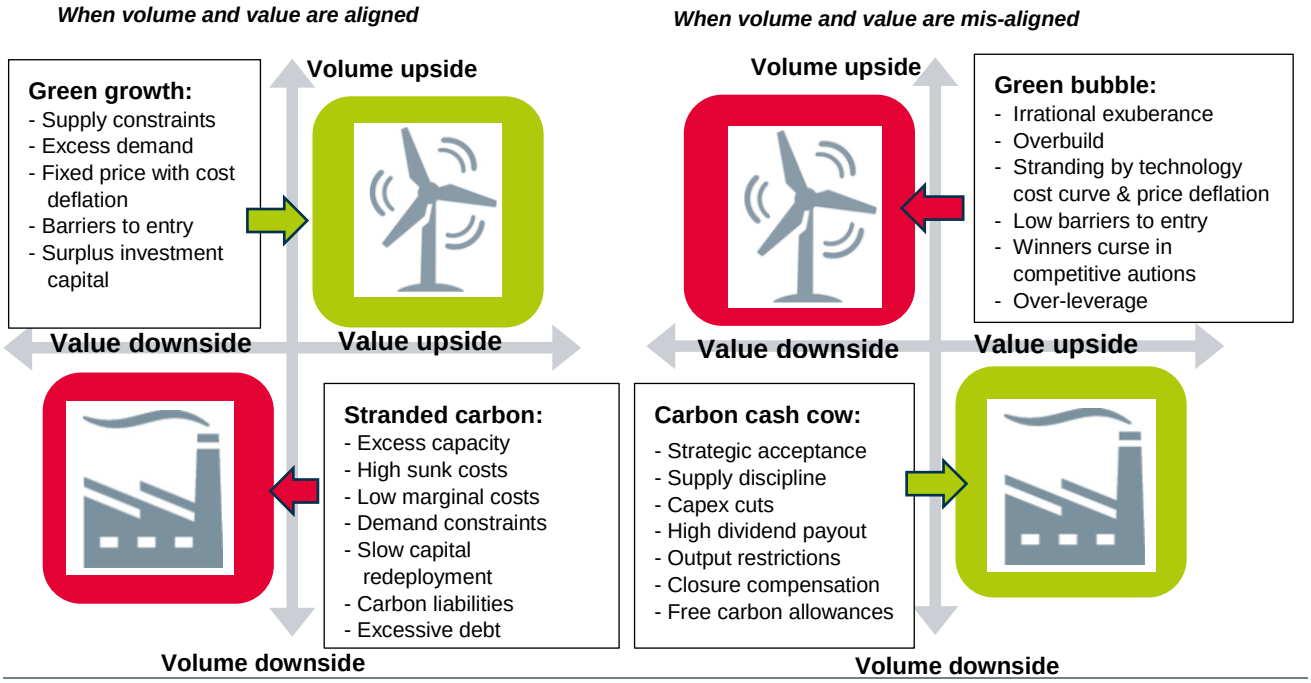
One of the more interesting frameworks for thinking about company valuations and climate change was created by Deutsche Bank Research: the Deutsche Carbon Alignment Framework or DeCAF (March 2017). Policy-makers are focused on chaging volumes: more renewable energy, electric vehicles and energy efficiency and less fossil fuel technologies. Investors' strongly focus on shareholder value.

While there is much focus on fossil fuel companies' stranded asset risk, green technology companies can also destroy shareholder value with poor business plan execution, while fossil fuel companies could return more capital to shareholders.

DeCAF is a two-by-two matrix, **Figure 4,** showing situations where value and volumne are aligned or mis-aligned. The frameworks shows under what circumstances a company can benefit or suffer from stronger decarbonisation scenarios. For instance, in a world where volume and value is aligned, is a company more likely to face a green growth or stranded asset future? When volume and value are mis-aligned, will the company become a carbon cash cow or face a green bubble? Deutsche Bank analysts have published a series of reports applying this framework to different sectors.

A growing number of sell-side research firms are incorporating ESG/climate into their analysis, which is another indication that asset owners' are having influence through the investment chain and which asset owners can help accelerate.

FIGURE 4. IS FINANCIAL VALUE ALIGNED WITH VOLUME CHANGES FROM THE LOW CARBON TRANSITON?



Source: Deutsche Bank, March 2017. For illustrative purposes only.

The pros and cons of climate related data sources

Assessing a rapidly changing environment

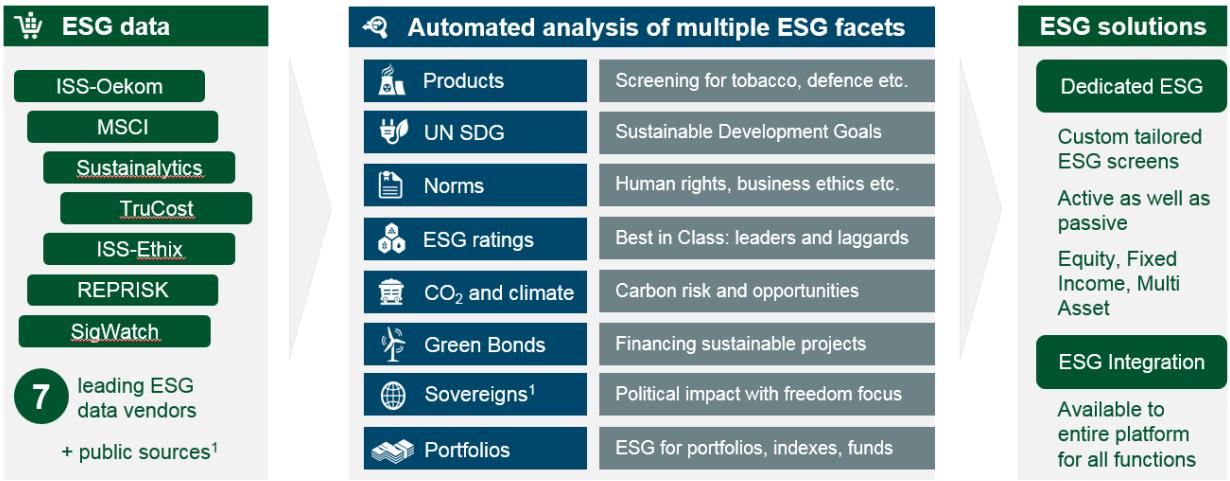
Assessing portfolio risks and opportunities from climate change as well as broader environmental, social and corporate governance (ESG) factors is a field that is undergoing continuous innovation in different areas from multiple data providers.

No single data company provides a complete and holistic assessment, thus requiring the use of multiple data providers to obtain a 360° view on risk and opportunity. The advantage of multiple data providers is that it increases reliability as well as data coverage of companies. Different data providers do come to different conclusions when assessing particular

companies. This may be due to one data provider being aware of particular company issues/facts or that the importance/weighting of different issues may differ. DWS believes that this diversity constitutes a strength.

If different ESG vendors with different data and different methodologies come to the same or a similar verdicts (e.g. "This corporation is better than that one", or "This corporation is better than the other by a certain measure"), then the 'verdict' can be seen as subjectively true in that the 'rational discourse' between different data providers came to the same/similar conclusion. Using multiple ESG data sources is the objective of DWS's ESG Engine, illustrated in **Figure 5**.

FIGURE 5. DWS'S ESG ENGINE



1: The DWS ESG sovereign rating is derived from data that includes the Freedom House 2018 freedom scores, available at freedomhouse.org

For more details onDWS's ESG Engine please see the accompanying text at the end of this report
Source: DWS October 2018. For illustrative purposes only.

In addition to the seven data providers in the ESG Engine, a number of additional companies/initiatives are developing different and complementary low-carbon transition risk assessment methodologies and data. **Figure 6**, presents an overview of a select number of transition risk data providers. DWS monitors market developments in order to plan further enhancements to the ESG Engine. Clients may be able to request new data sources be used in custom passive solutions and/or within the ESG Engine.

FIGURE 6. SUMMARY OF SELECT TRANSITION RISK DATA PROVIDERS

MSCI Carbon Beta	Quantitative carbon intensity based carbon risk score and qualitative carbon management score plus carbon strategic profit opportunities score.
S&P Trucost Ltd. Carbon price value at risk	Assess current & future carbon price scenarios in 130 different regions to identify sectors, companies or business segments most at risk.
Transition Pathway Initiative	Asset owner (£5 trn AuM) backed research initiative with London School of Economics and FTSE Russell. Evaluates and tracks the quality of companies' carbon management (0-4 score) and how future carbon performance compares to national targets/pledges and the Paris agreement ambition. To date, 180 high emission companies have been assessed in 6 sectors (cement, coal mining, power utilities, oil and gas, steel, autos). Will expand to ~200 companies by end 2018 (No assurance can be given that any forecast or target will be achieved). All data and methods freely available online.

ET Risk	EU funded consortium: Co Firm, 2 Degrees Investing, S&P Global, Oxford University, I4CE, Kepler Cheuvreux. Bottom-up scenario and financial data/models have been created for a number of carbon intensive sectors. Methodologies are becoming commercial product(s).
Carbon Delta	Assesses transition risk and physical climate risk in-part on sectors' top-down technology based emission reduction cost estimates and broad estimate of transition and potential value at risk from physical climate chage.
Paris Agreement Capital Transition Assessment (PACTA) - 2 Degree Alignment	EU funded consortium led by 2 Degrees Investing. Top-down portfolio energy & technology exposure gap for key carbon intensive sectors. 200+ investors and several financial/insurance regulators (i.e. California Insurance Commissioner) have/are using the methodology to assess portfolios. Free online tool available for assessing portfolios.

Source: DWS October 2018. DWS analysis, January 2018; MSCI 2012; S&P Trucost Jan 2018; LSE TPI Feb 2018; Carbon Delta June 2017. For illustrative purposes only. The information presented above has been obtained from sources believed to be reliable, we do not guarantee its accuracy, completeness or fairness, and it should not be relied upon as such. No assurance can be made investment objectives will be achieved.

All data providers have pros and cons. For instance, **Figure 5** shows our view of the PACTA methodology. The 2 Degrees Investment Initiative developed this methodology to address the limitations of relying on corporate disclosure of ESG/climate data. Despite the growing focus by regulators, investors and companies on climate change, the proportion of companies disclosing their carbon emissions is still surprisingly low. PACTA provides an alternative approach by assessing companies' current installed assets and capex plans.

FIGURE 5. PROS AND CONS OF THE 2 DEGREE PORTFOLIO ALIGNMENT METHODOLOGY

Pro	Con
Forward looking nature of the assessment	An emerging data source that may need additional due diligence (such as on the historical accuracy of underlying data providers' Capex forecasts)
Based on facility (asset) level data – a significant data innovation	Limited sector coverage (energy/carbon intensive sectors could represent ~22% of a portfolio's value)
Of a typical portfolio's 'owned' carbon emissions, sector specific analysis (oil, gas, coal, power, auto, aviation, shipping, steel & cement) covers 50-70% of scope 1 emissions and 80-90% of scope 2 emissions	No coverage of physical climate risk, but the underling data could be used for physical risk analysis in future
The 2 Degrees Investing Initiative think tank has used the methodology with financial regulators (such as the California Insurance Commission), prompting many more financial institutions to consider climate risk exposure and management	Does not analyse the strength or quality of companies' climate risk management strategies
	IEA has a relatively poor track record of predicating renewable energy growth.
Based on International Energy Agency (IEA) scenarios – an accepted global standard, with scenarios from other organisations being added	No assessment of the probability of the IEA scenario coming true – there are many potential future energy technology deployment scenarios
Started to develop a commercial data offering as a for-profit spin-off of 2 Degrees Investing Initiative that will re-invest/re-grant all profits.	IEA's 2017 'Sustainable Development Scenario' may only provide a 50% chance of meeting the Paris Agreement goal – according to analysis by an NGO and an energy research institute

Source: DWS October 2018 analysis of 2 Degrees Investing Initiative. Oil Change International and Institute for Energy Economics and Financial Analysis, April 2018. For illustrative purposes only.

Our conclusion on the state of ESG and climate data providers is that investors need to combine methodologies to obtain a more complete picture of companies' climate and ESG risks/opportunities.

It is clear that data for climate risk assessment is continuing to rapidly evolve. But as more data becomes available in the market, then it is more likely that such data could become priced into the valuation of stocks and bonds. Therefore, asset owners should balance tilting a portfolio now to avoid asset re-pricing and the impacts of climate risks, with a realisation of

the continuing evolution of climate related data. Indeed, greater use of advanced climate risk data sources should facilitate further improvement of data providers' methodologies.

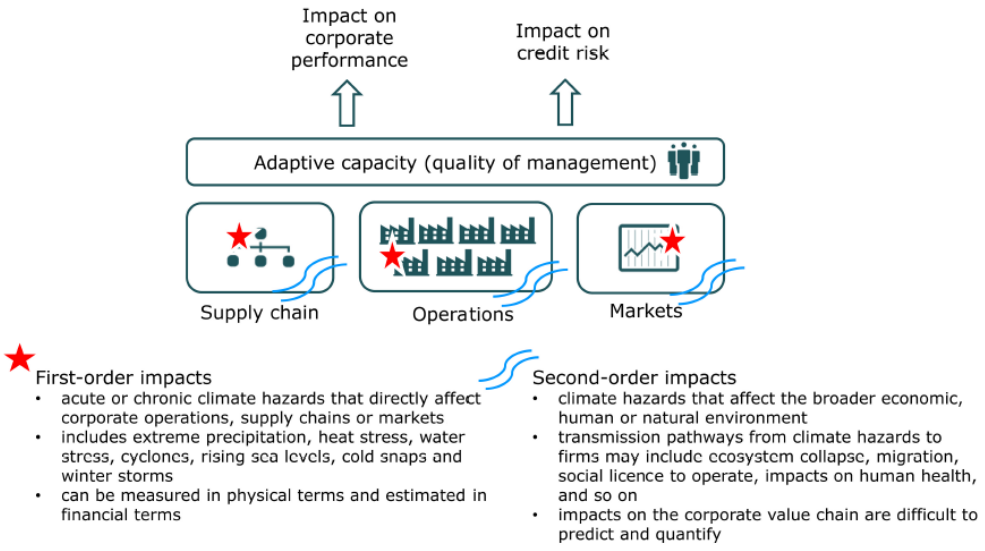
Assessing physical climate risks

A financially material risk that has so-far, been under-assessed

Assessing physical climate risk is far from easy. To do so, investors first need to identify the physical locations of the companies they invest in, a task made tricky by poor corporate disclosure around these topics. Investors then need to master the increasingly complex science around climate change to understand the vulnerability of companies' production and retail sites, as well as supply chains, to extreme weather events. Finally, investors need to account for the nature of the business activity being carried out in these locations to gauge the sensitivity to specific climate hazards. For instance, energy and water intensive industries will be more directly affected by extreme heat and water scarcity, whereas sectors such as construction, mining, retail, tourism and agriculture will be particularly sensitive to daily weather fluctuations.

A company's vulnerability to climate impacts goes well beyond the physical exposure of its facilities. Supply chains, distribution networks, customers and markets can all be affected. **Figure 6** shows that there are first-order impacts on companies' operations and supply chains as well as second-order impacts.

FIGURE 6. HOW PHYSICAL CLIMATE IMPACTS AFFECT CORPORATE VALUE CHAINS



Source: Four Twenty Seven and Acclimatise for EBRD and Global Centre on Adaptation, May 2018.

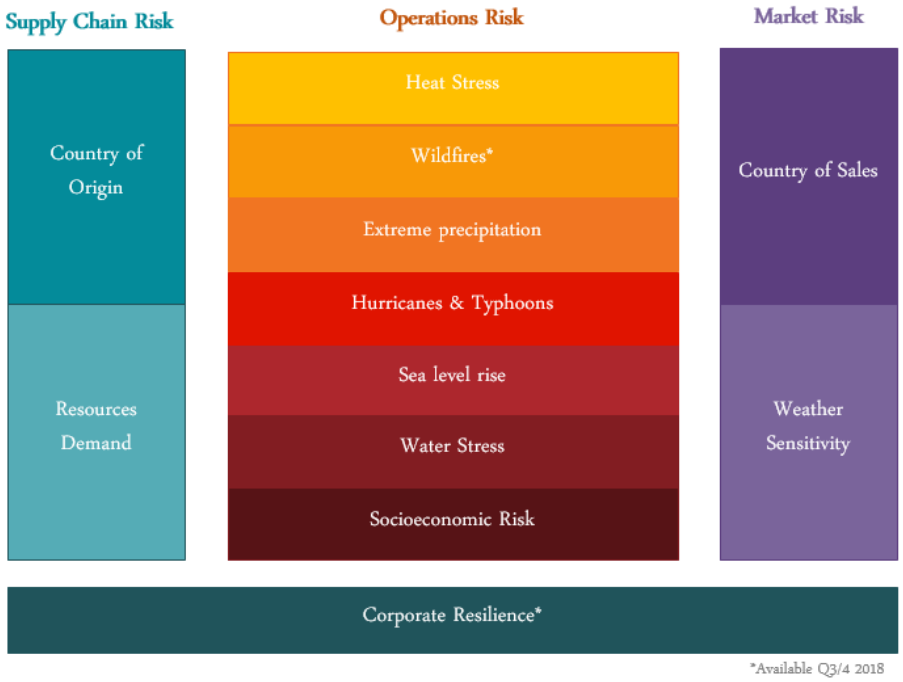
Working with academics, governments, and businesses, Four Twenty Seven's science-driven risk analytics provide insights into the risks posed by climate change, and identify barriers and enablers to climate adaptation. The company screens hundreds of thousands of corporate facilities around the globe using big data, and provides a concise yet thorough review of each company's exposure to the physical impacts of climate change across its value chain.

In November 2017, DWS published a report written by Four Twenty Seven explaining their methodology[51]. Four Twenty Seven classifies physical climate risk into three components as seen in **Figure 7**. Operational Risk identifies the exposure of a company's assets such as its manufacturing plant, warehouses and offices, to climate hazards such as floods, droughts, sea level rise and cyclones. Supply Chain Risk examines the country of origin of where a company relies on its raw materials and the level of the industry's dependency on climate sensitive resources such as water, land and energy across

[51] DWS, November 2017. https://dws.com/en-gb/insights/global-research-institute/physical-climate-risk/

the supply chain. Market Risk examines the vulnerability of a company's primary customers, markets and sales to extreme weather events. An aggregation of these three components ultimately provides an overall physical climate risk score.

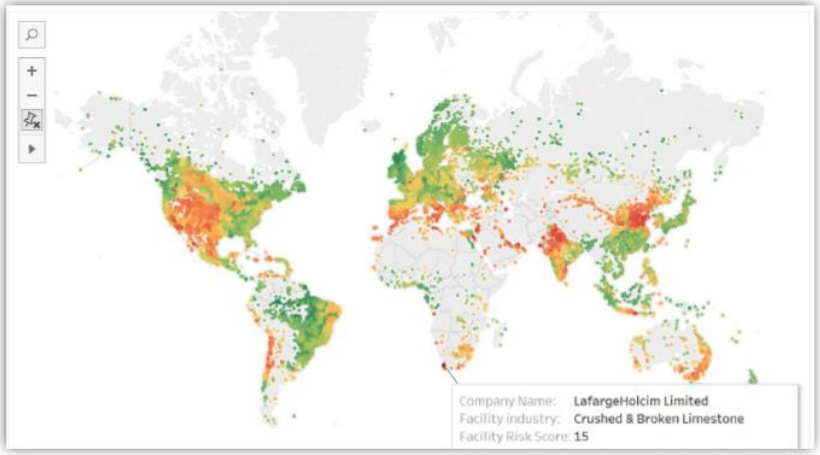
FIGURE 7. FOUR TWENTY SEVEN'S METHODOLOGY FOR PHYSICAL RISK ASSESSMENT OF COMPANIES



Source: © Four Twenty Seven, 2018—All Rights Reserved

Figure 8 shows a visulatisation of Four Twenty Seven's analysis.

FIGURE 8. EXPOSURE TO DROUGHT AND WATER RISK FOR FACILITIES OWNED BY COMPANIES IN THE MSCI ALL COUNTRY WORLD INDEX (ACWI)



1,900 listed companies,
900,000 corporate facilities globally scored for exposure to climate risk
30 data sources
Millions of climate data points

- Corporate headquarters
- Oil rigs & refineries
- Gas and water utilities
- Cement and glass manufacturing
- Aerospace and auto manufacturing
- Consumer product manufacturing (tires, phones, clothing, jewels)
- Food and beverage manufacturing
- Hotels
- Retail stores, gas stations, bank branches

Map: Exposure to Drought and Water Risk for facilities owned by MSCI ACWI companies

Source: © Four Twenty Seven, as of April 2018—All Rights Reserved. This information is intended for informational purposes only and does not constitute investment advice, a recommendation, an offer or solicitation.

Shifting a liquid asset portfolio's climate risk and return

Exclusions, best in class and ESG integration

The broad strategies that asset owners can adopt in liquid asset class portfolios are to exclude certain companies or sectors, focus on companies with superior scores on particular ESG/climate data points and to integrate climate and ESG data into decision-making. Clearly, these action can be taken together or separately. These types of strategies are relatively common but the investment community does not often consider how these actions do or do not lead to economy wide changes.

Dr. Raj Thamotheram was a former head of responsible investing at a major UK pension fund and with a major European asset manager. He established a think-tank, Preventable Surprises, to persuade and cajole the financial sector to better address systemic risks. **Figure 9**, presents his analysis of the indirect influence of exclusion, best-in-class and ESG/climate integration strategies.

We agree with his conclusion that there is high uncertainty regarding whether these types of strategies create change in the real economy, such as lower carbon emissions. Tilting a portfolio away from companies with high carbon emissions, may reduce risk for a pension fund if those companies' profitability falls due to regulations and faster expansion of renewable technologies. However, shifting stock ownership/divestment does not affect carbon emissions, real world resilience to physical climate impacts or change other factors such as companies' treatment of workers or gender diversity.

FIGURE 9. ANALYSIS OF THE INDIRECT INFLUENCE OF RESPONSIBLE INVESTMENT STRATEGIES

Indirect investment impacts			
Strategy	**Exclusion**	**Best in Class**	**ESG/climate Integration**
Mechanism of influence	Signal to society that excluded industry is illegitimate	Brand value of industry leaders leads to reputational incentives on other companies to improve	Increased demand for ESG data leads to better company management systems
Potential investment impact	Political reform restricting the excluded industry	Potential industry wide improvement of ESG performance	Potential industry wide ESG performance improvement
Only if investor…	Makes exclusion decisions public	Investment increases credibility of fund / index	Insists on high quality corporate disclosure
Critical catalyst	Political movement or societal shift resulting in tangible impact	Companies actively improve ESG performance to become ESG leaders	Company managers act on the reported data and pursue improvement targets
Uncertainty of impact on the real economy	**High**	**High**	**High**

Source: Preventable Surprises, June 2018; DWS analysis

The importance of stronger policy and corporate engagement, thematic and impact investments

Accelerating real economy change

Dr. Thamotheram concludes, and we agree, that stronger corporate and policy-maker engagement is needed by the investment community. **Figure 10** supports his conclusion that "Forceful stewardship" is needed. We suggest that investors should use their full influence to encourage businesses to accelerate action on systemic risks like climate change.

A later section of this article summarises the case for corporate & policy engagement and reviews major managers' actions.

FIGURE 10. ANALYSIS OF THE DIRECT INFLUENCE OF RESPONSIBLE INVESTMENT STRATEGIES

	Direct investment impacts		
Strategy	**Active ownership**	**Thematic investment**	**Sustainable/Impact Investment**
Influence mechanism	Communicate shareholder demands directly to management *(AGM resolutions)* Investors do more to encourage governments to adopt policies supportive of long-term growth and sustainability	Support transition of sustainable businesses to more liquid markets	Provide capital to capital restricted sustainable businesses, often in emerging markets
Potential investment impact	Target improvements in ESG performance of investees. Influence government policies	Growth of sustainable businesses	Growth of sustainable businesses
Only if investor…	Pursues realistic change at the right targets. Removes first mover disadvantage by sector wide and public policy focus	Focuses investments where additional capital makes a difference	Focuses investments where additional capital makes a difference
Critical catalyst	Asset owner demand / requirements	Creation of investable opportunities and asset owner willingness to invest	Creation of investable opportunities and asset owner willingness to invest
Uncertainty of impact on the real economy	**Low**	**Medium**	**Low**

Source: Preventable Surprises, June 2018; DWS analysis

Thematic investment

Figure 10 highlights the role of thematic investments such as green bonds. DWS (Nov 2018) recently published a report on green bonds, concluding that green bond funds are an important part of a portfolio for an investor seeking to support action on climate change. While it cannot yet be shown that any specific green bond has accelerated green investment, the growth of the market has expanded investor and issuer understanding and focus on climate and other issues.

This has, in turn, been an important factor for financial sector regulators to begin taking a variety of actions that should accelerate green investment and regulators encouraging/requiring financial sector acting to address the risks and opportunities of climate change and other social and environmental issues. These are important benefits of the green bond market that should not be discounted.

Continued allocation to green bond funds are important to continue the green bond market's momentum and the wider positive influence it is having within capital markets, companies, governments and regulators. Indeed in the 12 months to July 2018, assets in dedicated green bond funds have doubled to USD5.3 billion through 38 green bond funds.

Impact or sustainable investing

Unlike traditional ESG strategies, impact or sustainable investing does not just rely on shareholder influence to do 'good' while producing competitive returns. Private equity and private debt funds achieve positive outcomes via investment selection, portfolio management, and where needed, contractual arrangements. With impact investing, doing good becomes the goal in itself and there is a clear link between invested capital and measurable outcomes. Impact or sustainable investing

targets asset class relevant market returns. DWS recently published a report examining impact investing[52]. DWS has over a 20 year track record in sustainable investing, starting with one of the first institutional funds for expanding access to financial services in emerging markets through microfinance.

In March 2018, the UK Prime Minister established a taskforce to make progress in growing a culture of social impact investing in the UK. The Prime Minister said "*The UK is a pioneer in impact investing. Our financial institutions have long-recognised the importance of using their investments to generate a positive social impact as well as a financial return. The challenge now is for industry to unlock the capital to boost impact investment even further, finding solutions to some of the burning injustices we face as a society".*

While the main focus of the 'Implementation Taskforce' is on UK based investments, capital deployment to emerging markets is needed expand to help countries reduce their emissions, contribute to greater prosperity through the SDGs and become more resilient to physical climate impacts that developing countries did not cause.

Part of how 190+ countries reached the Paris Agreement was a commitment of developed countries to help developing countries gain access to capital, expertise and technology. Reaching a new global agreement in 2020 with stronger global emission reduction targets will in part depend on whether developing countries believe that this has happened. Institutional investors thus have a role to help accelerate deployment of capital to emerging markets. **Figure 11** shows the benefits of sustainable and impact investing.

FIGURE 11. THE BENEFITS OF SUSTAINABLE AND IMPACT INVESTING

Addititional and attributable impact without giving up profit	Capital is invested to achieve a predefined purpose as much as possible quantifiable in advance. Upon investment, the impact is planned to be achieved. No voting or influence needed to achieve the desired result, nor does it depend on others holding the same asset. The most direct way to achieve positive influence through the use of capital invested.
Transparent with predefined goals that are quantifiable where possible	Most funds are created as look through vehicles that invest either directly in real assets or through their set-up requiring underlying investments to do detailed reporting. It allows the investor to choose topics that fit best with their policies and ambitions to achieve real outcomes.
Higher risk adjusted returns possible	Opportunity for higher risk adjusted returns through addressing particular high growth topics. Investing ahead of the curve in emerging trends that impact positively on society.
Opportunity for portfolio diversification	Opportunity for portfolio diversification as these investments are often less correlated with mainstream asset classes. Diversification depends on the investment topic and no generic conclusion can be made for all funds.
Potentially more flexible than traditional ESG	Offering private equity and private debt solutions at a wide range of maturities and at the same time selecting one particular impact goal that matches the interest of investors. Structured solutions which use public capital to derisk private sector investment, allow investments into areas where normally the higher risk prohibit market based returns, e.g. allocation of capital to higher risk investments in African agriculture or off-grid solar.

Source: DWS September 2018. For illustrative purposes only.

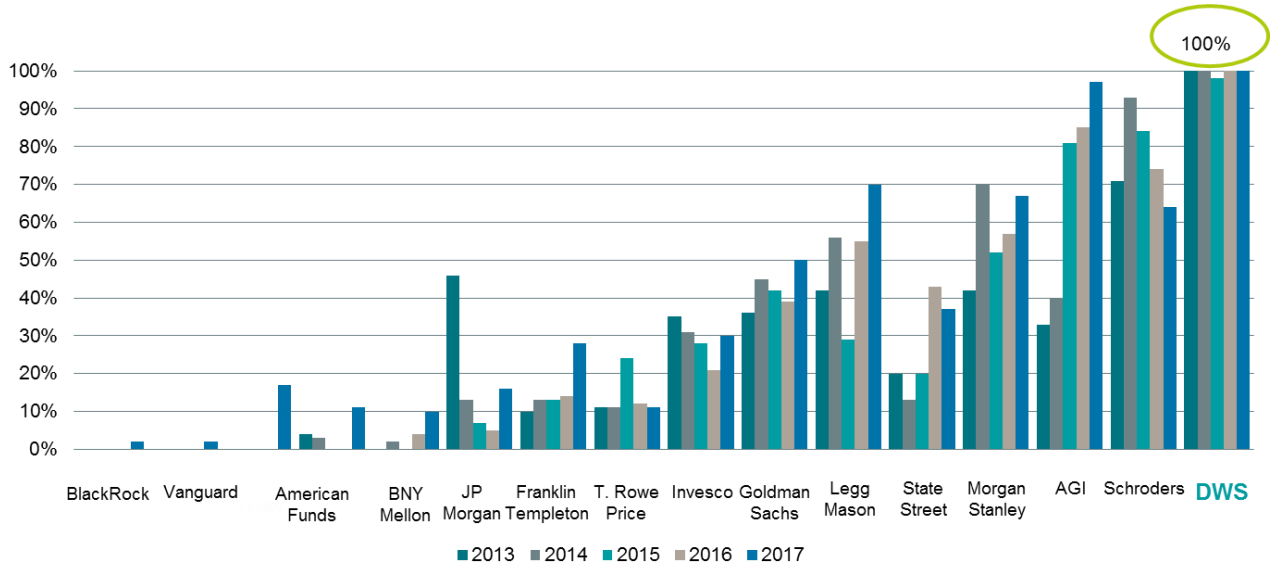
[52] DWS, Sept 2018. Brace for Impact https://dws.com/en-gb/insights/global-research-institute/brace-for-impact/

Major asset managers' voting track-record on US climate related shareholder resolutions

Does voting match rhetoric?

For the past six years, the US based Ceres Investor Network for Climate Risk and Sustainability (the sister organisation to IIGCC) has tracked major asset manager's voting on climate related company shareholder resolutions. **Figure 12,** shows how major asset managers have supported climate related resolutions in the US.

FIGURE 12. MAJOR ASSET MANAGERS SUPPORT FOR US CLIMATE RELATED SHAREHOLDER VOTES



Source: Ceres 2013-2017 based on FundVotes data, DWS analysis November 2017

We agree that voting on company and share-holders resolutions is only one way to influence companies and that closed-door shareholder dialogue has an important role. More asset managers are hiring or expanding teams to conduct corporate engagement and/or adding ESG/climate engagement to investment professional expectations.

Climate Action 100+ is a five-year initiative led by investors to engage systemically important greenhouse gas emitters and other companies across the global economy that have significant opportunities to drive the clean energy transition and help achieve the goals of the Paris Agreement.

Despite these initiatives, we believe that there is still under-investment in engagement activities and capabilities compared to the level of ESG and climate issues in society and the financial and ESG interests of asset owners and underlying beneficiaries.

To address the public good nature of investee engagement, we suggest that more asset owners should incorporate engagement expectations, requirements or evaluation into their mandates with asset managers. For instance, Japan's Government Pension Investment Fund (GPIF) has established a new fee structure with 30% of manager evaluation based on engagement activities (Top1000 Funds, Oct 2018).

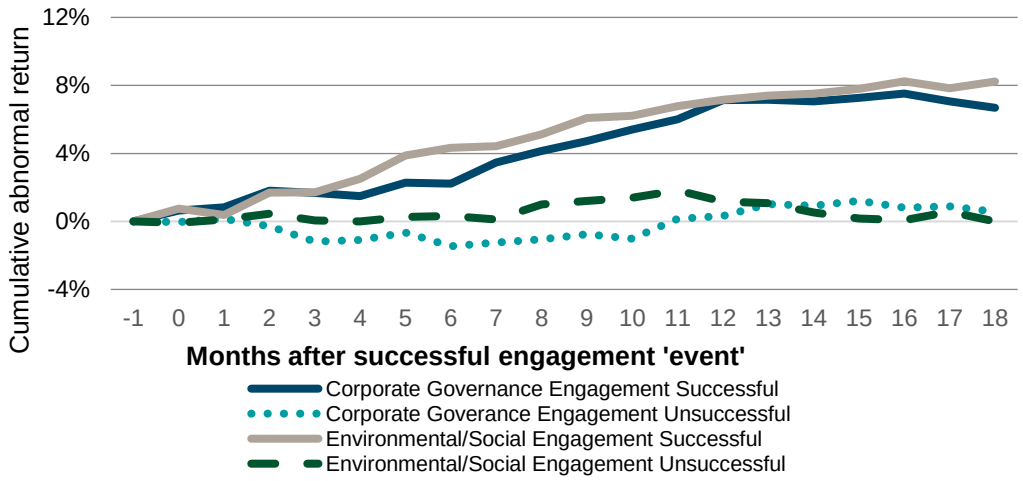
The case for corporate ESG/climate engagement

Academic research (Dimson, Karakaş and Li, Aug 2015) has found that engagement can have positive financial benefits. **Figure 13**, shows a positive return for companies which made changes following an investor engagement with them on environmental/social and corporate governance issues. The academics studied 613 U.S. companies engaged by a U.S. asset manager between 1999 and 2009. While it took 2–3 engagements of 1–1.5 years each for a 'success', the time and effort appears to be worthwhile. The companies engaged were large, mature and before engagement had poor performance both financially and reputationally.

Based on a historical analytical comparison to similar firms, the academics found that the year following a successful engagement, the performance of the company improved 7.1% (cumulative abnormal return). The performance improvement was even higher when the investor engagement focused on corporate governance (8.6% cumulative abnormal return) and for climate change (10.3% cumulative abnormal return).

Following a successful engagement, the firms' performance improved, it attracted a wider investor base and had lower stock volatility. For environmental/social engagements, the return on assets and ratio of sales to employees improved significantly, indicating that engagement can improve customer and employee loyalty. The academics conclude that "Active ownership attenuates managerial myopia and hence helps to minimize inter-temporal losses of profits and negative externalities".

FIGURE 13. SUCCESSFUL ENGAGEMENTS CAN LEAD TO HIGHER RETURNS



Source: Dimson, Karakaş and Li, Aug 2015. Past performance is not indicative of future returns.

Major asset manager advocacy for stronger climate policies

Which investors have signed the annual letter to governments on climate change?

Since 2009, a coalition of investor associations have asked asset managers and asset owners to sign an open letter to governments calling for stronger action on climate change. In 2018, the letter calls on governments to achieve the Paris Agreement's goals; accelerate private sector investment into the low carbon transition; and commit to improve climate-related financial reporting. As of early November 2018, the letter was signed by 345 institutional investors managing USD30tn in assets.

The 2018 letter was used as a representation of the degree to which investors support the government engagement component of the 'Investor Agenda' mentioned at the beginning of this article. **Figure 14** shows which of the largest

twenty asset managers globally and the largest ten UK asset managers have signed the letter each year. Amongst this grouping of large investors, DWS is the only asset manager to have continuously signed the letter.

FIGURE 14. MAJOR ASSET MANAGER SUPPORT FOR THE INVESTOR STATEMENT ON CLIMATE CHANGE

	2018	2017	2016	2015	2014	2013*	2012*	2011	2010	2009
DWS	■	■	■	■	■			■	■	■
BlackRock			■		■			■		■
Vanguard										
State Street Global Advisors										
Fidelity Investments										
BNY Mellon										
Capital Group										
JP Morgan AM										
Pimco										
Amundi	■	■	■	■	■				■	
Prudential										
LGIM	■	■	■	■	■			■	■	
Goldman Sachs AM										
Wellington AM										
Natixis IM	■	■			■					
T. Rowe Price						n/a *	n/a *			
Nuveen										
Northern Trust AM										
Invesco										
AXA IM	■	■	■		■			■	■	
Allianz Global Investors	■	■			■			■	■	■
BNP Paribas AM	■	■	■		■			■	■	■
UBS AM		■								
HSBC AM	■	■	■					■	■	■
Insight Investment	■	■	■	■	■					
Aberdeen Standard Investment **	■	■			■			■		■
Schroders	■	■		■	■			■		■
Aviva Investors	■	■	■	■	■			■		■
M&G Investments	■	■								
Baillie Gifford	■	■			■					
Royal London AM	■				■			■		
Man Group										

Source: DWS analysis of Investors on Climate Change 2009 to 2018. The list shows the largest twenty global asset managers and the largest ten UK asset managers according to IPE 2018. Shaded rows indicate that the firm signed the letter. Firm names that are bold indicate that the manager is a member of the Ceres Investor Network on Climate Risk and Sustainability and/or the Institutional Investors Group on Climate Change
* Individual institutional investors did not sign the 2012 or 2013 global investor statement – it was only signed by investor associations.
** Indicates whether Aberdeen and/or Standard Investments signed the investor statement.

We believe that the global investor letter on climate change continues to be an important indication to governments of investors' support for stronger public policies. However, only signing the letter should not be seen as sufficient investor engagement with public policy. Investors should actively participate in investor associations as well as participate in policy development processes.

While the direct incentive for doing so is currently weak, many investors are doing more to contribute their views to specific, national/regional energy, climate and sustainable finance policies. We believe that while investors are undertaking more policy activities, there is less climate/ESG policy engagement than would be justified by investors' ultimate interests.

The case for policy advocacy and a 'just' transition

An increasing role for government engagement, including the social aspects of climate climate

In 2014, the PRI published the *Case for investor engagement in public policy*[53]. The report argues that "policy engagement by long-term investors is a natural and necessary extension of an investor's responsibilities and fiduciary duties to the interests of beneficiaries. Lord Adair Turner, former Chairman of both the Financial Services Authority and the Committee on Climate Change, suggests in a forward to this PRI report that:

> *"Individual and voluntary action alone cannot deliver a financial system appropriately focused on long-term objectives. Public policy is also needed. Without public standards on disclosure of risk, less responsible companies and investing institutions may enjoy short-term advantages. Without a clear commitment to robust carbon pricing, the incentives to develop clean energy and improve energy efficiency will still be too weak. Financial institutions which want to adopt long-term horizons and to act responsibly in investors and society's long term interest, cannot therefore avoid engagement in the public policy debates which will shape the context in which they operate."*

PRI notes that investor commitment to policy engagement is growing but is still at an early stage of development. Asset owners could accelerate this trend by incorporating expectations/requirements for policy engagement in mandates and manager evaluation and communicate this to the market.

An important part of the Paris Agreement calls for a 'just transition' for workers and communities as the world responds to climate change. The increasing recognition that investors have so far given insufficient attention to the social consequences of the low carbon transition, led PRI and the International Trades Union Confederation to support the creation of a guide[54] for investor action. DWS was one of a number of investors that signed a linked investor statement.

It will become increasingly important to address the social aspects of the low carbon transition and physical climate risk and adaptation through investor advocacy towards government, engagement with corporate investee and investment strategies.

The diverse expert perspectives provided in this report, provide comprehensive expertise for pension funds to take action on the opportunities and risks of climate change.

[53] PRI Nov 2014 https://www.unpri.org/the-case-for-investor-engagement-in-public-policy/290.article

[54] Grantham Research Institute on Climate Change and the Environment, Sept 2018. Investor guide to a just transition

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