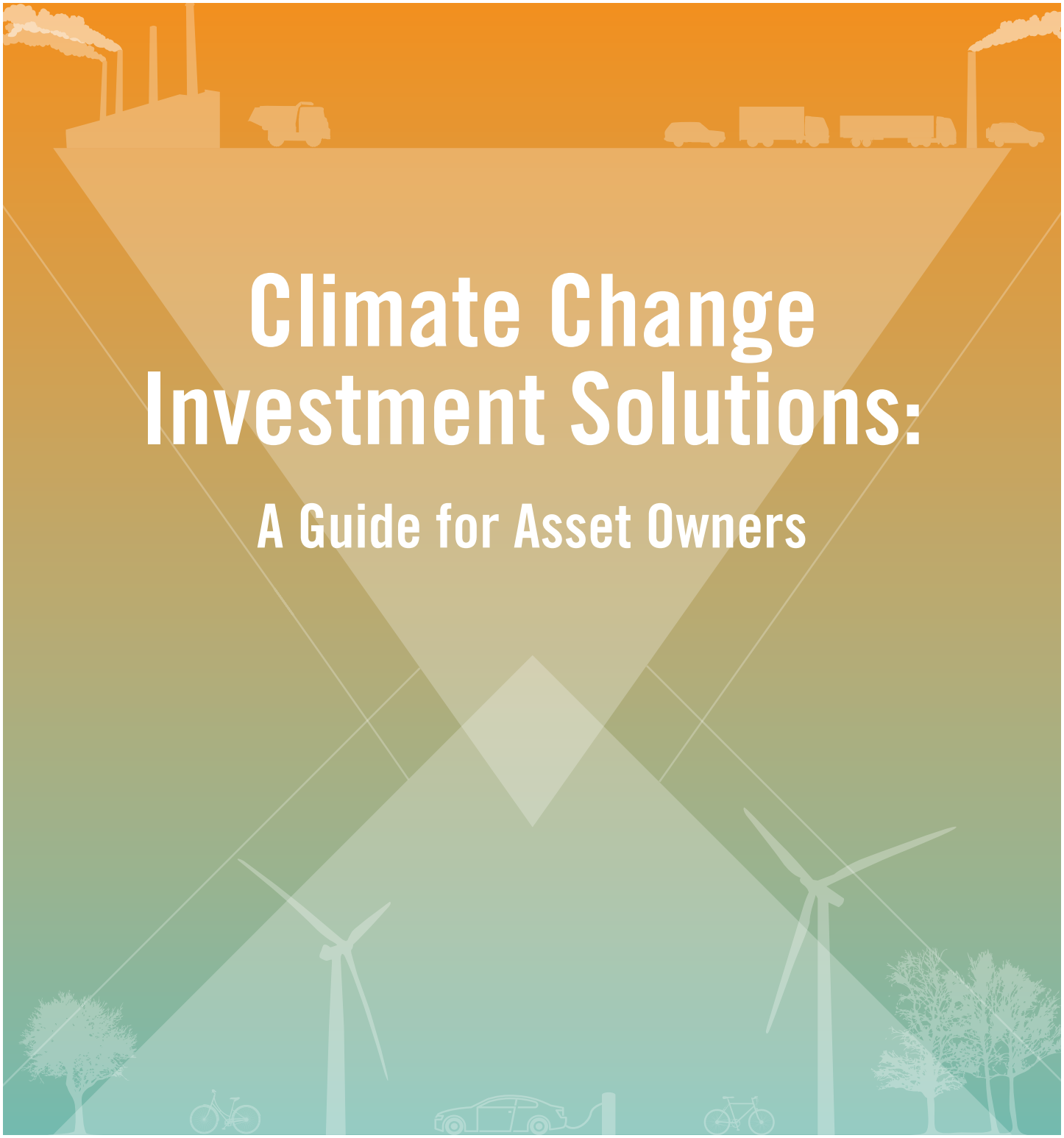


Climate Change Investment Solutions:

A Guide for Asset Owners

IIGCC Institutional Investors Group on Climate Change

Investor Network on CLIMATE RISK

Investor Group on Climate Change

ASIA INVESTOR GROUP ON CLIMATE CHANGE An ASrIA Initiative

GLOBAL INVESTOR COALITION ON CLIMATE CHANGE

SUPPORTED BY:

HERMES INVESTMENT MANAGEMENT

Nordea

1805 PICTET

RAFP Retraite additionnelle de la Fonction publique

Who is the Global Investor Coalition on Climate Change?

In December 2012, the four regional climate change investor groups, IIGCC (Europe), INCR (United States), IGCC (Australia & New Zealand) and AIGCC (Asia) formed the Global Investor Coalition on Climate Change (GIC) for joint projects and initiatives that benefit from global collaboration. The coalition provides a global platform for dialogue between investors and governments on policy and investment practice related to climate change and a focal point for international fora.

About Institutional Investors Group on Climate Change (IIGCC) - Europe

The Institutional Investors Group on Climate Change (IIGCC) is a forum for collaboration on climate change for investors. IIGCC's network includes over 100 members, with some of the largest pension funds and asset managers in Europe, representing €10trillion in assets. IIGCC's mission is to provide investors a common voice to encourage public policies, investment practices and corporate behaviour which address long-term risks and opportunities associated with climate change. Visit www.iigcc.org

About Ceres' Investor Network on Climate Risk (INCR) - United States

The Investor Network on Climate Risk (INCR) is a North America-focused network of institutional investors dedicated to addressing the financial risks and investment opportunities posed by climate change and other sustainability challenges. INCR currently has more than 110 members representing over $13 trillion in assets. INCR is a project of Ceres, a non-profit advocate for sustainability leadership that mobilizes investors, companies and public interest groups to accelerate and expand the adoption of sustainable business practices and solutions to build a healthy global economy. Visit www.ceres.org

About Investors Group on Climate Change (IGCC) – Australia & New Zealand

IGCC is a collaboration of 55 Australian and New Zealand institutional investors and advisors, managing approximately $1 trillion and focusing on the impact that climate change has on the financial value of investments. The IGCC aims to encourage government policies and investment practices that address the risks and opportunities of climate change, for the ultimate benefit of superannuants and unit holders. Visit www.igcc.org.au

About the Asia Investor Group on Climate Change (AIGCC) - Asia

The Asia Investor Group on Climate Change (AIGCC) is an initiative set up by the Association for Sustainable and Responsible Investment in Asia (ASrIA) to create awareness among Asia's asset owners and financial institutions about the risks and opportunities associated with climate change and low carbon investing. AIGCC provides capacity for investors to share best practice and to collaborate on investment activity, credit analysis, risk management, engagement and policy. With a strong international profile and significant network, including pension, sovereign wealth funds insurance companies and fund managers, AIGCC represents the Asian voice in the evolving global discussions on climate change and the transition to a greener economy. Visit http://aigcc.asria.org

Acknowledgments:

The networks in the Global Investor Coalition on Climate Change commissioned Dr. Danyelle Guyatt of COLLABORARE ADVISORY to draft this guide with support from the investor networks.

IIGCC would like to thank its Climate Risk programme for its input and review of drafts of the guide.

Climate Change Investment Solutions: A Guide for Asset Owners

Contents

Overview

The aim of this guide is to provide asset owners with a range of investment strategies and solutions to address the risks and opportunities associated with climate change. The guide is targeted at asset owners and more specifically at trustee boards and investment committees, but also contains insights for asset managers[1].

This guide builds on the report *Financial Institutions Taking Action on Climate Change* (2014)[2]. That report presented a range of different leadership actions that financial institutions have taken in response to climate change. It concluded that there is a need for these actions to be more widely integrated into mainstream investment processes to ensure that investment portfolios are more resilient to the financial implications of climate change. This requires, in part, the development and adoption of new industry norms, tools and expertise that embed climate change into core investment processes, which this Climate Change Investment Solutions guide aims to contribute to. The guide also affirms that corporate and policy engagement are important complementary strategies which can address climate change risks across portfolios and facilitate new investment opportunities.

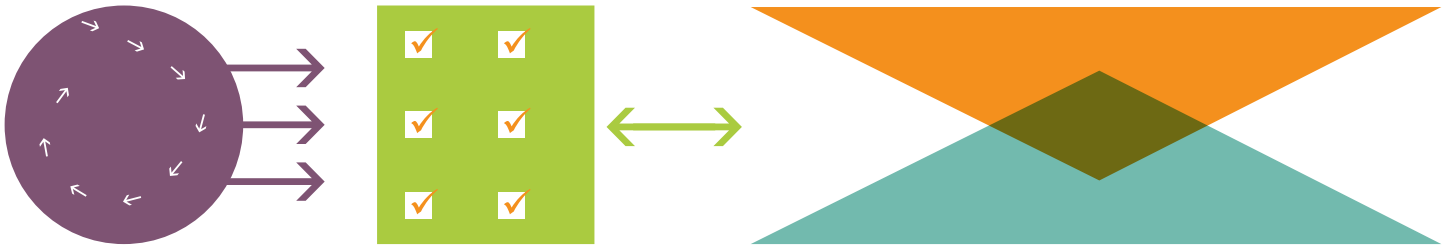
The guide is presented in 4 sections as depicted in Figure 1, each of which sets out a range of suggested actions that asset owners can take.

- *Section 1: Strategic review* – Presents actions to integrate climate change into investment beliefs and investment policies that are actionable and transparent.
- *Section 2: Strategic asset allocation* – Discusses actions for measuring and managing the risks and opportunities of climate change, both within the existing asset allocation structure and through evolving the asset mix over time.
- *Section 3: Mitigation investment actions* – Presents actions for reducing the carbon intensity of existing assets, along with opportunities to invest in low carbon, clean energy and energy efficient assets.
- *Section 4: Adaptation investment actions* – Discusses actions to reduce the vulnerability of existing assets to the physical impacts of climate change, as well as building exposure to adaptation opportunities.

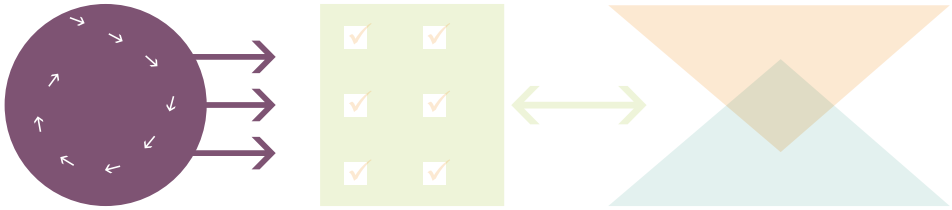
RESOURCES:

Throughout the guide, see the margins for sample questions, examples and sources for more information.

Figure 1: Framework for considering climate change investment solutions

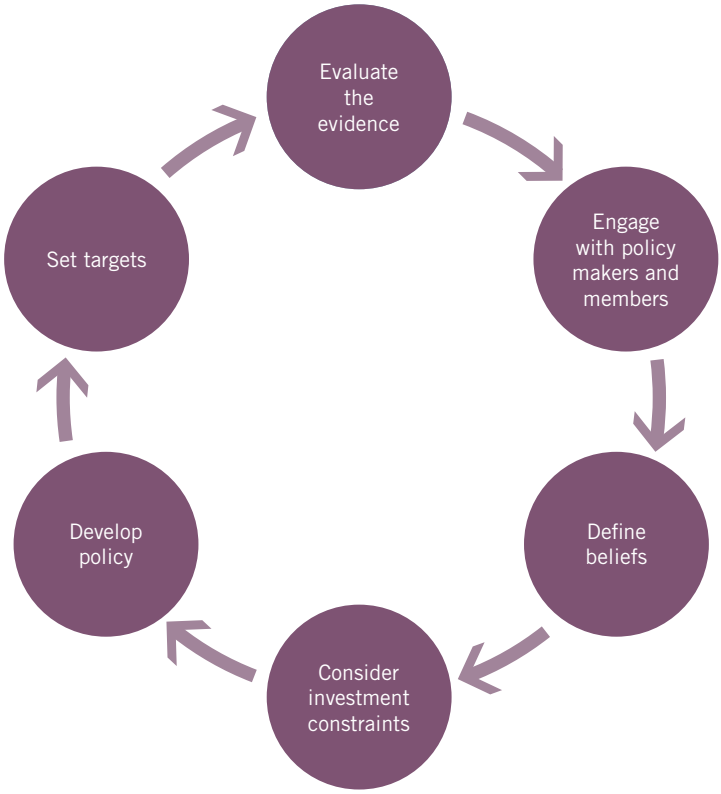


Strategic review	Strategic asset allocation	Mitigation investment actions	Adaptation investment actions
• Evaluate the evidence • Engage with policy makers and members • Define beliefs • Consider investment constraints • Develop policy • Set targets	• Review assumptions • Measure exposure to risks • Measure exposure to opportunities • Reduce risks within existing SAA targets • Increase opportunities within existing SAA targets • Set priorities to evolve SAA targets	• Reduce carbon intensity of existing assets • Increase exposure to the low carbon economy	• Reduce climate vulnerability of existing assets • Build exposure to adaptation opportunities



Section 1: Strategic review

Undertaking a strategic review will enable asset owners to better manage the risks and opportunities associated with climate change in a way that is consistent with the fiduciary duty to exercise due care, skill and diligence in the pursuit of the best interests of fund beneficiaries[3]. A comprehensive strategic review will involve, inter alia, the inclusion of climate change in the statement of investment beliefs, the investment policy and the setting of targets that are actionable and transparent. The strategic review will influence how an asset owner implements its response to climate change from a top down and bottom up perspective, and also how it communicates with its members and stakeholders. Some of the possible actions to take as part of this strategic review are presented and discussed below.



EVALUATE THE EVIDENCE

As with other investment considerations, there is some uncertainty about how future climate change scenarios could play out and their likely investment impact. This calls for a systematic approach, drawing on the latest evidence and analysis to support an informed and considered assessment of the possible scenarios. Asset owners can access information on climate change scenarios from various sources, for example Mercer (2011 and forthcoming)[4] and the International Energy Agency (IEA) in its regular World Energy Outlook reports. Annex A presents the possible impact of the IEA's New Policies and 450 Scenarios on a range of asset classes to illustrate how asset owners can consider the way that different scenarios might impact on investment portfolios.

Some of the key variables that asset owners might consider in evaluating the evidence include:

- **Physical impacts:** The IPCC Fifth Assessment Report (2014) noted that without substantial efforts to curb greenhouse gas (GHG) emissions[5], global temperatures by the end of the 21st century could be more than 4°C above what they were before the industrial revolution (see Annex B for further information). A change of that size would very likely lead to severe, widespread, and irreversible impacts on societies and the environment globally, increasing the likelihood of severe, pervasive and irreversible impacts for people and ecosystems. This places some existing infrastructure, business models and assets at risk, and also produces new opportunities in adaptation solutions and resilient infrastructure.

- **Policy trajectory:** World governments have agreed to limit the increase in global temperature to 2°C above pre-industrial levels to avoid the worst impacts of climate change. Asset owners need to understand how this agreement could play out and its potential investment impact. Some of the key policy levers include carbon pricing schemes, measures to support energy efficiency and renewable energy, research and development in the deployment of low carbon technologies, removing direct or indirect fossil fuel subsidies, and measures to facilitate private sector involvement in adaptation strategies. Climate policy creates new opportunities in asset classes and markets that asset owners may currently have little or no exposure to. It also increases the risk that existing assets might suffer declines in values and/or become more volatile. It is therefore essential for asset owners to understand, and engage with, the direction and likely impact of climate policy at the domestic and international level.

- **Carbon price:** The trajectory for future carbon pricing levels and how this varies by region will have a direct financial impact on investment portfolios. An economically meaningful carbon price would increase the incentive for the public and private sector to manage and reduce their emissions, encouraging more long-term investment in lower carbon options. It could also penalise higher carbon emission companies and sectors of the economy that do not manage their exposure effectively. More investors are recognising the need to measure and reduce the carbon exposure of their investment portfolios in anticipation of a rising cost of carbon, with a range of industry initiatives emerging (*Highlight 1: Carbon footprinting and portfolio decarbonisation*). Asset owners need to participate in this debate and stay abreast of new developments that may impact on the future carbon price outcomes, particularly in the lead up to the UNFCCC COP 21 in Paris, December 2015.

More investors are recognising the need to measure and reduce the carbon exposure of their investment portfolios in anticipation of a rising cost of carbon

HIGHLIGHT 1: CARBON FOOTPRINTING AND PORTFOLIO DECARBONISATION

Measuring carbon emissions and carbon intensity, often referred to in the industry as 'carbon footprinting' - offers a way for investors to quantify, measure and manage the carbon exposure associated with their investments. It is also a useful resource to set carbon emission reduction goals, to manage carbon risk and to communicate strategies and goals to fund managers and members/beneficiaries.

A number of industry initiatives have recently emerged in relation to carbon footprinting. The Montreal Carbon Pledge, launched by the Principles for Responsible Investment, encourages its signatory base to measure and disclose the carbon footprint of their investments annually, beginning with equities portfolios by September 2015, with the aim of using the information to develop an engagement strategy and/or identify and set carbon footprint reduction targets. The Montreal Carbon Pledge aims to attract US$3 trillion of portfolio commitment in time for COP21.

Another related initiative supported by the UNEP FI, called the Portfolio Decarbonisation Coalition (PDC), has invited investors to 'decarbonise' their

portfolios. The initiative seeks to mobilise a critical mass of institutional investors committed to measuring and gradually reducing the carbon intensity of their portfolios. By the COP21 meeting, the PDC aims to build a community of institutional investors measuring and disclosing the carbon footprint of a total of at least US$500 billion of assets under management. Over the same time it aims to assemble a coalition of investors who in aggregate will commit to decarbonising at least US$100 billion of institutional equity investment.

There is ongoing debate around data and measurement methodologies of carbon footprinting (further discussed in Annex C), and on whether and how footprinting measures risk. This is not a reason for inaction but rather highlights the need for active participation from the investment community to develop new norms and investment practices that are robust and embed climate change into the decision-making toolkit.

How can asset owners use carbon footprint data?

- Measure and report absolute and relative footprint versus benchmark and peers over time
- Seek to reduce the carbon intensity of an investment portfolio
- Engage with fund managers regarding materiality, alongside other climate risk indicators
- Engage with companies on carbon risk management and reduction

What are the data gaps/issues?

- Includes Scope 1 and Scope 2 emissions, but often does not include Scope 3 emissions
- Varying denominators being used for carbon intensity measurement, such as revenue, market capitalisation, or enterprise value
- May not capture stranded asset risk associated with carbon reserves
- Gaps in company reporting and varying estimation methodologies
- Not readily available for unlisted assets

TERMINOLOGY FOR CLASSIFYING GHG EMISSIONS

Scope 1: All direct GHG emissions.

Scope 2: Indirect GHG emissions from consumption of purchased electricity, heat or steam.

Scope 3: Other indirect emissions, such as the extraction and production of purchased materials and fuels, transport-related activities in vehicles not owned or controlled by the reporting entity, electricity-related activities (e.g. T&D losses) not covered in Scope 2, outsourced activities, waste disposal, etc.

Source: GHG Protocol

- **Technology development and deployment:** Climate change will impact on the development and deployment of low carbon, energy efficient and climate resilient technologies at the regional and international level. Asset owners need to consider when and how fast the technology transformation is likely to unfold and how this will impact on existing and new portfolio assets. This will include consideration of issues such as policy measures to support the level of uptake and deployment of renewable energy, technological progress in energy storage solutions, the pace of fossil fuel replacement (*see Highlight 2: Stranded assets*), the adoption of energy efficiency solutions, water treatment and distribution infrastructure, coastal infrastructure and early warning systems, to name a few.

HIGHLIGHT 2: STRANDED ASSETS

Various research reports produced by IEA, the Carbon Tracker Initiative and the University of Oxford's Stranded Assets Programme (to name a few) have studied the risk of fossil fuel assets becoming 'stranded' in a strong climate change mitigation scenario. These reports have produced varying estimates based on different future scenarios, some of which could have detrimental impacts on investment portfolios. As noted by Towers Watson (2015), it is in the interest of investors with a medium to long-term investment horizon to explore the stranded assets risk in the context of their own portfolios, defining their beliefs and assessing current portfolio exposure.

Some of the issues that asset owners might take into account when considering the risk of 'stranded assets' include:

- The extent to which climate policy and technology advancements place fossil fuel assets at risk
- Consumer trends that may impact on fossil fuel demand
- The role of geopolitics and the possible impact on re-pricing fossil fuel assets
- Assumptions around the utilisation of "negative emission" technologies (e.g. afforestation, agricultural soil carbon sequestration, bioenergy and carbon capture and storage, to name a few)
- The role and interplay of asset values with commodity price movements
- Consideration of the extent to which the market has priced in these uncertainties, the timing of when asset re-pricing may occur and the breakeven costs on new resource development projects

ENGAGE WITH POLICY MAKERS AND MEMBERS

Climate and energy policy engagement. Asset owners are increasingly engaging and consulting with policy makers at the domestic and international level in order to better understand the future climate change policy trajectory and its possible investment impact. Engagement with policy makers also has the potential to influence the direction of the policy outcomes in a way that could reduce the investment uncertainty and enhance the resilience of portfolios to future climate change outcomes. Investors are in a unique position to make the economic case for climate and energy policies that send the appropriate price signals to incentivise low carbon, clean energy investment.

Member/stakeholder engagement[6]. While the applicability and relevance of member engagement will vary by region, type of fund and the profile of the members, there is growing awareness about climate change across society that is supporting more member engagement. The UK Law Commission fiduciary duty review, whilst not necessarily representative of other legal jurisdictions, is illustrative of the debate that is taking place in the industry and the increased focus on the link between the financial materiality of environmental, social and governance (ESG) issues, the extent to which members have a concern and the actions that a fund takes as part of its fiduciary duty.

Communication. There are a variety of approaches that asset owners can take in communicating their climate change strategy to members and stakeholders, and this is likely to develop considerably over the coming years as the industry innovates. Some examples include: conducting member surveys; focus groups; online discussion forums; utilising social media; face-to-face discussions at conferences and events; integrating climate change into a fund's communication and reporting material; and completing industry surveys such as the Global Climate Change Investor Surveys[7] or the Asset Owners Disclosure Project[8].

RESOURCES ON MEMBER ENGAGEMENT:

Share Action engaging with members

CalPERS climate change disclosure

CalSTRS social media discussions on climate change

UK Pensions Trust survey of members

DEFINE BELIEFS

Incorporation of the investment risks and opportunities associated with climate change into an asset owner's investment beliefs will help to frame the way this issue is integrated into the investment decision making process (see *Box: Examples of climate change investment beliefs*)[9]. The majority of funds still do not explicitly do this either as part of the responsible investment (RI) policy or core investment beliefs. The beliefs of some asset owners may refer more broadly to 'ESG' issues or possibly make no reference to these issues at all. In order to give climate change sufficient consideration and transparency, the belief statement should include:

- Reference to the fund's assessment of the most likely future climate change scenario.
- The degree of concern and the fund's level of conviction about future investment impacts.
- The way the fund intends to manage this exposure.

The belief statement can also specify a fund's position on specific issues, such as the risk of 'stranded assets' and exposure to fossil fuel assets (*Highlight 2: Stranded assets*), as explored by Towers Watson (2015).

EXAMPLES OF CLIMATE CHANGE INVESTMENT BELIEFS:

Environment Agency Pension Fund

Local Government Super

CBUS

CONSIDER INVESTMENT CONSTRAINTS

When it comes to practical implementation options in translating beliefs into policies and asset allocation decisions, asset owners need to consider the most appropriate approach in the context of a fund's investment constraints, including the regulatory requirements particular to its region and type of fund. As Sections 3 and 4 of this guide set out, there are a range of actions and climate change investment solutions available for funds of varying size, resources, those with internally or externally managed assets, actively or passively managed and with different liquidity constraints.

DEVELOP POLICY

A strong climate change investment policy will reflect the preceding components of the strategic review, namely evidence gathering, engagement with members and policy makers, formulation of beliefs and consideration of a fund's investment constraints. The policy needs to make reference to the incorporation of climate change risks and opportunities across the portfolio (see *Box: Examples of climate change policies*), including how it will be considered in decisions related to:

- Strategic asset allocation.
- Selection of new and monitoring of existing mandates.
- Setting priorities and evaluation of new investment opportunities.
- Reporting to members/stakeholders.

EXAMPLES OF CLIMATE CHANGE POLICIES:

USS

CalSTRS

Pensions Trust

HESTA

General Board Pension and Health Benefits

SET TARGETS

Part of an asset owner's strategic review of climate change may result in setting targets that are measureable and reportable over time (see *Box: Examples of target setting*). One example might be to set a goal to measure and reduce the carbon emissions intensity of a portfolio over a certain time period. Another goal could be to reduce exposure to fossil fuel reserves and exploration over a period of time. On asset allocation, a target could be to invest a specified proportion of the fund's assets in low carbon, energy efficient and climate adaptation opportunities across different asset classes (subject to suitable opportunities being available). On engagement, funds could set targets for high carbon intensive companies to achieve specific carbon reductions by future points in time. And on voting, a goal might be to file climate change related resolutions and exercise voting rights on climate change proxies 100% of the time.

EXAMPLES OF TARGET SETTING:

PFZW: Increase sustainable investments 4x to at least €16bn over the next 5 years. Within this period, also committed to reducing the carbon footprint of its entire portfolio by 50%.

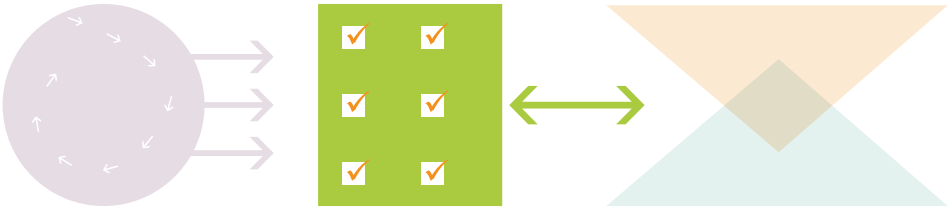
CalSTRS: Increase clean energy and technology investments from US$1.4 billion to at least US$3.7 billion by 2019 across all asset classes.

PensionDanmark: Goal to invest 10% of assets in direct equity investments in renewable energy assets and a further 10% in loans to infrastructure projects.

Environment Agency Pension Fund: Target of 25% invested in assets and companies that make a positive contribution to low carbon, climate resilient world by 2015.

AP4: Goal to decarbonise its entire listed equity portfolio of US$20 billion.

APG: Double its investments in sustainable energy generation from €1 billion to €2 billion in the next 3 years.



Section 2: Strategic asset allocation

Research suggests that the strategic asset allocation (SAA) decision is the most important source of variability of portfolio return over time, yet it is often bottom up considerations that dominate investment decision-making[10]. Bringing the top down together with bottom up considerations around climate change will help asset owners to translate their beliefs and policies into priorities and asset allocation decisions. Some asset owners may start by considering climate change issues on a case-by-case basis and make investment decisions without integrating climate change into their SAA processes. This could be an effective approach in the short-term as asset owners learn and adapt although, over time, the integration of climate change into the SAA framework will better equip asset owners to manage the risks and opportunities of climate change in a prudent and consistent way.

A framework is presented in Figure 2 to help guide these considerations, along with a practical example in Figure 3 as to how this might translate into asset allocation outcomes for different sets of beliefs.

Figure 2: Possible actions to integrate climate change into the SAA process

POSSIBLE ACTIONS	POSSIBLE STEPS
REVIEW ASSUMPTIONS	☐ Consider whether the assumptions need to be reviewed around risk premia, volatility, return drivers, correlations and macroeconomic variables (interest rates, inflation, GDP growth)
MEASURE AND REDUCE EXPOSURE TO RISKS	☐ Measure, reduce and report the fund's carbon emissions, carbon intensity and exposure to fossil fuel reserves. *See Section 3A* ☐ Evaluate the fund's exposure to assets most at risk to future climate mitigation scenarios and from the physical impact of climate change. *See Section 4A*
MEASURE AND INCREASE EXPOSURE TO OPPORTUNITIES	☐ Measure, increase and report the fund's exposure to mitigation opportunities, including through the Low Carbon Investment Registry. *See Section 3B* ☐ Measure, increase and report the fund's exposure to adaptation opportunities. *See Section 4B*
SET PRIORITIES TO EVOLVE SAA TARGETS	☐ Identify areas where the SAA targets and portfolio structure might evolve in the future ☐ Discuss and identify potential 'trigger points' for the fund to consider altering its SAA targets ☐ Agree to review and report on these considerations on an ongoing basis

Source: Compiled by the author from various sources

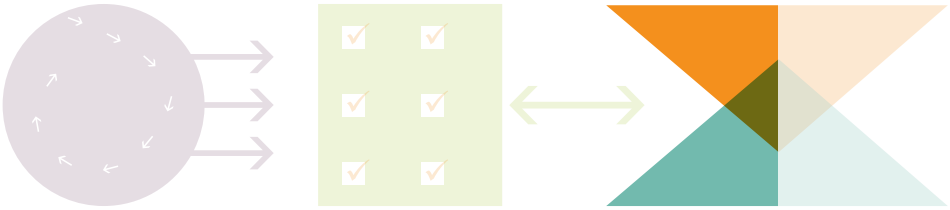
An illustrative example. Figure 3 sets out a hypothetical example of two different sets of beliefs on climate change and how this might feed through to decisions at the investment portfolio level. The two sets of beliefs are presented relevant to both the IEA's 450 Scenario [Belief #1) and New Policies Scenario [Belief #2] to illustrate how investor beliefs can be linked to climate change scenarios and an assessment of investment impacts. Annex A provides further details of these scenarios and the possible risks and opportunities of each scenario for the major asset classes.

For ease of comparison, the example has been applied across one investment portfolio and as such the investment constraints, regulatory backdrop and existing portfolio mix are held constant. This is a stylised example to facilitate discussion and should be interpreted in that vein. As for all investment decisions, asset owners need to undertake their own assessment of the potential risk/return implications of each stage of the decision-making process.

Figure 3: Translating beliefs into investment actions, an illustrative example

Investment constraints: US$20 billion European based pension fund; must have at least 60% of the assets in liquid, readily realise investments; listed equities passively managed (all others active); direct infrastructure internally managed (all others external)			
ACTIONS:	**CURRENT FUND POSITION:**	**BELIEF #1:** **[IEA 450 SCENARIO, 2°C OUTCOME]**	**BELIEF #2:** **[IEA NEW POLICIES SCENARIO, 3.6°C OUTCOME]**
DEFINE BELIEFS	Cash: 5% Fixed income: 30% Listed equities: 40% Property: 15% Infrastructure: 5% Private equity: 5%	2°C outcome possible Strong climate policy expected (within next 2-3 years) High and rising carbon price Significant technology shift Fossil fuel assets at high risk	2°C outcome very unlikely Weak climate policy (little change in next 2-3 years) Low carbon price continues Some technology shift Some risk to fossil fuel assets
REVIEW ASSUMPTIONS	Long run volatility: 10% pa Long run return: 7% pa	Risk of lower returns and higher volatility on high carbon assets	No change expected in foreseeable future
MEASURE AND REDUCE EXPOSURE TO RISKS WITHIN EXISTING SAA TARGETS	Carbon emissions and carbon intensity is 5% above benchmark and industry peers	Evaluate and set target at a minimum **25% below** benchmark and industry peers by certain future date **Shift all passive investments** into 'low carbon' tracking benchmark fund Engage with fund managers to promote integration and **mandatory** reporting of carbon intensity **Set** energy efficiency targets for property managers to meet Engage with companies to promote management and **set targets** to reduce carbon intensity	Evaluate and set target at a minimum **neutral** to benchmark and industry peers by certain future date **Consider some allocation** of passive portfolio to low carbon tracking fund Engage with fund managers to promote integration and **request consideration** of carbon reporting **Discuss** possible energy efficiency targets with property managers Engage with companies to **encourage stronger disclosure** and management
	Exposure to fossil fuel reserves is less than 0.5% of AUM	**Reduce exposure** to fossil fuel reserves due to anticipated re-pricing of some fossil fuel assets	**Retain exposure** to most fossil fuel reserves but increase focus on engagement

Investment constraints: US$20 billion European based pension fund; must have at least 60% of the assets in liquid, readily realise investments; listed equities passively managed (all others active); direct infrastructure internally managed (all others external)			
ACTIONS:	**CURRENT FUND POSITION:**	**BELIEF #1:** **[IEA 450 SCENARIO, 2°C OUTCOME]**	**BELIEF #2:** **[IEA NEW POLICIES SCENARIO, 3.6°C OUTCOME]**
	Assets at high risk from physical impact of climate change include: • 5 property and infrastructure assets • 50 companies with assets and activities in 'at risk' locations	Undertake a detailed review, introduce mechanisms to improve the resilience of assets and **consider asset replacement** Undertake targeted **engagement** with fund managers, companies and in collaboration with other investors. **Remove investments** if not satisfied with response	Undertake a detailed review and introduce mechanisms to **improve the resilience of assets** Undertake targeted **engagement** program with fund managers, companies and in collaboration with other investors. Set targets to monitor progress over time
MEASURE AND INCREASE EXPOSURE TO OPPORTUNITIES WITHIN EXISTING SAA TARGETS	Exposure to low carbon assets is estimated to represent 2% current portfolio Exposure to adaptation opportunities is estimated to be less than 0.2% of current portfolio	**Replace existing fund managers and invest in priority areas** in green bonds, renewable energy infrastructure, public and and private equity energy efficiency, building efficiency and water management Review on annual basis	**Set priority areas** in green bonds, climate resilient infrastructure, private equity energy efficiency **Evaluate new opportunities** in priority areas and **seek advice** from advisors Review on annual basis
PRIORITIES TO EVOLVE SAA TARGETS		Undertake analysis and agree to **invest** in low carbon, climate resilient opportunities to **minimum 25% of exposure within the next 2-3 years** Infrastructure, private equity, green bonds, listed equity thematic vehicles, new allocation to timberland and natural resources	Undertake analysis and agree to **invest** in low carbon, climate resilient opportunities **up to 25% of exposure within the next 5 years** Not yet identified, seek advice from consultants to set priority areas and evaluate opportunities

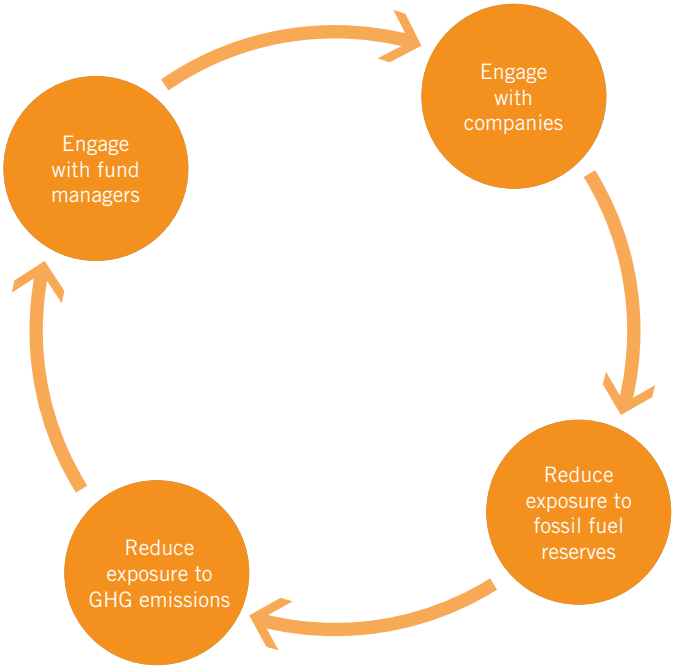


Section 3: Mitigation investment actions

Mitigation investment actions refer to all investment activities that are positively related to reducing GHG emissions and increasing exposure to low carbon economy. This can involve investments that use new technologies and renewable energies, those that improve energy efficiency, that protect natural carbon sinks, that lead to changing management practices or changing consumer behaviour. The IEA (WEIO, 2014) estimates that to achieve a 2°C outcome, mitigation investment flows would need to increase to $790 billion per annum by 2020 (up from an estimated $260 billion in 2013), increasing to US$2.3 trillion per annum by 2035. More than half of this investment will be in improvements in energy efficiency, which is expected to increase by 8x from the 2013 level to 2035, with low carbon power generation expected to increase by 3x from the 2013 level to 2035 (IEA WEIO, 2014). The Ceres Clean Trillion report (2014) discusses a range of possible actions that can be taken by businesses, investors and policy makers to help close the clean energy financing gap.

This section outlines a number of actions that asset owners can take, firstly to reduce the carbon intensity of an existing portfolio and secondly, to build exposure to low carbon, energy efficient opportunities.

A. ACTIONS TO REDUCE THE CARBON INTENSITY OF EXISTING ASSETS



ENGAGE WITH FUND MANAGERS

Asset owners can evaluate and encourage their fund managers to measure, report and reduce the carbon intensity of their portfolios in a number of ways:

- **Measurement.** Ask fund managers to measure and report the carbon emissions and intensity of the investment portfolio.
- **Integration.** Ask fund managers how carbon exposure is taken into account as part of the investment decision-making process (see Box: Possible questions to ask fund managers about reducing carbon intensity).
- **Active ownership.** Ask fund managers how they interact with the underlying entities in which they invest on carbon exposure, how they vote on climate change related issues as they arise (for listed equities) and the extent to which carbon intensity is included in the active buy/sell decisions.
- **Collaboration.** Consider the extent to which the fund manager engages with other investors or industry initiatives on carbon emissions measurement, reporting and reduction.
- **Benchmark selection.** Discuss with fund managers the relative merit of different benchmarks and low carbon indices.
- **Targets.** Measure the portfolio's overall carbon intensity and exposure to fossil fuel reserves and engage with fund managers about setting targets to reduce these over time.
- **Mandate design.** Consider embedding carbon emissions measurement, reporting and reduction into new (and potentially existing) mandates.
- **Replace fund managers.** Replace existing fund managers where there are concerns about how carbon exposure is being managed and the risks are considered to be too high to retain the mandate.

POSSIBLE QUESTIONS TO ASK FUND MANAGERS ABOUT REDUCING CARBON INTENSITY:

- Do you consider the carbon intensity and carbon management as part of the due diligence process?
- Do you ask underlying entities about reducing their carbon intensity?
- What is your assessment of the assets in the portfolio at risk of becoming stranded?
- What sources of information do you use to stay abreast of this issue?
- Can you measure and report the portfolio's carbon intensity on an annual basis?
- Would you consider agreeing to targets to reduce carbon intensity over time?

ENGAGE WITH COMPANIES

Asset owners can evaluate and engage with investee companies to reduce their carbon exposure and carbon intensity in a number of ways[11]:

- **Measurement.** Encourage companies to measure and report the carbon emissions and carbon intensity associated with their operations (e.g. via the CDP survey and in their annual reports and websites).
- **Integration.** Evaluate the extent to which carbon exposure is a risk factor for the company's business and how it is managing this across its strategy and business operations.
- **Policy engagement.** Enquire into the company's position on climate policy and its involvement in related groups or activities that seek to influence climate policy outcomes, and whether they are supporting or opposing climate and clean energy policies.
- **Collaboration.** Evaluate the extent to which the company is collaborating with other companies and industry participants to improve how carbon exposure is managed and ultimately reduced. Asset owners can also join forces with other investors and industry groups to encourage greater transparency and action (see Box: Examples of company engagement on mitigation).
- **Targets.** Request that companies set targets to reduce the carbon exposure and intensity of their operations over a certain time period and that this be measured and reported on a regular basis.
- **Reduce or remove exposure.** Remove or reduce exposure to companies where they have undertaken a process of evaluation and engagement and have concerns about how carbon exposure is being managed and consider the risks to be too high to retain the current exposure.

EXAMPLES OF COMPANY ENGAGEMENT ON MITIGATION:

Carbon Asset Risk Initiative. A group of 75 institutional investors representing more than US$3 trillion in assets have sent letters to 45 of the world's largest oil and gas, coal and electric power companies requesting them to assess and report to their shareholders on the risks posed by climate change and climate policy.

Carbon Action. The PRI and CDP have joined forces to engage with those Global 500 companies with emissions more than 1 millon metric tonnes per year. The group has met with 22 companies, 8 of which have disclosed a target to reduce emissions.

REDUCE EXPOSURE TO FOSSIL FUEL RESERVES

The IPCC Fifth Assessment (2014) reported a high degree of confidence that CO_2 emissions from fossil fuel combustion and industrial processes contributed about 78% of the total GHG emission increase from 1970 to 2010, with a similar percentage contribution for the period 2000–2010. The IPCC also reported a medium degree of confidence that most mitigation scenarios are associated with reduced revenues from coal and oil trade for major exporters[12]. Whatever scenario that an asset owner considers to be the most likely, the transition to a low carbon, clean energy economy is likely to reduce demand for fossil fuels over time, although different fuels and sources will be impacted differently and the timing is uncertain.

There are a number of possible actions that asset owners can take in evaluating the merit of reducing exposure to fossil fuel reserves:

- **Measure exposure.** Estimate the exposure of the portfolio to companies and assets that are heavily dependent on fossil fuel reserves, defined as conventional and unconventional oil, gas and coal reserves that are expected to be produced economically using today's technology[13]. This assessment can be carried out in-house, via investment consultants, third party specialists or research firms or by requesting the information directly from fund managers.
- **Assess risk of retaining.** Evaluate the potential financial risk of exposure to fossil fuel reserves through undertaking various scenarios testing under different policy and technology mix assumptions. New tools and research are emerging to support this assessment[14].
- **Assess risk of reducing or removing.** Consider the potential costs of reducing or removing the exposure to the companies and assets that are linked to fossil fuel reserves. This will involve consideration of the implications for the portfolio's tracking error to the benchmark and the impact on portfolio volatility and returns under different scenarios.
- **Consider options for reducing or removing.** Those asset owners that have examined their exposure to fossil fuel reserves and concluded that the risks of their fund's exposure is too high versus the risks associated with reducing it have a number of choices. Some of the possible responses include excluding some of the most heavily carbon intensive fossil fuel companies (e.g. coal, oil sands), placing a % cap on the exposure to fossil fuel extraction activities and/or excluding all companies involved in extracting and producing fossil fuel reserves (see Box: Examples of asset owners reducing exposure to fossil fuels).
- **Undertake engagement.** Those asset owners that believe it is preferable to assess fossil fuel reserve risks on a case-by-case basis may chose to retain exposure and engage with companies to improve the management of these risks. For example, the Norwegian government pension fund expert group recommended active ownership and integration into investment risk analysis, rather than automatic divestment. Subsequent to this recommendation, the fund announced it had sold its stake in 40 coal companies because of the risk inherent in such holdings, illustrating how engagement, integration and reducing exposure where the risk is considered to be high can work in tandem within a fiduciary framework[15].

REDUCE EXPOSURE TO GHG EMISSIONS

Asset owners can reduce their exposure to GHG emissions associated with their investments in a number of ways. Examples include:

- **Reduce carbon intensity relative to the conventional benchmark.** Active investors could maintain a traditional benchmark for existing and new investment mandates, while also measuring reductions in carbon foot print and intensity. This could also be used as a basis for engagement with fund managers and/or underlying companies as part of reducing the carbon intensity of portfolios.
- **Replace existing benchmarks.** Asset owners could change benchmarks where there is a suitable benchmark that has lower carbon intensity. The availability of low carbon/climate themed benchmarks is still at an early stage but has expanded over recent years (see *Box: Examples of low carbon indices*). Asset owners that are considering replacing existing benchmarks with low carbon

EXAMPLES OF ASSET OWNERS REDUCING EXPOSURE TO FOSSIL FUELS:

The Rockefeller Brothers Fund adopted a 2-step process to divest from fossil fuel investments. The immediate focus is on limiting exposure to coal and tar sands, with the goal to reduce its investments to less than 1% of the total portfolio by the end of 2014.

The Stanford University endowment fund will no longer invest in publicly traded companies whose principal business is the mining of coal for use in energy generation.

The Dutch asset manager ACTIAM set a 70% cap for coal usage by utility companies.

The Norwegian life insurance company Storebrand will no longer invest in 23 fossil fuel companies that have the highest share of power generation from coal.

APPROACHES TO CLIMATE CHANGE THEMATIC BENCHMARKS:

1. Minimise carbon footprint through re-weighting cap weighted index. These tend to retain a 10-12% exposure to oil and gas and may not be in line with 2°C outcome.
2. Exclude fossil fuel industry groups. This may produce a high tracking error and reduce portfolio diversification.
3. Pure play clean technology indices. High volatility, mixed performance and may reduce portfolio diversification.
4. Fundamental index energy technology weighting. May produce high tracking error, complex, new data requirements, not yet developed.

Source: 2° Investing Initiative (2014)

alternatives would need to assess the risk/return implications, the correlation with other portfolio assets and the performance of such indices under different scenarios.

Recent studies[16] have evaluated a number of equity indices that are 'carbon tilted' or reflective of climate change in their construction, with four main approaches emerging (see *Box: Approaches to climate change thematic benchmarks*).

B. ACTIONS TO INCREASE EXPOSURE TO THE LOW CARBON ECONOMY

EXAMPLES OF LOW CARBON INDICES:

S&P/IFCI: Carbon Efficient indexes, various

FTSE: Carbon Strategy indexes, various

MSCI: Low Carbon Indexes, various

Environmental Tracking: ET Carbon Indexes, various

HSBC: Low Carbon Energy Production Index

UBS: Europe Carbon Optimised Index

BofA Merrill Lynch: Carbon Leaders Europe Index

NYSE Euronext: Low Carbon 100 Europe Index

China Securities Index: China Mainland Low Carbon Economy Index

EVALUATE OPPORTUNITIES

In response to investor concerns about climate change and the transition to a low carbon, clean energy economy, a wide range of mitigation investment opportunities are available across asset classes. There are opportunities that are potentially suitable for all types of asset owners, with a choice of investments in liquid/illiquid, small/large sized funds, direct investments, public sector partnership investments, segregated/pooled mandates, active/passive including best in class, internal/externally managed and listed/unlisted assets. A summary of some low carbon, clean energy and energy efficiency opportunities are provided in Figure 6[17].

Figure 6: Mitigation opportunities, drivers, investment risks and vehicles

Renewable energy

OPPORTUNITIES:

Renewable energy generation
Renewable energy distribution & management
Renewable energy storage

DRIVERS:

Government policy
Rising demand for energy
Falling cost of renewable technologies
Rising extraction costs of fossil fuels
Depleting fossil fuel stocks
Energy security pressures

INVESTMENT RISKS:

Government policy
Technology risk
Concentrated sector risk
Sensitive to fossil fuel prices
High beta
Smaller firm bias in listed assets
Project risks in project based assets

INVESTMENT VEHICLES:

Fixed income (green bonds; securitised bonds; covered bonds)
Listed equity (active & passive funds including best in class)
Private equity (funds & fund of funds)
Infrastructure (funds, project equity, project debt)
YieldCos
Partnerships with development banks, IFIs, government agencies
Energy security pressures

Energy efficiency

OPPORTUNITIES:

Buildings
Industry
Transport
Information & communications technology

DRIVERS:

Energy efficiency policies
Competitive drive to cut costs
Manage rising input costs due to resource scarcity
New technology advancements
Data storage technology
Consumer choice/demand

INVESTMENT RISKS:

Policy risk
Potential delay / uncertainty in return on investment
Technology risk
Operational risk
Smaller firm bias in listed assets
Project risks in project based assets

INVESTMENT VEHICLES:

Fixed income (green bonds; securitised bonds; covered bonds)
Listed equity (active funds & indices including best in class)
Private equity (funds & fund of funds)
Infrastructure (funds, project equity, project debt)
Partnerships with development banks, IFIs, government agencies

Waste

OPPORTUNITIES:

Waste minimisation and control
Waste material recycling
Water recycling
Environmental pollution control

DRIVERS:

Waste management regulations
Cost savings on resource use and recovery
Food waste reduction (estimates of 30-40% waste between harvest and consumption)
Advances in waste management, waste water, waste to energy

INVESTMENT RISKS:

Operational risk
Technology risk
Policy risk
High capex requirements
Smaller firm bias in listed assets
Project risks in project based assets

INVESTMENT VEHICLES:

Fixed income (green bonds; securitised bonds; covered bonds)
Listed equity (active funds & indices including best in class)
Private equity (funds & fund of funds)
Infrastructure (funds, project equity, project debt)
Partnerships with development banks, IFIs, government agencies
Real Assets (including infrastructure and real estate)

Forestry

OPPORTUNITIES:

Plantation forestry
Managed natural forests
Carbon sequestration

DRIVERS:

Policy (REDD and REDD+, green procurement and building policies)
Population growth and deforestation
Consumer demand for greener materials
Scarcity in supply
Low correlation with economic fluctuations
Inflation protection

INVESTMENT RISKS:

Illiquidity (for unlisted)
Timber price changes / log values & land value
Policy risk, land tenure agreements
Risk of political interference
Social risk, where community pressure against timber plantations could impact on operational efficiency
Environmental – natural hazards (fire, floods, drought)

INVESTMENT VEHICLES:

Listed equity (active & passive funds including best in class)
Unlisted timberland/forestry (funds & direct)

Agriculture

OPPORTUNITIES:

Sustainable agriculture

Resource efficiency

DRIVERS:

Rising demand due to population and middle class

Pressure to increase farm yields, increase meat production

Policy drive to reduce emissions as agriculture and land-use change account for 1/3rd of GHG emissions

Reduce chemical inputs and energy use in farming systems, promoting the efficient use of water, the use of complementary planting/permaculture

INVESTMENT RISKS:

Global demand and commodity price exposure

Increased uncertainty for crop yields across regions

Increase in rainfall variability and depletion of water

Rising fertiliser costs

Higher transport costs reduce margins

INVESTMENT VEHICLES:

Listed equity (active funds & indices including best in class)

Unlisted specialist agriculture (funds & direct)

Unlisted specialist resources (funds & direct)

MATCH OPPORTUNITIES TO EXISTING SAA TARGETS

To help identify the opportunities that best fit within the existing portfolio mix and constraints, asset owners can undertake a cross section analysis of the opportunities by asset class and map that to the SAA target ranges that are in place. There may be asset classes and mandates within the existing portfolio that are under review for various reasons, which could open up the potential for the replacement of some fund managers with those that might have greater skills and expertise in mitigation investment. Likewise, there may be segments of the portfolio that are at the lower end of the SAA target return range that also correspond to the asset classes where there are attractive opportunities. Some actions asset owners can take as part of this review process:

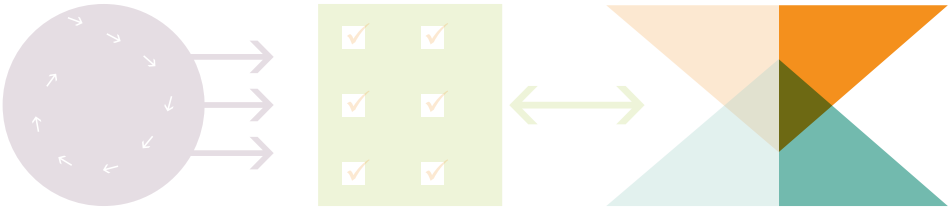
- Match areas where climate mitigation opportunities could be increased within the fund's existing SAA targets and portfolio structure.
- Consider "pilot" investments in climate solution strategies to build experience with new and emerging opportunities.
- Set and agree priority areas for the fund to gather information on the investment universe and potential opportunities.
- Ask asset managers and investment consultants to investigate and present opportunities in the priority areas.
- Consider replacing fund managers/mandates where new opportunities better manage climate mitigation risk/return than existing mandates.
- Report the fund's exposure to the opportunities in the Low Carbon Investment registry http://globalinvestorcoalition.org/form-page/
- Review and report on these priorities and outcomes on an annual basis.

As part of this exploration, asset owners will at the very least become more familiar with the range of mitigation investment opportunities that are available across asset classes. Where a potentially suitable fit emerges within an asset class, investors can set as a priority to evaluate funds and undertake due diligence for further consideration.

EVOLVE SAA TARGETS TO CAPTURE FURTHER OPPORTUNITIES

Asset owners may undertake a broad assessment of low carbon, energy efficient opportunities and conclude that the best opportunities from a portfolio wide, risk/return perspective are in asset classes for which the fund is either at its maximum target range already, or where it has not yet set a target exposure to that asset class at all. If it is the former, there may be potential to prioritise an inclusion of mitigation opportunities in the event that a fund manager is replaced in the future, or if the target ranges are changed. Likewise, in the case where the opportunities might be in asset classes for which a fund has no SAA target, a fund could define some trigger points to review its broader stance on the asset class and therefore open the door for future inclusion of mitigation opportunities. Some possible actions to help guide this process include:

- Identify areas where the SAA targets and portfolio structure might need to evolve in the future.
- Ask asset managers and investment consultants to investigate and present opportunities in the priority areas.
- Discuss and identify potential 'trigger points' for the fund to consider altering its SAA targets.
- Agree to review these considerations on an ongoing basis.



Section 4: Adaptation investment actions

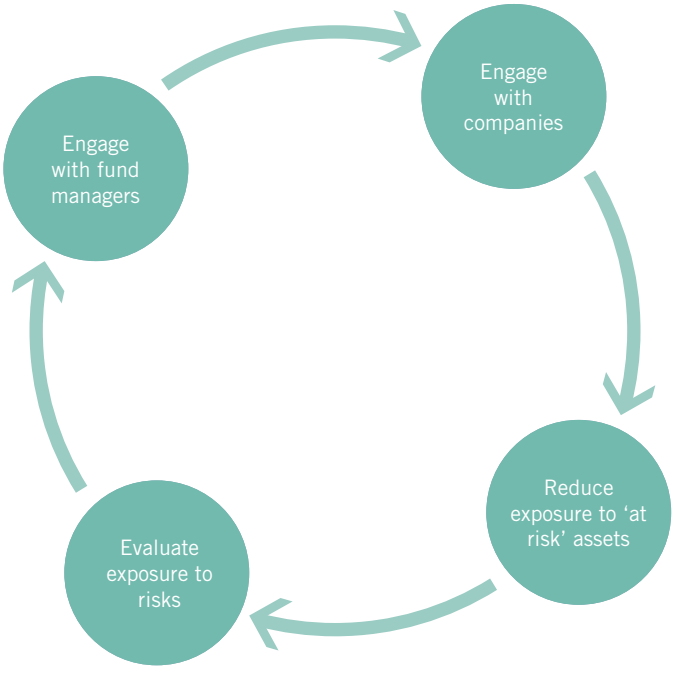
Adaptation investment actions refer to all activities that improve the resilience of an investment portfolio to the physical impact of climate change. Climate change and extreme weather events are impacting on agriculture and food supply, infrastructure, precipitation and water supply in ways that are only partially understood. This places some existing infrastructure, business models and assets at risk, and also produces new opportunities in adaptation solutions and climate resilient infrastructure.

This section discusses ways that asset owners can reduce the vulnerability of their existing assets to the physical impact of climate change, in addition to investing in new opportunities that will improve the resilience of the portfolio in the future.

A. ACTIONS TO REDUCE CLIMATE VULNERABILITY OF EXISTING ASSETS

The investment industry has focused more of its attention on mitigation than adaptation actions, perhaps due to the belief that the impacts might be a long way into the future, the uncertainty of generating a sufficient investment return on the expenditure, as well as the assumption that a policy and/or technological solution might emerge in time to avoid large-scale climate change impacts from occurring. However, as the IPCC Fifth Assessment Report concluded, climate change is already evident today and its impact indicates a significant lack of preparedness for climate variability. This lack of preparedness, together with continued delays in concerted policy action, makes it is essential for investors to reduce the vulnerability of their investment portfolios to the physical effects of climate change.

The following discussion presents a number of actions that investors can take to do this.



EVALUATE EXPOSURE TO RISKS

Consideration of the exposure of an investment portfolio to the physical impacts of climate change will become an increasingly important component of an asset owner's risk management process. The assets that are most vulnerable to climate change are likely to be embedded within investment mandates across asset classes and may not be immediately identifiable. For example, some 'real' assets may be at high risk from climate change impacts including property, timberland, agriculture and infrastructure assets such as telecommunications, power plants, coastal oil refineries, ports, airports, roads, railway (see *Box: Examples of managing exposure to 'real' assets*). Likewise some assets within listed equity, sovereign bonds and credit portfolios will be impacted by climate change to the extent that the issuer and/or country is exposed, prepared for, and managing, its impact (see *Box: Climate change and sovereign risk*).

EXAMPLES OF MANAGING EXPOSURE TO 'REAL' ASSETS:

Australian Super commissioned an engineering firm to complete an in-depth risk assessment of its six largest infrastructure assets to climate change impacts. The study identified the components of the asset responsible for the generation of investment returns and modeled each component using a variety of climate change scenarios and data supplied by CSIRO.

PRUPIM reviewed its flood risk assessment process. The rating of every UK property was cross-referenced against the Environment Agency's flood risk databases to ensure that its managers understood the flood risk levels for each asset. Where a property was determined to have an elevated flood risk, this triggered engagement with property and facility managers to ensure they were both aware of the risk level and understood potential mitigation measures.

Source: Global Investor Survey on Climate Change (2013)

CLIMATE CHANGE AND SOVEREIGN RISK:

Standard and Poors (2014) reported climate change to be a global mega trend for sovereign risk. While it has not yet revised the rating of a sovereign, it highlighted 3 main ways in which climate change could impact on creditworthiness:

1. **Economic growth:** changing crop yields, reduced productivity of workforce, damage to infrastructure and degree of dependence on fossil fuels.
2. **External liquidity:** trade imbalances and terms of trade shifts reflecting shift in demand and supply of fossil fuels, changing demand and supply of agriculture products.
3. **Fiscal impacts:** possible falling tax revenues for fossil fuel dependent economies, increased expenditure on disaster recovery and emergency support.

Source: Standard & Poors (2014), "Climate Change Is A Global Mega-Trend For Sovereign Risk"

Annex B summarises some of the key climate change impacts and sources of information to assist asset owners in identifying the sectors and types of assets in climate vulnerable locations within their portfolio. By way of illustration, Figure 7 reproduces the OECD's assessment of the sectoral risks to climate change impacts.

Figure 7. Potential sectoral risks to climate change impacts

GOODS PRODUCING SECTORS	MANUFACTURERS	**Physical risks:** Disruption to operations due to extreme weather events; damage to infrastructure; restrictions to production due to rising temperature, variations in water quality and in water availability.
	AGRICULTURE AND MINING BUSINESSES	**Physical risks:** Extreme weather events increase physical risks to business operations; risk of overflow storage due to increased rainfall; resource extraction could be limited by sea level and water availability. **Supply chain and raw material risks:** Water scarcity affects production. **Product demand risks:** Changes in quality, quantity and type of agricultural products. **Logistics risks:** Risks to the transport corridors and transport hubs from where raw materials are processed and exported.
GOODS AND SERVICES PROVIDING SECTORS	RETAILERS AND DISTRIBUTORS	**Physical risks:** Damage to products during transportation due to extreme events. **Supply chain and raw materials risks:** Interruption, inefficiency or delays in supply chain; difficulties with water scarcity and increased fuel prices. **Reputational risks:** Decrease in product quality affecting reputation and consumers' satisfaction.
	TRANSPORTATION	**Physical risks:** Extreme weather events causing delays, supply disruptions and losses of goods; access to transport routes affected by flooding, permafrost thawing and mass movements, subsidence due to drought.
	UTILITIES	**Physical risks:** Disruptions of supply due to flooding or extreme events; business interruption due to extreme weather. **Supply chain and raw materials risks:** Reduced output due to water scarcity impacting hydropower and power plants using a thermal plant cooling system. **Product demand risks:** Demand effects due to temperature changes. **Regulatory risks:** Increasing pressure to conserve water in water scarce areas.
SERVICES PROVIDING SECTORS	FINANCIAL BUSINESSES	**Financial risks:** Risks in investment portfolio where investments are made in areas with climate vulnerabilities; increased risk of customer default.
	INFORMATION BUSINESSES	**Physical risks:** Disruptions of operations due to extreme weather events; difficulties in transportation.
	REAL ESTATE BUSINESSES	**Physical risks:** Delays and disruptions in construction projects; damage to buildings and drainage problems; additional costs due to temperature changes increasing cooling loads. **Regulatory risks:** Changes in building and design requirements. **Financial risks:** Loss of value due to climate change impacts.
	OTHER SERVICE BUSINESSES	**Product demand risks:** Tourism industry affected in its infrastructure and by changes in tourism demands caused by different climatic conditions.

Source: Agrawala, S. et al. (2011), "Private Sector Engagement in Adaptation to Climate Change: Approaches to Managing Climate Risks", OECD Environment Working Papers, No. 39. In addition to those listed above other risks include: Manufacturers: supply chain disruption; Utilities: power line outage, power plant cooling water impairment, increased electricity demand for air conditioning; Oil & gas: storm damage to offshore oil platforms and coastal refineries.

ENGAGE WITH FUND MANAGERS

Asset owners can evaluate and engage with fund managers and investment consultants about their awareness and management of climate change impacts as part of the due diligence and monitoring process (see *Box: Examples of questions to ask fund managers about climate vulnerability*).

Areas on which asset owners can engage include:

- **Exposure.** Ask the underlying fund managers about their process and assessment of climate change impacts for the most highly exposed assets, both in terms of how they assess new opportunities and manage existing assets[18].
- **Disclosure.** Request fund managers to report their activities and assessment for the most 'at risk' assets.
- **Real assets.** For mandates in real estate, infrastructure and other 'real' assets, incorporate criteria to assess the capabilities of fund managers in measuring and managing the physical risks of climate change.
- **Financial assets.** For mandates in more liquid, financial assets, such as listed equities and fixed income, ask fund managers how they evaluate the preparedness of investee companies and/or issuers to climate change and to demonstrate that this has been taken into account.
- **Collaboration.** Consider the extent to which the fund manager engages with other investors or industry groups in raising standards of awareness and the management of climate change adaptation.

ENGAGE WITH COMPANIES

Asset owners can engage with companies to evaluate their exposure to the physical risks due to climate change, including weather and event risks, supply chain and raw material risks, reputational risks, product demand and regulatory risks. Engagement can also explore the company's adaptation strategies, management processes, potential financial implications and its stance towards climate policy[19].

Asset owners can do this by engaging with companies on the following:

- **Process.** Ask companies about their process for incorporating climate change adaptation into their strategic and operational processes (see *Box: Examples of questions to ask companies to reduce climate vulnerability*)[20].
- **Disclosure.** Encourage companies to publicly report their adaptation assessment and management activities (such as the CDP survey[21]) and adaptation cost estimates.
- **Policy position.** Explore the company's stance on climate policy, including the extent to which they support or resist climate change policies at the national and international level.
- **Collaboration.** Evaluate the extent to which companies are joining forces with others (companies, stakeholder groups, industry bodies) to encourage higher standards of climate change adaptation.

EXAMPLES OF QUESTIONS TO ASK FUND MANAGERS ABOUT CLIMATE VULNERABILITY:

1. To what extent do you consider the direct physical impacts of climate change and related changes in sustainability policy and regulation throughout the investment cycle?
2. What mechanisms are in place to embed the climate and sustainability risks in the buy, hold and sell decisions?
3. Where there is exposure, to what extent do you consider reinsurance and insurance companies to understand the physical implications of climate change and report on how you manage those risks?
4. Related to above, how will exposure to coastal assets be managed as insurance premiums rise or protection is no longer available?

Source: Adapted from IIGCC (2014) Protecting Value in Real Estate and GIC members

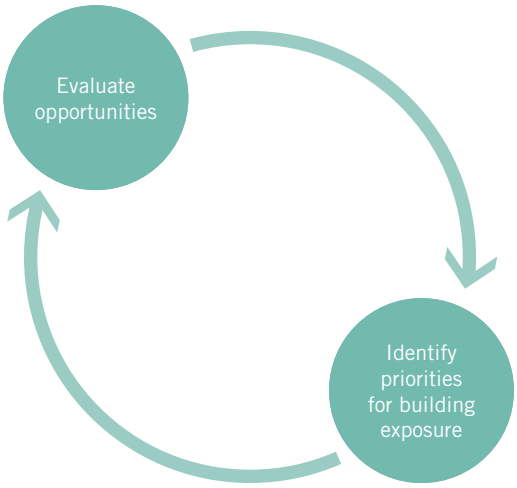
REDUCE EXPOSURE TO 'AT RISK' ASSETS

Ultimately asset owners may decide to reduce or remove exposure to the companies and/or assets they have exposure to if they are not satisfied that the climate impact risks are being appropriately managed by the fund manager and/or company in question. Where the asset is part of a pooled or unlisted fund, it may be difficult to liquidate just a few assets and may require replacing the entire mandate if the balance of risks is considered high enough to support such action.

B. ACTIONS TO BUILD EXPOSURE TO ADAPTATION OPPORTUNITIES

Despite the large investment needs in adaptation, private sector investment is not tracked or measured in a systematic way and as such, public sector financing appears to dominate investment flows[22]. However, adaptation investment is likely to emerge as a growing opportunity for asset owners as the size of the financial flows will potentially be very large. Many of the regions requiring investment capital represent new potential markets for investors and there is a strong public policy imperative to mobilise capital toward adaptation that could help to improve the risk/return profile for investors.

Some of the actions that asset owners can take to build exposure to adaptation investment opportunities are discussed below.



EXAMPLES OF QUESTIONS TO ASK COMPANIES TO REDUCE CLIMATE VULNERABILITY:

1. How do you evaluate climate change adaptation risks? e.g. physical risks, supply chain and raw material risks, reputational risks, financial risks, product demand risks, regulatory risks, and litigation risks.
2. Do you describe adaptation strategies as part of your overall climate strategy?
3. What are the potential financial implications of any identified physical climate impacts?
4. What are the adaptation practices - management processes, methods and costs?
5. Do you engage with policy makers on adaptation? i.e. Are you involved in positive or negative campaigns for policy action?

Source: Adapted from CDP (2012) Insights into climate change adaptation by UK companies

EVALUATE OPPORTUNITIES

Most of the investment vehicles available for asset owners to address climate change concentrate on the mitigation opportunities. Where adaptation is part of the strategy it may not be made explicit as a proportion of invested capital. Moreover, adaptation expenditure will likely be a component of an investee company and/or underlying entity's activities and may not be made explicit as 'adaptation' related. Despite these challenges, the drivers that are likely to encourage the development of investment vehicles suitable for asset owners include:

- **Growing needs.** Global estimates for adaptation investment needs are in the range of US$70 – US$100 billion per annum to 2050 (World Bank, 2010). The UNEP Adaptation Gap Report (2014)[23] extended this estimate to all developing countries and estimated that adaptation flows could climb as high as US$150 billion per year by 2025/2030 and to US$250 billion – $500 billion per year by 2050[24].

- **New regions and markets.** The UNEP Adaptation Gap Report highlights that Least Developed Countries and Small Island Developing States are likely to have greater adaptation needs, which could be an opportunity for asset owners who do not have exposure to frontier markets, some of which could have attractive diversifier features[25].

- **The policy imperative.** In response to the growing need for adaptation finance, a number of public sector funds and financing vehicles have been developed at the national and international level that create a strong motivation and need for governments to work in partnership with the private sector to attract capital. This opens the potential for asset owners to explore investment partnerships and risk sharing arrangements with the public sector, development banks and international financial institutions.

Figure 8 summarises the investment opportunities, drivers, risks and investment vehicles related to adaptation investment. Some of the opportunities are presented as an extension to the OECD's sectoral climate risks as summarised in Figure 7. In addition to these sectors, some public infrastructure, goods and services will also need to undergo repair, rebuilding and capital expenditure. At present, the investment vehicles are not pure-play adaptation opportunities and are therefore referred to as 'embedded exposure' within a broader mandate.

Figure 8. Adaptation opportunities, drivers, investment risks and vehicles

Resilience in goods producing sectors

OPPORTUNITIES:

Manufacturing (plants, operations, planning)
Agriculture (product type, methods, distribution)
Mining (plants, operations, planning)

DRIVERS:

Increased flood risk from rising sea level
Change water quality & availability
Extreme weather disruptions to operations
Damage to infrastructure
Supply chain disruptions
Change resource extraction quality, quantity & type

INVESTMENT RISKS:

Weather uncertainty
Capex versus cost savings
Government policy
Technology risk
Project risks

INVESTMENT VEHICLES:

Green bonds
Project bonds
Listed equity (embedded exposure)
Private equity (embedded exposure)
Infrastructure (embedded exposure)
Agriculture (sustainability focused)
Partnerships with development banks, IFIs, government

Resilience in goods and services producing sectors

OPPORTUNITIES:

Retailers & distributors (stores/systems, planning)
Transport (vehicle upgrade, routes, planning)
Utilities (grid, operations, planning)
Water (unlisted, listed, direct)

DRIVERS:

Store/system flood risk
Damage to product during transport
Extreme weather business disruptions
Damage to infrastructure
Supply chain interruption, inefficiency & delay
Access to transport routes affected by flooding, permafrost thawing, subsistence due to drought

INVESTMENT RISKS:

Weather uncertainty
Capex versus cost savings
Government policy
Technology risk
Project risks

INVESTMENT VEHICLES:

Green bonds
Project bonds
Listed equity (embedded exposure)
Private equity (embedded exposure)
Infrastructure (embedded exposure)
Partnerships with development banks, IFIs, government

Resilience in services producing sectors

OPPORTUNITIES:

Financial businesses (risk assessment, derivatives, insurance)
Information businesses (systems, network, planning)
Real estate (location, design, retrofit, planning)

DRIVERS:

Increased default risk on loans to climate vulnerable locations
Damage to technology & systems
Damage to buildings
Delays in construction projects
Changes in building design regulations
Loss of land value
Changing consumer demand

INVESTMENT RISKS:

Weather uncertainty
Costs versus cost savings
Government policy
Technology risk
Project risks

INVESTMENT VEHICLES:

CAT bonds
Green bonds
Project bonds
Listed equity (embedded exposure)
Private equity (embedded exposure)
Infrastructure (embedded exposure)
Real estate (embedded exposure)
Partnerships with development banks, IFIs, government

Resilience in public infrastructure, goods and services

OPPORTUNITIES:

Resilience in infrastructure, cities and rural communities (city and regional planning, disaster relief)

Public goods (health, education, legal system, transport safety standards, air quality, sewerage and waste disposal, defence, police, fire services, emergency services, flood defence)

Quasi-public goods (roads, bridges, sidewalks, parks, refuse collection, public service broadcasting, street lighting)

DRIVERS:

Policy imperative to build resilience

Threat to public health, safety and security

Public unrest and loss of lives

Damage to infrastructure and essential services

Reduction in standard of living

Loss in economic competitiveness

INVESTMENT RISKS:

Political risk

Public sector budget pressures/policy changes

Short term pressures vs long term needs

Technology risk

Project risks

INVESTMENT VEHICLES:

Green bonds (local, state, national, MDB and IFI)

Infrastructure (embedded exposure)

Real estate (embedded exposure)

Partnerships with local, state and national governments

Partnerships with development banks, IFIs

IDENTIFY PRIORITIES FOR BUILDING EXPOSURE

Asset owners can start to prioritise the adaptation investment opportunities in the markets and regions that best fit with their SAA portfolio mix, investment constraints and risk profile. Some possible actions for asset owners to take as part of this process include:

- Identify areas where climate adaptation opportunities could be built into the fund's SAA existing targets and portfolio structure.
- Set and agree priority areas for the fund to gather information on potential opportunities that embed adaptation solutions within a broader mandate.
- Ask asset managers and investment consultants to investigate and present opportunities in the priority areas, including exploring possible partnerships with the public sector, development banks and international financial institutions.
- Identify possible 'trigger points' for altering SAA targets to include new adaptation opportunities as they become available.
- Review and report on these priorities and outcomes on a regular basis.

Conclusion

This guide presents a range of investment strategies and solutions for asset owners to consider in addressing the risks and opportunities associated with climate change. The guide highlights four areas for asset owners to consider, namely: strategic review; strategic asset allocation; mitigation investment actions; and adaptation investment actions.

The aim of undertaking a strategic review is for asset owners to integrate climate change into their statement of investment beliefs and investment policies with actionable goals and targets. The next stage is to incorporate the beliefs and policies into asset allocation decision-making processes, to match the top down strategic priorities with bottom up implementation actions. This will involve measurement of the fund's exposure to climate change risks and opportunities and consideration of how the portfolio could be changed to mitigate the risks and capture the opportunities, both within the existing asset allocation structure and through evolving the portfolio in the future.

Third, asset owners should consider the relative merit and suitability of the range of mitigation investment actions, both to reduce the carbon intensity of existing assets and to build exposure to low carbon, energy efficient assets. Some of the opportunities across asset classes include renewable energy, energy efficiency in buildings, industrial processes and transport, waste management, timberland, agriculture and resource efficiency. Finally, asset owners can consider the vulnerability of their investment portfolio to the physical impacts of climate change, in order to better manage these risks and also to consider building exposure to climate adaptation solutions. These opportunities include both private and public sector infrastructure, goods and services that will need to undergo repair, rebuilding and capital expenditure to build climate change resilience.

Annex A: Impact of IEA climate change scenarios on asset classes

The IEA scenarios are regularly updated to reflect policy developments in the context of the scientific evidence on climate change, and are accompanied by detailed analysis of the implications of the scenarios at the regional and sector level including the likely future energy mix and technology investment flows[26].

In the IEA's WEO 2014, there are three scenarios: 'New Policies" (the IEA's central scenario), 'Current Policies' (business as usual) and 'The 450 Scenario' (consistent with 2°C). The 450 Scenario is the outcome that international policy makers have committed to, although there is a high degree of uncertainty around whether this goal will be met. In contrast, the New Policies scenario is based on policies that have already been announced and, although not fully implemented, its implications should be priced into specific assets values in the short to medium term as the policy measures take effect.

One of the contentious features of the IEA's 450 Scenario is the assumed deployment of CCS technology on coal and gas-fired power stations. As the IPCC (2014) noted, while all components of integrated CCS systems exist and are in use today by the fossil fuel extraction and refining industry to a limited extent, CCS has not yet been applied at scale to a large, operational commercial fossil fuel power plant. An assumption of widespread adoption is therefore questionable and will need concerted policy action at the national and international levels to realise this level of CCS deployment in the timeframe required. In the event that CCS is not widely deployed, there will be a commensurate need for greater emission reductions through energy efficiency, renewable energy, nuclear, and biofuels and a greater reduction in fossil fuels as a proportion of the global energy mix.

IEA NEW POLICIES SCENARIO (3.6°C OUTCOME):

- IEA's central scenario.
- Increased need to focus on adaptation investment due to inadequate policy response and outcomes.
- Based on policies and measures adopted and new ones proposed as at mid 2014.
- CO_2 price by 2040 at $50/T in Europe; $35/T in China; and $40/T in Canada, US and Japan.
- Modest change in fuel share in world primary energy demand by 2040, with a 5% reduction in oil (to 26%) and coal of 5% (to 24%), a 3% rise in gas (to 24%), a 2% rise in nuclear (to 7%) and a 5% rise in renewables (to 19%).
- CCS assumption: 4% total coal-fired electricity generation equipped with CCS by 2040.

IEA 450 SCENARIO (2°C OUTCOME):

- Significant mitigation investment flows due to strong policy response, with adaptation needs also growing to address the impact of 'locked-in' emissions.
- An energy pathway consistent with a 50% chance of meeting the goal to limit the rise in long-term average global temperature to 2°C compared with pre-industrial levels.
- CO_2 price by 2040 at $140/T in Europe, US, Canada, Aus/NZ, Korea and Japan; $125/T in China, Russia, Brazil, South Africa.
- Significant change in global energy mix to 2040, with a 10% reduction in the share of oil (to 21%), 12% lower share of coal (to 17%), a 1% rise in gas (to 22%), a 6% rise in nuclear (to 11%) and a 16% rise in renewables (to 30%).

- CCS assumption: 80% coal-fired electricity generation equipped with CCS; 22% gas-fired generation from plants fitted with CCS.

The following table summarises the possible impact of IEA's New Policies and 450 Scenarios on a selected range of asset classes. This is provided to illustrate how asset owners might start to consider the way that different climate change scenarios could impact on their investment portfolios.

ASSET CLASS	IEA NEW POLICIES SCENARIO (3.6°C OUTCOME)	IEA 450 SCENARIO (2°C OUTCOME)
LISTED EQUITIES (ACTIVE AND PASSIVE FUNDS)	**Risks:** Policy uncertainty and still low carbon price makes it more difficult for investors to predict and price the low carbon transformation. Passive equity climate solution indices could be adversely impacted by the high uncertainty and pricing risk associated with climate policy and may be more volatile than broader indices. Uneven policy framework could result in thematic benchmark low carbon/EE index solutions underperforming broader market. Stranded asset risk relatively low as policy measures already announced and likely priced (but perhaps not yet implemented so not fully priced in all assets).	**Risks:** Depending on the degree of policy transparency, high carbon price supports low carbon transformation, leading to asset devaluation of high carbon companies and sectors in favour of low carbon solutions, technology deployment. Stranded asset risk of some fossil fuel energy assets (IEA, WEO 2014): Power sector US$120bn; Upstream oil US$130bn; Gas US$ 50bn; Coal US$4bn. The deployment and utilisation of CCS is a crucial swing variable in assessing the likely impact on coal and stranded asset risk. In this scenario the IEA results are based on a massive expansion of CCS by 2040 such that 80% of coal-fired electricity generated is fitted with the CCS technology (compared to only 4% in the New Policies Scenario).
	Opportunities: Actively managed climate aware mandates that select winners in a patchy climate policy environment (and increasingly focus on rising adaptation needs). Active stock picking likely to be superior for capturing transformation as the shift will be less predictable and more sporadic across regions, sectors and companies. New opportunities in companies that provide climate change adaptation solutions to the changing climate may emerge, with risks also increasing for companies whose assets or operations are located in vulnerable locations.	**Opportunities:** Active (broad based sustainability and sector pure play) and passive solutions (sustainability and low emission benchmarks). Depending on the degree of policy visibility, the market will likely price a broad based global shift to low carbon, energy efficient economy; companies with that profile outperform high carbon companies. Investors will be more able to predict policy shifts and impacts, making the transformation possible to capture in both active (low carbon, EE focused funds) and passive (low carbon, climate solution benchmark) mandates.
FIXED INCOME (SOVEREIGN, CREDIT, GREEN BONDS, EMERGING DEBT, PROJECT BONDS)	**Risks:** This scenario is likely to be neutral overall for bonds, although some regions are climate policy leaders and some are laggards so location becomes important for bonds - particularly for high carbon credit issuers operating in regions where climate policy is more progressed and sovereign issuers in countries with high exposure. This could increase the volatility of returns, also in developing regions (emerging debt) with high uncertainty over developed country action and financial support.	**Risks:** Heavily dependent fossil fuel economies likely to face higher budget deficits as a result of dramatic policy measures that reduce economic growth and tax revenues from fossil fuel industries. Lower volatility likely in low carbon sovereign, credit and emerging debt issuers, as climate mitigation policy is strong, transparent and anticipated hence less uncertainty.
	Opportunities: Green bonds and climate project bond issuance grows steadily over time and start to feature more in institutional bond portfolios; although the pace and growth is slowed down by lack of climate policy action. Adaptation becomes growing feature of issuers (together with mitigation). Likely to remain individual issuers within fixed income mandates than pure-play mandate.	**Opportunities:** Green and climate bond issuance proliferates, becoming a core component of a fixed income asset mix, embedded into core mandates and also available as thematic mandates. In addition to credit issuers in large companies, private debt and project based financing targeting small and medium sized enterprises and projects that focus on low carbon, energy efficiency opportunities.

ASSET CLASS	IEA NEW POLICIES SCENARIO (3.6°C OUTCOME)	IEA 450 SCENARIO (2°C OUTCOME)
PROPERTY (DIRECT, LISTED FUNDS, UNLISTED FUNDS)	**Risks:** Risk of re-pricing of some property assets in core property portfolios, due to higher water costs, increased cooling/ heating needs due to increased weather variability and higher energy insecurity. Risk of flooding and extreme weather conditions could place some assets at risk and lead to location discounts/premiums in rental incomes and insurance costs.	**Risks:** Core property that is poorly rated on energy efficiency standards is likely to underperform highly rated assets. Older property assets likely to need capital injection to improve energy efficiency through deployment of new technology, retrofit and migration to renewable energy sources.
	Opportunities: Sporadic investment in property portfolios, with ongoing investment in energy efficiency and upgrades gradually improving the sustainability profile of core property portfolios. Core property portfolios will have a rising proportion of highly rated energy efficiency assets, although funds focused purely on 'green' property assets likely to remain at the fringe. Appraisal of, and measures to improve, resilience of property assets to climate change events, such as flood and fire resilience, physical building location appraisal, engineering and systems management 'climate event' solutions.	**Opportunities:** Green property mandates become a core part of property asset mix, both as standalone mandates and integrated assets into core mandates (the shift will take place over a number of years). Massive deployment and full commercialisation of energy and water efficiency in buildings, particularly in buildings where considerable energy savings can be made such as high-rise office buildings, high-profile uses such as retail centres and urban in-fill sites. More efficient cooling systems and appliances, retrofitting and new building standards. Fitting of technology such as heat pumps, solar power and water heating.
PRIVATE EQUITY (DIRECT, UNLISTED FUNDS, FOFS)	**Risks:** As for listed equity, the low carbon price and high climate policy uncertainty increases volatility in PE. Sectors with high carbon sensitivity more volatile including energy, transport, buildings, water/waste. At the global level, the energy mix is expected to change only modestly from 2012 to 2040 in this scenario, with fossil fuels remaining the dominant supplier of energy demand. As a result, the renewable energy PE market is likely to grow modestly as a proportion of the aggregate PE funds investable universe and be volatile due to high climate policy risk.	**Risks:** High carbon PE assets likely to underperform and suffer re-pricing due to concerted policy action at the international level. Core PE portfolios with low exposure to low carbon, energy efficient assets likely to underperform. Reduced uncertainty around climate policy will support a more broad based low carbon/energy efficiency component of PE exposure. These may be both specialist mandates and integrated solutions into core mandates (as for other asset classes, the evolution will take place over time).
	Opportunities: PE funds likely to embed more mitigation opportunities in countries that are reducing emissions and implementing policies, notably the EU (emissions already peaked), China (emissions to peak soon after 2030) and the US (emissions peak before 2020). Due to disparate policy response and higher uncertainty, the opportunities likely to require public sector financial measures at the asset level to attract private capital. Some adaptation opportunities will also emerge in developing countries to build climate resilience, likely in collaboration with development banks, local governments and supporting agencies.	**Opportunities:** Public policy framework at national and international level reduces need for asset specific measures to attract private capital. A more dramatic change in the energy mix in favour of renewables and away from fossil fuels will likely support a proliferation of new PE funds and fund of funds focused on low carbon, EE and adaptation opportunities (both venture and buy-out as higher carbon assets are re-priced). Core PE portfolios will reflect the shift in asset values and investment flows, with a combination of pure play low carbon/EE funds, alongside asset specific opportunities within core mandates.

ASSET CLASS	IEA NEW POLICIES SCENARIO (3.6°C OUTCOME)	IEA 450 SCENARIO (2°C OUTCOME)
INFRASTRUCTURE (DIRECT PROJECT EQUITY/DEBT, LISTED FUNDS, UNLISTED FUNDS)	**Risks:** Policy and regulatory uncertainty increase the risk attached to replacing aging assets and developing new assets associated with decarbonising the global economy. Some portfolio assets may be at risk if located in climate vulnerable locations, requiring asset re-pricing and/or relocation.	**Risks:** Policy and technology advancements could reduce the value of some existing infrastructure assets that are less suitable in a low carbon world, or in extreme cases it could render some infrastructure assets redundant (e.g. coal power stations not compatible with CCS). Increased use of public transport owing to rising cost of carbon could reduce vehicle and road usage.
	Opportunities: Mitigation opportunities focused on low carbon, energy efficiency in energy, transport, water/waste. Direct, fund and FOF opportunities in partnership to mobilise public sector finance; offset uncertainties and attract private finance in environment of sporadic climate policy, low carbon price. Replacement of assets or construction of new assets as part of adapting to climate change. Developing economies could be better placed to build the future, low carbon energy and transport solutions than the developed markets where replacement of aging and out-dated assets could be costly and undermine existing asset valuations.	**Opportunities:** Replacement of aging assets and provision of new assets associated with decarbonising the global economy. Direct investments, pure-play funds, FOF in energy, transport, water and waste. Increased exposure to greenfield assets and upgrade/improvement to brownfield. Energy: wind, wave, tidal power, nuclear, CCS, transmission and distribution networks, decentralised electricity and heat generation, additional fuel capacity storage, electric vehicle recharging points. Transport: replacing roads, rail and bridges, sustainable drainage systems, electrification of rail and overhead electrical lines, electric cars and battery charging and replacement points, road surfacing, improved draining and flood protection measures and larger berths and improved port design. Water/waste: Underground reservoirs, membrane treatment, biogas, desalination plants, recycling facilities.

Source: Compiled by the author drawing on a number of sources including: IEA WEO (2014); IEA WEIO Special Report (2014); IPCC AR5 (2014); Mercer Climate Change Scenarios (2011); OECD Pension Fund Investment in Infrastructure (2013); Ceres Clean Trillion report (2014); University of Cambridge sector specific IPCC Briefings, Understanding Climate Science (2014); IGCC sponsored research on sector risks and opportunities (various reports).

Annex B: The physical impact of climate change

The Intergovernmental Panel on Climate Change (IPCC) assessment provides a synthesis of the current state of scientific knowledge on climate change. It is influential in climate policy discussion forums such as the UN Framework Convention on Climate Change (UNFCCC). The IPCC Fifth Assessment Report noted that without substantial efforts to curb GHG emissions, global temperatures by the end of the 21st century could be more than 4°C above what they were before the industrial revolution. The University of Cambridge produced a briefing paper summarising the IPCC report and the implications for investors and financial institutions. The key points included:

- Climate change will affect all sectors of the economy, and is relevant to investors and financial institutions. However, not all macroeconomic changes and microeconomic conditions will apply equally to all investments.

- There are risks and opportunities associated with policy measures directed at reducing greenhouse gas (GHG) emissions. To meet the internationally agreed target of keeping the global average temperature rise since pre-industrial times below 2°C, patterns of investment will need to change considerably. This will include significant decreases in investment in fossil fuel extraction and conventional fossil fuel-based power generation, and significant increases in investment in low-carbon energy and energy efficiency.

- Physical impacts of climate change will affect assets and investments. Climate change and extreme weather events will affect agriculture and food supply, infrastructure, precipitation and the water supply in ways that are only partially understood.

- Decisions made by private sector investors and financial institutions will have a major influence on how society responds to climate change.

- There will be significant demand for capital, with governments looking to the private sector to provide much of it.

Some examples of additional references and materials available at the international level:

- A summary of the physical science of climate change its projected impacts based on the IPCC 5th AR as summarised by the University of Cambridge.

- The OECD's research on adaptation to climate change.

- The World Bank report series entitled "Turn Down the Heat: Why a 4°C Warmer World Must Be Avoided", to name but a few.

Some examples of further reports at the national or regional level:

- US Global Change Research Program, National Climate Assessments.

- European Environment Agency.

- UK Department of Energy and Climate Change collection of documents and research.

- CSIRO Climate Change and Adaptation research program in Australia.

- World Bank research on climate change impacts on Africa, Asia and coastal poor.

Annex C: Measuring portfolio carbon emissions and carbon intensity

Measuring carbon emissions and carbon intensity, often referred to in the industry as 'carbon foot printing' - offers a way for investors to quantify and measure carbon emissions associated with different assets. It is also a useful resource to set carbon emission reduction goals, to manage carbon risk and to communicate strategies to managers and members/beneficiaries. In view of this, it is imperative that the industry is familiar with the different approaches and methodologies that exist in carbon foot printing, to mobilise action and improve understanding and interpretation of results.

SOME OPEN QUESTIONS[27]

Company Greenhouse Gas (GHG) Emissions Data – Company emissions are generally considered to be Scope 1 (direct) emissions, and Scope 2 (e.g. emissions associated with generation of electricity they use). Scope 3 emissions include emissions associated with a company's products, and is generally most significant for sectors such as fossil fuel producers.

Financed Emissions – There is increasing interest in "financed emissions", for example relating to banks' loans to fossil fuel producers. These are not included in banks' Scope 1 + 2 emissions.

Double Counting – Hypothetically, emissions might be counted six times. Within an equities portfolio a coal miner's Scope 3 emissions could be the power generator's Scope 1 emissions and the industrial electricity user's Scope 2 emissions. These emissions might be 100% attributed to equity investors, but then also inadvertently counted again as part of a debt portfolio's footprint.

Emissions Per What? – A portfolio footprint might be calculated by taking each company's annual emissions x the fund's percentage holding, aggregating the total, and then deriving CO_2 equivalent emissions of the portfolio per $m of market capitalisation. This emissions intensity could be compared with the index's carbon intensity (CO_2e/$m). Alternatively, an investor might chose to footprint on the basis of emissions intensity per unit of turnover, EBITDA, or relate emissions to a given $ amount invested in the portfolio.

Debt vs. Equity – Should all emissions be attributed to equity investors in a company, or should emissions be pro-rated on the basis of E/(D+E)?

IIGCC WORKSHOPS

IIGCC is hosting regular carbon footprinting workshops, inviting three research providers (Trucost, MSCI ESG and Southpole Carbon) to analyse the carbon footprint of a global equity portfolio of 100 companies against MSCI ACWI, present methodologies and discuss issues such as product-related, financed and future emissions. There are some sector deviations within the benchmark used, such that it is overweight in chemicals and utilities and underweight in resources and oil and gas. Across the two meetings held so far, investors from over 60 organisations have gathered to evaluate methods to measure the carbon content of their portfolios, and discuss how to use this data for greatest impact. A summary of the results and discussion points raised in these workshops are presented below.

WHAT WERE THE RESULTS?

At the most recent workshop, MSCI found the sample portfolio to be 38% more carbon intensive than the benchmark, while Southpole Carbon and Trucost found the sample portfolio to be 20% more and 26% more carbon intensive, respectively.

- Intensity metric used – Carbon intensity can be calculated in a number of ways, eg carbon emissions per unit of revenue or per total market capitalisation. Each metric can introduce certain biases towards certain companies depending on profit margins, commodity prices and equity valuations.

- Company data incomplete – Of the sample portfolio, only 83% of the companies reported their carbon emissions to CDP. While different providers draw from a variety of data sources, companies who do not report their data have to be estimated and different providers will have different sources of data and risk tolerance in extrapolating them.

- Scope 3 emissions – Scope 3 emissions which include emissions associated with a company's products are still largely underreported by companies and will generally shift carbon intensity away from electric utilities towards coal mining, oil & gas and car manufacturers.

- Financed emissions – Participants acknowledged a lack of understanding how this should be measured for financial institutions.

WHAT DID THEY AGREE UPON?

Although there were some differences between research providers in the carbon intensity of the IIGCC sample portfolio versus the benchmark, all three were in agreement that improvements could be made via similar changes in asset allocation strategy and stock selection:

- Sector positions – All three service providers agreed that the bulk of carbon intensity was due to portfolio exposure to energy, utilities and basic resources.

- Company emissions relative to peers – There was agreement between MSCI and Trucost that selecting cleaner companies relative to their peers contributed to reduce carbon intensity.

WHAT ADDITIONAL 'BOLT-ONS' ARE OFFERED?

- Strategy – Metrics aimed at gauging companies' strategy on climate change can be applied at portfolio level to identify leaders and laggards in carbon risk management and reduction strategies, and using this information for decisions on company engagement.

- Proven reserves – Discussions also pointed at the possibility to quantify portfolio exposure to different types of proven reserves and potential emissions relative to the benchmark

- Beyond equities – While this event was primarily focused on the equity portfolio, there was some discussion of quantifying carbon intensity in other asset classes such as infrastructure and fixed income portfolios.

WHERE DOES MORE WORK NEED TO BE DONE?

- Financed emissions – Although current methodologies are capable of measuring the carbon intensity based on company emissions, more work remains to be done in capturing the intensity of emissions linked to financial institutions, for example through corporate and project finance.

- Time horizons – Carbon footprint methodologies are designed to capture the carbon intensity of a portfolio at a given point in time. Significant changes can be expected as a result of changing sector and company exposure, market movements, and companies disposing their holdings of high-carbon assets.

- Better company data – Investors need to communicate the importance of reporting to companies, urging them for example to respond to CDP. Extrapolating data is both expensive and imprecise, and companies should know if they don't report, the estimates may be much higher.

WHERE SHOULD INVESTORS START?

- Gain fluency – Investors are good at discussing price and other metrics, and carbon needs to become one of those.

- Integration – Determining and disclosing the carbon footprint of a portfolio is a vital element of any climate change strategy but that in order to integrate climate risks into stock-selection strategies such data needs to be complemented with other risk indicators.

- Seek climate solutions – There is a need to decrease the carbon risk of their portfolios, but also to invest more in climate solutions.

- Don't wait! – There is an urgent need for investors to think about how to use carbon emissions data.

- Engage – Align the portfolio with a 2 degree climate change outcome.

Footnotes

[1]Including pension funds, insurance companies, sovereign wealth funds, endowments and charities.

[2]http://www.iigcc.org/publications/publication/financial-institutions-taking-action-on-climate-change

[3]Australian law firm Minter Ellison noted that the process of information gathering and deliberation of climate change is critical to satisfying the duty of due care and diligence. As an illustration of the link between climate change and fiduciary duty it referenced the action that Client Earth is launching against the trustees of a UK pension fund for failing in its duty to consider climate change as a material financial issue, http://www.minterellison.com/publications/articles/Institutional-investment-corporate-governance-and-climate-change-what-is-a-trustee-to-do/

[4]http://www.mercer.com/content/mercer/global/all/en/insights/point/2014/climate-change-scenarios-implications-for-strategic-asset-allocation.html

[5]The IPCC defines greenhouse gases as those gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and emit radiation at specific wavelengths within the spectrum of infrared radiation emitted by the Earth's surface, the atmosphere, and clouds. Water vapour (H_2O), carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4), and ozone (O_3) are the primary greenhouse gases in the Earth's atmosphere.

[6]Pension fund or investment fund members are also widely referred to as beneficiaries. Sovereign wealth funds and insurance sector assets may not have 'members' in the same way but will still be accountable to different stakeholders.

[7]This survey is no longer being undertaken although past responses are available online and illustrate the content and information that investors might wish to disclose, http://globalinvestorcoalition.org/global-climate-change-investor-groups-publish-report-on-investor-practices-relating-to-climate-change/

[8]aodproject.net/

[9]For further discussion of investment beliefs see also Ceres (2013) "The 21st Century Investor: Ceres Blueprint for Sustainable Investing", http://www.ceres.org/resources/reports/the-21st-century-investor-ceres-blueprint-for-sustainable-investing/view

[10]Brinson, G., Hood, R., Beebower, G. (1986). 'Determinants of Portfolio Performance,' Financial Analysts Journal, July/August 1986, pp. 39-44. Brinson, G., Singer, Beebower, G. (1991). 'Determinants of Portfolio Performance II: An Update,' Financial Analysts Journal, 47, 3, 1991, pp. 40-48. R.G and Kaplan, P.D (2000). 'Does Asset Allocation Policy Explain 40, 90, or 100 Percent of Performance?' Financial Analysts Journal, 56, 1, pp.26-33.

[11]One of the challenges with engagement is the lack of consistent measurement and reporting of activities and outcomes in terms of their success or effectiveness. New research and tools are emerging as a means to standardise and facilitate reporting of shareholder engagement activities in a consistent and more effective way. See: Croatan Institute (2014), 'The Impact of Equity Engagement: Evaluating the impact of shareholder engagement in public equity investing' http://www.croataninstitute.org/total-portfolio/publication/impact-of-equity-engagement

[12]The effect of mitigation on natural gas export revenues is more uncertain, with some studies showing possible benefits for export revenues in the medium term until about 2050.

[13]Source: IEA Resources or Reserves (2013)

[14]Including various investment broker research reports, specialist research such as IEA, MSCI, Carbon Tracker Initiative, University of Oxford Smith School Stranded Asset Research Programme, as well as investment research providers such as Mercer's SAA research, Towers Watson's research on stranded assets, Cambridge Associates on fossil fuel divestment, to name a few.

[15]https://www.regjeringen.no/en/aktuelt/Report-from-the-Expert-Group-on-investments-in-coal-and-petroleum-companies1/id2342780/

http://ieefa.org/biggest-sovereign-wealth-fund-divests-40-coal-companies/

[16]For example UNEP FI (2013) 'Investor Briefing – Carbon Portfolio' evaluated 13 carbon tilted indices and 2° Investing Initiative (2014) examine benchmark use and bias for managing climate change risk and opportunity

[17]The opportunities are presented to align with the Low Carbon Investment Registry Taxonomy to facilitate AO's in matching the opportunities with their measurement and reporting of portfolio exposure. See: http://www.iigcc.org/files/publication-files/LowCarbonInvestmentRegistryReport.pdf

[18]http://www.iigcc.org/files/publication-files/IIGCC_Protecting_Value_in_Real_Estate.pdf

[19]Agrawala, S. et al. (2011), "Private Sector Engagement in Adaptation to Climate Change: Approaches to Managing Climate Risks", OECD Environment Working Papers, No. 39, OECD Publishing. http://dx.doi.org/10.1787/5kg221jkf1g7-en

[20]ClimateWise (2008), 'Managing the Unavoidable: Understanding the investment implications of adapting to climate change', A joint paper prepared by Henderson Global Investors, USS, Railpen, Insight Investment

[21]https://www.cdp.net/

[22]See for example, the UNEP (2014) The Adaptation Gap Report; as well as various OECD reports on finance sector adaptation, http://www.oecd.org/env/cc/financingadaptationtoclimatechange.htm

[23]http://climate-l.iisd.org/news/unep-launches-adaptation-gap-report-2014/

[24]These estimates are based on the assumption that further action is taken to cut emissions in line with a 2°C outcome and would therefore be considerably more in a higher temperature scenario.

[25]https://www.emfunds.us.assetmanagement.hsbc.com/investing-in-emerging-markets/content/investing-in-frontier-markets.fs

[26]There are also freely available tools that can be used to run scenarios to understand the implications of policy pathways for macroeconomic and investment flows, such as the Witch model [hyperlink: http://www.witchmodel.org/simulator/], whose scenario inputs can be matched to the IEA scenario outputs at the global and regional level.

[27]Excerpt taken from Citi Research Equities, "Portfolio Carbon Foot-Printing: Activity Increasing – Our Perspectives on What, How and Why", 10 October, 2014. The Citi research emphasises that the methodological challenges are more significant if a footprint is seen as an end in itself, rather than if it is a tool derived with a clear application in mind. Reproduced with permission from Elaine Prior.